18
1980

Netherlands Scientific Council
for Government Policy

Reports to the
Government

Industry in the Netherlands: its Place and Future

English edition published in 1982

Netherlands Scientific Council for Government Policy

To: The Prime Minister/Minister for General Affairs
From: The Scientific Council for Government Policy
Re: 'Industry in the Netherlands: its Place and Future'

The Hague, 21 May 1980

Herewith the Scientific Council submits its report 'Industry in the Netherlands: its Place and Future'. This report forms the outcome of a comprehensive study which examined in detail the Government's policy options with regard to Dutch industry. The subject is examined from various angles, with a summary of the conclusions in Chapter 6. The final section of that chapter briefly summarizes the main themes and recommendations of the report. In view of the urgent nature of the subject covered by the report, a prompt reaction on the part of the Government to the principal themes and recommendations would be desirable.

The report is accompanied by a dissenting opinion by one of the Council members, Prof. A.H.J.J. Kolnaar.

We would request that the report be placed on the agenda of the Council of Ministers.

CONTENTS

1. INTRODUCTION

1.1 Background

1.1.1 *Selection of subject*

In September 1978, the Scientific Council for Government Policy published its programme of activities for the second Council term (1978-1983). 'Industry in the Netherlands: its Place and Future' was named in the programme as one of the main projects for that period. With this choice of subject the Council was not seeking to highlight the position of industry as such but, partly on historical grounds (see section 1.1.3), to examine industry in the Netherlands more closely in relation to its potential contribution to economic growth. In doing so the study is not solely concerned with the stimulation of industry, but technological and economic developments are examined in relation to various criteria (including environmental considerations and energy). The report therefore aims to deal with industry from all angles and in a balanced way.

The term 'structure' of the economy generally refers to the composition of the production network as classified according to various criteria. The most important of these is the breakdown of the production network into sectors and branches of industry; it may also refer to regional distribution, or to a breakdown by company size.

Structural policies are directed towards the realization of socio-economic and intermediate objectives by means of sector-specific policies. In practice this involves:

- rendering the objectives operational by differentiating them according to individual sectors;
- stimulating, adjusting and restructuring as necessary.

Structural policies therefore differ from sector-specific policies, which seek to influence activity within a given sector. This can be done by the government, but also by the companies and trade unions operating within that sector. Such policies are implemented by the government with a view to the general interest, while seeking to contribute to the realization of general, socio-economic and intermediate objectives. Sectoral policies thus form part of structural policies.

The approach outlined above will henceforth be referred to as sector-specific. In addition there are general structural factors consisting of such elements as the level of costs, infrastructure[1] and knowledge and innovation potential[1] which help determine the competitive position and thus influence the realization of policy objectives. In this study, structure will in general be taken to consist of those characteristics of an economy that enable one to determine whether and to what extent there is a continuous process of adjustment to international competitive relationships, thereby (depending on the relevant independent variables) permitting economic and non-economic objectives to be met.

1.1.2 *Previous consideration by the Council of the problem of the structure of the Netherlands economy*

In its second report to the Government in 1974, the Council called for more integrated policy formulation in the long term in relation to the structure of the Dutch economy. The report called for a white paper by the Government indicating the way in which the Government wished to see the economic structure of the Netherlands evolve: 'For policies to succeed in this area, the Government's intentions must be clearly spelled out, and such clarity is lacking. Traditional economic objectives may retain their validity, but a number of other considerations have also become relevant in assessing the structure of the economy. It is not clear what priorities this will lead to in concrete terms, but we would urge

[1] These are both sector-specific and general in nature.

that they be examined.'[2] Since then the Government has discussed its policies in its white paper on selective growth (Structural Policy Report, 1976, Second Chamber, 1975-1976 session, 13 955, nos. 1-3).

1.1.3 *Changed objectives: economic and non-economic goals*

One of the main factors behind the Council's report of 1974 was its assessment that there had been a gradual shift of emphasis in structural policy:
- initially there had been a concentration on industrialization with largely defensive objectives, namely the prevention of mass unemployment, and protection of the balance of payments;
- in 1963, the objective of economic growth was introduced in the Eighth Report on Industrialization in the Netherlands (Second Chamber, 1963-1964 session, 7169), while in the Report on the growth and structure of the Netherlands economy of 1966 (Second Chamber, 1966-1967 session, 8879) this objective was even given primacy. The latter report also in effect called for policy integration, in the sense that other areas of policy should be evaluated in terms of their contribution to economic growth;
- policy integration can also be pursued in a reverse sense, i.e. by assessing structural policies in terms of more than one objective, including non-economic considerations. This was the approach adopted in the 'Report on Structural Policy' published by the Socio-Economic Council in 1969 (19 December 1969, publication no. 21).

Non-economic objectives thus came to form part of the general context in which structural policies were required to operate. The Socio-Economic Council wished this to be taken a stage further and argued that economic policies should pay greater heed to physical planning, environment, technology and the international division of labour.

In retrospect it is evident that the Government completely adopted the Socio-Economic Council's line: there is a clear emphasis on selectivity in the Government's policy report of 1976. It is something of a paradox that this report should have appeared at the very time that the defensive objectives dating to the early years of post-war industrialization – i.e. the prevention of mass unemployment and protecting the balance of payments – were beginning to reassert themselves.

1.1.4 *Selective continuity as an on-going problem*

The are no grounds for critizing the Government's Report on Selective Growth for being out of touch with reality. The approach adopted is readily justified and the concept of integrated policies has not lost any of its significance in the current circumstances. At the same time, the social content of this problem – and hence the priorities – has been transformed. The nature of social activity has been radically affected by the symptoms of recession evident since the early 1970s, and which have since come to assume the proportions of a depression. Because this economic slump has occurred at a time of gestation and dissension with regard to social organization and the appropriate objectives of government policy, there is a real danger of failing to respond adequately to these developments.

1.1.5 *Approach to industrial society*

The desire for continuity finds expression in the classical economic goals of full employment, external equilibrium and growth. These are not objectives put forward independently by the Council, but may be derived from the present forms of economic control exercised by the government, as evident for example from the annual reports published by the Central Economic Committee (CEC). (The Central Economic Committee is the main civil service advisory group on

[2] Provisional Scientific Council for Government Policy, The Structure of the Netherlands Economy, Reports to the Government no. 2 (1974), p. 19.

economic policy.) With regard to selective policies, however, it is not possible to refer to a set of specific objectives, since the field is a particularly broad one and the various approaches towards it have not yet crystallized into concrete propositions. Nevertheless, a study such as the present one cannot be satisfactorily conducted without specifying the approach to be adopted in this area, since we are dealing with assessments of social realities on the one hand and judgements as to possible solutions on the other.

In adopting a particular approach for the purposes of this study, the Council does not wish to imply that it considers this to be the only conceivable or legitimate approach. The subject is being examined in depth by the Council in its project Policy-oriented Survey of the Future.

What approach has the Council adopted in this report towards the problem of economic structure and industrial development? This study is based on the premise of projecting past trends into the future, with due provision being made for selective growth, balanced against considerations of continuity. In this respect the Council has adopted the framework put forward by Harman and Lewis,[3] which consists of the following four dimensions:

1. Nature of the satisfaction of wants;
2. Approach towards the environment;
3. Method of knowledge-building and technical progress;
4. Organization of production.

This frame of reference appears particularly suitable for outlining our approach. We shall not only be concerned with what is or might be desirable but also with what is feasible in principle and lends itself to governmental control. In so doing one consideration is taken to be of central importance in that it is assumed that, in general terms, the Netherlands will wish to retain its present position among industrialized countries and that the Netherlands will wish to remain a country of some importance in world affairs.

In more detailed terms, this approach with regard to each of the four dimensions amounts to the following.

- Satisfaction of wants

According to Adam Smith's famous adage, 'consumption is the sole end and purpose of all production'. In attempting to find solutions to structural economic problems, we assume at the outset that consumer freedom is taken as given.

In this respect we would add that:

– this does not necessarily mean that material goals are to be stressed; there are demonstrable shifts in consumption patterns in favour of the satisfaction of non-material wants. In general it has been sought in this study to anticipate consumption patterns and shifts in consumption in a non-normative fashion;

– the primacy of consumption can conflict with other objectives of equally immediate importance to citizens.

We would not rule out the possibility that these objectives can in turn influence consumers' preference and income allocation; this possibility indeed forms one of the justifications for the analysis of structural problems.[4]

- Approach towards the environment

We would support the view that account should be taken of the interdependence between man and nature, which entails the obligation of leaving the complex ecosystems on this planet intact and to exercise responsible husbandry in controlling our environment. This does not mean that we are optimistic about the prospects for preventing a further despoiliation of the natural environment, let alone reversing that process. This pessimism stems from a considered judgement of the objectives, scale and speed of the change that has taken place.

[3] W.W. Harman and L.F. Lewis, 'United States: Growth, decline or metamorphosis?', in W. Michalski (ed.), *The Future of Industrial Societies,* Alphen aan den Rijn, 1978.

[4] In this respect it is of interest to note a measure to reduce consumer loans introduced by the Government partly with a view to combatting balance of payments problems (see the Government's Report on Consumers and Consumption, Second Chamber, 1978-1980 session, 15 716, p. 133).

Many changes, including in highly industrialized countries, are designed to protect people from the unpredictability of nature. To this end societies are prepared to take measures resulting in a further interference with the natural environment. The large-scale nature of man's interference, as measured against natural ecosystems, is not a new phenomenon, and nor is it confined to industrial societies. There are no signs that this will change. To the extent that efforts are being made to reduce the scale, this usually concerns inter-personal relations and has little effect on man's impact on his natural environment. The speed with which changes are introduced is also very much greater than the speed with which new species and new ecosystems evolve: there has never really been any question of genuine co-evolution between man and his natural environment. We therefore anticipate the continued destruction of the natural environment, as measured for example by a reduction in the number of species, the number of separate ecosystems and its geophysical heterogeneity. This continuing destruction makes it necessary to adopt conservationist policies aimed at slowing this process down as far as possible.

- Science and technology

Technology plays a major part in industrial production and the satisfaction of wants, and in principle this is something we support. We are, however, also aware that an approach to industrial and economic organization in which the technical element assumes undue importance in the process of production can lead to the acceptance of excessive social risks. We would regard such an approach as incompatible with the proper regulation of society, which calls for a certain degree of self-imposed limitation and restraint.

- Organization of production

In the public discussion of this subject, individual self-development has come increasingly to be stressed as the proper foundation for the organization of production. This is related to the view that the traditional work ethic should be replaced by a 'creative work ethic'.

One can easily get bogged down in semantics in this area. We would stress that recent experience in relation to the – involuntary – exclusion from the labour market indicates that employment remains of fundamental importance to the individual, especially in terms of providing people with the means of leading a meaningful existence by rendering a contribution to society. There is a certain dualism inherent in employment, in that it entails a certain degree of coercion but is nevertheless something most people cannot do without. If this dualism is accepted as realistic, it is possible to hold the view that the 'work ethic' and the 'creative work ethic' are related rather than mutually exclusive. At the same time, however, we realize that there are significant minority elements in Dutch society, especially among young people, who have adopted different attitudes towards life.

This raises two important questions:

– whether such attitudes are consistent with the usual aspiration of a generation to impose its own stamp on society, as would seem required in the current circumstances; and

– whether in the long run such attitudes do not result in unbridgeable tensions in the employment sphere as substantial differences arise in individuals' obligations and responsibilities.

The Council would not propose defining its attitude any more closely on either of these questions at this stage, apart from accepting the legitimacy of the right to employment as an objective and making any consequences flowing from the acceptance of that right dependent on the outcome of this survey. In the case of the quality of work – which can be an issue where structural adjustments are taking place – the available data only enable us to make relatively superficial judgements. We are conscious that in doing so important aspects will remain unexplored. These will be examined in the Council's project on Employment.

1.1.6 *Relations with developing countries*

The marked change in international economic relationships has led to an increasing degree of mutual interdependence in relations with developing

countries. For example, a number of developing countries have combined together in OPEC and transformed their relationships with the industrialized world to such an extent that they no longer require aid. Other developing countries have built up their production structures to the point that they have become competitive in a number of areas. The unfavourable circumstances in industrialized countries have led to defensive responses designed to protect domestic production. It must, however, be accepted that certain products can be produced more efficiently in developing countries. Finally, cooperation with the remaining developing countries will have to consist of assisting the development process with the means at our disposal as a highly industrialized nation.

1.2 The nature of the problem

1.2.1 *General nature of the problem*

The stability and thereby the continuity of the system of national production have come under stress. For the present, these strains are confined to the economic sphere, but if adjustment does not prove possible in good time the risk will arise of instability in a wider social context.

While economic adjustment may be required, questions surround the manner in which this should occur. The classical policy instrument since the late 1950s of stimulating the economy, especially on the demand side, no longer appears adequate in itself. The question arises whether the major problems of today are not equally and perhaps even much more problems on the supply side – i.e. whether these problems are not structural in origin, and as such require policies of a more selective nature.

This is not something confined to the Netherlands but is international in nature. Nevertheless, many characteristics of the problem are specific to the Netherlands. These are not simply of an objective kind, such as the vulnerability of the present Dutch export package, but also of a subjective nature, i.e. that of aspirations.

It is fair to assume that, as in the case of previous worldwide depressions, the cards are being re-dealt in the world economy. Fundamental changes are occurring in the structures of national economies, while major adjustments are taking place in the international pattern of industrial location. How should the Netherlands react to these developments, assuming it wishes to maintain its relative position?

1.2.2 *Sector-specific factors: the structure of production in dynamic perspective*

Research by various authors, including Chenery,[5] has indicated that a country's structure of production is influenced by two factors:

- the stage of development reached by a country, as expressed in terms of per capita production. This has a dual influence, first of all via expenditure, and secondly via production costs and potential, including the state of technology;
- a country's relative position, especially in relation to other countries at a similar stage of development. This position is particularly reflected in size (the factor of scale), availability of resources (including raw materials and energy), specific technological know-how and location.

These two factors operate through the allocative mechanism, consisting of the desired 'product mix' (i.e. the structure of production) in conjunction with the selected factor intensities and the propensity to invest (i.e. the relationship between investment and consumption). It has proved possible[6] to draw up an overall development pattern demonstrating the way in which the structure of production evolves over time. The question arises whether it is also possible to project the way that structure will evolve. We propose doing so, in which respect specific assumptions need to be made about the following determinants:

[5] H.B. Chenery, 'Patterns of Industrial Growth', *American Economic Review,* 50 (Sept. 1960), pp. 624-654.
H.B. Chenery and L. Taylor, 'Development Patterns Among Countries and over Time', *Review of Economics and Statistics,* 10 (Nov. 1968), pp. 391-416.

[6] See the references referred to in footnote 5.

1. the development of domestic demand, especially private and public consumption. In terms of industrial sectors (i.e. product groups), the composition of consumption is subject to change and affects the structure of production through the distributive sectors;
2. the development of external demand (by volume), which influences the structure of production by means of the total volume of exports – even if the composition of exports remains unaltered – since the composition of external demand differs completely from that of domestic demand;
3. investment demand, which can vary in volume and distribution among the productive sectors, thereby in turn influencing the distributive sectors;
4. the international division of labour and competitive relationships, which bring about shifts in the package of exports (see 2 above) by means of technological developments and the factor mix employed, as well as in the package of production geared towards domestic demand;
5. the raw materials and energy situation, especially price changes over time and any ensuing substitution effects (i.e. changes in the pattern of trade).

This analysis is of importance in several respects:
- we need to form an overall impression of the developments we will have to contend with nationally and internationally and must determine the extent to which the structure of production will be affected in consequence. Insight will be required into the capacity for adjustment;
- on the basis of the objectives and expectations in this country in relation to the growth of income levels and employment, it must be examined whether the implicitly assumed structural adjustment is consonant with the possibilities suggested by empirical generalization and with current trends in the structure of production, i.e. insight is required into the compatibility of our expectations with economic and technological factors. This is considered in relation to the period up to 1985.

Apart from the economic and technological factors, other aspects of policy must be taken into account. First, this means distinguishing the various aspects in concrete terms and making them operational (by formulating the boundary constraints in the form of environmental impact limits and so on). Secondly, it is necessary to demonstrate the way in which the structure of production influences and acts on these aspects (for example environmental impact), including the effect of technical progress, substitution effects and so on.

1.2.3 *General structural factors*

In view of the importance attached to general structural factors – i.e. the level of prices in relation to close competitors, infrastructure, the general level of knowledge and potential for innovation – in a number of recent studies, government policy documents and in government policy itself,[7] little more need be said on this subject. The scope for industrial adjustment by means of altering factor proportions (i.e. rationalization) is limited by the technical possibilities and capital costs, and also leads to redundancies. As a result industrial adjustment can come into conflict with employment objectives.

We should like to emphasize that the level of knowledge and the potential for innovation do not in this context refer exclusively to science and technology but also to the organization of production and marketing. It is also necessary to determine the impact of this latter factor, both historically and looking to the future, on the competitive position and thus on the attainability of economic and non-economic objectives.

[7] H. den Hartog and H.S. Tjan, *Investeringen, lonen, prijzen en arbeidsplaatsen* (Investments, Wages, Prices and the Demand for Labour), Occasional paper no. 2/1974, Central Planning Office. An amended version appeared as: H. den Hartog and H.S. Tjan, 'Investment Wages, Prices and Demand for Labour', *De Economist*, 124, pp. 32-55. H. den Hartog, Th. van der Klundert and H.S. Tjan, 'De structurele ontwikkeling van de werkgelegenheid in macro-economisch perspectief' (The Structural Development of Employment in Macro-economic Perspective), *Preadvies voor de Staatshuishoudkunde*, The Hague, 1975. 'Een Macromodel voor de Nederlandse economie op middellange termijn' (A Macro-model for the Dutch Economy in the Medium Term) (Vintaf-II, *Occasional paper*, no. 12, Central Planning Office, 'Technische innovatie' (Technical Innovation), Second Chamber, 1979-1980 session, 15 855, nos. 1-2.

1.3 Basis of structural policy

1.3.1 *Generic versus sector-specific policies*

Economic growth and structure are closely related concepts both in economic literature and in the thinking behind policy formulation.

The way in which the two variables are related to one another can, however, vary enormously. In very generalized terms, one could speak of two diametrically opposed approaches. On the one hand, there is the school of thought that sees structural adjustment as the outcome of growth, with macro-economic control and general competition policies regarded as supporting the market mechanism. The other school of thought seeks to bring about economic growth by means of structural adjustment, and therefore supports sectoral and interventionist policies.

Table 1. Alternative approaches to growth and the structure of production: generic versus sector-specific approach

	Generic approach: structural adjustment through growth	Sector-specific approach: growth through structural adjustment
1. Means of economic control	Macro demand management and cost reducing policies	Restructuring of the supply side
2. Elimination of obstacles to growth	Liberalization and flexibility; creating the general conditions for growth	Mobilization and activation
3. Coordination principle	Free market mechanism	Intervention where market mechanism fails

Any structural policy must be based on a position within this spectrum. The question may be approached from various angles:

a. Fundamental aspects

We would distinguish the following:

- theoretical foundation (demand according to macro and meso theory);
- the government's responsibilities and specification of the scope for government action;[8]
- balance between a generic and a sector-specific approach in the administration of a structural policy;
- relationship between economic/technological considerations and other aspects of government policy;
- required administrative and political conditions for the implementation of structural policies;
- feasibility and practicability of implementing structural policies.

b. Theory versus practice

Just as there is a body of theory in this area, so also is there practice. Theory and practice do not necessarily always correspond. Peters has pointed out the extent to which the West German Ministry for Economic Affairs professes to follow 'ortho-liberalism', while in fact pursuing neo-mercantilist protectionist policies.[9] Much the same could be claimed in the case of the Netherlands. Sector-specific policies are in fact being implemented even though this might not be apparent from theory, and the question arises as to the grounds on which this is being done. In addition there is no doubt that sector-specific policies are not always conducted under that name.[10]

c. Basis of a pragmatic approach

[8] Lindbeck has reasonably asked why the concept of comparative advantage should not apply to the division of labour between the private and public sectors. A. Lindbeck, 'Hur skall en svensk näringspolitik se ut?' in *Ekonomisk debatt* 3/79.

[9] H.R. Peters, 'Konzeption und Wirklichkeit der sektoralen Strukturpolitik in der BRD', in: G. Bombach (ed.), *Probleme des Strukturwandels und der Strukturpolitik*, Tübingen, 1977, p. 159.

[10] Volker Hauff, *'Technologiepolitik als Strukturpolitik'* WSI-Mitteilungen, Vol. 29 (October 1976), pp. 626-631.

Hirschfeld,[11] who, in his capacity as a policy planner, was forced by the realities of economic life up against the question of the legitimization of structural policy, came to the conclusion that dogmatic adherence to principles did not work in the case of government policy, for the following reasons:

- the pressure of real-life circumstances; principles are rarely of universal validity, and may be of greater or lesser practical value according to the circumstances;
- principles restricted by nature to general norms often leave room in practice for divergent measures.

These two considerations alone raise the question as to whether a recognition of the value of underlying principles, together with the avoidance of opportunism – to which the viewpoint outlined in b above would readily give rise – permit a theoretical position to be taken up in which the practical complexities confronting policy planners are able to come into their own.

1.3.2 *Structural policies and the economic order*

The economic order can to a large extent be characterized in terms of the currently in vogue coordination principle.[12] Sector-specific policies affect the coordination of allocative decisions and can as such have an effect on the economic order.

We are therefore concerned with the legitimization of structural policy, but in this case in the most basic, practical, way. In view of the observations under 1.3.1 on the scope for some form of formal basis for a pragmatic approach, it might seem fruitless to become involved in questions of the economic system. However, this seems to us unavoidable, for two reasons:

- the rejection of any form of sector-specific policies is often based on the fear[13] that to countenance such policies could set in motion a chain of events leading to sectoral planning and in due course to sectoral investment controls. Such fear can impede the rational discussion of specific proposals, especially since the discussion is often conducted in terms of feasibility and related issues, while the decisive considerations remain unexplored. Such discussion is particularly fruitless.
- it is widely supposed, including among economists, that economic behaviour is subject to certain autonomous principles comparable to the laws of nature.[14] One of the first to raise this proposition with regard to government intervention was Böhm-Bahwerk.[15] In his view – which still enjoys widespread support – governmental intervention in the economy (by 'Macht' or control) cannot eliminate the autonomous operation of these principles (or 'Ökonomisches Gesetz', i.e. economic laws), for which reason such intervention is subject to strict limits. This approach stands or falls by the proposition of autonomous economic laws. We need not concern ourselves at this stage with the philosophical foundation of these propositions[16], but it is relevant to note that certain factors have become regarded as natural laws that in fact form part of the historical growth of economic control.[17] This is of course the key question for government policy: where does the boundary lie between 'exogenous', inviolable economic laws and those forms of economic control and regulation that lend themselves to government intervention?

It is also the intention of this survey to examine whether structural policy may be:

- opened up for public debate, and

[11] H.M. Hirschfeld, *Actieve Economische Politiek in Nederland in de Jaren 1929-1934* (Interventionist Economic Policies in the Netherlands, 1929-1934), Amsterdam 1946, pp. 141-142.
For a similar view based on historical precedents see: H.W. de Jong, *De zichtbare vinger aan de onzichtbare hand* (The Visible Finger on the Invisible Hand), Scientific Council for Government Policy, Preliminary and Background Studies, The Hague, 1980.

[12] Coordination relates to the way in which producers' and consumers' dispositions and plans are reconciled, including the way in which producers' behaviour is mutually reconciled.

[13] Peters, op. cit., p. 150, refers in this context to a 'panicky fear' even to consider structural analysis and forecasting.

[14] H.W. de Jong, *Paradoxale Economie* (Paradoxical Economics), Leiden 1979, p. 8.

[15] E. von Böhm-Bahwerk, *Macht oder Ökonomisches Gesetz* (Power or Economic Laws), 1914 (Wissenschaftliche Buchgesellschaft, Darmstadt, 1975).

[16] See De Jong, op. cit. and W. Stark, *The Fundamental Forms of Social Thought*, New York, 1963.

[17] Since 1914 government intervention has assumed a scale which at least calls into question the range of application of economic laws.

– reduced to manageable proportions as far as government policy is concerned.

The design of the study itself and the cooperation sought and obtained from many people are aimed at developing a conceptual framework by means of which specific proposals can most easily be assessed on their merits.

Ideally, the attempt to devise such a broad conceptual framework will rest on a combination of restraint and sense of realism on the one hand and, on the other, a willingness to react effectively to changing circumstances, even if this should require a totally fresh approach.

1.4 Survey design

1.4.1 *Methodology*

A distinction is generally drawn in economic analysis between data, objectives and means (or instruments). We propose following this distinction, indicating the meaning attached to each of these elements and the way in which solutions will be sought within the framework of the 'model' (in the broad sense of research design). In doing so the specific nature of the structural approach will have to be brought out clearly, and in this respect we will follow the standard approach developed by Tinbergen.[18]

As will be evident from the above (section 1.3.2), the economic system is not taken as fixed but only those factors that may be taken as parameters, provided that:

– this is within the framework of our social and cultural traditions;

– it is recognized that international developments have repercussions on the Dutch economy and are largely beyond our control.

Table 2. Diagrammatic representation of data, aims and means in the survey

Data	Aims/boundary conditions	Operationalized ('intermediate') aims (structural variables)	Instruments
– need to optimalize production in relation to relative factor costs (sales), prices and existing techniques of production – size and composition of world market – international division of labour and specialization – consumer preferences – technological development	– economic growth – employment – balance of payments equilibrium – environmental control – improvement of international division of labour – improvement of quality of work – improvement of regional distribution	– structure of production – propensity to invest – cost levels – infrastructure – knowledge and innovation potential	– macro-economic adjustment – competition policy – sector-specific policies (investment adjustment) by means of: • innovation, risk & uncertainty sharing • knowledge, information • anticipation/control • motivation • regulation of technology etc. • environmental protection

Two important observations should be made on this model:

– in seeking solutions to the problems in question we will essentially be adopting the approach of instrumental analysis: i.e. on the basis of the objectives and the available data, we shall seek to indicate which mix of policy instruments would lead to dynamic equilibrium. This does not presuppose that a dynamic equilibrium is in fact possible, and where it is not the objectives will have to be amended;

– Lowe in particular has pointed out that the mutual resolution of data, objectives and instruments assumes a certain social 'setting' or 'pre-stabilized harmony'.

It may well be asked whether the problems with which we are at present confronted do not in fact have their origin in a lack of stability or harmony, manifesting themselves for example in risk calculations based on very short time horizons. One element in a structural approach consists of tackling the restoration of stability.

[18] J. Tinbergen. *Economic Policy: Principles and Design*, Amsterdam 1956. See also A. Lowe, *On Economic Science toward a Science of Political Economics*, New York 1965. We have added one element to his model, namely operationalized 'intermediate' aims.

With a view to policy relevance a projection period of approximately five years has been selected, with 1985 as the specific point of comparison or control-date.

1.4.2 *Organic structure of the survey*

The survey is divided into various sections designed to form a composite whole, but which also largely stand on their own merits. The structure of the report is as follows:

Chapter 2. Structure and growth

Determination of the structural element in post-war growth and assessment of its future implications if present policies are maintained. Model-based analysis of future structure with and without greater government intervention, assuming contrasting policies.

Chapter 3. Technology, innovation and management

Survey of future technological developments and the specific possibilities in the case of the Netherlands. This chapter is designed to assess the technological feasibility of the economic options explored in Chapter 2, as well as to provide a more general impression of the state of knowledge and innovational potential in the Netherlands.

Chapter 4. Intermediate objectives

Quantification of non-economic objectives and their implications for the structure of production. Assessment of non-economic objectives for the optimalization of government policies and their implications for the production structure selected.

Chapter 5. Institutional aspects and policy

Survey of practical scope for various policy instruments, including their desirability and acceptability, with a view to providing a foundation for and facilitating the selection of those policy options which:

- may be regarded as economically effective;
- may be regarded as technologically feasible;
- are consistent with the constraints.

Chapter 6. Summary and conclusions

Overview and conclusions, assessing the case for greater government intervention with regard to the development of the economy. Consideration is given to the extent to which economic aims and non-economic policy aims are linked to the structure of the economy. A judgement is reached on the degree to which economic policies should be structurally oriented. Structural policies are tentatively worked out in greater detail, with a comparison of the respective merits of sectoral and general policies. The chapter concludes with a number of policy recommendations.

Chapters 2-5 are primarily analytical in nature. A number of factual conclusions are drawn and various policy options are explored. Chapter 6 draws the study together as a whole. The advantages and disadvantages of general as against sector-specific policies are examined, with the conclusion that the two are complementary. The conclusions and recommendations to emerge from the study are contained in this chapter.

In order to mobilize the available expertise in this field, and to act as a forum for matters of judgement, this study has drawn extensively on outside experts and advisers.

Their contributions are not only reflected in this report but, in the interest of generating public discussion, are being published in the Council's series Preliminary and Background Studies. The individuals and organizations in question are listed below (by subject):

1.4.3 *Composition of the project team and advisers*

Composition of the internal project team

Council members
- Prof. A. van der Zwan, chairman
- Dr. J. Boldingh
- Prof. J. Volger

Staff members of the Council Bureau
- K. Vijlbrief, secretary
- R. J. de Bruyn
- M. C. E. van Gendt
- G. E. G. N. Grünning
- H. Huisman
- Dr. W. M. de Jong
- J. W. Nelson
- J. C. van Ours
- J. Oudshoorn

External advisers, by subject

Time-series analysis, model analysis and related contributions[19]
Regional differentiation[20]
- Dr. C. P. A. Bartels

(University of Groningen)

Multi-sector model studies
- Prof. W. Driehuis

(University of Amsterdam)
- Prof. S. K. Kuipers

(University of Groningen)
- Dr. F. Muller

(Erasmus University, Rotterdam)
- Dr. A. B. T. M. van Schaik

(Catholic University, Tilburg)

World market/export/import penetration
- Prof. L. B. M. Mennes

(Erasmus University, Rotterdam)

Model analysis of environment/economy relationship
- Prof. J. A. Hartog and
- Dr. J. Spronk

(Erasmus University, Rotterdam)

[19] Special mention should be made of the extremely helpful provision of data on the various branches of industry by the Central Planning Office and the Central Bureau of Statistics.

[20] The material compiled by Dr. Bartels has not been incorporated in the report. A similar if tentative projection has been made in the section on 'Technology' (section 3.1). Bartels' report is being published by the Scientific Council in its Preliminary and Background Studies series.

Structural policy

Prof. J. J. van Duyn (Delft Business School)
Prof. H. J. Ellmann (University of Amsterdam)
C. A. de Feyter (Delft Business School)
C. Inja (Federation of Netherlands Trade Unions)
Prof. H. W. de Jong (University of Amsterdam)
M. L. Mogendorff (Unilever Nederland)
Prof. P. VerLoren van Themaat (University of Utrecht)

International trade policy

A. J. Basoski (Central Organ for International Economic Relations)
Alan Budd (London Business School)
F. Racké (Ministry of Foreign Affairs)
A. Kalff (Netherlands Credit Insurance Association NKM)
Dr. J. C. Ramaer (Philips)

2.1 The growth and specialization of Dutch industry

2.1.1 *Introduction*

This section sets out to determine the structural element in post-war economic development and to assess likely structural developments if present policies remain unchanged.

In doing so it is assumed that the structure of production of an economy forms an effective framework for determining the market congruence of the productive capacity. This view is supported by the fact that although the structure of production varies from country to country, the selected factor intensities of individual industries tend to be much the same in various countries. The differences between sectors are greater than the variations for a given sector between countries. In other words, the structure of production in various countries can be divided into the same units, i.e. sectors. This has in fact been the case for some time.

The selected factor intensities may therefore be derived retrospectively from:

- the industrial structure, in which respect the position of the Netherlands in relation to other industrialized countries is of interest; and
- the factor intensities in individual industries (which turn out to be much the same in various countries in a given period).

Taken together these two elements provide the characteristics of the structure of production, which can then be related to the underlying comparative advantages or 'assets' of the economy. This in turn provides insight into the pattern of specialization, which may then be examined in terms of its contribution to economic growth. Finally, an estimate may be made of the future value of the economy's 'assets'.

The analysis draws on theoretical concepts, for example in relation to the factors of production at issue in a comparison of the structure of production in various countries (i.e. the theory of international trade). Use has also been made of empirical studies by such bodies as the EEC, the OECD, the UN Economic Commission for Europe and the World Bank, which essentially consist of international comparisons. Reference should also be made to a significant longitudinal study of the factor intensities in the various sectors of industry in the Netherlands carried out by staff-members of the University of Amsterdam.

2.1.2 *Retrospective survey*

Broad outline

The structure of production in the Netherlands has altered radically in the last 125 years, as may be seen from the distribution of the labour force in three major sectors.[1]

[1] The only available data for such a long-term review of the structure of production consist of employment figures. In interpreting table 3 it should be borne in mind that on account of differences in productivity between the sectors, the share of industry in production will be higher than the share in employment. This applies even more to production in terms of volume.

Table 3. Distribution of the Dutch labour force in three sectors

	Percentage shares		
	Agriculture	Manufacturing	Services (incl. govt.)
1849	44.1	24.1	31.8
1930	20.6	36.4	43.0
1965	8.6	41.9	49.5
1978	6.1	31.8	62.1
	Annual percentage change		
1849/59	— 0.66	+ 0.21	+ 0.45
1859/09	— 0.18	+ 0.13	+ 0.05
1909/20	— 0.45	+ 0.26	+ 0.18
1920/47	— 0.15	+ 0.04	+ 0.11
1947/65	— 0.59	+ 0.28	+ 0.31
1965/78	— 0.19	— 0.78	+ 0.97

Source: Taken from J. J. van Duijn, Economisch beleid en industriële ontwikkelingsfase (Economic Policy and the Stage of Industrial Development) (table 1); WRR 'Preliminary and Background Studies', The Hague, 1980.

As far as employment is concerned, the Dutch economy has evolved from one largely based on agriculture to one based principally on manufacturing or on a combination of manufacturing and the services sector. In doing so, the centre of gravity of the economy has gradually shifted towards the services sector (including government). This trend has not been an even one but has varied over time:

- periods of rapid change alternate with periods of more steady adjustment;
- the growth of the industrial sector has proceeded at much the same pace as the expansion of the services sector, with the exception of the most recent period. The decline in employment in industry during this period is equally as spectacular as the growth of employment in the services sector.

In itself the recent reversal of the growth in industrial employment need not have far-reaching implications. If the size of the industrial work-force and economic development are compared over the long term, it is normal for the share of industrial employment in total employment initially to rise fairly steeply, becoming stationary or even declining at a later stage of development. The decline in industrial employment in the Netherlands has, however, been more marked than in other industrialized countries and is also greater than would normally be associated with this basic pattern of development.[2]

It is difficult to tell on the basis of such general observations whether this deviation from the general development pattern in the Netherlands is related to the less favourable position of Dutch industry in relation to industry in West Germany and Belgium. There are without doubt specific factors at work in the Netherlands, such as the industrial tradition, comparative advantages and disadvantages and labour productivity trends. The latter factor is unquestionably of relevance in comparing the Dutch situation with that in Britain.

Apart from the sector shares of employment and production, a breakdown of exports into goods categories can throw light on the relative position of the Netherlands, especially that of the goods sectors. With regard to table 4 it should

[2] Economic Commission for Europe, *Structure and Change in European Industry,* New York 1977, pp. 5-11. The trend is already discernible in the data in this publication for the period up to and including 1973.

After that date the decline gathered strength. See for example *World Development Report,* Washington 1979, Annex table 3 (structure of production). This report did however suggest that industrial capacity in the Netherlands might be serving the function of reserve capacity in Europe, and that it would be built up if full capacity were reached elsewhere.

See also EEC, *Die Entwicklung der Sektoralen Strukturen der Europäischen Volkswirtschaften seit der Erdölkrise 1973-1978* (The Development of the Sectoral Structures of European Economies since the Oil Crisis 1973-1978), Brussels (July 1979), p. 94, which refers to de-industrialization in the Netherlands.

The most detailed documentation on the secular connexion between industrial structure and economic development is to be found in S. Kuznets, 'Quantitative Aspects of the Economic Growth of Nations; Industrial Distribution of National Product and Labor Force', *Economic Development and Cultural Change,* V, 4, 1957, Suppl.

be noted that the share in exports of manufactured goods reached in the Netherlands after the last War had already been achieved in competing countries before the War, while in most industrialized countries this share now stands at 80% or more.

Table 4. Dutch exports according to goods categories

	Percentage shares		
	1928	1956	1972
Food, beverages and tobacco	49	32	22
Raw materials	9	7	7
Energy	5	2	12
Manufactured goods	37	59	59
	100	100	100

Source: Central Planning Office, *Centraal Economisch Plan* 1958, Table VI.3 (1928 and 1956); K. Henkner, *Wettbewerbsrelationen im Aussenhandel westlicher Industrieländer 1959 bis 1973*, Berlin 1976.

In comparison with most industrialized countries, the export share of manufactured goods in the Netherlands remains low. The same is true of Denmark and Canada. Since both of these may also be regarded as 'young industrialized countries',[3] this would seem at least in part to account for the trend outlined above.

Further insight is provided by the analysis made by Chenery and Syrquin[4]. The authors related export ratios in various countries to a number of causal factors, thereby enabling them to determine whether a given country was more active or less active in international trade than the average international pattern (allowing for the particular characteristics of the country).

As part of their analysis the authors draw a distinction between exports of manufactured goods and exports of primary products. The Dutch export ratio turns out to be far higher than would ordinarily be associated with such a country, but in large part this is attributable to the high level of exports of primary goods.[5] To some extent, therefore, the low share of manufactured goods in total Dutch exports of goods may be accounted for in terms of the unusually high export levels of primary commodities.

Later in this chapter further consideration will be given to these phenomena, i.e. the recent nature of industrialization in the Netherlands and the high share of primary products in the Dutch export package of goods.

Post-War industrialization and the 'assets' turned to advantage

Industrialization in the Netherlands is largely a post-World War II phenomenon. The process of industrialization got under way in the early 1950s and was sustained until well into the 1960s. After that time there was a turn-around which may be described as 'de-industrialization'. This found expression in a steep decline in the share of manufacturing in total employment, followed by a decline in the share of output and a drop in industrial exports, accompanied by increasing import penetration.

In order to understand the post-war process of industrialization properly, it is necessary to establish the forces that shaped it. The following factors are of particular relevance:

- the product mix (i.e. the industrial structure), with special emphasis on the *relative position of the Netherlands (i.e. in relation to its European competitors)* and changes in its competitive position. These considerations help explain the Dutch pattern of industrial specialization;

[3] See Henkner, op. cit., table 1.

[4] H.B. Chenery and M. Syrquin, *Patterns of Development 1950-1970*, Oxford 1975, pp. 91-93.

[5] Including raw materials of both agricultural and non-agricultural origin and minerals, including energy.

- the factor intensities used in production, especially the factors of labour and capital (i.e. capital intensity),[6] the degree of skill of the labour force (skills intensity), R &D (research intensity) and energy (energy intensity).

These characteristics of the structure of production are shown in table 5.[7] The structure of industry is depicted by means of a breakdown into fifteen branches of industry. These are in turn sub-divided into a 3 x 3 group-matrix showing relative specialization at a given point in time (1958/60) together with subsequent trends (1958/60-1968/70). Branches of industry are then shown in terms of their:

- capital intensity (K)
- skills intensity (S)
- research intensity (R)
- energy intensity (E)

These characteristics have been plotted in terms of an ordinal scale from 1 to 15, with 1 representing the highest intensity and 15 the lowest.

Table 5. Pattern of specialization in Dutch industry 1958/60-1968/70 (ordinal figures)

		Change 1958/60-1968/70					
		+		=		—	
			K-S-R-E		K-S-R-E		K-S-R-E
Situation 1958/60	+	- Chemicals	2- 2- 2- 1,5	- Food & beverages	5-11-11- 7	- Electrical engineering	8- 9- 1-12
		- Petroleum refining	1- 1- 3- 3	- Tobacco	id.		
	=	- Printing and publishing	11- 6-14-12	- Metal products	13-10- 9- 7	- Transport facilities	9- 3- 5-12
						- Textiles	10-14-12-12
						- Clothing/footwear	16-16-16-12
	—	- Timber/construction materials	14-13-13- 4,5	- Machine building	12- 5- 7-12	- Rubber	7- 7- 6- 7
		- Paper	4- 8- 8- 4,5	- Leather goods	15-15-15-12		
		- Basic metals	3- 4- 4- 1,5				

Key: K = capital intensity
S = skills intensity
R = research intensity
E = energy intensity

+/=/— indicate that the Netherlands did or began to do more/as much/less than its European competitors

The ordinal numbers indicate the relative position of the various branches of industry for each of the factor intensities. The lower the ordinal number the greater the intensity.

Source: WRR.

The ordinal ranking has been based on averages for European industrialized countries, which prove to be fairly uniform from country to country,[8] while these averages also correspond closely with the averages for the United States.[9] Only in the case of energy intensity (E) was it necessary to rely on Dutch data.[10]

In broad terms, the top row and left-hand column of the matrix include those branches of industry on which post-war industrialization in the Netherlands has tended to be concentrated. The top row shows those branches in which the Netherlands already enjoyed a strong or in other words specialized position, while the left-hand column shows those branches on which the Netherlands has tended gradually to concentrate. The most prominent position is that of the branches of industry shown in the top left-hand corner: these are branches in

[6] Defined as the input of capital in relation to the volume of labour.
[7] Economic Commission for Europe, op. cit., table 1.11.
[8] Economic Commission for Europe, op. cit., table 2.11.
[9] G.C. Hufbauer, 'The Impact of National Characteristics & Technology on the Commodity Composition of Trade in Manufactured Goods', in R. Vernon (ed.), *The Technology Factor in International Trade*, New York 1970, pp. 212-223.
[10] J.R. Magnus and L. Vastenou, *Prijzen van arbeid, kapitaal, energie en produktie in acht sectoren van de Nederlandse industrie 1958-1976.* (The Costs of Labour, Capital, Energy and Production in Dutch Industry), Report AE 10/78, Instituut voor Actuariaat en Econometrie, University of Amsterdam, Amsterdam, September 1978.

which there already existed relative specialization in the Netherlands, and which became more pronounced over time.

The bottom right-hand corner of the matrix indicates those branches where specialization has been the lowest in the Netherlands, with the minimum degree of specialization being shown in the bottom right-hand cell: in that branch of industry the Netherlands already was in a weak position, which has deteriorated further since then.

The 'assets' on which the Netherlands has capitalized may now be ascertained directly from the matrix or else derived with the aid of some supplementary information. The results of this analysis have been confirmed by a study of comparative advantages in Dutch industry at branch level.[11]

This is scarcely suprising since this study also draws on historical statistical data, although in a different way. At the risk of being repetitive, we would stress that it cannot be inferred from these studies that Dutch industry will necessarily continue to benefit from these advantages. That will be of course depend on future domestic and external trends.

The 'assets' on which post-war industrialization in the Netherlands has been based may be classified as follows:

- Specialization in terms of product mix[12]
  - intermediate goods, especially basic products (chemicals, steel, petroleum products)
  - electrical engineering
  - food and beverages
- Specialization in terms of factor intensities
  - capital-intensive branches (relatively low capital costs)
  - skill and research-intensive branches (availability of facilities among large (multi) national enterprises
  - energy-intensive branches (relatively low price and abundance of energy)
- Organizational structure in branches of relative specialization
  - dominance of processing industries
  - prominence of large multinational enterprises (possessing sales networks etc. in addition to training and research facilities)
  - strong agricultural basis for food and beverage industries
- Other 'assets'
  - location and infrastructure (especially important in relation to the processing industry; importation of raw materials and export of products)
  - export orientation.

[11] L.B.M. Mennes, *Sectorstructuur- en handelsbeleid* (Structural and Trading Policies), section 4.1, WRR, 'Preliminary and Background Studies', The Hague 1980.

[12] This classification is based on the pattern of specialization in the Netherlands outlined above on the basis of production at branch level. An independent analysis has been conducted of production in relation to the degree of domestic consumption (the domestic consumption ratio) in 54 branches of industry. See: Centre français du commerce extérieur, *Croissance Mondiale et Strategie de Specialisation,* Paris 1976. The following summary for the Netherlands has been derived from the data in that publication (Annexe II; Specialisation par pays):

Product group (main groups)

Domestic consumption ratio (1964-1972)	Intermediate goods/ food & beverages	Other goods	Total
- Improvement	14	13	27
- Stability	7	10	17
- Deterioration	1	9	10
	22	32	54

If one were to characterize post-war industrialization in the Netherlands in terms of the pattern of specialization it might be reduced to the following formula:

- large-scale as against small-scale[13]
- narrow-based as opposed to diversified
- bulk as opposed to differentiated/refined[14]
- intermediate as opposed to capital goods
- processing-oriented as opposed to engineering-skills[15]

There is no doubt that this formula has been extremely successful in the past, especially in terms of rapid industrialization and building up a competitive international position.

The survey referred to earlier by the Centre français du commerce extérieur[16] established a link between the degree of specialization and the growth in manufacturing output. During the period 1964-1972, the Japanese economy proved to be easily the best adapted in terms of specialization to take advantage of growth prospects (i.e. international trade). The Netherlands also proved to have had a relatively favourable package of products, and – at a respectable distance behind Japan – assumed second place in terms of growth potential among all the countries surveyed.[17] In many respects, therefore, the Netherlands may be regarded as having been in the forefront of developments.

The resultant industrial structure has, however, been achieved at the cost of a disproportionate impact on the environment in relation to the Netherlands' trading partners.[18] The international pollution account contains a large deficit entry for the Netherlands, attributable almost entirely to four branches of industry, namely basic chemicals, the petroleum industry, the paper industry and base metals. To a lesser extent, and solely in relation to the atmosphere, the food and beverages industry has also been a net polluter.

Structure of imports and exports in more detail

The above analysis is further confirmed by an analysis of the structure of Dutch imports and exports of goods.

[13] There are significant variations in scale among the various branches of industry; these variations tend to be much the same for alle countries in a certain period. The pattern of specialization in the Netherlands indicates a concentration on relatively large-scale branches of industry. This point is particularly well-documented in the literature. See for example:

Ranadev Banerji, 'Average Size of Plants in Manufacturing and Capital Intensity', *Journal of Development Economics,* 5, 1978, pp. 155-166.

C.F. Pratten, *Economies of Scale in Manufacturing Industry,* Cambridge 1971.

Simón Teitel, 'Economies of Scale and Size of Plants', *Journal of Common Market Studies,* XIII, 1975, pp. 92-115.

F.M. Scherer, 'The Determinants of Industrial Plant Sizes in Six Nations', *Review of Economics and Statistics,* LV, 2, 1973, pp. 135-145.

[14] Consistent with this is the observation by H.J.J. Kals, *Tussen eruditie en specialisme* (Between Erudition and Specialization), speech Twente Institute of Technology, 1978, that the Dutch metal manufacturing industry has clung obstinately to a relatively undiversified and largely obsolete set of products.

[15] On the basis of a similar analysis to that contained in footnote 13, and based on the same sources.

[16] Centre français du commerce extérieur, op. cit., part 1, diagram E.

[17] Much the same period was concluded to have been a particularly favourable one for Dutch export performance and the competitive position of the Netherlands in the *Centraal Economisch Plan* (Central Economic Plan) 1978, p. 70 (Central Planning Office). This publication does, however, relate these factors to the trend in relative Dutch export prices. But even if this connexion is accepted, this by no means establishes the direction of causality, i.e. this connexion in no way rules out the composition of production as a causal factor. The latter possibility is supported by the fact that the responsiveness of the Dutch share of commodity exports to relative export prices (i.e. elasticity) is by no means constant (*Centraal Economisch Plan* 1978, table III.1).

[18] In terms of air pollution, water pollution (organic and inorganic substances) and chemical wastes. See Instituut voor Milieuvraagstukken, *Milieuverontreiniging en produktiestruktuur* (Environmental Pollution and Industrial Structure), part 1, Amsterdam 1978, table IV.6.

Table 6. Structure of Dutch trade (balance of trade in $ m.) 1972

	Trade with industrialized countries	Trade with rest of the world	Total trade
Manufactured goods	—1969	1189	—780
of which chemicals	508	470	978
Machine building and transport facilities	—1340	666	— 674
Other manufacturing	—1031	53	—1084
Other goods	3066	—2190	876
of which food, beverage and tobacco	1776	— 314	1462
Raw materials	16	— 317	— 301
Energy	1441	—1662	— 221
Miscellaneous goods	— 167	103	— 64
Total	1097	—1001	96

Source: Henkner, op. cit., table 5.

In selecting 1972 as the base year, it should be noted that the pattern has become more pronounced since that time (see section 2.3).

In its trade with industrialized countries, the Netherlands exhibits a similar pattern as the rest of the world, in that it is a net importer of manufactured products and a net exporter of 'other products'. This is so marked that, despite the Netherlands' special position in relation to the rest of the world, it is true of the Dutch balance of trade as a whole. The Netherlands is not alone in this respect, in that other small countries (with the exception of Belgium) display a similar tendency; but in the case of the Netherlands the pattern is so marked as to be comparable only with Canada and Denmark.

Partly as a result of natural gas, the Netherlands is able to record a surplus in its balance of trade with other industrialized countries; this surplus is large enough to compensate for its deficit with the rest of the world. Of the manufacturing sectors, the chemical sector is responsible for very substantial trading surpluses, but these surpluses are not sufficient to offset the trading deficits in other manufactured products.[19]

The pattern becomes all the more evident from a detailed examination of the Netherlands' balance of trade in manufactures with other industrialised countries, i.e. intra-industry trade.[20] Classifying trade into three main and twenty sub-groups, the Netherlands does not manage to record a surplus in any of the main groups, while of the twenty sub-groups only four register a surplus: chemicals, shipbuilding and aircraft construction, paper products and printing and publishing. Even the electrical engineering sub-group is slightly in deficit, if only just.

As expected, there are enormous deficits for the main group of capital goods, but this also applies in the case of consumer goods. It must be borne in mind that we are concerned here with trade with other industrialized countries, where low wage-costs are much less of a factor.[21] The largest deficits occur in the sub-groups of musical instruments, toys, ready-to-wear clothing and furnishing fabrics; imports from West Germany are of particular significance for these categories.

If the Netherlands is compared with other small industrialized countries on the basis of this table, one is obliged to conclude that the Dutch manufacturing base is narrow and one-sided.

[19] See also EEC, *Sectoral Change in the European Economies from 1960 to the Recession*, Brussels 1978, pp. 30 and 50.

[20] Henkner, op. cit., table 7.

[21] The size of the home market can well be a factor of importance in competition among the industrialized countries themselves.

2.1.3 *Future developments*

While the Dutch manufacturing base may be narrow and one-sided, it does not necessarily follow that this is undesirable. It obviously served the Netherlands well in recent decades; why should this situation not be able to continue? The answer, in analytical terms, might well be found by examining the 'assets', and especially estimating the extent to which they will continue to be of value in the future. These considerations may be shown in table 7, with an indication of the sources on which the estimates are based.

Table 7. 'Assets': likely future developments

'Assets'	Current Dutch position[a]	Contra-indications with regards to future developments
Product mix		
• intermediate goods	+	Competition from NIC's and OPEC countries[b]
electrical engineering (especially light electronics)	+	Competition from Southeast Asia[c], US and Japan
• food, beverage and tobacco	+	Competition from Eastern Europe; accession of Greece and Portugal to EEC
• capital goods	—	Increasing share in world trade[d]
Factor intensities		
• capital intensification	+	Scarcity of capital[e]
• skills and research intensification	+	Relevant skills will not remain exclusive and questionable scope for further intensification along these lines
• energy intensity	+	Scarcity of energy
Organizational structure		
• Prominence of multinationals	+	Relocation of production and transfer of know-how
Other advantages		
• location	+	Relocation of industrial concentration in FRG to North and South[f]
• export orientation	+	Protectionist trends/strong guilder

[a] + (—) indicate that for the sub-heading in question the Netherlands is more/less favourably placed than its industrialized competitors.
[b] OECD, *The Impact of Newly Industrialized Countries,* Paris 1979, text table 5. EEC, Bericht der Sachverständigengruppe 'Sektorale Analysen'; *Die Entwicklung der Sektoralen Strukturen der europäischen Volkswirtschaften seit der Erdölkrise 1973-1978,* Brussels 1979, p. 93.
[c] The World Bank, *World Development Report,* 1979, Washington, Annex table 6 (industrialization) and OECD (1979), op. cit., text table 5 and annex table 1 (electric engineering industry).
[d] The World Bank (1979), op. cit., text tables 3 and 20; Leontief et. al., *The Future of the World Economy,* New York 1977, pp. 56-59; K. Pavitt, 'Technical Change – The Prospects for Manufacturing Industry', *Futures,* 1978, pp. 283-292; EEC (1979), op. cit., pp. 94 and 142; OECD, *Facing the Future, Mastering the Probable and Managing the Unpredictable,* Paris 1979.
[e] OECD, *Towards Full Employment and Price Stability,* Paris 1977, pp. 295-303; H. Giersch (ed.), *Capital Shortage and Unemployment in the World Economy,* Kiel 1978, pp. 85-158.
[f] Prognos, *Die Bundesrepublik 1980-1985-1990,* Prognos Report no. 9, Basle 1979.

There have been several references in this section to the fact that industrialization in the Netherlands is of fairly recent date. Initially this provided the Netherlands with certain advantages in relation to established industrialised countries. Newcomers are able to establish themselves advantageously in relation to established suppliers by such means as:

- in-depth specialization;
- concentration on growth industries with favourable sales prospects;
- modern equipment.

There are many indications that this until recently still comfortable position will be challenged in the coming decades by the newcomers in the industrial world of 1980, i.e. the NIC's (Newly Industrialized Countries). The pattern of specialization and industrial strategy adopted in the Netherlands lend themselves particularly well to such countries.[22] These countries are in fact moving in these directions, as is evident from the following development survey of South Korea.

Table 8

	1966-1971	1971-1976	1976-1981	1981-1986
Infant industries	- Electronics assembly - Shipbuilding - Fertilizer - Steel	- Commodity car assembly - Consumer electronics - Special steels - Precisions goods (watches, cameras) - Plant construction - Metalworking	- Machinery components for cars, ships - Machine tools (MC) - Final machinery assembly - Simple instruments - Assembly of heavy electrical machinery - Semi-conductors for watches and calculators	
Industries attaining competitiveness	- Textiles - Clothing - Shoes	- Electronics assembly - Shipbuilding - Steel - Fertilizer	- Commodity car assembly - Consumer electronics - Special steels - Precision goods (watches, cameras) - Plant construction - Metalworking	- Machinery components for cars, ships - Machine tools (MC) - Final machinery assembly - Simple instruments - Assembly of heavy electrical machinery - Semi-conductors for watches and calculators
Self-sustaining industries		- Textiles - Clothing - Shoes	- Electronics assembly - Shipbuilding - Steel - Fertilizer	- Commodity car assembly - Consumer electronics - Special steels - Precision goods - Plant construction - Metalworking

Source: Korean Economic Planning Board, Five-Year Plans, taken from: Boston, Consulting Group, *A Framework for Swedish Industrial Policy,* October 1978, exhibit.

[22] Further elaboration of this view may be found in H. B. Chenery and L. Taylor, 'Development Patterns: Among Countries and Over Time', *Review of Economics and Statistics,* Vol. L, No. 4 (Nov. 1968), pp. 391-416. The branches of industry in which the Netherlands has specialized in the post-war period are predominantly middle industries, while the accent would need to shift to late industries in the course of further development.

In the coming decades, therefore, the Netherlands is likely to experience what has been termed in relation to Britain 'premature maturity'. The international competitive structure appears to be becoming increasingly tiered, with two separate hierarchies, one of product groups and the other of country groups, whereby there is a consistent forward progression over time of the country groups.[23]

The dynamic nature of the international division of labour may be illustrated by the case of Japan.

Table 9. Japan: export structure

Product groups according to intensity (GATT classification)[a]	Percentage share		
	1955	1965	1973
1. Research/skills intensive	3.0	4.0	5.8
2. Research, skills and capital intensive	5.5	9.0	9.4
3. Capital and skills intensive	18.5	20.6	28.8
4. Other capital intensive	3.0	7.9	8.4
5. Labour intensive	65.0	52.8	43.5

[a] This classification is based on a set group of products in each category. Adjustments over time therefore show changes in the package of goods produced. In addition, there is likely to have been a trend towards greater capital intensity etc. within the separate product categories; these do not however come to light in the table.

Source: L.B. Krause and S. Sikiguoki, 'Japan and the World Economy' (table 6-9), in: *Japan, Asia's New Giant,* Washington 1976.

Many experts believe that small developed countries will be confronted with three sets of problems as a result of the shifting nature of international competitive relationships:

- In relation to the category of advanced products (1 and 2), strong competition from the large industrial powers, i.e. the US, Japan and West Germany.
- In relation to the intermediate categories (3 and 4), increasing competition from the new, emerging industrialized countries (in general terms, South Korea, Taiwan, India, Brazil and Argentina; OPEC countries in relation to petrochemicals).
- In relation to the labour-intensive sector (5), substantial pressure from developing countries.

These competitive pressures will be experienced not only in foreign markets but also in the domestic market. It is by no means inconceivable that small industrial countries will find themselves in difficulties as a result of these developments, since the international division of labour already covers the entire range of products without these countries. Or to put it differently: in each of the separate areas, the small industrialized countries will be subject to one or more comparative disadvantages in relation to their principal groups of competitors.

[23] The GATT employs the following graded, constant classification into five product groups:

1. high intensity with regard to research and skills (advanced electronic equipment, precision instruments, specialized mechanical construction)
2. high intensity with regard to research, skills and capital (synthetic rubber/synthetics, generators and office machines, photographic equipment)
3. high intensity with regard to capital and skills (metal products, steel, tractors and construction machinery, motor vehicles, paper and synthetics)
4. capital intensive (synthetic fibres, durable consumer electronics)
5. labour intensive (textiles, clothing, food and beverage, etc.)

The classification ranges from the technologically most advanced (1) to the least advanced (5), and is of particular application to the manufacturing export sector.

The classification into country groups has recently been amended by the recognition that the NIC's no longer form part of the group of developing countries:

1. Industrialized countries (including large and small economies)
2. NIC's and Eastern Europe
3. Developing countries with industrial activities

See also EEC (1979), op. cit., pp. 67-82.

These developments cannot fail to hold implications for employment, productivity and output. The relationship between these variables is a complex one, partly because of the sectoral variations on this point: productivity is much higher when output is rising sharply than when it is rising only slowly.[24] The projections for these variables in *The Next Twenty-five Years,*[25] for example, are based on similar assumptions, leading to the unexpected result that while a significant decline in the growth of manufacturing output is foreseen for the period 1980/90, the net change in employment in the manufacturing sector is expected to be only slightly negative (-0.3% per annum). As a result of the rapid growth in output projected for the services sector, where productivity is relatively low, it is anticipated that total employment in industry will rise by over 1.5% p.a. during the 1980s. In assessing the internal consistency of such projections and specifying the conditions in which they would have practical validity, international competitive relationships and their possible impact on an economy such as that of the Netherlands are of decisive importance.[26] In this respect productivity is a key variable, since it is one of the most important determinants of competitiveness in high-cost countries.[27] Other significant factors include:

- the degree of openness of an economy;
- the extent to which price competition is countered by means of specialization and product differentiation;
- the extent to which major competitors succeed in raising their rates of growth and hence of productivity above the rates in one's own country.

There exists documentary evidence on each of these points for the Netherlands over the next decade.

[24] See on this subject the recent analysis by T.F. Cripps and R.J. Tarling, *Growth in Advanced Capitalist Countries,* Cambridge 1973.

[25] Netherlands Scientific Council for Government Policy, *The Next Twenty-Five Years,* Reports to the Government No. 15, The Hague 1977, table 28A, p. 109.

[26] Ironically, the pattern of output, employment and labour productivity projected for the period 1980/90 in *The Next Twenty-Five Years* was - totally against the expectations expressed in that report - in fact realized during the period 1975/79.

Projected and actual employment, productivity and output at 1970 prices

	Actual[a]		Projected[b] (excl. natural gas)		
	1963/73	1974/79	1975/80	1980/90	1990/2000
Productivity					
Agriculture	6.5	4	6.6	4.9	3.3
Manufacturing	8.0	4	7.1	4.2	4.4
Construction	2.0	0.5	2.0	1.8	1.6
Services	3.0	3	2.7	2.4	2.4
Production					
Agriculture	3.5	2.5	3.6	3.3	2.2
Manufacturing	7.0	1.5	6.3	3.9	3.7
Construction	3.0	0.0	1.3	1.2	1.1
Services	5.0	4.0	4.6	5.5	2.7

[a] Central Planning Office, *Centraal Economisch Plan 1979* (Central Economic Plan 1979), Annex D3 and D4.

[b] WRR, *The Next Twenty-Five Years,* table 28A, p. 109.

N.B. Changes in employment may be derived by subtracting changes in productivity from those in production.

[27] R. Dick and H. Dicke, Determinanten des Industrieländerhandels *Die Weltwirtschaft,* 1979, Vol. 1.

The openness of the Dutch economy is beyond dispute;[28] the report *The Next Twenty-five Years* even anticipates a further spectacular increase in the openness of the economy.[29] This means that the Netherlands will be particularly susceptible to changes in the pattern of international competition. The degree of specialization and product differentiation have been discussed above. Product differentiation is not the Dutch economy's strongest point, but specialization is well developed. But as already noted with regard to specialization, the Netherlands will become increasingly vulnerable to competition from NIC's, and it so happens that it is this very group of countries for whom significantly higher production growth rates may be anticipated in the 1980s than in the case of the Netherlands and Western Europe.[30] This trend has already got under way in recent years, and may be expected to become more marked over the next decade. This will bring about a new situation marked by increasing penetration by the NIC's of the Dutch domestic and export markets, which a reduction in costs would be insufficient to counter[31]. In these circumstances, modest growth of output will have to be coupled with a marked rise in productivity if Dutch industries are not to be squeezed out of the market altogether. This has, indeed, been the experience in industries that have been subject to severe competition from the NIC's in recent years[32], i.e. stagnation of production coupled with increases in productivity little below those in growth industries. This would of course have a considerable impact on employment, the outlook for which would therefore be a good deal less favourable than anticipated in *The Next Twenty-five Years.* This problem was recently analysed by Kolnaar in terms of a dilemma: driving out the devil of structural unemployment with the Beelzebub of the unemployment caused by the loss of markets arising from an uncompetitive price level.[33]

This is not a new subject; economic problems in the 1950s were broadly comparable, as was the public discussion. The way in which these problems might be tackled by government action was set out in the policy reports on industrialization: the creation of new employment by strengthening existing activities and encouraging the growth of industries with a promising future. This marked the beginning of structural policy.

Additional considerations

An extrapolation of the present-day pattern of specialization has a number of strategic implications that should be taken into account. In this regard we may once again consider factor intensities in Dutch industry, splitting the latter into two sections, namely those industries on which the Netherlands has concentrated, and the remainder.

[28] The Netherlands' export ratio (i.e. total exports as a % of GNP in current prices) stood at 41% in 1977, which easily put the Netherlands at the top of the OECD league, together with BLUE and Ireland. See the international survey in *OECD Observer,* no. 97, March 1979.

[29] Under Alternative A, the annual percentage growth of production and exports in the goods sector was as follows:

	1975/80	1980/90	1990/2000
Production	5.6	3.3	3.2
Export	7.9	5.8	4.8

This amounts to an increase in the export ratio during the period 1975-2000 of no less than 65%.

[30] The World Bank (1979), op. cit., text tables 1-5.

[31] It is all too frequently assumed that developing countries, including the emerging newly industrialized countries, continue to rely on less advanced technology. In all sorts of areas this view no longer holds good.

[32] See EEC (1978), op. cit., pp. 108-121. Cripps and Tarling (op. cit.) also provide documentation on international sectoral developments, while H. den Hartog and H.S. Tjan deal with various Dutch developments in *A Clay-Clay Vintage Model Approach for Sectors of Industry in the Netherlands,* The Hague 1979. The two latter studies both reach the conclusion that the supposed link between growth in output and changes in the productivity of labour did not apply in recent times. Changes in labour productivity appears to be determined much more autonomously.

[33] A.H.J.J. Kolnaar, 'Technische vooruitgang, werkgelegenheid en sectorbeleid' (Technical Progress, Employment and Sectoral Policy), *Maandschrift Economie,* July 1979.

Table 10. Factor intensities in Dutch industry[a] 1958-1974

	Man hours/ unit of output		Capital input/ unit of output		Energy consumption/ unit of output	
	1	2	1	2	1	2
1958	1.85	4.50	2.89	2.66	1.87	0.61
1960	1.62	3.81	2.68	2.39	1.82	0.54
1965	1.13	2.87	3.25	2.43	1.98	0.48
1970	0.88	1.87	3.89	2.53	2.32	0.40
1974	0.61	1.26	3.60	2.04	2.46	0.31

[a] Split into two as follows:
1 = branches of industry in which the Netherlands has tended to specialize since the Second World War.
2 = other branches of industry.

Source: J.R. Magnus and L. Vastenou, *Prijzen en hoeveelheden van arbeid, kapitaal, energie en produktie in acht sectoren van de Nederlandse industrie, 1958-1976* (The Price and Quantity of Labour, Capital, Energy and Production in Eight Sectors of Dutch Industry), Report AE/10/78, Instituut voor Actuariaat en Econometrie, University of Amsterdam, September 1978.

If we accept Magnus's finding for industry as a whole that the factors of production of labour and energy were to a certain extent substitutes[34] for one another, and if the above table may be taken to indicate that this applies to an even greater extent to that section of industry in which the Netherlands has specialized, this would mean that efforts to improve our competitive position along traditional lines would have the following consequences:

- Efforts to achieve the (required) reduction in costs in sector 1 by reducing the wage component through greater capital intensity would seem to be frustrated by the fact that such increases in capital intensity could only be achieved by increasing energy consumption per unit of output.

This effect could only be avoided if new technical solutions were available or could be developed in the short term.[35]

- Increased capital input in sector 1 is becoming steadily less attractive in terms of the use of capital and also more risky in view of the anticipated increase in world capacity in precisely this sector. At the same time demand for the products in this sector is becoming less vigorous (substitution and saturation).
- Sector 1 will be coming under increasing pressure from an environmental viewpoint, with a possible need for supplementary environmental investment, thus leading to a further rise in capital intensity. This intensification of the capital burden will for the present have scarcely any impact in emerging industrial countries, thereby giving them an additional competitive edge.
- Assuming a by no means implausible shortage of capital during the next decade,[36] an intensified input of capital in the already capital-intensive sector 1 could have adverse consequences for the remainder of industry. Moreover, in view of the amount of capital needed per job, such a development would do little to create employment. Although a similar need for rationalization may be anticipated in sector 2, the capital: labour ratio in this sector is likely to remain lower than that in sector 1 and to be favourable in terms of the amount of capital required per job.

[34] J.R. Magnus, 'Substitution between energy and non-energy inputs in the Netherlands 1950-1976', *International Economic Review*, 20, No. 2 (June 1979), pp. 465-484.

[35] The suggestion that in the face of the steep rise in energy prices it might be possible simply to reverse the historical trend in sector 1, i.e. making production more labour-intensive and less capital and energy-intensive, strikes us as dubious and certainly untenable over the longer term. (This is suggested in E.R. Berndt and D.O. Wood, 'Engineering and Econometric Interpretations of Energy-Capital Complementarity', *American Economic Review*, 69 (June 1979), pp. 342-354). Dubious because such a reversal would require a radical change in production methods and new techniques; and untenable in the longer term because the price of labour may then be expected to rise again in relation to that of energy.

[36] For a detailed discussion of this subject see P. McCracken, *Towards Full Employment and Price Stability* (Paris 1977).

In a survey of the economic consequences of moving towards a stable population,[37] specific attention was devoted to the effects of lowering the capital coefficient, which is synonymous with increasing the relative size of sector 2. In the model used, a 10% reduction in the capital coefficient was found to lead to a 3 to 4% rise in productive capacity. The latter would have an almost 100% flow-on effect on employment, unless full employment were reached. This is, therefore, a matter of some significance.

In the model, the positive impact on the level of output turned out to be a good deal lower than 3 to 4%, meaning that labour productivity tends to be reduced as a result. This has its origins in the resultant degree of capacity utilization.

Within the model, which is – inevitably – an empirical estimate based on historical data, this configuration of events is inherent in the current market position of the Dutch economy.

In this respect it is significant to note that by means of policies oriented towards a greater degree of product differentiation, this market position – and the associated trend in capacity utilization – can be redirected in a positive sense.

On balance we believe that substantial uncertainty surrounds the tenability of our current pattern of specialization over the next few decades. On the other hand it is of course inconceivable that the structure of production could be transformed overnight. Instead we should be thinking in terms of a transitional period in which the specialization pattern outlined above should be protected responsibly and as required while at the same time encouraging a process of restructuring based on a formula that will retain validity for the next twenty-five years. This question is discussed in detail in sections 5.1.5 and 5.2.5.

2.1.4 *Concluding observations*

Industrialized countries which wish to grow successfully in terms of a satisfactory employment situation, equilibrium in the balance of payments and a reasonable rate of growth of productivity, cannot escape the need for a sector of advanced, highly productive, expansion and export-oriented industries.[38] As a result of post-war industrialization, such an export sector was in fact created in the Netherlands. The lines along which the industrial structure was built up have been discussed above.

Initially, that is until around 1965, this process was accompanied by a strengthening of Dutch industry both in the domestic and in foreign markets. After 1965, as emerges clearly from a study by the Netherlands Economic Institute,[39] this trend was reversed. As a result of a process of marked internationalization there was a considerable increase in foreign penetration of the Dutch market. Initially, it proved possible to compensate for the effects this had on employment and the balance of trade by increased exports. This lasted until around 1974, when employment in the export sector also began to decline.

What may one expect with regard to employment and the balance of trade over the next decade? The NEI study suggests that in general the industrial situation will deteriorate during the 1980s. It attributes this simply to the fact that exports cannot be expected to keep pace with import penetration. These expectations are entirely consistent with the conclusions reached in section 2.1.3. Such a development would of course have serious consequences for the balance of trade and employment. Care must, however, be exercised in dealing

[37] N. J. de Beer et al., *De economische gevolgen van een overgangsproces naar een stabiele bevolking* (The Economic Consequences of Moving Towards a Stable Population), National Programma Demografisch Onderzoek – research report no. 4, Voorburg, July 1979.

[38] See on this point Cripps and Tarling (op. cit.) and also A. van der Zwan, 'On the assessment of the Kondratieff Cycle and Related Issues' in S. K. Kuipers et al. (eds.), *Prospects of Growth,* Amsterdam 1980.

[39] Netherlands Economic Institute, *Herstructurering, herstructureringsbeleid en ontwikkelingssamenwerking. Een analyse van de handel in industriële produkten tussen Nederland en Ontwikkelingslanden* (Restructuring, Restructuring Policy and Development Cooperation. An Analysis of Trade between the Netherlands and Developing Countries). Final reports 1 and 2, Rotterdam 1979. See also L. B. M. Mennes, op. cit.

with such projections, since adjustment mechanisms may be at work in the economy, the effects of which may not be taken sufficiently into account. Perhaps it might be put in the following terms: if policies were to remain unchanged, the economy would tend to move in the direction outlined.

The task in the next few decades for the Netherlands as a relatively small industrialized country will be to assume such a position in the international constellation of forces, or in other words to achieve such a formulation of its functional position, that these threatening developments are averted. This must form the heart of anticipatory structural policies, which will have to define and where necessary create the comparative advantages (assets) for the Netherlands that are consistent with the functional position being aimed at. In this respect the regulation of technical progress at the level of industrial application – or at least its conversion in line with Dutch circumstances and possibilities – will play an important part.

In adopting this position for the Dutch economy, not just the direction of the specialization to be aimed for will be important but also the pace at which it should occur.

Some of the relevant objectives for the reformulation of our functional position are listed below in the form of hypotheses to be examined further in this and subsequent chapters:

– a restructuring of our current export industries (chemicals and crude oil) in technological terms and in line with market conditions, with greater emphasis on high-value products and the modernization of the production process.[40] Greater energy conservation will play an important part with regard to the latter.

– slowing down foreign penetration of the Dutch market, combined with a general expansion of Dutch export capacity. This could include:

- the revitalization of so-called sensitive sectors (textiles, clothing, footwear etc.).

At least two marginal notes are in order here. The first is that this revitalization will have to concentrate primarily on those products and markets where we are losing ground to industrialized countries – which in fact form the greater part – and not on those products in which developing countries are beginning to specialize. As far as the actual loss in competitive power is concerned, the Netherlands moreover has no peer.[41] Secondly, such a revitalization will have to be conducted with care, since, as recent developments in this sector, including in the Netherlands, indicate, it is all too easy to be wide of the mark.[42]

- 'dynamic import substitution'[43] with regard to the equipment sector (machinery, engines and electrical appliances).

As indicated above in section 2.1.2, this sector does not account for a large part of Dutch industrial production. This is one of the reasons why the Dutch economy should be under severe import pressure, while in view of its increasing importance in international trade, this sector may also be regarded as important in terms of strengthening the Dutch export capacity. The favourable employment prospects in this sector are another serious consideration. It is evident from our competitive position that there are limits to proceeding along traditional lines, that is compensating for the weak points in the industrial structure by strong expansion in the intermediate goods sector (chemical products, high-value products). Over the next few decades the equipment sector will be able and will have to make a greater contribution to the required maintenance and strengthening of the advanced sector of the Dutch economy. This will, of course not just be a matter of what is ideally desirable but of what is in fact possible, since the

[40] Cf. Pavitt, op. cit.

[41] See EEC (1979), op. cit., p. 94.

[42] Evidence to this effect for the Netherlands is suggested by Den Hartog and Tjan's tentative estimate of the scale of economic ageing of the productive capacity (i.e. capital destruction) in this sector. Den Hartog and Tjan, op. cit., table 6.4.

[43] This term is intended to indicate the simultaneous improvement of the competitive position in both the domestic and foreign markets. This has nothing to do with protection; these are competing industries.

This view is consistent with the empirically established importance for this sector of a combination of export-led growth and home-spun growth. See Terutomo Ozawa, *Japan's Technological Challenge to the West,* Cambridge, Mass. 1974.

possibilities in a small country with a relatively limited home market are by no means limitless. At the same time, the acceleration in the pace of technological change, for example in micro electronics, will place established market structures under pressure. In principle this should create scope for new suppliers able to react quickly to openings in the market (see section 3.1).

2.2 Current trends in the Dutch economy

2.2.1 *Trends during the 1970s*

During the first four years preceding the recession year of 1974 output grew at a reasonable rate, with a pronounced boom in 1973. One disturbing development during that period, however, was the considerable acceleration in wage and price increases. Wage demands were increasingly influenced by inflationary expectations, the rate of economic growth, the rising cost of living and the tight conditions in the labour market, despite the stagnating level of industrial employment.

In 1972 the rise in costs was accentuated by a sharp increase in the price of raw materials brought about by raw materials shortages and a simultaneous economic improvement in industrialized countries. To this was added a four-fold increase in the price of oil at the end of 1973. During the course of 1974 the international economic outlook changed. The impact of the rise in oil prices was an obvious factor. The decline in the terms of trade suffered in industrialized countries had a marked impact on incomes. In addition a number of industrialized countries introduced restrictive monetary policies. The fight against inflation was accorded priority.

In the Netherlands the growth in sales of goods and services slowed considerably. The slackness of international trade led to a drop in the volume of exports in 1975 of 5%. The growth in domestic expenditure was insufficient to compensate for the decline in exports, despite the fact that private consumption continued to rise and that the government's reflationary policies led to an 8% rise in current government expenditure. Private investment, however, declined sharply, especially building investment. On balance the volume of private sector output fell by 1.5%, the first time this had happened since 1958.

The next few years saw a certain degree of recovery, both in the Netherlands and internationally, but growth remained limited. The low rate of growth may be primarily attributed to the sluggishness of exports, as well as to the penetration of the domestic market by foreign competition. The sluggishness of exports was caused by the stagnation in world trade and the gradual undermining of Dutch export competitiveness, partly as a result of the persistent increase in the value of the guilder. The stagnation of exports and the large-scale market penetration by foreign competitors serve to explain why the balance on current account should have swung from a surplus of over 7 billion guilders in 1976 to a deficit of 2.5 billion in 1978.

The weakness of economic growth in recent years cannot be ascribed to the trend in domestic expenditure. The volume of private consumption, for example, rose more rapidly than the pattern of real income would have led one to expect. The volume of private investment also rose again in 1977, while current government capital expenditure was at a high level, especially in relation to those items forming part of the Government's anti-cyclical policies.

In a clear break with the 1960s, output continued to rise despite a decline or stagnation in employment. During the period 1970-1974 some 70,000 jobs were lost in industry, even though output was growing reasonably. This phenomenon was explained in terms of the rise in real labour costs, which exceeded increases in the productivity of labour. This gave rise to a strong incentive to limit the rise in costs. Rationalization, labour-saving investment as well as the discontinuation of certain lines of production all took place. The growth in employment was primarily concentrated in the services sector, especially non-commercial services. The lack of creation of new jobs in industry and commercial services may be attributed to disappointing profit expectations, caused partly by the excessive wage-income ratio, while the sluggish level of exports also had an impact on employment. All this resulted in the level of employment rising to over 200,000 during the 1970s.

2.2.2 *The Dutch economy in greater detail*

This section examines the pattern of economic growth in the 1970s in terms of a number of economic indicators. From 1970 to 1973 output grew at a reasonable level (approx. 5.5% p.a.). This rate of growth exceeded the OECD average.

In the second half of the 1970s economic growth fell considerably. In particular, industrial output grew slowly, averaging only 1%.

Expenditure

In what way did expenditure develop against the background of this change in economic growth patterns? Particularly striking is the pattern of private consumption, which grew strongly throughout the period. The high rate of growth in the last two years could well be related to a change in income distribution and to an increase in consumer credit, particularly since the growth in real disposable incomes was much lower.

The pattern of total exports changed dramatically. In the last two years, in particular, export growth fell to a very low level.

There were marked fluctuations in the level of gross fixed capital formation of enterprises, with a decline in volume in the mid-1970s and a recovery in the last two years.

In international terms it is noticeable that in contrast to the Netherlands, West German exports continued to grow at a reasonable rate. Trends in other categories of expenditure do not differ greatly from the pattern in the Netherlands. In terms of the growth of gross investment in the last two years and the growth in private consumption over the whole period, West Germany and the Netherlands compare favourably with the rest of the EEC (see table 11).

Table 11. Changes in volume of a number of expenditure categories 1970-1978, 1970 prices

	Netherlands					Germany				
	1970 share	1970/ 1973[1]	1973/ 1976[1]	1976/ 1978[1]	1978 share	1970 share	1970/ 1973[1]	1973/ 1976[1]	1976/ 1978[1]	1978 share
Private consumption	56.7	3.9%	3.0%	4.1%	58.2	57.0	4.0%	3.0%	3.2%	60.4
Government expenditure	16.3	1.8%	3.4%	2.9%	15.6	12.8	3.6%	1.5%	2.2%	12.6
Gross fixed capital formation	25.7	1.7%	-3.4%	7.1%	21.6	25.6	3.3%	-3.2%	5.1%	22.9
Stocks	2.5	—	—	—	1.9	2.3	—	—	—	0.4
Exports	45.6	11.4%	3.5%	0.1%	54.0	20.3	8.4%	5.4%	4.6%	26.8
Imports	-46.9	7.5%	1.5%	2.9%	-51.2	-18.0	5.7%	6.6%	5.7%	-23.2
Gross Domestic Product	100	4.7%	2.6%	2.3%	100	100	3.9%	1.3%	2.9%	100

[1] Average annual growth at 1970 prices.

Source: Bericht der Sachverständigengruppe 'Sektorale Analysen'. Commission of the European Communities, July 1979.

Labour costs

One of the factors associated with the disappointing growth in the volume of exports after 1972 was the development of labour costs, which increased more rapidly than in competing industrialized countries. To the extent the rise in costs cannot be passed on this is reflected in a rise in the wage ratio. This in turn affects profitability and can in certain cases lead to withdrawal of supply or to higher export prices.

In its monthly Bulletin of Social Statistics for June 1979, the Central Bureau of Statistics provides a survey of relative labour costs in EEC countries during the period 1972-1977. During this period hourly wage rates in the Netherlands rose by approximately 95%. Only Germany, with a rise of 64%, recorded a more moderate increase. In the remaining EEC countries labour costs more than doubled, especially in France and Italy.

But relative labour costs should not be assessed in terms of domestic currencies alone; exchange-rate variations must also be taken into account.

To this end all labour cost figures have been converted into European units of account (EUA's). In these terms labour costs in the Netherlands rose by 151%. This clearly reflects the rise in the value of the guilder in relation to the EUA.

Similarly in the case of Germany, the appreciation of the mark is of great significance: hourly wage rates rose by 122%. Countries with the highest increases in labour costs in terms of national currencies nevertheless compare favourably with Germany and the Netherlands in regard to relative labour costs because their currencies consistently depreciated in relation to the mark and the guilder.

Table 12 provides a survey of relative labour costs in manufacturing industry in a number of EEC countries, measured in European units of account.

Table 12. Hourly wage-rate trends, in manufacturing industry (excluding public utilities); Netherlands = 100

	Netherlands	Germany	France	Italy	Belgium	Luxembourg	United Kingdom	Denmark
1972	100	101	76	77	91	95		
1973	100	102	78	68	93	93	52	92
1974	100	96	67	60	90	92	48	92
1975	100	89	71	65	92	87	45	89
1976	100	87	70	60	92	89	40	87
1977	100	90	68		97	94	38	84

Source: Central Bureau of Statistics, monthly extracts of statistics, June 1979.

Up to and including 1976, wage-rates in the Netherlands and Belgium developed virtually in parallel, but in 1976 the trend changed in favour of Dutch manufacturing. Relative wage-rates in France declined year by year in comparison with the Netherlands. Although wage-rates in France rose more rapidly than in the Netherlands, the steady increase in the value of the guilder resulted in a deterioration in the relative cost situation in the Netherlands.

Wage-rates also rose considerably in the United Kingdom during 1972-1977, but the steady depreciation of sterling meant that on balance wage costs fell to very low levels in relation to other EEC countries.

To sum up it may be said that there was a sharp rise in relative labour costs in the Netherlands. This does not apply in relation to Belgium but is true for the rest of the EEC.

In order accurately to assess the effect of the relatively marked rise in the level of labour costs on the competitive position of the Netherlands, hourly wage-rates need to be expressed in terms of labour costs per unit of output. This means taking changes in the productivity of labour into account. During the 1970s, the Netherlands recorded reasonable increases in the productivity of labour, comparable with those in countries such as West Germany, Belgium and France, and clearly outstripping the productivity gains in Italy and the United Kingdom in those years.

In overall terms, this meant that the greater increase in labour costs in the Netherlands was not adequately compensated for by rises in the productivity of labour, so that unit wage costs worsened in relation to other EEC countries.

The same conclusion was reached by the Central Planning Office, which estimated a deterioration of some 7.5% for Dutch industry during the period in question.[44]

Profitability

An important indicator for describing the condition of the Dutch economy is the wage-income ratio of enterprises, which shows the share of wages and salaries in total private-sector income (net value added at factor cost). The wage-income ratio is important because its complement, the property-income ratio, provides an indication of company profitability.

The wage-income ratio rose considerably during the 1970s, reaching approximately 90% in 1978. In consequence there was a steady decline in property-income. The major items in property-income consist of interest payments, taxes and net profits, from which it will be evident that property-income cannot be equated with company profits. In particular, the change in the structure of assets together with the rise in interest rates have led to the displacement of profits by interest. Thus the borrowed funds of public companies

[44] Central Planning Office, Central Economic Plan 1979, p. 16.

rose as a percentage of total assets from 56% in 1970 to 64% in 1977. In 1977, the share of interest charges in property-income was around 40%. (This figure relates to the 152 public companies, excluding the five multinational enterprises.)

Table 13 shows changes in the wage-income ratio during the period 1968-1978.

Table 13. Wage-income ratio of the private sector[1]

	1969/1973	1974	1975	1976	1977	1978
Wage-income ratio	84	88	94	91.5	91.5	90

[1] Excluding minerals exploitation, public utilities and housing.

Source: Central Planning Office, Central Economic Plan 1979.

The rise in this ratio may be explained in terms of a number of factors. In the first place the calculation of the wage-income ratio takes into account the wages and salaries of the self-employed. To do so their income must be divided into a wages and salaries and a profits component.

In doing so it is assumed that the average wages of the self-employed are equal to the average wages of those in salaried employment. This method does, however, tend to underestimate the earned-income ratio, since empirical surveys have shown the average income of the self-employed to be considerably higher than the average income of employees. If only for this reason, a continuation of the long-standing pattern of an annual decline in the number of self-employed by about 1½% would result in a tendency for a structural increase in the earned-income ratio. A second factor of significance was the pattern of production. In 1975, for example, the volume of total company output dropped without a direct corresponding reduction in the size of the labour force. This inevitably meant an increase in the earned-income ratio.

A further factor that affects the size of the wage-income ratio is the movement in prices for raw materials and intermediate goods. It did not prove possible fully to pass these increases on in the price of the end product. In particular the steep rise in oil prices in 1974 affected property-income, which in turn led to a rise in the wage-income ratio.

Finally there is the effect of changes in labour costs on the wage-income ratio. Since the early 1970s unit wage costs have risen annually. The growth in hourly wage-rates considerably exceeded productivity gains, resulting in a net growth in unit wage costs. To the extent this rise in costs could not be passed on in prices it led to a rise in the earned-income ratio.

There can be considerable variations between the various branches of industry. In general wages trends were much the same in the various branches. Variations in labour productivity therefore automatically entail differences in cost increases. The extent to which this is reflected in prices depends however on the degree of international competition. The lower the degree of international competition, the greater the extent to which cost increases can be passed on.

Thus it may be seen that in almost all branches of industry prices in the domestic market rose faster than export prices during the period 1970-1978. The extent to which costs could be passed on declined however with increasing foreign penetration of the domestic market.

In conclusion it may be said that the marked rise in the wage-income ratio indicates a decline in company profitability during the 1970s.

Apart from the slump in international economic activity and the steep rise in the price of raw materials, the increase in labour costs has been responsible for the decline in company profitability.

Appreciation of the guilder

The competitive position of the business sector has not only been affected by the rise in labour costs but also by exchange rate variations. Substantial changes have taken place in the rate of exchange since the dollar ceased to be convertible

at a fixed rate in 1971. During the same period, with the exception of the last two years, the Netherlands recorded considerable current account surpluses. This enabled the guilder to be counted among the strong currencies, with a consequent steady increase in its value. This had two implications for the Dutch competitive position. On the one hand exporters were faced with higher export price levels, while on the other the appreciation of the guilder meant a reduction in import prices, thereby reducing costs. Now exchange rate variations do not necessarily have an equal impact on import prices and the export price level, for the geographical composition of the package of imports differs from that of exports. Table 14 indicates that during the period 1970-1978 the initial cost advantages on the import side were consistently lower than the initial competitive disadvantages. This meant that the Dutch competitive position could not be maintained and that there was a significant decline in the terms of trade.

Table 14. Appreciation of the guilder 1971-1978

	% change on preceding year								
	1971	1972	1973	1974	1975	1976	1977	1978	Cumulative total
With respect to suppliers	1.0	1.5	3.0	4.5	2.0	1.0	4.0	5.5	24.5
With respect to competitors in foreign markets	1.5	2.5	5.5	6.0	2.5	1.5	6.5	3.5	33.5

Source: Central Planning Office, Central Economic Plan 1978.

The yardstick used to express changes in the rate of exchange on suppliers and competitors is the effective rate of exchange of the guilder. In essence this is computed as the weighted average of exchange rate fluctuations of the guilder on the currencies of the Netherlands' trading partners. In general the weights consist of the trading shares of individual trading partners in Dutch imports and exports. The calculations draw a distinction between countries but not according to branch of industry or product category.

In so far as the categories of countries to which exports are sent differs among the various branches of industries, the effective rate of appreciation will vary from branch to branch. This effect has been studied by Anema and Jepma.[45] Their study was based on the ten product categories distinguished in the standard industrial classification (SITC). An index weighted for export shares was drawn up for these categories on the basis of the four major trading partners (West Germany, France, Italy and the U.K.).

During the period 1971-1976 the effective appreciation of the guilder for the various product categories ranged from 23% to 0%. The greater the share of exports to a country with a strong currency (such as West Germany) in a particular product category, the lower the effective appreciation of the guilder. The product categories of raw materials and coal and petroleum products were consistently below the average, while the categories of beverage and tobacco, chemical products, machinery and means of transport were consistently above average.

2.2.3 *The industrial structure*

The pattern of specialization of Dutch industry during the 1960s was outlined in section 2.1.2. This section examines growth in strong and weak branches of industries in subsequent years. The development of other branches of industry is also considered (see table 15).

[45] W.J. Anema and C.J. Jepma, 'De effectieve wisselkoers als maatstaf voor de opwaardering van de gulden' (The Effective Rate of Exchange as Yardstick for the Appreciation of the Guilder), *Economisch Statistische Berichten*, 9 August 1978, no. 3166, p. 792.

Of the intermediate branches of industry, such as chemicals, petroleum refining and basic metals, which had a marked effect on the development of the Dutch economy, chemicals in particular managed to maintain their position. The oil industry and basic metals, which were among the more rapidly growing industries up to 1974, were clearly affected by the lower rate of economic growth in subsequent years.

Table 15. Trends in the volume of output and the industrial structure 1970-1978, gross value added at market prices of 1970

	Annual % change		Share		
	1970-1973	1974-1978	1970	1973	1978
1. Agriculture	5.1	2.1	7.0	7.0	7.1
2. Livestock industry	4.8	1	0.4	0.4	0.4
3. Other	4.0	2.4	3.0	2.9	2.9
4. Beverages and tobacco	7.8	3.2	2.4	2.5	2.6
5. Textiles	−1.5	−4.6	1.4	1.1	0,8
6. Clothing, leather etc.	−6.4	7.3	1.0	0.7	0.4
7. Paper and printing industry	1.8	4.1	2.7	2.4	2.6
8. Timber and construction materials	4.5	−0.5	2.7	2.6	2.3
9. Chemicals	10.5	2.8	4.7	5.6	5.6
10. Basic metals	6.6	−1.0	1.6	1.7	1.4
11. Petroleum refining	10.3	−2.0	2.1	2.2	1.8
12. Metal products	4.4	+0.8	5.5	5.1	4.7
13. Electrical engineering	7.4	+2.5	3.9	3.9	3.9
14. Transport facilities	5.1	−3.2	2.0	2.0	1.5
15. Manufacturing (2-14)	5.6	1	33.4	33.1	30.9
16. Mining (natural gaz)	18.8	2.8	1.9	2.8	2.8
17. Public utilities	12.4	4.2	2.7	3.3	3.5
18. Construction industry	1.5	−0	8.5	7.5	6.6
19. International services	5.8	4.0	24.8	24.9	26.8
20. 'Local' services	4.8	3.4	21.7	21.5	22.4
21. All enterprises	5.5	2.5	100	100	100

Source: WRR.

In the case of basic metals, these lower rates of growth were not directly translated into a reduction in productive capacity. Between 1974 and 1976, for example, the productive capacity of steel rose by 26% while production fell by 11%. Similar surplus capacity exists in all advanced industrialised countries. The lower rate of economic growth has also meant problems for the petroleum refining industry, which has traditionally topped up shortages in other European countries.

The decline during the 1960s of the share of textiles, clothing, leather and footwear persisted during the period 1970-1978. The decline in the volume of production also continued.

Within the metal manufacturing industry, electrical engineering forms something of a positive exception, in that it managed to sustain a reasonable rate of growth of output beyond 1974. The lower rate of economic growth after 1973 has had a marked effect on the transport facilities industry, where there is now structural surplus capacity. A stable sector consisted of food, beverage and tobacco, which maintained its position during the 1970s.

The growth of the services sector compared favourably with that of manufacturing. One obvious explanation for this trend is the fact that a number of functions formerly carried out by enterprises themselves in the field of market research and marketing are now performed by specialist firms.

Secondly, a demand has been established for new services often complementary in nature to manufactured products: computer service companies form a good example.

Finally the partial or complete provision of public funds has enabled the non-commercial services sector to grow substantially. Obvious examples include health care and welfare facilities.

We have classified the services sector into two sub-sectors. One of these consists of services of an international nature, such as trade, shipping, aviation and other transport, while the other consists of services of a more domestic nature, such as housing, banking and insurance, health care and other services.

International oriented services – which, in economic terms, are obviously complementary to industrial activity – grew rapidly. Although industrial output grew only slowly, this growth in international services is not as surprising as it might seem, since the foreign trade of the Netherlands has consistently grown faster than manufacturing output.

In volume terms there has been a rise in the share of these two sectors in total output by enterprises. In nominal terms, however, the rise in the share of the services sectors has been appreciable. This is because, in contrast to the manufacturing sector, the services sector has a largely protected market and is therefore able to pass sharp wage and price rises on in its prices. Agriculture, with a steadily declining labour force and acreage under cultivation, was nevertheless able to record reasonable rates of growth in the last few years. Agriculture has become increasingly organized along manufacturing lines. Increases in scale, mechanization and high labour productivity are the characteristics of this process. The reduced rate of growth of output after 1973 is related not only to the general state of the economy but also to structural factors such as increased competition in European markets and saturation of the market.

The explosive growth of the mining sector was caused by the rise in production of natural gas. Between 1972 and 1976 the volume of production in the construction industry declined consistently. This applied not only to private dwellings but also to industrial building. Between 1970 and 1976 investment in industrial building declined by 21%. In the case of manufacturing industry, investment volume declined by no less than 50%. In 1977 there was a recovery in industrial building. This may have been partly related to the general improvement in the economy, but a number of measures taken by the government to stimulate the economy will also have had an effect. In agriculture, for example, investment in farm buildings rose by 43% in 1977 and 19% in 1978.

Finally it may be noted that of all the EEC member states, only the Netherlands and the United Kingdom display any signs of de-industrialization. In the Netherlands the share of manufacturing industry in the total volume of industrial output fell from 33% in 1970 to a little over 30% in 1978.

2.2.4 *Sales trends*

Reference was made in section 2.2.2 to the fact that the growth in the volume of exports during the second half of the 1970s lagged considerably behind the growth in production. As a result the Netherlands' share in international trade in goods has fallen by over 10%.[46] This is a particularly disappointing result when compared with West Germany and the United States, both of which managed to improve their market shares. As noted earlier, this trend is related to the higher rise in unit labour costs than in other EEC countries. To the extent that the rise in costs cannot be passed on in prices, this leads to a rise in the share of wages in national income; this in turn squeezes profit margins and can lead to withdrawal from production. Alternatively, higher unit labour costs can result in higher export prices. Another major factor has been the effective appreciation of the guilder since 1971.

In its macro-economic survey for 1980 the Central Planning Office has examined the deterioration in the Netherlands competitive position and its declining share of world trade more closely. It would appear that part of the decline may be attributed to differing methods of calculation. Preliminary estimates suggest that the amount of ground lost in foreign markets since 1973 was only half as great as thought and that approximately half the deterioration in the Netherlands' competitive power may be ascribed to differences in the method of calculation. The changing nature of the Dutch package of exports is a further significant explanatory factor for the impression given by the macro figures of a decline in the country's competitiveness. The sharp rise in relative export prices in 1974 may be wholly explained in terms of changes in the composition of exports. It is fair to conclude, however, that the Netherlands' share in world trade has been declining since 1973 and that there has been a relative rise in the price of Dutch exports since 1976.

[46] Department of Economic Affairs, Budget Estimates, Second Chamber 1979-1980 session, 15800, chapter XIII, no. 2, p. 10.

Dutch losses in foreign markets may be partly explained in terms of the deterioration in competitiveness, but an additional factor consists of the fact that, in comparison with other industrialized countries, the Netherlands has an inferior package of exports in the sense that the fastest growing groups of goods in international trade are primarily manufactures in which, with the exception of chemical products, the Netherlands is poorly represented. Finally the pronounced geographical orientation of Dutch exports towards the EEC has played a role. In the past this has enabled the Netherlands to benefit actively from the vigorous growth within the EEC region. But now that other groups of countries (such as OPEC) are growing rapidly, the Netherlands finds itself at a disadvantage. Countries such as France and the United Kingdom were able to increase their exports to OPEC countries substantially during the 1970s. The EEC's Group of Experts report on 'Sectoral analysis' ascribes the Netherlands' declining share of world trade primarily to the marked geographical concentration of its exports on Europe, while the composition of its package of exports is seen as playing a much smaller role.[47] Of all the EEC countries thé Netherlands has the highest degree of concentration on the European community. Approximately 71% of Dutch exports go to the European Community. If the remaining Western European countries are also taken into account, Western Europe accounts for 82% of total Dutch exports. Over the course of the years there has been a slight decline in this figure, while outside Europe exports to the Middle East assumed more importance; exports to America have been declining while exports to Asia, Eastern Europe and Africa have remained fairly stable.

A comparison of Dutch export prices with those of foreign competitors provides an indication of our competitive position but does indicate the extent to which high Dutch export prices have in fact acted as a brake on exports.

The competitive power of Dutch industry does not just depend on the level of prices and the range of products produced. Industry's position in foreign markets is also determined by such factors as the quality of the goods produced, delivery times, financing conditions and the profitability of exports. It is useful to examine profitability more closely as an indicator. A comparison between unit costs and export prices indicates that industry was confronted with a contraction in net profits from exports during the 1970s. This macro-indicator suggests that the decline in profitability from exports may be put at 7%. The Central Economic Plan 1978[48] indicates that this process of contraction of net profits dates back to the 1960s. At the expense of net profits it proved possible to withstand foreign competition for some time.

The competitiveness of Dutch industry has not only had an impact in export markets; Dutch industry is also increasingly exposed to foreign competition in the domestic market. Manufacturing industry, in particular, is faced with market penetration. Between 1970 and 1978 there was a sharp increase in market penetration, defined as the share of competing imports in domestic consumption. In 1970, market penetration in the manufacturing sector stood at 38.5%; in 1978 it had risen to 45%.

There is evidence of structural market penetration in the case of consumer goods.[49] This emerges clearly if one examines the share of the annual growth in the volume of consumption accounted for by imported finished goods. In the 1960s the marginal direct propensity to import in relation to the volume of private consumption was a little over 20%; in the last few years this has risen to 30%.

If imports of raw materials and semi-finished goods used for the manufacture of consumer goods are taken into account, as well as tourist expenditure abroad, the marginal propensity to import comes to well over 50%. The increasing degree of market penetration in the case of consumer goods is directly related to the deterioration in relative prices (i.e. the price of imported consumer goods versus domestic consumer prices). Also of importance is the higher income elasticity of imported consumer durables. Investment in equipment, excluding

[47] *Bericht der Sachverständigengruppe Sektorale Analysen,* Commission of the European Communities, July 1979.
[48] Central Planning Office, *Central Economic Plan 1978,* p. 76.
[49] Central Planning Office, *Central Economic Plan 1979,* p. 88.

transport facilities, presents a totally different picture. In this case the import ratio has been extremely constant (60%), coupled with a virtually unaltered relationship between domestic and import prices.

In the case of raw materials and semi-manufactures the link between relative prices and the propensity to import is less clear. This is because imports of these articles are closely related to the nature and structure of the production process and because there is often little scope for substitution between imported raw materials and domestic sources of supply.

In outlining sales trends, two main developments have been noted. These are first, the increased penetration of the domestic market by foreign suppliers, and second, the gap between the growth of the volume of Dutch exports and the growth in international trade, which has resulted in a decline in the Netherlands' share of the market.

Any assessment of these developments must include some account of the performance of individual branches of industry. The analysis below focusses particularly on manufacturing and agriculture, which together account for nearly 80% of Dutch exports of goods, and which are also the most exposed to foreign competition in the domestic market.

The lower rate of growth in the volume of exports during the second half of the 1970s occurred throughout all branches of manufacturing industry. The setback was particularly marked in the case of chemicals, basic metals, petroleum refining, textiles and clothing and transport facilities; there was also a decline, although less marked, in exports of food, beverages and tobacco, metal products, mechanical engineering and electronic equipment. The Central Planning Office has examined the extent to which these trends in Dutch exports differ from those in a number of other OECD countries.[50] Although the results must be interpreted with a certain amount of caution, since the analysis concerns the value of exports and the comparison for the last few years is limited to five OECD countries, it is fair to say that the ground lost by the Netherlands was concentrated especially in 1977 and 1978. Among the various branches of industry, livestock products, textiles, clothing and leather, the paper industry, basic metals, metal products, mechanical engineering and the transport facilities industry stand out for their disappointing performance. The performance of the various branches of industry is shown in table 16.[50]

Table 16. Dutch export performance in relation to OECD countries by branch of industry 1970-1978

Branch of industry	Average % change in Dutch exports 1974/1978 (by volume)	Difference in export growth between the Netherlands and OECD countries (value in dollars)			
		1970-75[1]	1976[2]	1977[2]	1978[2]
Agriculture	5	2	6	10.5	—14.5
Foodstuffs incl.					
- livestock	5	—4.5	0	—7.5	6
- other products	5	—0.5	5	—7	—3
Beverages & tobacco	11.5	0.7	—1	8.5	—1
Textiles	—3	0	—8	—6.5	0.5
Clothing, leather, footwear	1	0	—3.5	—17	1
Paper, printing & publishing	2	0.5	—6	—9	1.5
Timber & construction materials	5	5	1	—5	6
Chemicals	4	4	0.5	—7.5	2.5
Basic metals	2	3	13.5	—3.5	—2
Metal products and mechanical engineering	6.5	4	5.5	0	—4.5
Electrical engineering	7	—1.5	—1	1	2
Transport facilities	—0.5	5.5	7.5	—24	—11
Petroleum refining	—4	1	14	—3.5	—9.5
Mining	6	9.5			
Total		3	6	—4	—3.5
All enterprises	3				

[1] Covers all OECD countries.

[2] US, W. Germany, UK, France and Italy.

Source: Central Planning Office, Central Economic Plan 1978 and 1979.

[50] Central Planning Office, *Central Economic Plan 1978*, p. 158.

Up to 1976 the export performance of the metal engineering industry compared reasonably with that of other countries. After 1976 there was a distinct turnaround. One of the causes for this was undoubtedly the continuing appreciation of the guilder. It is noticeable that during the years 1974-1977, the only EEC countries that managed to increase their share of intra-EEC trade in manufactured goods were those with weak currencies (Italy, France and the United Kingdom).[51] There was also a stagnation in demand in a number of markets of significance for the Netherlands. These included the offshore market and shipbuilding. Furthermore, the Dutch metal industry had only limited success in the new, growing markets in OPEC countries, since these countries tend to be interested in complete, large-scale projects rather than in separate products. The relative smallness of scale of metal manufacturing in the Netherlands has therefore been an obstacle towards achieving a comparable level of market penetration. Finally one cause of the deterioration being experienced by the metal industry is attributable to the fact that it has a very high export ratio and is primarily oriented towards the EEC market, where growth rates have been much lower than in the past.

Exports of basic metals, especially iron and steel products, suffered from the general existence of excess capacity in the industrialized world. The impact was all the more marked since some 70% of the industry's gross output is intended for export.

The export performance of the chemical industry following the oil crisis tended to lag behind average export performance in other EEC countries. In 1978 there was a distinct recovery. Dutch producers successfully developed new markets to compensate for the relative losses in the EEC market. The growth in exports outside the EEC occurred particularly in the Middle East, the Far East and the United States.

The relative losses in the EEC market would appear partly related to unfavourable changes in exchange rates and the one-sided nature of export production in the chemical sector (approximately 75% bulk chemicals). The Dutch private sector was also exposed to increasing foreign competition in the domestic market. As noted earlier, import penetration in the manufacturing sector rose from 38.5% in 1970 to 45% in 1978. While there were of course internal variations within manufacturing, all branches of manufacturing industry suffered some loss of ground in the domestic market. Table 17 provides a survey of the degree of import penetration.

Table 17. Import penetration (by value) according to branch of industry

	1970	1974	1978
Agriculture	22	26	23.5
Foodstuffs			
- livestock products	12.5	19	20.5
- other products	17.5	20	21
Beverages and tobacco	11.5	18	21.5
Textiles	55.5	62.5	68.5
Clothing, leather, footwear	41.5	60.5	72
Paper, printing & publishing	21.5	24.5	23.5
Timber & construction materials	35.5	40.5	43.5
Chemicals	58	56	61
Basic metals	38	38	36
Metal products and mechanical engineering	49.5	49.5	54.3
Electrical engineering	59	63.5	70
Transport facilities	58.5	62	71
Petroleum refining	22	26.5	29
Manufacturing industry	38.5	41.5	45

Source: Central Planning Office, Central Economic Plan 1979.

The greatest degree of import penetration occurred within the textile, clothing and leather-goods industry, electrical engineering, and the transport facilities industry. The structurally weak position of the textile, clothing and leather-goods industry emerges clearly. It is often assumed that this sector is particularly

[51] W.F. Smits, 'De Nederlandse concurrentiepositie binnen de EG' (The Dutch Competitive Position within the EEC), *Economisch Statistische Berichten*, 9 May 1979, p. 457.

subject to import penetration by developing countries. This is true only to a very limited extent. In the case of textiles, two-thirds of the import penetration stems from developed countries. In the case of clothing the figure is 50%; only in the leather and footwear industry are developing countries responsible for 60% of the increased level of import penetration. The electrical engineering industry saw something of an improvement in exports in the last two years but was subject to severe import competition, especially in the consumer goods market.

The transport facilities industry suffered from a high degree of import penetration in both consumer and capital goods. The lively demand for private cars and the limited size of the Dutch car industry necessarily entail a high degree of import penetration.

In the case of manufacturing industry as a whole there was an average annual increase in import penetration of 2%. In the industries referred to above there was an average annual increase in import penetration of 6-7%. Of the branches of industry with a lower than average degree of import penetration, the beverages and tobacco industry witnessed a particularly strong growth in import penetration.

An overview of a number of sales trends is provided by the report Restructuring, restructuring policy and development cooperation.[52] This report sets out to provide an impression of the degree of import penetration in the domestic market and gains and losses in foreign markets. For this purpose the concept of 'competitive power' was introduced. A constant share of imports in domestic consumption indicates that the competitive power of domestic producers in relation to foreign competitors has not changed. Similarly a rise in the share of imports in domestic consumption would indicate that foreign suppliers had become more competitive.

A similar approach has been used to determine competitiveness in foreign markets. In this case the competitive power of Dutch exporters would be regarded as unchanged if their share in the total imports of a particular country or group of countries remained unchanged. In order to compare domestic and foreign sales results with one another the two have been related to the scale of production.

Throughout the period 1970-1978 manufacturing industry' share of the domestic market declined, while a deterioration in its competitiveness in foreign markets also set in during the second half of the 1970s. As indicated in table 7, over 25% of the total loss in sales in the period 1974-1978 consisted of exports. During the period 1970-1974 significant gains were still being recorded in export markets, which more than offset the losses in the domestic market.

In large measure this was due to the sound performance of the chemical industry. This came to an end in 1974, without other manufacturing industries being able to compensate fully for this loss.

All branches of manufacturing industry lost ground in the domestic market during this period, while the only industries to improve their shares in foreign markets were: livestock products; beverages and tobacco; timber and furniture; paper, printing and publishing, and electrical engineering. These industries account for some 21% of total exports of manufactures.

A distinction has also been drawn between trade with developing countries (LDC's) and developed countries (DC's).

In both periods in question, ground was lost in the domestic market to both developing countries and developed countries. Export performance in relation to developing countries was consistently positive.

The calculated sales results represent production losses or gains resulting from changes in competitiveness. As such they also have an effect on employment. Between 1970 and 1974 there was a net growth in employment of 9,000 man-years. The tobacco, chemicals, basic metals and transport facilities industries managed to increase their share in foreign markets, thereby creating an employment stimulus of 54,000 man-years. Against this, there was a decline in employment of 45,000 man-years resulting from the marked losses sustained in the domestic market by the foodstuffs industry, textiles and clothing and metal manufacturing (excluding transport facilities).

[52] See footnote 39. J. Kol, *Het concurrentievermogen van de Nederlandse industrie* (The Competitive Power of Dutch Industry), Netherlands Economic Institute sub-report no. 9A, 1976.

Between 1974 and 1978 lost sales in both the domestic and foreign market had a negative impact on employment of 41,000 man-years.

The above employment figures do not necessarily correspond with actual employment trends during the period 1970-1978. This is because a decline in exports can conceivably be accompanied by a rising share of the market if the decline in exports by other exporting countries is even greater. This will have a beneficial impact on employment, while in itself the decline in exports may mean a loss of jobs.

Table 18. Competitive power of Dutch industry 1970-1978

	Percentage changes in sales results					
	1970-1974			1974-1978		
	LDC	DC	Total	LDC	DC	Total
Domestic market	−0.5	−3.0	−3.5	−1.0	−1.5	−2.5
Foreign markets	+0.7	+6.0	+6.7	+1.1	−2.0	−0.9
Total	+0.2	+3.0	+3.2	+0.1	−3.5	−3.4
	Employment impact (in man-years)					
Domestic market	−10,000	−35,000	−45,000	−12,000	−17,000	−29,000
Foreign markets	+ 5,000	+49,000	+54,000	+ 8,000	−20,000	−12,000
Total	− 5,000	+14,000	+ 9,000	− 4,000	−37,000	−41,000

Source: Centre for Development Programming, Erasmus University, Rotterdam, 'Marktpenetratie en concurrentievermogen van de Nederlandse industrie: 1970-1986' (Import Penetration and the Competitive Power of Dutch Industry, 1970-1986), WRR, 'Voorstudies en achtergronden' (Preliminary and Background Studies), The Hague 1980.

2.2.5 *The comparative advantages of Dutch industry*

The concept of comparative advantage plays an important part in the discussion about the restructuring of the Dutch economy. Interest in restructuring is closely related to the emergence of newly industrialized countries as competitors, in both the domestic and export markets. As such, restructuring quickly tends to become identified with adjustment to the increasing competition from these countries. But adjustment to foreign competition and to changes in the balance of market forces in general is certainly just as important as adjustment to competition from newly industrialized countries. In other words: the restructuring of the Dutch economy, and in particular of manufacturing industry, should be seen in terms of the consistently changing pattern of international competition.

The concept of 'comparative advantage' is frequently cited in the context of such adjustment. The theory of international trade states that a country will do best to specialize in the production of goods in which it enjoys a comparative advantage. This is the Heckscher-Ohlin version of the law of comparative advantage, according to which specialization in terms of comparative advantage would lead to an optimal international division of labour. M. Hulsman-Vejsova and K.A. Koekoek have attempted to account for the structure of Dutch foreign trade.[53] Apart from physical and human capital, labour and natural resources, their research also takes the propensity for innovation into account as an input factor. In order to determine the existence of comparative advantages the relative export position has been used, i.e. the relationship between the share of a particular sector in the total exports of a region and its share of comparable imports in the total imports from that region. The following conclusions were reached on the basis of their research and a number of international studies that touch on the structure of Dutch trade:

- the Netherlands enjoys a comparative advantage especially in relation to

[53] Centre for Development Programming, Erasmus University, Rotterdam, *Comparatief voordeel en de Nederlandse industrie* (Comparative Advantage and Dutch Industry). WRR, 'Voorstudies en achtergronden' (Preliminary and Background Studies), The Hague 1980.

developed countries with regard to goods the production of which require a relatively high input of domestic natural resources. The intensity of natural resources is measured in terms of foreign supplies in the agricultural and mining sectors.

- the Netherlands enjoys a comparative advantage in goods with a high skills or human capital intensity; this applies all the more in the case of trade with developing countries. Skills intensity is measured as a percentage of the work-force in a particular sector with secondary or higher education.
- the favourableness of the relative export position varies inversely with the labour-intensity of production.
- it was not possible to draw any firm conclusions with regard to the intensity of physical capital. The strong position occupied by the Netherlands in the field of intermediate goods might well be related to the country's physical location rather than to the factor of physical capital as such.

This specialization is evident from the composition of the Dutch package of exports. Table 19 compares the composition of the Netherlands' exports of goods with that of 7 EEC countries.

Table 19. Exports of goods at current prices

	The Netherlands			7 EEC countries, total[2]		
	shares			shares		
	1970	1973	1977	1970	1973	1977
Agriculture	9.5	9.2	8.6	4.1	4.4	3.7
Energy[1]	10.8	13.1	18.3	3.8	4.2	5.9
Basic metals	8.9	8.9	8.1	14.4	13.9	12.1
Chemicals	17.0	17.9	17.2	13.8	14.3	14.3
Metal products and mechanical engineering	8.2	8.2	8.7	18.7	17.5	18.4
Electrical engineering	12.0	10.5	11.1	11.9	11.6	11.8
Transport facilities	4.4	4.9	4.0	12.4	12.6	13.0
Foodstufs, beverages and tobacco	18.2	16.9	15.9	7.3	8.2	7.8
Textiles, clothing and leather	6.7	6.2	4.5	8.4	8.2	7.2
Paper	2.9	2.6	2.2	2.2	2.1	2.0
Other	1.4	1.5	1.5	3.0	3.0	3.2
Total industry	79.7	77.7	73.1	92.0	91.5	90.2
Total	100	100	100	100	100	100

[1] Includes petroleum products.

[2] W. Germany, France, Italy, United Kingdom, Netherlands, Belgium and Denmark.

Source: Bericht der Sachverständigengruppe 'Sectoral Analysen', July 1979 (Commission of the European Communities).

The agriculture, food, beverage and tobacco, energy and chemical industries play a dominant part in Dutch exports. In comparison with other Western European countries the share of capital goods is definitely on the low side, although this is not true in the case of the electrical engineering industry.

Discussions of the composition of Dutch package of exports often stress its one-sided nature in comparison with other Western industrialized countries. It should, however, be borne in mind that this narrow base arose from the exploitation of the available opportunities. In the first place, a well-organized agricultural sector enabled the foodstuffs industry to export products of high quality. Secondly, a petrochemicals industry was developed in the Netherlands exploiting the country's favourable location and know-how with regard to transshipment and transport. The fact that the Netherlands' share of world trade continued to increase slightly up to 1974 was in large measure due to these two sectors. The negative aspect of this one-sidedness comes into its own now that there are clear signs that these powerful sectors are coming under pressure. Petroleum refining, for example, is grappling with structural excess capacity. The same applies to various categories of bulk-chemical products. Agriculture and food, beverage and tobacco are increasingly exposed to competition from Southern European countries while in a number of markets there are signs of saturation (milk, butter, poultry and meat). Within the EEC, the dairy industry is up against stiff competition from Ireland.

It was suggested at the outset of this section that the emergence of the newly industrialized countries (NIC's) had led to the intensified consideration of the need for restructuring. The section concludes with an assessment of the significance of these countries for Dutch exports, based on a recent study.

This study classified 140 manufactured goods according to the degree of capital intensity and the level of skill of the labour employed. In general manufactures from NIC's are not capital intensive; nor is the skill level of labour high. In 1976 70% of their exports of manufactures consisted of goods of this kind. The extent to which industrialized countries still specialize in these types of manufactured goods has been examined in order to measure the process of adjustment in such countries in relation to the increased competition from NIC's. A country may be said to be relatively specialized in such goods if it exports more of them than other industrialized countries and imports fewer. During the past 15 years, countries such as Japan and the United States, which used to have a significant share of this market, have concentrated less and less on the production of these types of manufactured goods, while their imports have risen greatly. Among the EEC countries, West Germany retained its share of the export market but its imports of these products also grew considerably.

Italy and the United Kingdom turn out to have a high degree of specialization in these types of manufactured goods. In the case of the Netherlands, imports of these commodities are steadily increasing while their export significance is steadily diminishing. This trend corresponds with that in the United States and Japan but the degree of adjustment is less pronounced. The study reaches the conclusion that among European countries, the Netherlands has concentrated the least on these types of manufactured goods; given the shifts in the international pattern of production, this may be regarded as a positive development.

The process of industrialization in developing countries has opened up significant new markets for manufactured goods. Such goods include products with a high research and skills intensity, such as advanced electronic equipment; significant intermediate products with a high degree of research, skills and capital intensity; and finally significant capital goods such as generators and office equipment. The degree of specialization in these three groups of products in the past 15 years has also been examined. Production of goods in these three categories is heavily concentrated in the United States, West Germany and Japan, which together account for 54% of the export market. Since 1963 Japan has managed to double its share of the market. This has been particularly at the expense of the United States and the United Kingdom. The Netherlands occupies only a very modest place in this field. It is, however, worthy of note that imports of these three categories of goods, which have always been high, have fallen markedly. The analysis indicates clearly that the market for capital goods is dominated by three industrialized countries. The Netherlands could only improve its relative position by concentrating on highly specialized products.

2.2.6 *Private investment trends*

The scale and nature of investment are of major significance for economic growth and employment. Up to 1970 the relationship between private investment (excluding housing construction) and national income remained stable, although the sensitivity of investment to cyclical conditions meant there were variations from year to year. Not until 1971 was there a clear decline in the ratio of investment to national income. This slump in investment occurred throughout Europe; only the timing of the trough differed.

In general terms there are a number of reasons for the decline in investment during the 1970s. At the beginning of the period the government conducted a restrictive monetary policy in order to combat the high rate of inflation. This depressed the level of investment. Sales expectations were affected by the cyclical downturn in 1972 and the subsequent raw materials shortage and sharp oil price increase at the end of 1973, which caused a worldwide slump in industrial activity. Industry was rapidly faced with a marked decline in capacity utilization. In 1974 and 1975, capacity utilization in industry declined to around 75%. Nor did the decline in profitability brought about by high import prices, the slump in sales and high labour costs provide any incentive for undertaking new investment.

Table 20 provides a survey of the pattern of investment. Three aspects stand out at once. The volume of investment in industrial building fell by 21% between 1970 and 1976. Within manufacturing industry the decline was as high as 50%. The recovery that got under way in 1977 may have been partly related to the general economic recovery, but various government measures also had a stimulatory effect.

The pattern of investment in machinery and other equipment is totally different. With the exception of 1972, the volume of investment remained virtually constant (approximately N.Fl. 12 billion at 1975 prices) and did not exceed the 1970 level until 1977.

Table 20. Trends in the volume of private investment

Gross fixed capital formation	1970	1972	1973	1975	1976	1978
(Excl. private dwellings)	100	92	103	95	92	110
of which industrial building machinery	100	87	91	78	79	104
and other equipment	100	90	98	98	97	107
Investment in private dwellings	100	125	128	104	106	125
Volume of output of enterprises	100	109	116	119	125	130

Source: Central Bureau of Statistics, National Accounts 1978.

In order to place private investment in proper perspective it is useful to relate the course of investment to the level of output. This may be done by means of the investment ratio, which may be defined as gross fixed capital formation as a percentage of gross value added at factor cost. Two types of investment may be distinguished: (a.) investment in industrial building, which is particularly directed towards the creation of further productive capacity, and (b.) investment in machinery and other equipment, which may either be for replacement or for expansion purposes.

The investment ratios worked out for enterprises and industry during the period 1970-1977 reflect the same sort of trend that emerges from the pattern in the volume of investment (see table 21). Following the marked growth in net investment in 1969/1970 prompted by favourable sales expectations, the growth in investment was distinctly disappointing. The ensuing decline in capacity utilization as well as the limited growth in the volume of output after 1975 acted as a brake on investment in industrial building. Projects were cancelled or else deferred. Investment in machinery and other equipment fell after 1972, with the ratio reaching its lowest point in 1976. The bulk of this investment was for replacement purposes of existing productive capacity.

There was little incentive to expand capacity if the low degree of capacity utilization of 1974 and 1975 and the subsequent improvement are borne in mind. The relatively stable level of the machinery and other equipment investment ratio after 1972 is probably due to the fact that rationalization of the process of production formed the only means by which enterprises could counter the deteriorating economic situation. The sharp rise in production costs (especially energy) and disappointing sales provided inpulses for rationalization. This occurred at the expense of employment; the process was moreover strengthened by the already well-established trend towards labour-saving investment.

Table 21. Investment ratio of enterprises[a] and industry

Enterprises	1970	1971	1972	1973	1974	1975	1976	1977
Investment ratio:								
Buildings	6 %	5.8%	5 %	4.8%	4.5%	4.2%	4 %	4.7%
Plant and equipment, transport, etc.	14 %	13.9%	11.9%	12 %	11.7%	11.1%	9.7%	10.9%
Industry								
Investment ratio:								
Buildings	5.7%	5.4%	4 %	3.8%	3.4%	3.5%	3.2%	3.5%
Plant and equipment, transport, etc.	16.9%	15.4%	12.2%	11.4%	12.4%	11.8%	11.2%	12.8%

[a] Gross investment as a percentage of gross value added at factor cost.

Source: WRR.

We may now examine whether this general picture also holds good for particular industries.

Investment activity in agriculture differs sharply from the overall pattern. After 1972 there was a considerable rise in investment in both buildings and machinery and other equipment. The above-average rise in investment in 1977 and 1978 was principally due to the effects of two successive favourable harvests in terms of the prices paid for arable products, while a number of attractive subsidy provisions also exerted a positive influence. Employment in arable and livestock agriculture continues to decline as a result of rationalization. The foodstuffs, beverages and tobacco sector grew steadily if not spectacularly, including in times of recession. This is reflected in the level of the investment ratio for buildings and machinery and other equipment, which remained fairly stable. Labour-saving investment has meant that the decline in employment in this sector has persisted. In recent years there has been a steady drop in the volume of production in the textiles, clothing and leather industry. Investment activity has been concentrated particularly on machinery and other equipment, and the investment ratio has managed to remain at much the same level. This development may be primarily attributed to the need to withstand intense international competition. Government assistance was justified in that the profitability of this sector had been poor for many years (a wage-income ratio of over 100%).

Within the intermediate goods sector there was a clear level of excess capacity in the oil and base metals industries. In the case of steel, for example, capacity utilization slumped after 1974 to 66%; in the early 1970s the figure had been as high as 94%. In the case of basic metals, there was a dramatic fall in the investment ratio after 1973 for both buildings and machinery and other equipment. The petroleum industry completed a major investment programme in the early 1970s, but after 1974 the pace of expansion slowed down. Within the intermediate sector one of the major investors is the chemicals sector, accounting for between 10 and 12% of total investment in machinery and other equipment. The pattern of investment was in large measure determined by large projects implemented by Shell and the Dutch State Mines.

Within the metal manufacturing sector, investment in the metal products, mechanical engineering and electrical engineering industries broadly corresponded with the overall industrial pattern. There was something of a decline in the investment ratios for buildings, while the investment ratios for machinery and other equipment remained relatively stable after 1972. In the electrical engineering industry, reasonably high gains in labour productivity, facilitated by labour-saving investment, enabled it to maintain a reasonable rate of growth of output during the second half of the 1970s. The transport facilities industry encountered severe difficulties after 1973. The gloomy situation was typified by the decline in the volume of output, excess capacity within the shipbuilding industry and low profitability. Large-scale government assistance to the shipbuilding and motor vehicle industries enabled investment in buildings and machinery and other equipment to be sustained (see table 22).

Table 22. Investment ratio in selected branches of industry[a]

Agriculture:	1970	1972	1973	1974	1975[b]	1976	1977
inv. ratio - buildings	9.4	7.3	9.9	13.1	9.7	11.1	16.2
inv. ratio - machinery and other equipment	9.3	9.0	9.8	12.1	10.8	11.6	13.7
Beverages and tobacco:							
inv. ratio - buildings	3.8	3.2	3.9	3.6	8.4	2.4	2.7
inv. ratio - machinery and other equipment	12.8	11.2	12.1	13.1	21	11.8	14.0
Textiles:							
inv. ratio - buildings	3	1.2	2.5	1.7	2.2	1.6	1.8
inv. ratio - machinery and other equipment	11.8	7.3	9.9	9.2	8.1	8.7	8.5
Chemicals:							
inv. ratio - buildings	5	4.1	3	3.5	3.3	2.3	3
inv. ratio - machinery and other equipment	36.7	23.5	17.1	12.7	17.2	20	27.2
Basic metals:							
inv. ratio - buildings	9	4	5.1	3.3	7	2.1	1.1
inv. ratio - machinery and other equipment	30	29	13.6	11.7	16.2	12	8
Electrical engineering:							
inv. ratio - buildings	4.3	1.7	2	2	3	2.1	1.9
inv. ratio - machinery and other equipment	9.5	6.1	6.6	7	6.5	6.4	6.7

[a] Gross investment as a percentage of gross value added at factor cost.

[b] The sudden rise in the investment ratio in a number of industries is related to the sharp decline in the value of production in that year.

The investment ratio declined in most industries during the period 1970-1977. As noted earlier this downward trend was related not only to the declining level of profitability of enterprises but also reflected the considerable decrease in the rate of growth of production after 1973. In this light it would not be fair to characterize the propensity to invest of the Dutch private sector as cautious, especially in the last few years. This is for example evident from the level of the marginal efficiency of capital, calculated as the quotient of gross investment and the increase in output. Up to 1974 this stood at nearly 3 whereas it has doubled in the last two years. These investments were particularly of a replacement nature.

Source: WRR.

Finally a few words are in order about foreign investment in the Netherlands and Dutch investment abroad. Up to and including 1973 it is fair to say that the two capital flows were broadly in equilibrium and that the growth corresponded with the pattern of investment in gross fixed capital formation of enterprises in the Netherlands. In 1974 there was a distinct change. Dutch investment abroad grew substantially, and has remained at a high level in the last few years. Foreign investment continued to grow to some extent before slumping heavily in 1976. The result was a net capital outflow between 1976 and 1978 of over N.Fl. 2 billion (see table 23).

Table 23

Investment index in current	Prices	1970	1972	1973	1974	1975	1976	1977	1978
Dutch investments abroad	2 bn.	100	118	127	231	209	148	200	200
Foreign investment in the Netherlands	1.9 bn.	100	100	122	134	127	47	43	67

Source: De Nederlandsche Bank N.V. 1978, Annual Report.

It is striking that Dutch enterprises have dramatically increased their investment abroad since 1973, while investing in the Netherlands on a lesser scale. In particular, there has been a steady increase in investment in the United States. During the 1960s and in the early 1970s, the Netherlands was an attractive country for foreign investors seeking to penetrate the European market, but this stimulus was lost after 1975.

2.2.7 *Employment trends*

The Dutch private sector was no longer able to absorb the growth in the labour force during the 1970s. In fact a net 90,000 jobs were lost during this period. Two sectors were particularly responsible for this trend. In agriculture 55,000 jobs were lost. High levels of investment taking the form of increases in scale and mechanization meant the displacement of labour even though output was growing satisfactorily. This trend dates back to well before the 1970s, and there has been a substantial change in the relationship between the input factors of capital and labour over the course of time.

It was evident within industry as early as the second half of the 1970s that an increase in output no longer automatically entailed a growth in employment. Various economic studies of this phenomenon have concluded that the loss of jobs should be attributed to the rise in labour costs and the acceleration of structural productivity, which has shortened the economic life of durable means of production.

Nevertheless it would be incorrect to ascribe the decline in employment in industry of some 220,000 jobs exclusively to these factors. There was also a clear lack of demand during the 1970s.

The growth in investment and public capital expenditure lagged behind the rise in output, while the level of exports also changed substantially. In fact only in the case of consumer expenditure was there reasonable and balanced growth. These expenditure trends had a direct impact on the level of employment.

As noted previously, the only sector where there was a growth in employment was the services sector. If this sector is broken down into services of an international nature and local services, it emerges that the growth in employment was concentrated in the latter category, which accounted for an additional 250,000 jobs.

The relatively high productivity gains in internationally-oriented services were not connected with a rise in employment. In the ports, for example, there were such gains in productivity in the handling of goods (e.g. from containerization) that trans-shipment figures per head rose several times over. Within the sector as a whole, the trading industry saw a slight drop in employment. This was in contrast to the 1950s and 1960s, when trade accounted for over a third of the rise in employment in enterprises. One of the causes for this change was undoubtedly the large increase in labour costs.

One of the means of labour saving in the services sector consisted of the engagement of part-time labour. This helps explain the relatively high average rate of growth of productivity of 4% during the period 1974-1978.

A number of other aspects of significance for the level of employment emerge from a brief examination of employment trends in individual industries. Over 40% of the jobs lost in manufacturing occurred within the textiles, clothing and leather industry. Declining levels of production resulting from the loss of markets, company closures and labour-saving investment based on extensive government assistance all took their toll of employment. The financial support provided by the government did, however, postpone redundancies. This is indicated by the highly fluctuating level of labour productivity.

One branch of industry where the volume of output declined, especially after 1973, was the oil industry. Although there was some loss of employment in this industry as well, a sharp decline in production does not necessarily lead to large-scale redundancies: much the same level of staff is required even at 60% capacity utilization. The decline in the volume of output consequently manifested itself in a drop in labour productivity. The same applies in the case of the basic metals industry.

The impact of over a billion guilders of government assistance designed to preserve the domestic shipbuilding industry is reflected in the situation of the transport facilities industry. The fall in labour productivity after 1974 indicates that many jobs were temporarily retained as a result of this assistance. Industries in which there was a clear trend towards labour-saving investment as result of technical change and high labour costs include foodstuffs, beverages

and tobacco; metal products and mechanical engineering; and electrical engineering. There was also some shedding of productive capacity in the latter two industries. This was due not only to high labour costs but also to inadequate adjustment to changes in the market. Closely related to the drop in output that commenced in 1972, there was a loss of 47,000 jobs in the construction industry. Employment levels in this industry are highly responsive to changes in the level of output. In 1977, the rise in output saw a growth in employment. The low rise in productivity is partly explained by shifts towards relatively labour-intensive activities such as repair work and renovation.

As noted earlier there was a gain of some 250,000 jobs in local services. One industry that grew strongly within this sector was health and veterinary services. During the period under review employment rose by 87,000. In the last few years, however, there was also a downward trend in employment in absolute terms. This may be ascribed to a switch in government policy whereby greater stress was placed on extramural care (CP's, dentists, obstetricians and other paramedical services) and less on intramural care (hospitals etc.).

Employment within the banking and insurance industry continued to grow despite continuing computerization. The rate of growth has, however, slowed down.

Finally there is the 'other services' industry. A significant part of this sector is dependent on government subsidies and finance. Employment in these non-commercial services grew vigorously. Care of the elderly, training and social education, and sport and culture together accounted for an additional 90,000 jobs. A commercial sector of significance within the other services sector consists of commercial services. Apart from architects' offices and firms of consulting engineers, there has been a marked growth in new forms of commercial services such as computer service, leasing and project development. This is reflected in the rise in employment of some 28,000 man-years. In brief, it is fair to say that over 70% of the growth in employment in local services occurred in non-commercial services (see table 24).

Table 24. Employment trends and labour productivity changes, 1970-1978

	Employment 1969	Annual percentage change				Employment increase/ decrease 1970-1978	Employment 1978
		employment 1970-1973	1974-1978	productivity 1970-1973	1974-1978		
	(x 1000 man-years)					(x 1000 man-years)	
- Agriculture	339	— 2.3	— 1.7	7.4	4.4	— 55	284
Livestock ind.	51	0.5	— 2.5	4.3	3.5	— 5	46
Other	122	— 1.5	— 3.0	5.5	5.4	— 23	99
Beverages	29	— 1.8	— 2.3	9.6	5.5	— 5	24
Textiles	85	— 7.6	— 8.0	6.1	3.4	— 44	41
Clothing & footwear	88	— 8.8	—10.5	2.4	3.2	— 53	35
Paper, printing & publishing	115	— 0.7	— 1.3	2.5	5.4	— 10	105
Timber & construction materials	118	— 2.0	— 3.4	6.5	2.9	— 26	92
Chemicals	119	— 0.2	— 0.7	10.4	3.5	— 5	114
Basic metals	33	+ 2.1	— 1.7	4.5	0.7	+ 1	34
Petroleum refining	10	+ 2.4	— 1.9	7.9	— 0.1	0	10
Metal products and mechanical engineering	229	— 0.6	— 2.0	5.0	2.8	— 26	203
Electrical engineering	117	— 0.2	— 2.2	7.6	4.7	— 13	104
Transport facilities	83	— 0.3	— 2.3	5.4	— 0.9	— 10	73
Manufacturing industry	1,199	— 1.6	— 2.8	7.2	3.8	—219	980
- Mining	25	—15.1	— 9.3	33.9	12.1	— 17	8
Construction	493	— 1.1	— 1.1	2.6	1.1	— 47	446
- Public utilities	43	+ 1.1	0	11.3	4.2	+ 2	45
Internationally oriented services	1,036	0	— 0.2	5.8	4.2	— 4	1,032
Local services	948	3.4	+ 2	1.4	1.4	+249	1,197
All enterprises	4,083	+ 0.0	— 0.5	5.5	3.0	— 91	3,992

Source: WRR.

2.2.8 *Balance of payments on current account*

An important precondition for satisfactory economic growth consists of balance of payments equilibrium. This section examines the extent to which the Dutch balance of payments on current account has been affected by import penetration and changes in the level of Dutch exports.

Before doing so, however, two factors should be taken into consideration that have exerted a more or less independent effect on the balance of payments on current account.

For many years now the visible balance has been in deficit, while the balance of invisible trade has been in surplus. The visibles deficit would have been far larger still had there not been a high level of exports of natural gas from the Netherlands. Without the export of natural gas the deficit on visible trade would have been at least N.Fl. 6 bn. higher than it was.

The production of Dutch natural gas not only boosted the balance of trade but also led to the substitution of other forms of energy, whereby energy dependence on other countries was reduced or grew less rapidly. If the energy account, consisting of imports of coal, crude oil and refined products and exports of refined products and natural gas, is lifted from the visibles account, there turns out to have been a reasonable balance during the 1970s.

A second major factor has been the increasing volume of foreign tourism by Dutch people, which has placed the invisibles balance under pressure in recent years. In the early 1970s, Dutch tourists spent some N.Fl. 600 m. more abroad than foreign tourists spent in the Netherlands. After 1974 the deficit on the tourism account rose to reach N.Fl. 4.7 bn. in 1978.

In comparison with the growth in world tourism expenditure at constant prices, the average annual volume of expenditure by Dutch tourists abroad during 1973-1978 rose by 3.5% *more* while the annual volume of expenditure by foreign tourists in the Netherlands lagged behind by 14.5%. The bulk of the deficit on the tourism account may consequently be explained in terms of the difference in expenditure. It is assumed that the deficit in 1979 will be over N.Fl. 1 bn. higher again (see table 25).

Table 25. Significance of netural gas exports and tourism for the balance of payments on current account

	N.Fl. bns.						
	1970	1973	1974	1975	1976	1977	1978
Visible balance	−5.9	−1.5	−2.5	−1.9	−0.7	−5.5	−8.2
Natural gas exports	0.5	1.4	2.5	4.0	5.2	6.4	6.2
Invisible balance	+3.8	+6.4	+7.7	+8.9	+8.8	+6.9	+7.1
Of which net tourism receipts	−0.6	−0.6	−0.9	−1.4	−2.4	−3.3	−4.7

Source: De Nederlandsche Bank N.V. 1978, Annual Report.

Returning to the question of the extent to which import penetration and export growth have affected the Netherlands' balance of payments on current account, we may take the analysis in section 2.2.4 a step further. In that section it was noted that there was an increase in the export-gearing of production in manufacturing industry during the period 1970-1976 and that there was a greater degree of foreign competition in the domestic market. Between 1970 and 1976 the import cover ratio – i.e. exports as a percentage of competing imports – rose from 81% to 88%.

There was also an increase in the import cover ratio in the agricultural sector during this period. This positive trend is reflected in the visible balance. After 1976 there was a dramatic change in the visible balance. In 1977 and 1978 imports (cif) grew at an average annual rate of 4.5%, while exports rose by only 1%. The visibles deficit rose to N.Fl. 8.2 bn. in 1978.

For many years there has been a structural surplus in the invisibles balance. Services of an international nature continued to grow steadily during the 1970s, as reflected in the substantial surplus on invisibles.

2.2.9 *Conclusions*

1. Employment has not managed to keep pace with the growth of the labour force. Unemployment rose from 1.4% in 1970 to over 5% at the end of the period under review. If some of the persons receiving employment disability and other benefits, as well as concealed unemployment, were to be taken into account, the real unemployment figure would be at least twice as high. The only sectors in which employment grew at a reasonable rate were the public sector and local services. The bulk of employment creation took place in the quarternary sector, i.e. non-commercial services.

2. The pattern of specialization of the Dutch economy that had evolved during the 1950s and 1960s persisted in subsequent years. Agriculture, foodstuffs, beverages and tobacco and the intermediate sector continued to dominate exports.

Problems have, however, arisen within the intermediate sector in the basic metals and petroleum refining (e.g. a declining volume of output, surplus capacity and declining investment ratios). De-industrialization has been taking place in the Netherlands and the share of industry in total output has fallen.

3. The competitiveness of private industry in the Netherlands has diminished. This decline has been due not only to a rise in labour costs (including higher social insurance payments), but also to the consistent appreciation of the guilder.

4. In relation to other European countries labour costs in manufacturing have risen more sharply in the Netherlands. The frequent exchange rate variations of the various European currencies have, however, affected the net impact of these rises. In countries such as Italy and France there was a higher rise in money wages but this was more than offset by the depreciation of the lira and franc.

5. The Netherlands has been exposed to increasing import penetration. During the period 1974-1978 all branches of manufacturing industry were confronted with declining shares of the domestic market. This applied particularly to the textiles, clothing and footwear industry and the transport facilities industry, while the electrical engineering industry also increasingly lost ground in the domestic market. In terms of product categories, import penetration was particularly marked in the case of consumer goods. In the space of eight years the share of imports rose by 40%.

6. The Netherlands' share of international trade declined during the second half of the 1970s, especially after 1976. The heavy concentration of Dutch exports on the European market meant that the lower rates of growth in these countries had a marked impact on Dutch export performance. The loss of European markets was inadequately compensated for in other export markets.

7. Investment was hit by declining levels of company profitability and the low growth of output. The volume of investment in industrial building, for example, fell by 21% between 1970 and 1976, while investment in plant and equipment did not regain 1970 levels until 1977. Investment became increasingly of a replacement nature. Nevertheless the evidence indicates that there was no decline in the propensity on the part of enterprises to invest, especially in 1977 and 1978. This is shown by the sharp increase in the marginal efficiency of capital.

8. The financial strength of the private sector was weakened during the 1970s. In various industries the wage-income ratio exceeded 100%.

2.3 The structure of production in the medium to long term: economic models

2.3.1 *Introduction: anatomy of the multi-sector approach*

Four experts[54] were asked to construct multi-sector economic models on the basis of which

a) insight could be obtained into the future structure of production (1985) and major underlying trends and causalities, as well as possible disequilibrium in the economic structure;

b) it might in the event of disequilibrium be examined how the structure of the economy could be adjusted by means of official policy and brought more closely into line with macro policy objectives.

In general terms, the following determinants are responsible for shifts in the structure of production[55]:

1) the level of domestic demand, especially private and public expenditure on consumer goods. The composition of consumer demand in terms of sectors (i.e. product groups) varies in response to changes in income, relative prices and consumer preferences. Through the medium of the supplying sectors these shifts in demand have a direct impact on the structure of production;

2) the level of foreign demand, which exerts an impact on the structure of production through the total volume of exports - even if the composition of exports should remain unchanged - because the composition of export demand differs completely from that of domestic demand;

3) investment demand, the level and sectoral distribution of which may vary, with a consequent effect on the supplying sectors;

4) the international division of labour and pattern of competition which, by means of technical change and the factor intensities (i.e. relative factor prices), bring about shifts in the export-mix and the composition of production geared to domestic demand;

5) the raw materials and energy situation, especially price levels and possible resultant substitution effects (i.e. shifts in the pattern of intra-industry supplies).

The economic models drawn up as part of this project were essentially aimed at bringing out the interaction between ecnomic growth and the structure of production. The working method adopted is thus in contrast to distribution models, in which growth is generated with the aid of a macro model, from which the growth of individual industries or sectors is then determined. In approaching things from below, as it were, in which the emphasis is on interaction, it therefore becomes necessary for the following determinants to be taken into consideration for separate industries and sectors.

[54] Dr. W. Driehuis (University of Amsterdam), Dr. S.K. Kuipers (University of Groningen), Dr. F. Muller (Erasmus University, Rotterdam) and Dr. A.B.T.M. van Schaik (Catholic University, Tilburg).

Their findings are contained in the following reports, which have been published by the WRR as preliminary and background studies:

- W. Driehuis and P.J. van den Noord, *Produktie, werkgelegenheid en sectorstructuur in Nederland, 1960-1985* (Output, Employment and the Structure of Production in the Netherlands, 1960-1985), Foundation for Economic Research and University of Amsterdam, May 1980.
- S.K. Kuipers, J. Muysken, D.-J. van den Berg and A.H. van Zon, *Sectorstructuur en economische groei: een eenvoudig groeimodel met zes sectoren van de Nederlandse economie in de periode na de tweede wereldoorlog* (The Structure of Production and Economic Growth: a Simple Six-Sector Growth Model of the Dutch Economy in the Post-War Period), Groningen, February 1980.
- F. Muller, P.J.J. Lesuis and N.M. Boxhoorn, *Een multisectormodel voor de Nederlandse economie in 23 bedrijfstakken* (A Multi-Sector Model of the Dutch Economy divided into 23 Branches of Industry), Insitute for Economic Research, Erasmus University Rotterdam, February 1980.
- A.B.T.M. van Schaik, *Arbeidsplaatsen, bezettingsgraad en werkgelegenheid in dertien bedrijfstakken* (Jobs, Capacity Utilization and Employment Opportunities in Thirteen Branches of Industry), March 1980.

[55] See section 1.2.1.

Table 26. Determinants of significance for individual industries and sectors

Demand for labour and capital; in general dependent on:
- Gross value added (at constant prices)
- Technical progress
- Shorter working hours
- Relative labour/capital costs (i.e. substitution)

Wage and price determination
Wages; in general dependent on:
- Price of consumer goods
- Labour productivity
- Unemployment
- Level of taxation and social insurance contributions

Prices; in general dependent on:
- Money wages
- Cost of imports and supplies
- Factor productivity
- Degree of capacity utilization

Sales; in general dependent on:
- Factors of scale (level of final demand)
- Shifts in final demand
  - dependent on the level of demand (i.e. income elasticity)
  - dependent on relative prices (including cross elasticities)
  - autonomous shifts (i.e. consumer preferences)
- International patterns of competition (i.e. competing price-levels)

The major form of interaction between economic growth and the structure of production operates through the sales mechanism; the dynamism of the structure of production is essentially based on shifts in final demand and the extent to which individual industries are exposed to and able to withstand international competition. On the other hand, the level of final demand is itself affected by the sales performance of individual industries (moreover in a differentiated way). These relationships alone mean there exists an interaction between growth and the structure of production. But the picture is in fact more complex, since shifts in final demand and the ability to resist international competition are affected by wage and price determination, which are in turn dependent on the factors of supply and vice versa. Furthermore, through the medium of capacity utilization and the situation in the labour market, sales and price formation are in theory linked to one another, in a way that works through the entire system.

This multiplicity of influences can only be given quantitative expression in a multi-sector model. It will, however, be immediately apparent that there are definite limits to the extent to which the full complexity of the real world can be built into a model (through specification or endogenization). This applies particularly to the wide variety of feedback permutations. Certain limitations must be imposed in the interests of clarity and avoiding excessive complexity. The fact that a particular feedback mechanism has not been built into a model does not necessarily imply that it has been ignored. It may be included in the analysis by, for example, the separate determination of sets of parameters and exogenous factors which are then grafted onto the model, or by incorporating the feedback reactions in an iterative manner. The types of limitations imposed in these medium to long-term multi-sector models generally consisted of the feedback effects between the group of sales determinants on the one hand and the group of production determinants (e.g. the factor intensities, wage and price formation) on the other. In the first instance these determinants may be operationalized as more or less independent groups. The implications of doing so and of the selected working method will be examined later.[56]

A second deliberate limitation consists of the type of comparisons included in the models and the resultant reaction parameters. A distinction may in general be drawn between behavioural parameters and economic coefficients. On the

[56] This is not the place to examine the construction of the economic models specially devised for this project by the four external research teams. The specifications of their models differ in many respects. The observations made at this point relate only to the broad outlines of the models and do not do justice to the differing methods of approach. These will be examined in detail in section 2.3.4.

basis of two methodological considerations, it was decided in principle to limit the number of behavioural parameters and, to the extent that use was made of such parameters, to quantify them stochastically by drawing on long-term empirical generalizations. The first of these methodological considerations concerns the medium to long term nature of the study, which enables short-term behavioural fluctuations to be disregarded. The second consideration (see chapter 1.3.1) concerns the explicit wish for the economic models to be as free as possible from institutional factors, thereby allowing the appropriate institutional setting to be determined by means of instrumental inference. This is of interest from a policy viewpoint, since technical economic relations tend to be fixed in nature while the institutional setting is, at least in principle, susceptible to control by the policy-maker. We have departed from these guidelines in one major respect, namely with respect to consumption expenditure. Our reasons for doing so have already been set out (in chapter 1.1.5), with the proviso that this premise could be reconsidered in the event of serious desequilibrium.

2.3.2 *Determinants in individual industries and sectors: future trends*

Table 26 provided a survey of major determinants in individual industries and sectors. The extent to which (if at all) these determinants should be specified in the models and subsequently endogenized or exogenized was gone into thoroughly with the external advisers commissioned to draw up the models. These discussions did not lead to uniform conclusions. Nor was this necessary, for, in the interests of the problem to be investigated –i.e. the interaction between economic growth and the structure of production – the external advisers had been left relatively free to determine the specification of their models. Use could if desired be made of special studies carried out on individual determinants. An attempt has been made broadly to standardize the approach in the models towards exogenization. The advantages of doing so will be self-evident, in that the comparability of the model findings becomes maximized.

2.3.2.1 Sales trends

Private consumption

The endogenization of private consumption in the economic models by means of a macro-economic consumption function geared to the size of National Income does not present any particular problem. Shifts in the pattern of consumption are, however, of decisive importance for the structure of production. Assuming that changes in consumption patterns – apart from the effect of income levels and prices – are relatively autonomous, the main concern is to portray these shifts in terms of budgetary items and thus to assess their impact on supplying sectors.

For this understanding is required of:

- the responsiveness of individual objects of consumption to the total level of consumption expenditure (i.e. income elasticities);
- movements in the relevant price structure, so that price and quantity effects may be distinguished and substitution effects traced;
- shifts in the matrix of transposition coefficients (i.e. the transposition of objects of consumption to the distributive sectors).

A detailed separate study has been made of these projections up to 1985, linked always to the level of consumption expenditure since the latter forms the starting point of the models. The study employs a detailed breakdown of objects of consumption (40) and distributive sectors (33), the latter subsequently being reduced to the Central Planning Office's 28-sector classification. The detailed nature of this breakdown enhances the precision of the projections, which can be incorporated into the economic models at any desired level of aggregation. For further details on the methods used we would refer to the separate documentation.[57] At this point we would confine ourselves to a general survey of the

[57] J. van Ours, *Binnenlandse consumptieve bestedingen van de Nederlandse gezinshuishoudingen in 1985 en 1990* (Domestic Consumption Expenditure by Private Dutch Households in 1985 and 1990), WRR, *Voorstudies en achtergronden* (Preliminary and Background Studies), The Hague 1980.

changes that may be expected during the period 1977-1985 given an average annual growth rate of real expenditure of 2¼% (table 27).

Table 27. Percentage distribution of (domestic) consumption by private households over six categories: 1969, 1977 and 1985. The 1985 distribution is a projection based on an average annual increase in real consumption expenditure of 2¼% in relation to 1977.

	1969	1977	1985
Foodstuffs	23.5	20.9	19.8
Housing	25.5	23.5	22.0
Clothing/footwear	10.9	9.0	7.9
Health services	13.1	12.5	12.6
Education/recreation and cultural services	21.0	27.1	30.0
Other	6.0	7.0	7.7
Total	100.0	100.0	100.0

Government consumption

Government consumption of goods consists of:
- consumption related to the operation of government services such as energy, maintenance, office requirements and communications;
- defence spending and other public consumption.

Public consumption of goods is taken as autonomous and may be derived from medium-term government projections and programmes. A projection for 1985 has been drawn up on the basis of these data.[58] This projection anticipates a 4% annual increase in government consumption of goods during the period 1975-1985.

With regard to the transposition of this increase to the supply sectors, government consumption of goods has been split into two separate categories; otherwise the methodology corresponds with that used for private consumption.

Development of export demand

The earlier observation that demand and supply have been incorporated in the models as independent 'blocks' applies particularly to export demand. Exports have essentially been determined exogenously. In doing so supply and demand factors have of course been implicitly taken into account, to the extent that these factors have become apparent in the period just ended (for example changes in the share of Dutch exports). Demand factors have been explicitly incorporated into export projections, such as the size and composition of world trade according to product group.

The export projections, broken down into 28 sectors (the Central Planning Office classification) were carried out by:
- the Centre for Development Programming, Erasmus University Rotterdam: industry;[59]
- the Scientific Council for Government Policy (WRR): construction industry and service sectors.[60]

At the Council's request the Landbouw-Economisch Instituut (Institute of Agricultural Economics, LEI) drew up forecasts for the future level of export demand for Dutch agricultural products. These were, however, received too late to be incorporated in the economic models.

[58] Foundation for Economic Research, University of Amsterdam, *De ontwikkeling van het volume van de autonome bestedingen 1960-1990* (Level of Real Government Expenditure 1960-1990), WRR, *Voorstudies en achtergronden* (Preliminary and Background Studies), The Hague 1980.
[59] Centre for Development Programming (Erasmus University Rotterdam), *De industriële uitvoer van Nederland in 1985* (Industrial Exports by the Netherlands in 1985). WRR, *Voorstudies en achtergronden* (Preliminary and Background Studies), The Hague 1980.
[60] K. Vijlbrief, *Exportprognose, bouwnijverheid en dienstensectoren* (Export Projections; the Construction Industry and Service Sectors), Internal report (WRR/PTNI/79/45), 21 September 1979.

Table 28. Dutch enterprises: export projections 1979-1985

Industries CPO Classification (condensed version)	Exports in 1985 N.Fl. m.	Average annual percentage growth 1979-1985			Exports in 1985 N.Fl. m.
	current prices	value	volume	price	1970 prices
- Total industry incl. oil and natural gas prod.	153,844	6.6%	2.8%	3.7%	74,636
- Other minerals	203	4.4%	1 %	3.4%	139
- Agriculture, forestry, etc.	8,360	6.2%	4.2%	2 %	5,477
- Construction industry	3,193	7.5%	2.5%	5 %	1,205
- Total services excl. expenditure by foreigners in the Netherlands	36,607	6 %	3.1%	2.9%	19,953
- Total exports	202,207	6.5%	3.0%	3.4%	101,410

These projections have been used in the economic models of Muller and Driehuis (see sections 2.3.4 and 2.3.5). It should be noted that certain changes were made on the grounds of the relationship between import and export prices. In addition export trends have been endogenized in the variant analysis by means of price elasticities.

Investment demand

Public investment demand, including housing, has been taken as autonomous and has been incorporated in a manner corresponding with the level of government consumption of goods.[61]

This investment has been broken down into:

a) gross investment in housing, which is determined to a significant extent by the government;

b) gross public investment in:

- schools and government buildings;
- civil engineering projects;
- investment in vehicles and other assets.

Estimated changes in the volume of investment are shown in table 29.

Table 29. Average annual change in the volume of housing investment and public investment 1960-1985

	Volume of housing investment	Volume of government investment
1960-1970	6.4	6.8
1970-1975	0.8	—1.6
1975-1985	1.6	—0.2

Source: Institute for Economic Research, op. cit.

The volume of investment (with government investment split into three categories) in each of the periods was then worked out for the various supplying sectors.

The level of gross investment by enterprises in each sector is determined by a mechanism linked to the level of output. In empirical terms, it turns out that a high proportion of long-term fluctuations in the level of investment by enterprises – broken down into categories – may be 'explained' by sectoral shares of value added. In other words: gross investment, sub-divided into categories, turns out to bear a fairly stable relationship in each sector to value added. Exceptions apply however in the case of sectors producing intermediate goods. In these industries, the investment ratio has slipped back in recent years to below the

[61] Institute for Economic Research, op. cit.

level of the 1950s. One of the economic models assumes there will be no recovery in these branches of industry in the next few years (the Driehuis' model). In another model, gross investment has been linked via the accelerator to changes in the level of gross value added at constant prices (Muller's model).

Share of the domestic market

A distinction has been drawn between competing and non-competing imports.

Non-competing imports forming part of public expenditure and private consumption have been determined exogenously; with regard to investment by the enterprises sector one of the models assumes a fixed import percentage. Competing-imports per individual industry have been determined as a percentage of total sales and inventory investment. Over the long term these import ratios display marked increases, but from around 1976 (with the exception of 'sensitive sectors') they are relatively stable. One model (that of Driehuis) worked with exogenously determined import ratios (i.e. stable trend values), which were estimated empirically; in another model (that of Muller) the domestic share of the market has also been made dependent on domestic prices.

Pattern of inter-industry supplies

The pattern of supplies between the various branches of industry has been explicitly incorporated into the operation of one of the models. This was done using recent input-output coefficients, namely those for 1976 (in Muller's model) and those for 1970 (in Driehuis' model). These coefficients have been assumed to be fixed. This assumption is based on practical considerations, in that there exists little empirical material enabling these coefficients to be extrapolated exogenously in a reliable manner, while their endogenization would be exceedingly complex. Such an endogenization has nevertheless been attempted in one of the models (that of Muller), in the form of a variant alongside the basic calculation based on fixed coefficients. This attempt at endogenization is of interest because the study in question also incorporated a separate energy sector, and it is of course precisely in the energy sector that shifts in the pattern of inter-industry supplies may be anticipated, in response to the probable increase in energy prices.

2.3.2.2 Changes in the selected factor intensities; wage and price formation

Selected factor intensities

In principle the factor intensities has been taken as being determined by relative factor costs and the nature and pace of technical change (see table 26). This is based on an optimum proposition worked out in a different way in the various models and which can be given a different form for individual sectors[62] within the one model. The models make a distinction between labour and capital as factors of production, so that – depending on the type of optimum principle applied – judgments have to be made on the relative rewards for capital and labour and on money wages in the period up to 1985.

The specification of technical change tends to vary between the economic models (see section 2.3.6). The pace of technical change has been based on stable long-term values, which have been estimated empirically. The Kuipers' model assumes a break in trend after 1967/1968 in relation to preceding years. No a priori weakening in the pace of technical change is allowed for. The empirical data afford no firm grounds for such an assumption, which is also rejected in the Interfutures project.[63]

In the Driehuis' model it has been assumed that the reduction in working hours, which is of importance in this context, cannot continue at the same

[62] In this respect a distinction has been drawn between sectors using plant and equipment and those that do not.

[63] OECD, *Facing the Future: Mastering the Probable and Managing the Unpredictable,* Paris 1979.

exponential pace as it has since 1960. The study bases its projection on a more moderate pace of change, more in conformity with that in West Germany.

Wage and price formation

On the basis of research findings indicating that there were only minor differences in the sectoral growth of money wages, any sectoral variations have been disregarded in the models. In one study (that of Kuipers) wage formation has been endogenized, with the determinants listed in table 26 being worked into the model, while in the other models the central projection is based on a uniform increase of approximately 7% per annum. This projected rate of increase was derived with the aid of other macro-economic models. To the extent that wage formation has been endogenized and the rate of unemployment taken as a relevant factor (i.e. the Phillips curve mechanism) the labour market projections of the Central Planning Office have been used.[64]

With regard to sales prices it has been assumed that these are generally influenced by the costs of production, the competitive position and the level of demand. This general premise has however been worked out separately in each of the studies. All the models assume that the increase in the prices of imports and of supplies can be fully passed on. This assumption is among other things based on the view that foreign competitors will be faced with the same price increases. As far as the increase in labour costs is concerned (i.e. wage increases less productivity gains), various methods have been applied. In the case of export prices, use could be made of an exogenous estimate of sectoral export prices (see table 28). The Driehuis' and Muller's models are essentially based on these projections, but upon working through the effects of these increases in the model with regard to the extent to which sales prices covered costs, Muller decided to make certain adjustments. Marginal adjustments have been made in the Driehuis' model with regard to the petroleum refining and mining. In general terms the models have adopted a normative approach with regard to price formation.

In Kuipers' model the passing on of labour costs has been made explicitly dependent on competitors' prices and the level of demand (i.e. capacity utilization).

Import price trends

A separate study has been made of import price trends.[65] Import price levels were derived from this study for a number of product groups (table 30) and branches of industry.

Table 30. Price trends of imported goods and services 1970-1985 (indices, 1970 = 100)

	1977	1985	1975 weights
Import price index for:			
- raw materials and semi-finished goods + auxiliary materials	180	323	570
- inventory investment[1]	180	323	6
- re-exports[1]	180	323	56
- investment by enterprises	163	242	93
- enterprise services	151	218	64
- consumer goods	152	215	211
- import of goods and services	170	286	1,000

[1] It is assumed that prices in these categories will be determined by the price of raw materials and semi-finished goods.

Import price projections are of relevance not only for price formation but also for the impact of import prices on the balance of payments on current account.

[64] *Omvang en samenstelling van het trendmatig arbeidsaanbod* (Scale and Composition of the Secular Growth of the Labour Force), Central Planning Office monograph no. 22.
[65] An average increase in import prices of 6.7% per annum has been assumed for the period 1977-1985. See K. Vijlbrief, *Het verloop van het importprijspeil* (Import Price Trends), WRR, *Voorstudies en achtergronden* (Preliminary and Background Studies), The Hague 1980.

2.3.3 *The economic models*

As far as the macro-economic objectives of government policy are concerned, the models have been based on the existing system of official economic policy. These objectives may readily be determined from the periodic reports issued by the Central Economic Committee (CEC). The latest report of the CEC (1979) indicates that the basic aims of economic policy are concerned with the growth of income and expenditure levels (i.e. a moderate rate of growth), employment (the reduction of unemployment, which, given the continuing growth of the labour-force, implies that new jobs will have to be created on a large scale) and the balance of payments (equilibrium on current account).

The substantive aspects will be examined in the next section (2.3.4); this section provides a comparative survey of the differences in specifications between the models. The model specifications, as well as the findings of these studies, are contained in detailed reports which have been published in their entirety in the Preliminary and Background Studies series issued by the Council.

Three of the four experts were given the same terms of reference,[66] although they were left room to inject their own insights in the actual elaboration of the models. Various options were drawn up with regard to the classification into sectors. These are included at annex 1.

The considerations behind asking four different experts to undertake this aspect of the project were as follows:

- the project had to be completed in the relatively short space of a year, so that an additional safety margin needed to be built in;
- it was anticipated that the model specifications and approaches adopted would vary, which would be of benefit in the comparative evaluation of the individual model findings.

The external experts were partly chosen on the latter grounds, that is, differing insights and approaches were deliberately encouraged. The four experts were of course required to possess research experience in the field so that they would be up to date with recent developments.

The principle differences in model specifications are set out in table 31.

In approach the two most comparable models are those of Driehuis and Muller. The differences centre on the number of sectors and the specification of the demand for labour and capital. The exogenous factors also differ. With regard to exports both models proceeded on the basis of the projections in table 28, but then modified these in a number of respects. Their models are of an input-output type in which final demand in exogenously determined, with the exception of private investment and consumer spending, which are endogenous. The rest of the world has been fully specified and the models produce a detailed balance of payments on current account. In both models labour costs are treated as exogenous. Sector dynamics are determined in these models by the level of an anticipated shifts in final demand, as well as by the extent to which domestic production is geared to domestic demand.

[66] More restricted terms of reference were agreed beforehand with Dr. A.B.T.M. Schaik.

Table 31. Survey of the mejor differences in model specifications of the studies by the external experts

		Driehuis	Kuipers	Muller	Van Schaik[1]
1a.	Separate production and sales blocks?	yes, for capital-using sectors	yes, mutually denpendent	yes	no, only a supply block
b.	Are there limiting supply factors?	no	partly: labour	no	N.A. (see 1a)
c.	Does demand determine output?	yes	no	yes	N.A. (see 1a)
2.	Sales and output linked endogenously?	yes, as regards investment & consumption	instant adjustment of demand and supply assumed (with respect to long-term nature); production is endogenous	yes, with regard to investment and determination of domestic market share	not applicable
3a.	Input and output structure explicit?	yes	no	yes	no
b.	Fixed or variable coefficients	fixed	not applicable	fixed	not applicable
4a.	Nature of supply block?	vintage model for capital-using sectors, factor substitution based on relationship between labour and capital costs	CES production functions	fixed coefficients	vintage model, factor substitution along Vintaf II lines with distinction between pre and post-war capital coefficients
b.	Input factors distinguished?	labour, capital and raw materials	labour and capital	labour, capital & raw materials	labour and capital
5.	Nature of technical change?	embodied & disembodied labour-saving, disembodied capital-saving	both labour and capital intensifying	labour-saving (Harrod neutral)	labour-saving (see also 4a)
6a.	Factor payments endogenous?	no	yes	no	no
b.	Input prices endogenous?	no	N.A.	yes	N.A.
c.	Sector prices endogenous?	yes	yes	yes	no, given for the past, assumed for the future
d.	Do prices react to relative scarcities?	no	yes	no	N.A. (see 1a)
7.	Number of sectors distinguished?[2]	10	7	23	11, plus Industry and Non-industry
8.	Major endogenous variables (per individual sector)	- value added - employment - investment - prices - balance of payments on current account - productive capacity, jobs and capacity utilization in capital-using sectors	- value added - employment - wages and prices	- value added - employment - investment - prices - balance of payments on current account - capital-goods stock - sales	- productive capacity - labour - capacity utilization - employment

[1] The limited design of the model, whereby branches of industry have been dealth with independently, was agreed beforehand.
[2] A survey of the sector classifications used is contained in annexes 1-3 to this chapter. The annexes also indicate which classifications have been used in comparing the results of the models.

Kuipers' study differs from those of Driehuis and Muller in many respects:
- more limited breakdown into sectors;
- constructed as a general equilibrium model in which production, sales, employment, wages and prices are simultaneously determined;
- inter-industry supplies not made explicit; the model is completely specified in terms of value added;
- the structure of production allows for substitution between labour and capital in individual sectors, which can moreover vary in scale between sectors;
- endogenization of wage formation, with the Phillips curve mechanism playing an important part;
- rest of the world not explicitly considered;
- no sub-classification of final demand, including investment.

Shifts in the structure of production are achieved within this model by means of the specification of separate dynamics for individual sectors. These consist on the one hand of the impact of real National Income and (endogenous) sector prices on value added and employment in each sector, and on the other hand of the impact of the state of the labour market (itself partly determined by the above factors) on sales through the induced changes in wages and prices.

Van Schaik's study was deliberately restricted to and vintage model for individual sectors, and was as such not integrated into a coherent whole.

2.3.4 *The model results: basic variant and policy variants*

The multi-sector models enabled a number of policy variants to be worked out. In order to obtain an impression of the medium-term prospects for the economy, changes in a number of major variables, such as employment, value added, the balance of payments on current account and prices, were projected up to 1985. These projections are of a medium-term nature, meaning that only structural changes are taken into account.

The models do not set out to predict cyclical fluctuations; the projected values for 1985 are therefore free from any cyclical influence. In practical terms, this has meant that the model projections are based on a 'normal' level of capacity utilization. This therefore also means that the effect of the sales situation on prices has been disregarded. The projections are naturally highly dependent on the projected path of the exogenous variables, including the instrument variables susceptible to government control. The extent to and circumstances in which the government may be deemed capable of intervening effectively in the economic system are not invariable. This in fact forms the essence of this study, that is to examine the scope for effective government action by means of structural economic policies.

For this reason the models have not been confined to basic projections but variant analyses have been carried out. These analyses depict the effect of changes in those exogenous variables that lend themselves to government intervention.

The basic projections cover the period 1976-1985; the Driehuis' model covers the period 1977-1985. The reason for selecting an earlier year than 1980 as the base year for the projection period consisted of the availability of the empirical data, which do not go beyond 1977.

The projected path of the exogenous variables was considered in some detail in section 2.3.2, where a number of specialized studies were touched on. At the risk of repetition we would stress that the selection of exogenous variables within each of the models varies, as indicated in section 2.3.3.

As far as policy variants are concerned, this study has focussed especially on:
- the level of money wages;
- government expenditure;
- the selective stimulation by the government of individual industries or sectors.

A comparative analysis of the results of the model studies is made below. In this context three preliminary observations are in order. In the first place it should be noted that a number of basic projections have been made in the Kuipers model, in which wage formation, and in particular the Phillips curve, play an important part. These projections differ from one another with respect to the assumed size of the labour-force. As might be expected, these assumptions are of far-reaching significance for the results obtained. As noted earlier, use has in the first instance been made of the projections for the labour-force of the Central Planning Office. These envisage an annual increase in the size of the working population of 45,000 man-years. For calculation purposes it has been assumed in the models that the public sector will absorb 11,000 of these, meaning that the private sector would be required to absorb 34,000.

A certain degree of doubt, however, surrounds the realism of this assumption, since these labour-force projections were drawn up some years ago, and no such increase in the labour-force has (as yet) become evident. (For a possible reinterpretation of the trend in 1979 see: Ministry of Social Affairs, Annual Report on the Labour Market 1979, The Hague, April 1980.) For this reason a second variant, in which the labour supply is taken as constant, has been added to the basic variant in which the supply is assumed to rise.

The projections for individual branches of industry in Van Schaik's study are based on rates of growth suggested by production trends in the second half of the 1970s. From 1977 onwards there is a fixed percentage increase in the

variables of relevance for individual sectors, namely output, investment and real labour costs. In addition to estimates allowing only for capital-saving technical change, Van Schaik also performed calculations in which allowance was made for capital-saving technical change, with the possibility that the latter might be negative. These alternative specifications of technical change produce different projections for 1985. The differences are particularly marked in the case of the service sectors and the construction industry, while the manufacturing sectors turn out to be much less sensitive to changes in specification.

It is difficult to choose between the alternative specifications on the basis of the estimates obtained, and for this reason use has only been made of Van Schaik's results for the manufacturing sectors. The calculations in question relate to the alternative in which there is no capital-saving technical change.

A second marginal note concerned the interpretation of the policy variants. In the usual way, the policy variants derived from the models have been compared against the basic variants. As such the results of the policy variants are presented in the form of deviations from the basic variant, thus enhancing the comparability of the results obtained from each of the models. It should, however, be borne in mind that the consequences of the policy variants as worked out in the models are partially determined by the same initial situation as that assumed for the basic variant. In this respect it is important to note that in the Kuipers' model, the policy variants have been grafted onto the basic variant, except that the labour supply is now assumed to rise. Allowance must therefore be made for the fact that the outcome would have been different if the same starting point had been taken as that in the basic variant, i.e. a constant supply of labour.

Finally we would stress that primacy has been given in this study to three target variables (see section 2.3.4). In the comparative analysis of the model results attention will be concentrated on these target variables, i.e. employment, economic growth and the balance of payments on current account.

Basic variant

The results of the basic variant are summarized in tables 32-35. A five-sector classification has basically been employed, to which the various classifications could be reduced with a little resourcefulness (see on this point annexes 2 and 3). The Driehuis' model is broken down into ten sectors, to which the highly disaggregated Muller's model could also be reduced, thereby enabling a more detailed comparison to be made for these two models.

An initial inspection of the results reveals that the major differences arise between the Driehuis' and Muller's models on the one hand and the Kuipers' model on the other, while the variations between the two basic variants in the Kuipers' model are also striking.

These differences may be readily accounted for. They are related partly to the differing assumptions made in respect of exogenous circumstances, and partly to the model specifications, which are to a greater or lesser extent based on particular conceptions of the way in which the economy operates. The conditions and assumptions underlying the results of the Kuipers' model have been discussed in detail in the relevant research report.[67] This is followed up below with a comparison of the assumptions underlying the Driehuis' and Muller's models.

1. Volume of exports

As noted previously, the rest of the world is not explicitly considered in the Kuipers' model. By means of supplementary analysis, however, an estimate can be made of the extent to which (if at all) the sectoral sales forecasts are consistent with the anticipated trend of world trade and the Dutch share in that trade. It turns out that the sales forecasts implicitly assume a 5-6% annual growth in world trade which, in the light of the recent past, is regarded as not unrealistic. On the basis of the Vintaf-II model it is argued ad hoc that the volume growth of Dutch exports of goods is equal to the growth in world trade.

[67] Kuipers et al., op. cit., pp. 78-82.

The latter implies that the Netherlands will be able to maintain its share of world trade which, in Kuipers' model, is dependent on the level of export prices in relation to competitors' prices. Supplementary calculations grafted onto the results of the Kuipers' model suggest that this is in fact possible.

Table 32. Basic 1985 projection of employment, gross value added and the balance of payments on current account (changes 1976-1985)[1]

1000 man-years	Employment				
	Muller	Driehuis	Kuipers		Van Schaik
			I	II	
I. Primary sector	— 48	— 58	— 25	— 9	
II. Industry	—202	—161	—147	— 67	—97
III. Public utilities	— 16	0	—	—	
IV. Construction	71	22	— 53	— 64	
V. Services	133	74	+ 240	349	
Total	— 62	—123	15	209	
N.Fl. bns. (1970 prices	Gross Value Added				
	Muller	Driehuis	Kuipers		Van Schaik
			I	II	
I. Primary sector	3.6	2.8	2.4	3.0	
II. Industry	9.9	10.9	13.3	18.7	16.0
III. Public utilities	1.3	1.1	—	—	
IV. Construction	1.4	0.7	1.1	0.8	
V. Services	3.1	11.5	23.3	27.1	
Total	29,3	27.0	40.1	49.6	
N.Fl. bns. (current prices)	Balance of payments				
	Muller	Driehuis			
Total	—0.7	—22.5			

[1] Driehuis: changes 1977-1985.
Van Schaik: changes for industry only.
Kuipers: two variants - constant labour supply (I)
- labour supply rising by 34,000 man-years per annum (II).

In the Driehuis' and Muller's models exports in the basic variant have been taken as exogenous. These projections were taken from a separate study, the results of which are shown in summary form in table 28. According to these estimates the volume of Dutch exports of goods will grow by only some 3% p.a., i.e. half the growth figure assumed by Kuipers. The separate study takes a more conservative line on the likely growth in world trade and - which is more important - assumes that the growth in Dutch exports of goods will lag behind the growth in world trade.

Table 33. Basic 1985 projection of gross value added, employment and labour productivity (annual percentage change 1976-1985)[1]

	Muller	Driehuis	Kuipers I	Kuipers II	Van Schaik
Employment					
I. Primary sector	—1.9	—2.7	—1.0	—0.3	
II. Industry	—2.4	—2.3	—1.3	—0.6	—1.1
III. Public utilities	—4.4	0	—	—	
IV. Construction	1.7	0.6	—1.4	—1.7	
V. Services	0.7	0.4	1.3	1.9	
Total		—0.2	—0.4	0	0.6
Gross Value Added					
I. Primary sector	2.9	2.7	2.0	2.5	
II. Industry	2.4	3.4	2.6	3.5	3.5
III. Public utilities	3.0	0.5	—	—	
IV. Construction	1.8	1.1	1.4	1.1	
V. Services	2.4	2.2	5.0	5.6	
Total	2.5	2.5	3.4	4.1	
Labour Productivity					
I. Primary sector	4.9	5.5	3.0	2.8	
II. Industry	4.9	5.8	4.0	4.1	4.7
III. Public utilities	7.7	—	—	—	
IV. Construction	0.1	0.5	2.8	2.8	
V. Services	1.7	1.8	3.7	3.6	
Total	2.7	2.9	3.4	3.5	

[1] See footnote to table 32.

Table 34. Basic 1985 projection of employment and gross value added (changes 1976-1985)[1]

	Employment (1000 man-years)			Gross Value Added (N.Fl. bns., 1970 prices)		
	Muller	Driehuis	Van Schaik	Muller	Driehuis	Van Schaik
1. Primary sector	— 48	— 58		3.6	2.8	
2. Food, beverage & tobacco	— 11	— 23	21	2.7	2.4	1.4
3. Sensitive sectors	— 62	— 56	—53	0.2	—0.4	1.9
4. Intermediate goods	— 50	— 44	—21	3.9	3.9	8.3
5. Capital goods	— 79	— 38	—44	3.1	5.0	4.4
6. Public utilities	— 16	0		1.3	1.1	
7. Construction	71	22		1.4	0.7	
8. International services	— 56	— 31		7.6	5.5	
9. Local services	189	105		5.5	6.0	
Total	— 62	—123		29.3	27.0	

[1] Driehuis: 1977-1985.
Van Schaik: changes for industry only.
N.B.: There are differences in the sectoral classification between the models; see annex 3.

Table 35. Basic 1985 projection of gross value added, employment and labour productivity (annual percentage changes 1976-1985)[1]

	Employment			Gross Value Added			Labour Productivity		
	Muller	Driehuis	Van Schaik	Muller	Driehuis	Van Schaik	Muller	Driehuis	Van Schaik
1. Primary sector	—1.9	—2.7		2.9	2.7		4.9	5.5	
2. Food, beverage & tobacco	—0.7	—1.5	1.3	3.2	3.2	1.8	3.9	4.8	0.4
3. Sensitive sectors	—4.4	—6.4	—2.0	0.5	—1.8	2.5	5.1	4.9	4.6
4. Intermediate goods	—2.2	—3.0	—1.5	2.6	3.5	5.0	4.9	6.7	6.6
5. Capital goods	—2.4	—1.3	—1.3	2.3	4.3	3.1	4.8	5.7	4.5
6. Public utilities	—4.4	—		3.0	0.5		7.7	—	
7. Construction	1.7	0.6		1.8	1.1		0.1	0.5	
8. International services	—0.6	—0.4		2.5	2.2		3.1	2.6	
9. Local services	1.7	1.0		2.4	2.1		0.7	1.1	
Total	—0.2	—0.4		2.5	2.5		2.7	2.9	

[1] See footnote to table 34.

The latter assumption is moreover more consistent with recent trends as outlined in chapter 5.2.3, without this being primarily attributable to the level of export prices. These differences in the initial situation are obviously of decisive importance for the results obtained. In the Kuipers' model these effects are magnified through the operation of sector dynamics.

2. Sector dynamics

In the Kuipers' model the interaction between the structure of production and economic growth is to a significant degree determined by two sectors, namely the 'exposed' industrial sector (i.e. highly export-oriented industries) and the services sector: both of these have a growth elasticity of greater than unity. The growth impulse received by the exposed sector from sales (i.e. exports) is passed onto the private sector as a whole by means of this elasticity.

This also occurs in the Muller's and Driehuis' models, in their case by means of the multiplier/accelerator mechanism, but in a more differentiated manner since their models are broken down into a greater number of sectors, so that the distribution of sales among the sectors plays a part. In this way it is also possible for variations in demand trends for the various services and the absorptive capacity of consumers to be incorporated in the analysis.

3. Technical change

The rapid growth in output obtained in the Kuipers' model is partly determined by the assumed pace of technical change. This means that average labour productivity continues to rise rapidly; in relation to the other models the services sector stands out particularly. This difference in the growth of productivity between the services sector and other sectors is much lower in Kuipers' model than in those of Driehuis and Muller.

The smaller productivity differential is reflected in price formation, as a result of which the real growth of the services sector is much greater in Kuipers' model. This is then passed on to the rest of the economy through the medium of sector dynamics.

4. Growth of the working population

The growth of the working population plays an important role in Kuipers' model. By means of the Phillips curve mechanism, a marked growth of the working population results in a strong boost to growth. This mechanism essentially has a downward effect on money wages, which in turn exerts downward pressure on prices because of the close link between wages and prices.

Within the model, this then leads to an increase in real demand and output. The rise in the rate of growth is further increased by means of sector dynamics.

At a later stage the effect of the Phillips curve mechanism becomes weaker as labour is absorbed and money wages tend to rise more rapidly. On balance, it is possible for money wages to rise more rapidly in the case of a rapidly growing working population than in the case of a stationary working population. This also forms the reason why the assumption of wage restraint in Driehuis' and Muller's models does not have the same effect that a growth in the working population

has in Kuipers' models. No mechanism of this kind has been included in the Driehuis' and Muller's models.

The resultant consequences should of course be considered in the light of the assumed growth of the working population; in the event of a stationary working population the Kuipers' model will obviously produce different results.

During the 1970s the growth of the working population was checked by the statistical reclassification of part of the labour made redundant (e.g. by classifying them as disabled) and by later entry into the labour-force. In the light of these developments there must be considerable doubts as to whether the working population will in fact grow rapidly in the next few years. This is moreover something that will be affected by the policies adopted.

5. Deterioration in the terms of trade and relationship between the private and public sectors.

Two other matters deserve mention in relation to the differences in the results derived from the Driehuis'/Muller's and Kuipers' models. Kuipers' basic variants should, in fact, be corrected for the deterioration in the terms of trade resulting from the appreciable rise in import prices for raw materials etc.[68] The projections are also only consistent with a nil growth in the salaries of government officials,[69] while the basic variants envisage a growth in real wages in the private sector of 2-2.5%.

Such a situation is not readily conceivable, while the effects of an adjustment on this score are by no means clear-cut.

The relationship between the private and public sectors will be considered further in the context of the partial nature of the models (see chapter 6).

The differences in the initial situation assumed in each of the models and in their respective technical relations account for the differences in the results obtained at both the macro and micro level. An assessment of the merits of these results must rest on a closer examination of the following key issues:

- the growth in and Dutch share of world trade, depending on both price and non-price factors. Detailed consideration has been given to this point in this study; we would refer to chapter 5.2 (structure of production and trade policy), and chapter 2 (structure and growth).
- the growth of the working population and the flow-on effect on the economy. This subject will be taken up in the final chapter.
- the growth of productivity in the services sector and the dynamics of this sector. This subject is also taken up in the final chapter.

As noted previously, the exogenous export projections have a critical bearing on the model results. This applies to the level of value added and employment, and of course to the balance of payments on current account. The Driehuis' and Muller's models provide detailed projections for the balance of payments on current account. Kuipers has made an estimate of the balance of payments situation based on sales projections and certain supplementary calculations. Reference has already been made to the different initial situations assumed in the models with regard to the volume of exports. All the models are, however, based on the same estimates for import price levels (table 30); needless to say these are of direct significance for the balance of payments situation.

Finally the question arises of export price levels. Exogenous estimates have also been made for these, but they have not been accepted as they stand by Driehuis and Muller.

Price formation in the Kuipers' model is endogenous but, since the rest of the world is not specified in the model, it is not possible for export price levels to be derived directly. This can only be done indirectly, yielding a rise of 4.9% per annum, which would then correspond with foreign competitors' prices. The export price level is obviously closely linked to a country's competitive position, as well as to domestic cost levels and the commodity terms of trade.

Upon working through the effect of the exogenously estimated export price

[68] Kuipers et al., op. cit., p. 81.
[69] Ibid., p. 82.

level in the Muller's model, it was found in the light of import price projections that some industries in the Dutch private sector would be faced with serious losses. Muller's study reveals moreover that export prices have been lagging behind domestic prices in many industries for a number of years (1970-1977). Exceptions include 'other foodstuffs', the oil industry and 'other transport and communication enterprises'. It is also clear that in many industries the ratio of wages and salaries would have risen less strongly if it had been possible to increase export prices to the same extent as domestic prices. It goes without saying that the rise in export prices cannot consistently lag behind domestic price increases, since the point would eventually be reached when exporting would cease to be profitable. This point may well already have been reached in a number of industries. Conversely, a point will be reached when price rises in the domestic market cannot continue to lag behind rises in export markets.

These findings with respect to the level of export prices are consistent with two recent policy documents published by the Ministry of Economic Affairs:

- W. Groot and J. J. L. M. Janssen, *Goederenuit- en invoer: een empirisch onderzoek* (Imports and Exports of Commodities: an Empirical Survey), Position paper 7901, The Hague 1979 (see also chapter 5.2);
- R. Knegt, *Ruilvoet en arbeidsinkomensquote* (The Terms of Trade and the Wages-Income Ratio), Position paper 8001, The Hague, 1980.

The empirically observed trend in export prices has thus been projected forward in the forecasts shown in table 28.

Any adjustment of these forecasts must be based on factors to do with the level of Dutch competitiveness. The basic projections in the Driehuis' and Muller's models assume an annual increase in money wages of 7%. In the light of recent experience this is on the low side. It has also been assumed that the sharp rise in import prices is due to the rising cost of raw materials, and that competitors in export markets will be confronted with the same increases in costs.

On this basis it would seem fair to assume that future cost increases can be fully passed on in export prices and will no longer necessarily lead to compressed profit margins in relation to 1977: nor, however, will these increases necessarily lead to an improvement. Seen from this angle the situation will remain out of equilibrium, in that profit margins will remain too low. The question remains: can the projected volume growth in exports be realized at these adjusted export prices?

In line with the above reasoning, Muller has assumed that it can. Driehuis has accepted the original export projections in value terms, but has in one respect adjusted the prices and hence export volumes. For this reason there is a considerable deficit in the balance of trade in his basic projection; this difference in the results between his and Muller's model is almost entirely attributable to the differing assumptions with regard to export prices (see table 36).

Table 36. Export projections for 1985 in the Driehuis and Muller models

	Volume (constant 1970 prices; in N.Fl. billions)		Value (current prices; in N.Fl. billions)		Price ratio (value: volume)	
Sector:	Driehuis	Muller	Driehuis	Muller	Driehuis	Muller
Primary sector	7.7	7.9	10.4	22.1	2.6	2.8
Industry	71.6	72.3	141.1	144.9	2.0	2.0
Construction	1.2	1.2	3.2	3.4	2.7	2.8
Services	22.7	23.5	42.4	56.3	1.9	2.4
Total	103.2	104.9	207.0	226.7	2.0	2.2

The most significant conclusion reached by Van Schaik (op. cit., pp. 21-22) on the basis of his projections for 1985 is a follows. In nearly all branches of industry the evidence suggests a lengthening of economic life. Nevertheless his projection indicates that the reduction in the number of jobs in most manufacturing industries will persist. Apart from the only moderate rate of growth of investment assumed by Van Schaik there are two other relevant factors, namely technical change and technical wear and tear. If the past pace of labour-saving technical change should be sustained into the 1980s, the number of jobs that will be created by new investment will fall off heavily. It will only be possible for this effect to be neutralized if there is a high rate of growth of investment. The decline in employment will be further accentuated by the loss of jobs brought about by technical wear and tear.

Wage restraint policy variant

The effect has been calculated in three of the models[70] of a 1% per annum reduction in the growth of money wages over the entire projection period.

Much the same approach was adopted in each of the models in working out this variant. A reduction in the growth of money wages leads to a lower rise in real primary labour costs, which enables (export) prices to be lowered without squeezing the return on capital. This in turn provides exporters with a slight advantage or helps compensate for a relative disadvantage, thereby leading to a volume growth in sales. A price elasticity of demand for exports greater than unity will produce a greater percentage volume growth than the percentage cut in prices. The fact that the price elasticity of exports is (in an absolute sense) greater than unity in the medium to long term is not disputed; views differ, however, on the extent to which this parameter exceeds unity.

The estimated or assumed values for this parameter vary in the models between 1 and 2. Recent literature on the subject has suggested even higher values for the price elasticity of exports, in which case lower price cuts would be able to achieve the same volume rise. The hazards of econometric estimates of coefficient values are taken up in chapter 5.2. In statistical terms, these estimates tend to be subject to rather large margins of unreliability. The Council's reasons for accepting the values assumed in the models are set out in the final chapter. Table 37 provides a survey of the effects of this policy variant.

[70] As noted in chapter 2.3.4, the Van Schaik's model is a partial study only. By injecting additional information on the path of various exogenous variables, it would in principle be possible to use his model to work out the effects of the policy variants considered in this section, but time did not allow this to be done.

Table 37. Changes in employment, gross value added and the balance of payments on current account in relation to the basic projection resulting from a 1% reduction in the growth of money wages in three models[1]

	Employment (x 1000 man-years)		
	Muller	Driehuis	Kuipers
I. Primary sector	8	0	6
II. Industry	31	13	3
III. Public utilities	0	0	—
IV. Construction	13	11	3
V. Services	71	75	18
Total	123	98	40
	Gross value added (N.Fl. bns., 1970 prices)		
	Muller	Driehuis	Kuipers
I. Primary sector	0.4	0.9	0
II. Industry	1.7	2.9	0.1
III. Public utilities	0	0.2	—
IV. Construction	0.2	0.2	0.1
V. Services	2.0	3.7	0.7
Total	4.4	7.9	0.9
	Balance of payments on current account (N.Fl. bns., at current prices)		
	Muller	Driehuis	Kuipers
Total	—2.3	—4.3	N.A.

[1] Muller from 1979; Driehuis from 1979; Kuipers from 1981.

The effects as calculated by Muller and Driehuis broadly correspond. Such differences as there are may largely be accounted for in terms of the assumed value for the elasticity of exports (Muller lower than Driehuis) and the projected level of labour productivity (Muller lower than Driehuis).

The similarity between these two should be seen in the wider context of the general similarity between their basic projections for 1985, in that the initial situation as projected for 1985 affects the outcome of the variant projections. Since the level of employment in Kuipers' initial situation for 1985 is much higher, the additional absorption of labour in his model would lead to greater tightness in the labour market. This will exert upward pressure on money wages through the operation of the Phillips curve effect, thereby partly cancelling out the initial wage restraint. This forms a major reason why the net generation of employment is lower in Kuipers' model.

The balance of payments effects obtained in the Muller's and Driehuis' models deserve a special note. At first sight the deficit obtained in their models may appear surprising, given the fact that orthodox theory (the 'Marshall-Lerner condition') would suggest that there should be a positive effect on the balance of payments. The reason why the net effect should be negative is related to a particular configuration of circumstances to do with the specific features of the Dutch economy in the 1980s. Given particular price elasticities of demand for import and exports, the initial impact of wage restraint on the balance of payments can be undone. This depends on the values of the import and export multipliers, as well as on the (marginal) propensities to import and export. It should also be borne in mind with respect to the effects obtained in the Muller's and Driehuis' models that they are of a partial nature only, because the consequences of wage restraint for the public sector have not been taken into account and no allowance has been made for the operation of the Phillips curve. Wage restraint can likewise create room in the public sector for an increase in the volume of output. This is, however, a rather complex matter, in that prices will be falling and hence also taxation revenues. This makes it possible that no additional room would be created. The partial nature of the models should, therefore, be kept in mind in interpreting these results.

Table 38. Changes in employment, gross value added and the balance of payments on current account in relation to the basic projection resulting from an autonomous increase in government expenditure of N.Fl. 1 billion (1970 prices)[1]

	Employment (x 1000 man-years)	
	Muller	Driehuis
I. Primary sector	1	0
II. Industry	6	0
III. Public utilities	0	0
IV. Construction	10	9
V. Services	25	14
Total	42	23
	Gross value added (N.Fl. bns., 1970 prices)	
	Muller	Driehuis
I. Primary sector	0	0
II. Industry	0.3	0.2
III. Public utilities	0	0
IV. Construction	0.2	0.2
V. Services	0.6	0.7
Total	1.1	1.1
	Balance of payments on current account (N.Fl. bns. at current prices)	
	Muller	Driehuis
Total	—2.0	—1.6

[1] In Kuipers' model nominal value added in the public sector increases at an annual rate of 10% instead of 7.5% from 1981 onwards. The consequences of this are:
additional growth in output of enterprises: 0.2% p.a.
additional growth in employment by enterprises: 0.1% p.a.
additional employment by enterprises: 15,000 man-years in 1985.

Higher government expenditure policy variant

In this variant the impact on the public sector has been examined of an autonomous increase in current government expenditure of N.Fl. 1 billion (1970 prices). The partial nature of the studies should once again be stressed, since the financing of an increase in government expenditure will have feedback effects, which have largely been left out of account in the calculations. The effects of an increase in government expenditure as set out in this section assume that there would be the same breakdown into expenditure categories as in 1985.

The differences in the results obtained by Muller and Driehuis may be attributed to the fact that the stimulation of government expenditure largely benefits output in the services sectors. The respective increases in employment in those sectors. The respective increases in employment in those sectors vary considerably. The deterioration in the balance of payments resulting from an increase in government expenditure should also be noted.

Structural policy variant

In this variant the effects have been examined of an autonomous increase in productive capacity (investment) in individual sectors, linked with a simultaneous increase in sales on a scale sufficient to ensure a constant level of capacity utilization. The increase in sales would be a combination of higher exports and higher domestic sales. The aim of this variant is to obtain insight into the consequences of selective stimulation designed to increase the effective penetration of a particular sector in both the domestic and export markets. The initial effects are of course accompanied by cumulative effects, in that an increase in the level of activity in one sector will work through to other sectors by means of the input-output system.

Due allowance should be made for the fact that these calculations take no account of the lags that would occur in the real world, in that the investment push would have to precede any increase in sales. The effects as shown here are thus of a structural nature. This is not to deny the importance of lag factors – especially in the current economic circumstances. These effects have been separately considered in chapter 6.

The results of these calculations are set out in table 39 (changes in absolute values in relation to the basic projection for 1985) and table 40 (changes in indices per initial invested guilder over the period 1977-1985, the average change in all sectors being equal to 100).

Table 39. Changes in employment, gross value added and balance of payments on current account resulting from sector-specific stimulation (absolute values)[1]

Sector		Employment (1000 man-years)		Value added (N.Fl. bns., 1970 prices)		Investment (N.Fl. bns., 1970 prices)		Balance of payments on current account (N.FL. bns., current)
		initial	total	initial	total	initial	total	total
2. Food, beverage & tobacco	M	8	54	0.7	2.2	195	643	+ 450
	D	8	31	0.5	2.4	238	399	
3. Sensitive sectors	M	21	51	0.7	1.7	161	446	+ 375
	D	28	62	1.4	3.8	171	357	
4. Intermediate sector	M	13	48	1.0	2.1	279	609	+ 590
	D	3	14	0.4	1.0	253	306	
5. Capital goods	M	20	87	0.9	3.1	164	722	+ 345
	D	46	96	2.3	4.9	605	858	
8. International services	M	34	81	1.4	2.9	439	871	+ 865
	D	—	—	—	—	—	—	
9. Local services	M	46	87	0.7	2.1	281	675	— 149
	D[2]	169	180	8.0	8.5	753	913	

[1] Kuipers' structure of production variant:
1. From 1981 onwards the volume of sales of the 'exposed' industry (Kuipers' sector 4) increases by an additional 1% p.a.:
   Result: employment in enterprises: + 16,000 man-years in 1985.
2. From 1981 onwards nominal sales of the services sector (Kuipers' sector 5) increase by an additional 1% p.a.:
   Result: employment in enterprises: + 37,000 man-years in 1985

[2] Applies to the services sector as a whole, i.e. sectors 8 en 9 together.

Key:
Initial = in the stimulated sector
M = Muller
D = Driehuis.

Table 40. Changes per initially invested guilder in employment and gross value added resulting from sector-specific stimulation (Indices: average in all sectors = 100)

		Changes per initial investment (av. = 100)			
		Employment		Gross value added	
		initial	total	initial	total
2. Food, beverage & tobacco	M	42	103	101	122
	D	29	58	28	72
3. Sensitive sectors	M	133	118	121	114
	D	158	182	125	204
4. Intermediate sector	M	50	64	101	81
	D	9	23	20	30
5. Capital goods	M	125	197	155	204
	D	74	80	58	75
8. International services	M	83	69	90	71
	D	—	—	—	—
9. Local services	M	121	115	70	81
	D[1]	193	158	213	136
Average in all sectors	M	100	100	100	100
	D	100	100	100	100

[1] Applies to the services sector as a whole, i.e. sectors 8 and 9 together.

Key:
Initial = in the stimulated sector
M = Muller
D = Driehuis.

The effects computed by Muller and Driehuis differ, but the internal relationships between the sector-specific effects correspond reasonably closely. An exception consists of the capital goods sector. The background to this difference lies in the way in which investment has been defined.

2.3.5 *Conclusions*

1. It emerge clearly from the results of the economic models that the prospects for 1985 depend particularly on the following factors:
- the volume of exports and export prices, in the light of the growth of world trade and the Dutch competitiveness;
- the growth in the working population and the stimulus to growth provided by an increase in the working population through the operation of the price mechanism in the markets for goods and the labour market.

2. On the basis of formal, model-based analysis it is difficult to select between the various possible approaches to the economy. This study has not, however, remained confined to model-based analysis.
In this context we would refer to chapters 2.1, 2.2 and 5.2, which seek to arrive at empirical generalizations on these points by working round the models.

3. Even if it may be assumed that the price mechanism operates in both the commodity and labour markets, or that its operation may be improved, much still depends on one's assessment of the underlying structural position of the Dutch private sector: how competitive is the Dutch economy as presently structured, and does it possess the necessary capacity for adjustment?
Putting this in more policy-oriented terms, this comes down to two main questions:
- to what extent can one rely on the spontaneous regenerative capacity of the economy, or on its regenerative capacity given an improvement in the operation of the price mechanism?

- which conditions need to be fulfilled in order to ensure the improved operation of the price mechanism, and how can these conditions be brought about through official policies?

We shall seek to answer these questions in chapter 6.

4. Consideration will also be given in chapter 6 to a number of important economic relationships that have not been fully brought out in this chapter, such as the relationship between the private and the public sector.

Annex 1

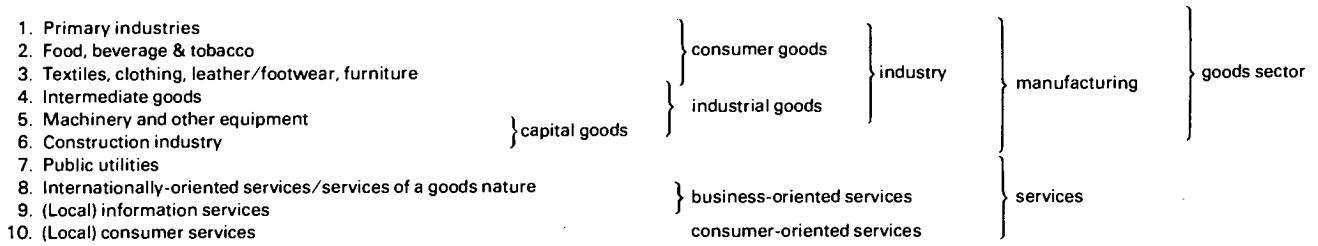
Policy-oriented industrial classification

It will be evident that the industrial classification or sectoral breakdown employed must enable the economy to be approached in a variety of ways, and that it should differentiate the following aspects:

- intensities in terms of knowledge, capital and labour skills;
- export potential;
- energy intensity;
- the information aspects.

Additional constraints that must be satisfied include the fact that the classification should be capable of being reduced to the traditional 3 or 4-sector classification and that it must be statistically defined and described.

The result of these (partly conflicting) considerations are roughly as follows:



All the various policy angles are reflected in this classification, which also largely satisfies the constraints.

Two points should be noted with regard to the above classification into ten sectors:

1. Private housing has been included under sector 10 and not under 6 (construction industry).
2. The printing and publishing industry is the only one to have been included under a branch where it is does not belong (sector 9). This has been done in the interests of demarcating an information sector, of which printing and publishing necessarily form part (although publishing belongs more properly in the services sector).

In addition to the ten-sector classification, two more-condensed classifications have been made:

a) 7-sector breakdown

1. Agriculture and mining
2. Consumer goods
3. Industrial goods
4. Construction
5. Public utilities
6. Business-oriented services
7. Consumer-oriented services

b) 4-sector breakdown

1. Agriculture and mining
2. Industry including shipping and aviation
3. Construction including housing
4. Services including public utilities, excluding shipping, aviation and housing.

The 7-sector classification (a) still reflects the 'exposed' and 'capital-intensive' aspects, as well as the traditional sectoral breakdown. In (b), however, these aspects survive in only diluted form.

Annex 2

Basic industrial classification

1. Agriculture, forestry and fishing
   Foodstuffs industry:
2. - Livestock products
3. - Other products
4. Beverage and tobacco
5. Textile industry
6. Clothing, leather and footwear
7. Paper industry
8. Printing and publishing
9. Timber and furniture
10. Construction materials
11. Chemical and rubber industry
12. Basic metals industry
13. Metal products and optical industry
14. Electrical engineering
15. Transport facilities
16. Petroleum refining
17. Mining (natural gas)
18. Public utilities
19. Construction
20. Private housing
21. Trade
22. Shipping and aviation
23. Other transport and warehousing
24. Communications enterprises
25. Banking and insurance
26. Business services
27. Medical and veterinary services
28. Other services

Annex 3

Sectoral classifications used in the models with the corresponding sector numbers according to the basic industrial classification

Sectoral classification	Muller	Driehuis	Van Schaik	Kuipers
I. Primary sector	1, 17	1, 17		1, 17
Food, beverage & tobacco	2, 3, 4	2, 3, 4, 7	2, 3, 4	
Sensitive sectors	5, 6, 9, 10	5, 6, 9	5-10	
Intermediate goods	7, 8, 11, 12, 16	10, 11, 12, 16	11, 12, 16, 17	
Capital goods	13, 14, 15	13, 14, 15	13, 14, 15	
II. Total industry	2-6	2-7 9-16	2-7	2-16 22, 23, 24
III. Public utilities	18	18		
IV. Construction	19	19		19
International services	21-24	21, 22, 23		
Local services	20, 25-28	8, 20, 24-28		
V. Total services	20-28	8, 20-28		21, 25-28

3.1 Technology

3.1.1 *Introduction*

A distinction may be drawn with regard to industrial processes between basic technology of general application throughout industry and technology of a more specific nature confined to a particular branch of industry. This section is primarily concerned with basic technology.

Apart from human inputs, three general factors come into play in any industrial process. These are:
- 'material intelligence': formalized intelligence in the form of capital goods: mechanical, electro-mechanical and electronic;
- energy: the 'power' of industrial appliances, etc.;
- the transformation of matter: all conversion associated with the inflow and outflow of matter.

Technology is in a constant state of evolution within these three general areas. In the case of material intelligence this concerns developments in the field of micro-electronics which can give capital goods and products a much higher (formalized) intelligence content. In the field of energy, which forms a vital input for any industrial activity, there are a number of interesting developments, especially the improvement of efficiency and switching to other forms or sources of energy. In the case of the transformation of matter, basic transformation – i.e. the chemical conversion of substances – is, in addition to physical design, of considerable and general concern. A number of major developments are anticipated within the chemical industry (being the main industry concerned with basic transformation) that could have a considerable impact on a large slab of industrial activity. Interesting developments are also occurring in the field of physical design, i.e. the control of materials.

In this discussion of basic technology, an attempt has been made to gear it specifically to Dutch circumstances and, where possible, to indicate fields that appear promising or of importance for the Netherlands. There exists no generally accepted framework or established procedure for this purpose. As such the attempt to translate technological developments for Dutch circumstances is based simply on a qualitative assessment of relevant factors such as industrial experience, knowledge within industry and elsewhere, existing interconnections and physical and institutional obstacles.

3.1.2 *Electronics*

General

The central development in the field of electronics consists of the rapid advance in miniaturization which, apart from a number of other advantages, has led to a sharp decline in the unit cost of basic electronic operations. This decline in costs, coupled with the other advantages, is widely expected to lead to a far-reaching penetration of electronics in industrial processes, infrastructural facilities and capital and consumer goods.

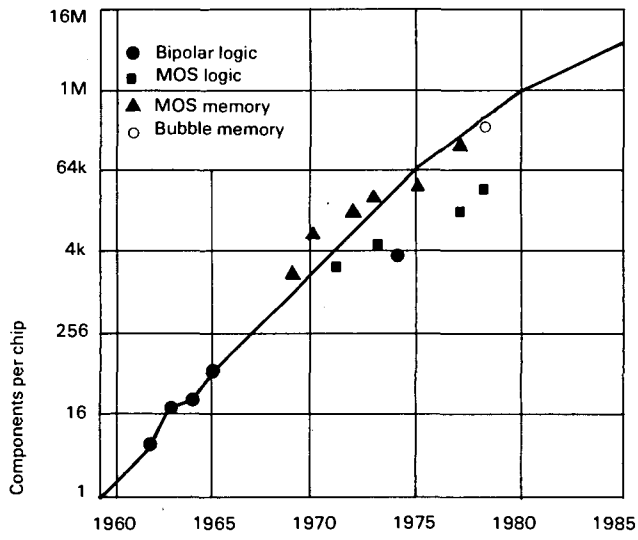
In general, the introduction of micro-electronics is associated with a shift from hardware to software. Within certain limits, this shift brings with it a great degree of flexibility, providing capital goods with a certain built-in immunity against obsolescence. The need for a capital good to meet other requirements or to be used in other applications has increasingly become a matter of the same hardware with different software.

Electronics is concerned with the transmission, processing and storage of data. The miniaturization of electronic components has made the digitilization or binarization of data possible on an extensive scale.

The chip

The chip or microprocessor is the basic unit of 'intelligent' electronics. In recent years the complexity of the chip has increased by an average factor of 2 per year (see figure 1).

Figure 1. Growth in complexity of the most advanced commercially available chips



Source: G. Moore, 'VSLI: Some fundamental challenges', IEEE-Spectrum, April 1979, p. 30.

This trend towards increasing miniaturization is likely to continue, at least for memory circuits, although for most purposes a more than adequate level of complexity has already been achieved, or will be achieved within a few years with existing techniques. The bulk of chip production (in numerical terms) will consequently stabilize at a certain level well below the technically feasible maximum. The further technological development of these technically speaking mediocre microprocessors will be heavily geared towards cutting the cost of the chip, especially by means of the computerization of individual procedures (such as packaging), the reduction of raw material costs and increasing the market for and by economics of scale and learning effects. Efforts to increase the size of the market will run into stiff competition, with the United States and Japan having an edge on Europe, the latter being fragmented.

For practical purposes good software is essential. The lack of sufficient standardization in the hardware field is an obstacle to the production of inexpensive standard software in the form of interchangeable floppy disks or semiconductor store (i.e. modules with a magnetic or semiconductor memory in which programs can be stored). Standard software is particularly responsive to economies of scale. Delivery costs are low or are becoming low, so that given sufficient standardization, volume and price will be closely linked. As a result, competition is likely to be intense.

In the last few years there has been a sharp growth, averaging 24% a year, in sales of integrated circuits (hard-wired and soft-wired logic) in the United States. With the probable exception of a few stages of production, there exists little scope at present for the chip to be produced competitively within the Netherlands. To do so Dutch industry will have to look beyond its own borders and obtain a foothold in technological centres where advanced technology is already available as well as in ready-made markets where the application and absorption of micro-electronics are already sufficiently advanced. It should also be noted that on the other hand the incentive to increase market-size referred to previously, and the highly important interaction between component producers and users, may lead to a more widespread distribution of chip production plants. Partly because of its geographical location (i.e. proximity to a large and technic-

ally advanced market) and existing trading infrastructure, the Netherlands is an attractive point of entry into the European market for American or Japanese firms. Japan has been making great technological strides which, together with the effective penetration tactics adopted by Japanese firms, have been perceived in the United States as a marked threat to the lead that the latter is still thought to have.

Mainframe computers and minicomputers

The market for mainframe computers has seen a sharp growth in concentration. The producer monopoly has, however, led to a product-line monopoly, arising from the modular nature of mainframe computers. This degree of product standardization has led to the failure of a number of competing activities, such as those of Philips in Apeldoorn, and to the marked success of the so-called plug-compatible companies (which manufacture and supply products that fit into existing product lines).

The specialized production of plug-compatible units helps avoid certain general costs, and this means that the quality and cost of these units often compare favourably with those of the units supplied by the original developer of the computer-line. The process of concentration responsible for the widespread standardization of product lines (with the IBM-line forming the standard line to which other firms have adapted) is still continuing. In view of this, Dutch activities aimed at breaking through this process must be regarded as having little point. Mainframe computers are likely to experience increasing competition from the larger minicomputers, for example in intelligence distribution within administration. Table 41 shows the anticipated sales of minicomputers in Western Europe.

Table 41. Minicomputer sales per country, 1977-1982

	West Germany	France	U.K.	Italy	Benelux	Scand.	Switz.	Other	Av. syst. value $ 1000	Total
1977	4,020	3,216	3,055	1,447	1,608	1,286	965	843	43.5	16,080
%	31%	28%	29%	25%	28%	29%	27%	35%		
1978	5,285	4,116	3,940	1,808	2,058	1,659	1,225	652	42.3	20,743
%	32%	28%	32%	25%	28%	29%	27%	35%		
1979	6,988	5,268	5,240	2,260	2,634	2,140	1,555	880	42.3	26,966
%	27%	27%	29%	25%	30%	29%	27%	36%		
1880	8,884	6,690	6,700	2,825	3,471	2,760	1,977	1,198	42.7	34,515
%	26%	26%	27%	24%	26%	26%	25%	34%		
1981	11,117	8,396	8,536	3,443	4,443	3,477	2,471	1,605	43.1	43,488
%	26%	25%	26%	23%	26%	28%	26%	32%		
1982	14,002	10,512	10,720	4,243	5,598	4,485	3,113	2,121	43.5	54,794

Source: Europa Report, LDC Europe Ltd., 1979.

Production opportunities must exist for Dutch industry in the field of minicomputers and specialized computers, especially if it should prove possible to acquire sufficient knowledge of advanced hardware technology through participation in microprocessor development and markets elsewhere.

Applications for micro-electronics

Micro-electronics, in the form of logical processing or memory units, can be used in any system operating with the aid of internal or external data or signal flows, provided these flows can be sufficiently formalized. A number of major aspects and applications are briefly discussed below.

Interface systems occur on either side of the central processing unit, i.e. on input and output. These interface systems may consist of display units, sensors, etc. In general terms, it is fair to say that there is a distinct possibility that the development of interface systems and software – with regard to technology as well as ergonomic application and standardization – will not keep pace with hardware developments. This gap could act as a significant brake on the use of micro-electronics.

The advent of micro-electronics will mean an even greater spread of industrial computerization at many levels of administration and production. Hitherto, the high cost and centralized installation of computers have restricted their application to large-scale and generally continuous processes.

Computerization was often a risky business since it tended to consist of a combination of investment in new production equipment and computers. The sharp rise in overheads associated with computerization acted as a definite incentive to increase production. In those cases where it did not prove possible to increase the size of the market on the scale required, computerization had a significant negative impact on costs and thus on competitiveness.

Micro-electronics make it possible to computerize individual parts of the production process (i.e. sub-systems) in a more flexible, ad hoc manner. To a large extent, it is no longer necessary for production processes to be geared to the specific requirements or constraints of the computer. The shift from capital hardware to software provides a certain immunity to obsolescence and makes it easier to react flexibly to market changes.[1] Product quality and reliability are enhanced by improved control and supervision.

In addition to continuous processes, computerization may also be expected to penetrate to batch processes. Flexibility can provide small series batch production with the economies of scale of much larger series. Numerical control and special-purpose or programmable robots with adaptive properties will play a large part in the computerization of batch processes. Knowledge and control of materials are of great importance in this respect.

Goods interface systems are also important in this regard, especially good sensors able to detect the relevant control parameters of a process sufficiently accurately and quickly. Although the Dutch industrial tradition in the field of capital goods is generally not outstanding, there nevertheless exists scope for participating in the production and supply of goods for use in computerization. The ad hoc nature and relatively small scale on which micro-electronics can be applied, often unlinked to the special features of large facilities, make this possible. As in other countries, however, a basic precondition consists of the joint mobilization of micro-electronic know-how and production technology.

The impact of micro-electronics in the sphere of commercial services will be particularly marked on the main activity, i.e. information processing. Distributed intelligence, based on intelligent word-processors and mini-computers, will form a central part of such computerization. Inter and infradata base structures will ensure the rapid exchange of the necessary data.

The application of modern micro-electronics will produce large shifts in occupational categories, in that there will be a high demand for internal and external system hardware and software expertise. The design, perfection and maintenance of software are of particularly great importance. The quality of the services required and the remaining administrative functions will also be affected.

As electronic communication becomes more widespread, human communication may decline or become highly formalized. The ultimate implications for workers and for employment are not yet clear. Apart from an increasing requirement for internal expertise to handle computerization, it is anticipated that there will be a significant increase in all sorts of activities by computer service bureaus. These activities will differ significantly from the types of services currently provided by these bureaus.

Apart from information processing, commercial services can also cover transport, storage, repair and processing. These activities will also be affected. Many transport and storage systems are capable of further rationalization, while the nature of repairs will assume a different form, partly because of the incorporation of micro-electronics in commercial articles. The monitoring of stock levels with the aid of micro-electronics will make for greater flexibility in stock

[1] It is interesting to note that the ad hoc nature of computerization by means of micro-electronics and the certain degree of built-in immunity provided against obsolescence could reduce the validity of certain econometric Clay-Clay vintage models often used in economic forecasting. Apart from indirect longitudinal effects, micro-electronics facilitate a greater degree of direct transversal change, i.e. change of existing vintages.

systems and will enable the amount of 'dead' capital frozen in stocks to be dramatically reduced. To do so, however, it will be essential for supplying industries to be able to deliver promptly and flexibly. This type of flexibility can be provided by the application of micro-electronics in the relevant industrial processes. A reliable transport system naturally plays a vital part in this context.

One sector of interest to the Netherlands consists of measuring and regulating instruments in the broadest sense. The application of micro-electronics can lead to a substantial increase in versatility, detection sensitivity, speed and accuracy. Instruments that were once only used in specialized laboratories (or which did not exist at all) are now becoming available for a much wider market. In some fields the first generation of such appliances is already on the market. Examples include medical diagnostic equipment (e.g. computer-aided tomography), the testing and control of industrial processes and products (including micro-electronics themselves), the location of geological formations (including remote sensing), communication (compression, detectión, restoration of signal patterns), and complex, time-consuming laboratory techniques (gas and liquid chromatography, mass-spectrometry, etc.).

A large market is also likely to develop for general or special purpose logic analysers into which basic micro-electronic components have been incorporated. Such analysers are able to test basic components, goods or equipment, before assembly for their logic content without requiring excessive knowledge on the part of the operator. Such logic analysers may be programmed by telephone so that a relatively small analyser with programmable measuring and testing algorithms assumes the character of a large testing battery. This too is essentially a form of distributed intelligence that can be called up by micro-electronics.

By means of the chip many existing consumer goods can be considerably improved and completely new products developed. Mechanical and electro-magnetic guidance mechanisms will to a large extent be replaced by micro-electronics. Here too, changes in the series of production steps can sometimes be achieved simply by changing the programming. In this way the product obtains a great deal of versatility.

For many goods the incorporation of the chip will not automatically lead to a drop in price but will mean an improvement in quality at much the same price. Micro-electronics will become used in the household, sport and recreation, transport facilities such as the car, medical facilities, education, etc. In the short term this is expected to be particularly the case for consumer goods, where the obstacles to making good software are usually less great. New uses for the chip can mean advantages for industrial integration from the component stage to the final product. Countries where such industrial integration already exists and which have moreover acquired a reasonable share of the foreign market therefore have an edge. Examples of such countries include Japan and – in more concentrated form – the Netherlands. In the field of consumer goods (in terms of the quality/price relationship) the United States is weak. If Dutch industry is to make optimal use of the opportunities that exist, it will have to improve its not always outstanding quality control and standards. Because of the black-box nature of many articles containing micro-electronics, special attention will have to be paid to ergonomic application and reliability.

An important area of technological change consists of telecommunications. Various new and economically significant techniques (e.g. lasers, light-emitting diodes, glass fibres, digitalised micro-electronics) may be brought together to great synergetic effect. Although the transition to the so-called information society is not proceeding as fast as technically possible, these techniques still have a large impact even in the fairly short term, in both a negative and a positive sense. The major developments concern communications by means of electro-magnetic waves, both wireless and along cables. Digitalised transmission and processing should make this form of communication less susceptible to interference; unit information costs will decrease, the frequency spectrum can be used more effectively, virtually lost patterns of information can be restored more easily, certain types of faults can be traced more readily and occasionally rectified automatically, and in many instances less maintenance is

required. In the case of wireless communication, developments include not only the increase in transmission capacity and a better and fairer allocation of frequency bands but also the extension of the spectrum to higher frequency bands (of importance for satellites) and, for higher frequencies, the emergence of more sophisticated modulation and compression/expansion techniques and the use of satellites for a variety of purposes (including data communication; a number of American firms are working on a worldwide communications network).

In the case of communication by means of conductors, digitalization also makes other forms of switching possible (e.g. packet switching: under this system messages are broken up into packets which are then each optimally relayed through the communications network) which enable the communications network to be used more effectively and with enhanced reliability. Optical communication, with light waves as super carrier waves, permit rapid transmission with very high information density.

A number of applications have been derived from these technological developments. One may think of all sorts of commercial data communication, Viewdata, Teletext, electronic post (word-processors with communications possibilities, facsimile equipment), cable television with new types of services, electronic blackboards, etc.

There exists a good deal of expertise in these areas in Dutch industry and institutes of technology. Particular stress has been placed on ergonomic aspects, which are of vital importance for the successful introduction of communication systems with man-machine interfaces. Once these new applications begin to get off the ground, they should offer reasonable scope for participation by Dutch industry. The division of responsibilities between industry and the Post Office, Telegraphs and Telecommunications (PTT) is a significant factor in certain applications.

3.1.3 *Energy*

Current technological developments in the field of energy are particularly concerned with:

- exploration and exploitation techniques of existing and new sources of energy;
- techniques to increase energy efficiency and profitability at all stages, from energy extraction to final power consumption;
- conversion and storage techniques enabling particular forms of energy to be optimally adapted to the existing and anticipated dynamic structure of the demand for energy;
- techniques to reduce the direct environmental impact associated with the generation of energy and power consumption.

Savings that could be achieved by cutting back energy-intensive activities and by switching to new or different processes that use less energy given existing energy techniques fall outside the scope of this chapter.

Table 42 provides a survey of the major forms and sources of energy and intermediate technologies. This brief discussion is confined to a number of techniques and applications of relevance to the Netherlands in the short term.

Table 42. Survey of major energy forms and sources and intermediate technologies

a. Fossil	- oil (crude oil, tar-sands, oil-shale) - natural gas (associated, non-associated) - coal (pit coal, brown coal)
b. Renewable sources	- solar energy (photovoltaic, photothermal, photochemical) - wind energy - biomass energy (combustion, pyrolysis, bioconversion) - wave energy - energy from temperature differences in ocean - hydro-electric energy (tidal, reservoirs) - geothermal energy (dry, wet)
c. Nuclear energy	- fission (with or without breeding) - fusion
d. Various intermediate energy technologies	- storage systems (kinetic, thermal, electrochemical, thermo-chemical, electromagnetic, potential) - heat pumps (absorption and compression) - combined cycles (STEG units) - topping cycles (magnetohydrodynamic conversion) - fuel cells - district heating - reducing consumption by means of insulation

The intermediate energy technologies are of particular importance in the short term. The small-scale nature and potential for decentralised application of most of these technologies open up interesting possibilities for Dutch industry. Examples include the production and application of insulation techniques and products, heat pumps (including, especially for use within the Netherlands itself, gas-fired absorption heat pumps and, at a later stage, integrated motor-compression systems with special screw turbo-compressors), small steam and gas units (STEG) for combined heat/power generation and consumption ('total energy'), energy management systems (using micro-electronics), high-efficiency boilers, district heating (the economic application of which is limited to certain localities) and thermal storage systems. Other storage systems (including the thermochemical or electrochemical formation of intermediate forms of energy) and magnetohydrodynamic conversion are less important in the short term. The short-term production and application of photothermal conversion of sunlight is also of significance. Photovoltaic conversion is for the present limited to special applications.

In general it may be contended that the opportunities for Dutch industry in the short-term centre not on large facilities but on small-scale systems. Here too, however, there are difficulties, with all sorts of teething problems related to technical deficiencies and the lack of adequately trained installation fitters. Furthermore the market for energy technology is highly complex, with many conflicting forces (e.g. because economic considerations and optimal energy use do not alwys correspond). Looking further ahead it would not be impossible, provided the necessary measures are taken, for Dutch industry to participate in larger systems, especially those systems the market for which is not strongly subject to political developments (as in the case of nuclear power facilities). Possible examples include techniques such as coal gasification or the liquefaction of pit coal, secondary conversion methods of oil fractions (e.g. the gasification of heavy residual fuel oil into cleaner fuelgas), transport techniques (LNG tankers: this market is however highly uncertain; pipeline systems), fluidbed combustion, all manner of SO_2 scrubbing methods, photovoltaic conversion of sunlight (to a lesser extent also photochemical and photosynthetic conversion) and wind energy systems (presumably of limited application in the Netherlands).

Many of the above techniques are also of significance for other industrial activities, for example in the supply of raw materials for the chemical industry. The large-scale chemical industry, in particular, is working on the development of its own gasification systems. The knowledge obtained could be of considerable significance for other sectors of Dutch industry providing the latter is properly organized and reorganized.

In the field of energy, an open government-purchasing policy, in which the specifications are clearly laid down, could have a stimulatory effect.

3.1.4 *Chemical industry*

General

The chemical industry is characterized by a high degree of technological complexity: a large number of different processes and products. Any attempt to cover the field concisely will therefore tend to be an over-simplification of reality. At the same time, however, various general trends may be noted that provide an indication of likely technological developments. For a long period, the Dutch chemical industry has been characterized by relatively high growth rates, substantial technical change with regard to both products and processes and a considerable increase in the scale of production units. Factors that have played an important part include the country's geographical location, the expansion of the 'home market' by EEC regulations, a well-developed trading, transport, transshipment and storage apparatus combined with longstanding commercial experience and, in the case of certain energy-intensive chemical sectors, the availability of cheap natural gas. In recent years this situation has changed dramatically. Both in the Netherlands and elsewhere, the chemical industry is currently afflicted on many fronts by the inheritance of excessive optimism in the recent past, surplus capacity and the resultant dumping, market saturation, the sharp decline in flexibility resulting from far-reaching increases in scale, occasional heavy losses resulting from these increases in scale, the declining availability and increasing cost of certain raw materials, safety and environmental problems and, in the Netherlands' case, the difficulties caused by the hard guilder. Views differ widely on the effect of labour costs. At any event, an analysis of comparable data carried by the European Chemical Federation[2] has shown that countries with weak currencies have been far better placed to maintain their export positions than countries with strong currencies, independent of labour costs. But here too it is difficult to determine causality.

The above developments will have a significant influence on technical change within the chemical industry. A number of these changes are noted below.

a. After the period just referred to of substantial growth the chemical industry is now, taken as a whole, in a period of stabilization and consolidation, linked with extensive rationalization of industrial processes, peripheral activities and marketing. Although few new products may be expected to be developed in these circumstances, technology will continue to play an important part in the near and more distant future. Apart from the improvement of industrial processes efforts will be concentrated on the improvement of existing products and finding new applications (e.g. engineering plastics). The edge that may thus be obtained on other producers and on other, often non-synthetic goods can lead to a substantial growth in certain market segments of the relevant chemical industries.

b. The process of consistent increases in scale has virtually come to a halt. Surplus capacity, market fluctuations, price changes, greater inertia and reduced flexibility have frequently converted economies of scale into diseconomies. This slow-down in the trend towards increases in scale, which may also be observed in other industrial sectors suffering from surplus capacity, can, in conjunction with all sorts of dynamic inertia factors, have a deleterious effect on the growth in productivity.

c. By means of process integration and selective computerization, industry will seek to increase the flexibility of production units and to minimize the use of materials, thereby cutting back energy consumption and pollution per unit of output.

d. In the case of certain raw materials, physical scarcity, political uncertainty with regard to availability, and increasing prices will lead not only to more efficient use of materials but to substitution by other raw materials. In the long-term this shift to other raw materials will lead to totally new production proces-

[2] K. Lanz, 'CEFIC', *Het Financieel Dagblad*, 7 November 1978.

ses; in some sectors naturally-occurring biological processes may be taken as an example.

e. In general, the international relocation of production plants is likely to remain limited. In many cases, pollution and other undesirable side-effects can be cut back sufficiently in the countries where production is taking place now to render the activities in question acceptable. In many of the countries that might come into prospect for relocation and which would appear to enjoy some form of comparative advantage, the chemical industry is often handicapped by a lack of properly trained staff and inadequate infrastructure, political instability, an inadequate stock of knowledge, inability to supply promptly, relatively high capital costs and insufficient transport, transshipment and storage facilities.

Oil industry and petrochemicals

A large part of the modern chemical industry is based on crude oil. As this raw material becomes dearer, there will be a switch to the less expensive heavy fractions. Depending on availability and relative prices there may also be some substitution by natural gas, which can be converted via methanol and ethanol into semi-manufactures such as synthetic fibres, plastics and rubbers. Further in the future other raw materials may be expected to assume greater significance, such as coal and biomass (for the methane, methanol and ethanol route; starch chemistry is another possibility).

Oil refining and cracking leads to a broad spectrum of products, ranging from very heavy to extremely light fractions (gas) (see table 43).

Table 43. Survey of refined oil products produced in the Netherlands in 1976 (in percentages)

Fuel oil	35.1
Gas oil/diesel oil	29.2
Petrol	11.3
Naphthas	8.8
Mineral waxes and other products	4.4
Kerosene-based jet fuels	4.3
Liquid gas	1.7
Asphalt	1.7
Light/tractor kerosene	1.1
Mineral lubricants and fats	0.9
Special petrol and mineral turpentine	0.6
Gasoline-based jet fuels	0.5
Aviation fuel	0.2
Refinery gas	0.2

Source: Central Bureau of Statistics, *De Nederlandse Energiehuishouding* (Dutch Energy Budget), 1976.

The excessive optimism of the period 1960-1973 also manifested itself in the oil refining industry in the form of a large surplus of primary distillation capacity. It will take time to shed this surplus capacity since a number of countries are anxious to refine their own oil. In order to eliminate surplus capacity and to meet environmental standards, there is now greater concentration on secondary conversion with the use of catalytic crackers where heavy fractions are converted into lighter, higher quality fractions. This will help bring supply and the anticipated level of demand back into equilibrium. The switch to greater secondary conversion could, however, come under pressure from the supply of cheaper LNG and LPG. New technology is also heavily focussed on rationalization. Oil refining is in a rather inflexible position: an acceleration in economic growth would quickly lead to significant shortages of particular oil fractions. The resultant rapid rise in price for these fractions can seriously disrupt the system of economic production in general. Petrochemical products include heavy chemicals (ethene, propane, butadiene, etc.), synthetics (thermoplastics, thermoharders, synthetic rubbers), industrial chemicals (solvents, aromatics, plasticizers, detergents, synthetic acids, etc.), specialty chemicals (fine chemicals), chemical fibres and resins.

The surplus capacity referred to above is evident from figure 2 for ethene, one of the most important base chemicals.

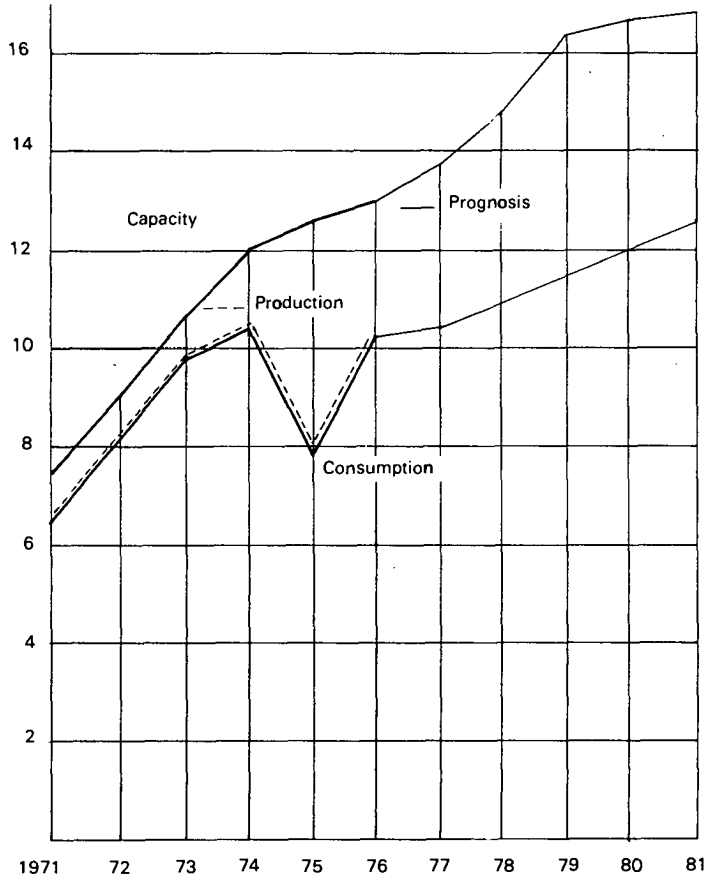
Catalysts of great importance in petrochemical processes: a different process generally means a different catalyst. One of the ways of increasing flexibility and

conserving energy and raw materials consists of process integration, with the use of highly developed catalysts (e.g. in propylene chemistry).

Further rationalization of petrochemical processes may be expected with the aid of micro-electronics, while the improvement in technical specifications for certain materials will broaden their range of application.

The Dutch petrochemical industry tends to be geared towards the early production phases, i.e. base products. Of particular importance are bulk products with a relatively high energy content. This concentration has arisen from the local availability of natural gas and of oil fractions from the large oil-refining complex. It may be anticipated that there will be a shift towards more highly-refined products and fine chemicals with a greater value added content, although this development will not stem from within the petrochemical sector alone; nor will it lead to any rapid dismantling of the base chemical industry.

Figure 2. Capacity, production and consumption of ethene (Western Europe)



Source: P.F. Wetter, *Proceedings European Control and Gas Conference*, 1978.

Carbon chemistry

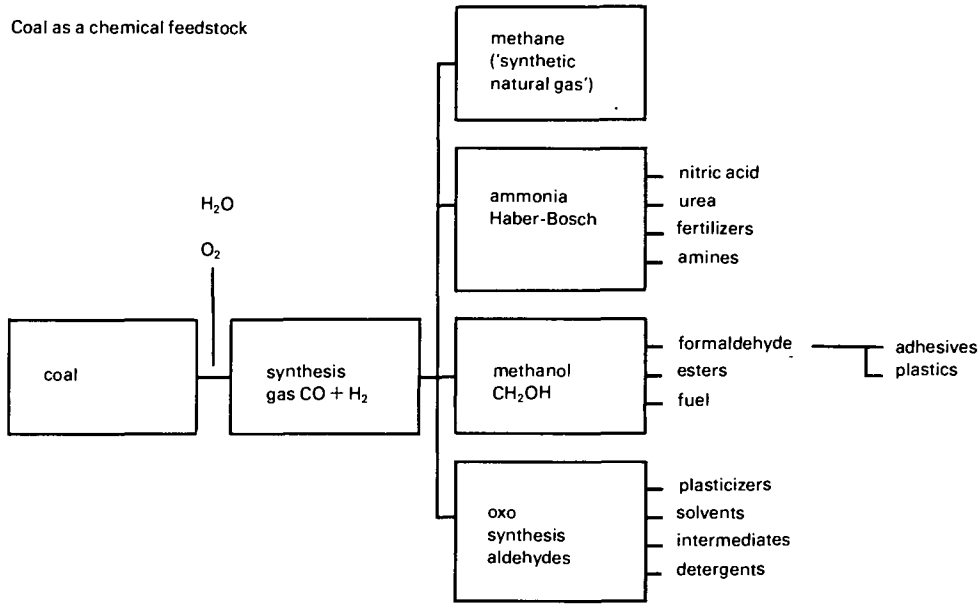
An alternative feedstock to oil is coal. A large part of the organic chemistry industry used to be based on coal, the major base product being acetylene, from which chemical fibres and all sorts of synthetics could be produced. Some of the possibilities of using coal as a chemical feedstock are shown in simplified form in figure 3.

There are many ways of using coal. Figure 3 shows just a few of these. Which of the various processes (Lurgi, Winkler, Koppers-Totzek, Otto-Saarberg, Texaco, Hy-gas, Co2-acceptor, Bi-gas) will eventually be the most favoured is as yet unclear.

At the present time the main use of coal in the chemical industry is as a source of energy. One problem that will have to be solved if coal is to be used as a feedstock is the development of economically feasible and sufficiently clean conversion processes, i.e. gasification and liquefaction.

Research is being carried out in many places on these problems, the solution of which is also of substantial importance for the supply of energy. Although at this stage coal is still more expensive than other feedstocks for many production processes (for example fertilizer from natural gas), it may be anticipated that coal will make new inroads as a chemical feedstock by the year 2000. The complete replacement of oil or gas by coal is not, however, to be expected, including in the longer term.

Figure 3. Examples of coal as a chemical feedstock



Source: H. Dörfel, Innovation in the chemical industry, 12th international TNO Conference, 1979.

Bio-organic chemistry (biotechnology)

Many products also used to be obtained in the chemical industry by means of biological techniques. Numerous examples still exist of biological processes being used in the industrial fabrication of simple compounds through to complex pharmaceutical preparations. Biological production techniques were squeezed out in many fields with the advent of carbon chemistry and later petroleum chemistry. This has considerable economic advantages but is coupled with a much higher rate of consumption of fossil fuels and sometimes with greater pollution. Given the need to conserve raw materials and energy in industry, to reduce pollution and to manufacture substances which can be made synthetically only with great difficulty if at all, it is fair to assume that biological processes will re-establish themselves in the Netherlands. There has been a considerable growth in understanding of these processes, and this will be an important factor. Greater use is likely to be made again of biological materials as feedstocks (such as starch for the manufacture of chemical end-products). Biological industrial processes centre on the operation of biological catalysts, i.e. enzymes. Direct or indirect use of such catalysts may occur with fermentation processes using living organisms and processes using isolated enzymes.

At present fermentation is of particular importance in the pharmaceutical industry and the foodstuffs industry. Small and medium-scale fermentation units are likely to be introduced with a high level of computerization designed to control biological processes, increase yields and prevent malfunctioning. In a

number of instances this will consist of symbiosis between chemical synthesis and biological processes, as is already the case in the production of semi-synthetic antibiotics.

Apart from processes using living organisms, processes will also be introduced using isolated enzymes linked with stabilizing carriers. The introduction of such methods will benefit greatly from a multidisciplinary, synergetic approach such as that employed in the combination of enzyme technology and membrane technology (the binding of enzymes to membranes).

A significant development consists of genetic engineering. In principle, this offers a promising route for the fabrication of many complex compounds of particular application for therapeutic purposes but with other uses as well. Consideration is also being given to the genetic transformation of bacteria, making these suitable for certain metabolic activities such as the break-down of oil and leaching of low-grade mineral ores. Whether these routes will ultimately be the cheapest remains to be seen. In many instances, however, price is of less significance since what is at stake is the production of substances which could otherwise not be produced in sufficient quantity (such as growth hormones). For the therapeutic application of certain products, e.g. hormones such as somatostatine, a better understanding is required of human regulatory mechanisms. A good deal of research is being conducted in these fields, in which respect the substances manufactured by means of genetic engineering can be an important aid. Recent research suggests that the risks of most DNA experiments currently being conducted are less than originally believed, epecially in relation to the C1 and C2 risk categories, where there exist significant technical and industrial applications.

Fertilizer industry

Nitrogenous fertilizers may be obtained from crude-oil fractions, natural gas or coal. In the Netherlands the principal source is natural gas. The production of fertilizer is energy-intensive. Some 10% of total industrial energy consumption in the Netherlands and some 30% of total industrial gas consumption (both as a source of energy and as a feedstock) go towards fertilizer production. The Dutch fertilizer industry is heavily export-oriented (65% of production). Technological developments are particularly concerned with reducing energy input, where considerable progress has been made.

The current energy intensity of approximately 40 GJ/tonne NH_3 is close to the theoretical minimum as determined by the reaction equations (20 GJ/tonne NH_3). The reduction of energy intensity has been a combination of switching to new high-pressure techniques and increases in scale. To achieve further reductions in the amount of energy used in the process as such, better control is required of process discontinuities that now give rise to irreversible processes. In the short term, direct process energy consumption per unit of output is unlikely to be significantly reduced.

In relation to its market value, the transport costs of fertilizer are high. This means that there are advantages in concentrating production close to the point of consumption. The ready availability of certain sources of energy (such as the gas associated with the production of crude oil, which is still flared off) can also be of importance. It is expected that there will be a certain shift in fertilizer production to oil and gas producing countries. It is, however, unlikely that countries will wish to be completely dependent on oil and gas producing countries for such an important material as fertilizer; for this reason the shift will not mean the complete elimination of the fertilizer industry in Western Europe. To the extent that production takes place in Western Europe it may be expected that heavy oil fractions and later possibly coal will be substituted for natural gas.

3.1.5 *A possible future pattern of regional specialization*

Introduction

The types of economic activities undertaken in individual countries vary greatly. There is also a certain distribution of activities within countries. The structure of production is not regionally homogeneous; instead there is a certain

measure of regional specialization. This section is concerned with regional industrial specialization in the Netherlands.

Industrial processes often depend heavily on particular local characteristics. These requirements cover both the physical environment (e.g. the availability of cooling water) and all the other industrial factors of production. These cannot be universally satisfied, or in certain localities subject only to delays and at significantly higher cost and with a good deal more difficulty. The linkage of these requirements to variations in regional endowments can, if due allowance is made for dynamic changes, provide a possible explanation of regional specialization patterns. When looking to the future, however, it is as well to treat such an explanatory model with a certain degree of circumspection. The establishment of production plants in certain localities can also be a matter of chance (e.g. the accidental presence of an entrepreneur with sufficient vision, drive and capital) and need not necessarily stem from any underlying rational pattern of net comparative advantages or disadvantages.

But even if the chance factor played a role in the establishment of many facilities in the past, this need not remain so in the future. If a particular industrial activity can get off the ground somewhere by chance, then this can also happen as the result of well-planned stimulatory measures. By way of justification of such action, and in order to clarify the shaping role of the government, this section sets out to sketch a possible future pattern of regional specialization in the Netherlands. This has been done in the light of the basic technological developments discussed in previous sections.

Characteristics of industrial activities

Many factors can play a role in regional specialization. On the supply side there is the availability of the major raw materials, including air and water, land, energy, intermediate products, infrastructural and intermediate services, capital, capital goods, knowledge obtained under licence or consultancy arrangements, as well as human labour (both employees and employers), covering muscular energy, knowledge, intelligence, creativity and intuition. Availability also covers the conditions under which these factors are available.

The industrial processes themselves cover not just the technical aspects but also the entire organizational structure and ancillary activities. The type of organization will depend partly on the type of product being manufactured. The demand side comprises not only the market aspect (i.e. further industrial stages and final demand: existence, availability and organization, both domestically and abroad) but also the impact on the built environment. This does not just concern permanent side-effects (or side-effects limited to the period of operation), but also the risk of accident. There are certain industrial activities which have very little impact on the environment during normal operation but which entail a not insignificant chance of causing serious damage.

In assessing the prospects for a particular industrial activity in a given region virtually all the above factors play a part. This section is primarily concerned with innovative activities. From the government's viewpoint, regional variations in knowledge are of particular importance in determining the location of new activities of this kind. The special significance for the government of the knowledge factor is examined in more detail below.

Building on regional knowledge

The current economic situation is marked by an increased level of competition. To a significant extent this increase is structural in origin. There are two possible methods or ways of attempting to cope with the ensuing problems. The first of these aims at lowering production costs per unit of output. This, it is to be hoped, will give an edge on competitors and enable the share of the market to be maintained or increased. The second path is to endow production with a certain additional value in terms of quality, durability or servicing. 'Gaps' in the market can be identified and filled by providing existing products with the right characteristics or by manufacturing new products. The second path is of particular interest with respect to maintaining employment levels, especially in a situation of lowered growth prospects. But to follow this route successfully presupposes

specialized knowledge: technological and organizational knowledge and understanding of the demands of the market, allied to an adequate level of creativity. Existing or newly acquired knowledge should therefore be put to optimal use in the Netherlands.

The smaller a country, the less marked regional variations tend to be. This applies to a number of, but not to all, the relevant factors of production. In particular, the availability of know-how as a factor of production[3] may vary widely between regions on account of:

- the regional distribution of educational, research and service establishments (such as the Netherlands Central Organization for Applied Scientific Research, TNO);
- the distribution of knowledge in relation to existing industrial activities;
- the lack of human mobility;
- the limited geographical range of an effective, creative exchange of information.

This means that certain new activities particularly dependent on industrial know-how will be able to get off the ground more quickly and cheaply in certain areas than in others, or will in short stand more chance of success. In mobilizing the relevant sources of industrial know-how and creating an appropriate regional climate for selected industrial activities, the government can play an important part.

The role that sources of know-how can play in innovation has often been pointed out. The Innovation White Paper published by the Dutch Government in 1979[4] proposed a structure of 'transfer points' at Institutes of Technology and other institutions. Substantial advantages may be obtained by supplementing such structures with clusters of selected industrial activities nearby. Such activities should be sufficiently closely related to enable cross-fertilization to take place, while at the same time being sufficiently different to avoid the development of industrial monocultures. The influx of recent graduates who are able to originate activities themselves provides a direct means of transferring know-how (especially if they retain their links with their Institutes of Technology) between the persons concerned, i.e. the principal actors in the innovation process. These clusters of new enterprises can form a type of vanguard establishing a link with sources of know-how and preparing the way for industrial redevelopment. The innovation-oriented climate engendered in this way can significantly stimulate other industrial activities in the same area or elsewhere.

In this respect the government's role can concentrate on:

1. the provision of special assistance to selected activities, i.e. explicit cluster formation;
2. adapting the educational system as necessary;
3. the creation of a favourable entrepreneurial climate at the regional level for the selected activities; the government can also play an active part by attracting entrepreneurs.

Possible pattern of regional innovation

The regionally differentiated approach outlined above involves selective intervention by the government in the regional structure of industry. There are, however, risks as well a benefits associated with selective interference. It should, accordingly, be conducted in such a way that the expansion of desirable industries in other areas is not checked; that the actual implementation of innovation should basically be carried out by those best qualified to do so (i.e. the entre-

[3] The accessibility of knowledge as a factor of production should not be taken as meaning just the availability of knowledge in books, data banks and the like. This type of accessibility is less distinctly regional in nature. The key factor is the 'climate of knowledge' within which mutual interaction sets the stage for the effective and innovative use of both formalized and non-formalized knowledge. As carriers of knowledge, people play a leading role in this regard. The limited mobility that tends to be characteristic of people is one of the reasons for regional imbalances in the availability of knowledge. A creative source of knowledge such as an Institute of Technology can fulfill a major direct and especially indirect role in creating or maintaining an innovation-oriented 'climate of knowledge'. The presence of such an institute is, however, by no means the only factor of significance.

[4] *Technische Innovatie* (White Paper on Technological Innovation), Second Chamber, 1979-1980 session, 15855, nos. 1-2.

preneurs); that it does not lead to a analysis paralysis in which government responsibility is only accepted for further studies; that institutionalization and bureaucratization should be kept to a minimum; that it should not just be a matter of the public funding of losses; that industry should not be allowed to become dependent on public funds; and, finally, that governmental action should not be undertaken out of any obsession with the need for economic growth but that it should be geared towards activities of social as well as economic significance.

By aiming at the selective stimulation of innovative activities in particular regions, the approach outlined above will create clarity, avoid arbitrariness and, especially through its concentration on the flexible, regenerative sector of the economy (rather than on the restoration to a healthy state of existing industry), will to a large extent avoid the dangers noted above. Figure 4 sets out the particulars of a possible pattern of regional clustering.

Figure 4. Regional accents in new industrial activities. The circles show a number of industrial activities which could be given special stimulation in the regions concerned. In principle, these industrial activities may be regarded as detached from the training and research at institutes of technology or universities in the regions in question. 'General' includes activities that can either best be grafted onto existing industrial activities (and the present geographical distribution of those activities) or which tend to be so widely distributed as to make it unworthwhile for the government to promote their regional specialization.

It should be stressed that we are concerned here with only one aspect of regional economic policy, namely regional specialization in relation to selected industrial redevelopment. Concentration on existing strong points and centres in the Netherlands would play an important part in achieving such redevelopment as quickly and successfully as possible. Such policies would in no way affect existing regional policies, especially those concerned with economically weak regions, except in so far as policies in backward areas can also be oriented more towards redevelopment and the exploitation or creation of strong points.

Such policies are concerned with clusters of industrial activities. In principle, these activities will not in any way disturb the existing research carried out at Institutes of Technology. Only in isolated cases may there be a case for encouraging adjustments in training and research in consultation with all parties concerned.

In the province of Twente there exists a longstanding tradition in the field of production and application of (machine) tools. Examples include the textile industry and companies such as Stork (of Hengelo). Apart from a growing market, changes are expected in this sector because of the advent of the chip. The application of micro-electronics will give rise to a new generation of flexible, multi-purpose capital goods enabling computerization to penetrate into totally new areas.

The Twente Institute of Technology (TH) is experienced in the field of micro-electronics. The linking of the machine-tools tradition to this expertise would be an obvious development, possibly leading to the production of computerized or automated capital goods such as robotics numerical control systems, etc. Both the TH and the *Overijsselse Ontwikkelings Maatschappij* (Overijssel Development Company) are highly dynamic in nature. The recent opening of a Micro Centre branch in Twente will provide a significant boost in this context.

Special dedicated chips can be developed for use in computerized machine tools. There is a strong degree of interaction between application and chip architecture. The cost of the chip is less of a factor in high-value capital goods than it is in relatively low-value mass consumption goods, which are best produced by existing large firms. In numerical control systems and (possibly adaptive) robotics the concept of 'distributed intelligence' plays a large part. The linking up of various subsystems and the integration of main systems require interface systems and chips and additional software. The guidance and control of machine tools call for high-quality sensors. These sensor may also possess a certain level of (distributed) intelligence. The field of sensors offers a number of excellent opportunities.

The industrial clustering of these activities in Twente would seem an obvious approach.

In comparative terms, industrial activities in the province of Groningen are of a low-value nature. This need not remain the case for ever or everywhere. Industrial activity in Groningen need not remain confined to a sort of overflow or reserve function: there exist a number of interesting possibilities in Groningen as well. The most obvious example consists of medical aids such as prostheses and other corrective remedies (the idea of the pacemaker, for example, originated in Groningen). Other significant possibilities include the production of medical equipment and certain instruments. The chip also holds out important possibilities for the improvement of quality in medical aids such as prostheses. The patient's individual requirements can be met more exactly. In this respect collaboration with the Twente industrial cluster holds out possibilities, and there would be merit in expanding existing contacts with Twente and elsewhere. The development of good materials (e.g. high-quality, hard-wearing synthetics unlikely to cause bodily irritation) is very important for medical aids. There exists an extensive body of knowledge in Groningen in this field, especially as far as polymers (and superstrong fibres) are concerned.

There are many possible routes towards developing a fine-chemical industry. One area where there are revolutionary breakthroughs is that of recombinant-DNA. It is expected that many substances with a therapeutic application will be able to be made by this method in the near future. It is already possible – although not yet on a commercial scale – to produce important substances such as somatostatine, insulin and interferon. Groningen has built up extensive

experience in the field of DNA recombination. The recruitment of people with industrial and research experience in foreign recombinant-DNA companies (e.g. Genetech, Cetus) can provide a special stimulus for industrial activities.

The Delft region has a tradition in the field of instruments, both in industry and at the Institute of Technology. The field of instrumentation and related areas such as process control, measurement, regulation and testing are evolving rapidly with the introduction of micro-electronics. Signal, image and pattern identification all play an important part in digitized signals and their processing. The Delft region has amassed an extensive body of knowledge in the fields of instrumentation, micro-electronics and signal processing algorithms. Delft covers a particularly broad spectrum in the instruments field, ranging from medical diagnostic equipment (the emphasis in Groningen as far as industrial cluster formation is concerned is more on the therapeutic side) to maintenance equipment for off-shore drillings rigs, where the early detection of structural fractures is essential. Other possibilities include a wide range of transportation control systems (covering all forms of transport). The development of goods sensors is required for measurement, control and testing. Definite possibilities exist in this field in the Delft region as well. Developments in the field of telecommunications are particularly concerned with its increasingly digitized nature. Important factors in this respect include signal identification and the restoration of partly distorted signals. Scope exists in the Delft region particularly with regard to the instrumentation and software side of telecommunications.

Eindhoven has a knowledge potential of significance for a number of energy technologies, especially technologies making use of special materials (such as photovoltaic conversion with the aid of amorphous silicon). Extensive consideration is also being given to various series systems that can lead to substantially increased efficiency in the generation of energy or the simultaneous generation and consumption of electricity and heat (total energy). Special materials with high corrosion and heat resistence will have to be developed further for series systems, such as those based on gas turbines, especially if they make use of dirtier forms of energy or gases derived from them. Knowledge accumulated in these fields is also of importance for other industrial equipment and for the metallurgical industry in general. There are definite possibilities for Eindhoven in the field of special materials and their application. Here too the field of telecommunications is of interest. Whereas Delft is strong in instrumentation, Eindhoven could concentrate on the solid-state side. Possibilities are opened up by industries based on opto-electronic telecommunication making use of lasers, glass fibres, luminous intensity amplification, detectors, optical codecs etc.

An important development in the chemical industry concerns the growing application of environmental technologies that consume less energy and use raw materials the availability of which is less problematical. Central in these developments are techniques based on biological catalysts. Applicable knowledge exists in Wageningen in the field of enzymes and fermentation. The development of an industry based on small and medium-sized plants should be feasible. There would be obvious merit in collaborating with Delft in this area Recombinant-DNA techniques are also of importance for the production and application of biological organisms or isolated enzymes. The development of a Wageningen cluster could help shape the emergence of a fine-chemical industry in the Netherlands.

There are also a number of new industrial processes that do not stand to benefit significantly from being located in proximity to a source or centre of knowledge. Additional regional stimulation by the government can even seriously impede the development of these processes if stimulatory measures in a particular region are at the expense of support for other regions. There are, for example, intermediate energy techniques that are reasonably well developed in a technical sense; the main concern is penetrating a somewhat rigid market. It would be incorrect to confine such a development, which is attempting to

establish itself throughout the Netherlands and to penetrate the market, to one locality.

Then there are developments that have reached the stage of increases in scale, for example coal gasification plants and fluid-bed combustors. These activities are best grafted onto existing industries (and existing patterns of regional concentration) equipped to deal with such upscaling. This is not to remove the possibility of research into and production of component parts being conducted in the proposed clusters (e.g. corrosion and heat-resistant materials).

The activities listed under General in figure 4 are all of considerable importance for Dutch industry. As such they deserve to be stimulated wherever they may spring up.

Concluding remarks

Business enterprise and especially industrial innovation involve taking risks and acting in situations in which not all the details are clear. This applies equally to government involvement. The selection of appropriate industrial redevelopment schemes for government support is a difficult matter; there can be no hard and fast evidence that the right steps are being taken in the right direction.

This should not, however, be allowed to form a reason for undue postponement of selective measures. At a certain point it becomes necessary to cut through the knot if the available choices are not to be dictated by uncontrollable developments. The regional differentiation of innovation policy can form a significant aspect in such a choice.

3.2 Outline of the process of technical innovation

3.2.1 *Introduction*

The main elements of the Dutch export/import situation were briefly analysed in chapter 2. It was indicated that data will have to be assembled over a number of years in order to identify trends in various branches of industry. These trends will then have to be analysed more rigorously in an effort to determine the underlying causes, or in other words to assess whether these trends are determined by economic, competitive factors or by technical factors (e.g. inferior technical content, quality, etc.).

In the first case general economic policy instruments would be called for; in the second, policy instruments specifically related to manufacturing. The latter category should also cover innovation in fields where Dutch industry is not as yet active, as well as the application of new techniques for the improvement of existing products. All this comes down to an examination of possible ways of promoting innovation on a sectoral basis, or to more general policy measures (or both). In view of the Netherlands' dependence on the European Community in general and West Germany in particular, international comparisons will have to be made before drawing any conclusions. Comparisons would also be in order with the United Kingdom, the United States and Japan.

In anticipation of the results of such a survey it would be useful to draw up a survey of the operational aspects of industrial technological innovation. This survey would be designed to produce the practical framework within which redevelopment and change can be conducted (i.e. it would cover the preconditions for and obstacles towards these processes in the Dutch context). The survey would have to be related to existing industrial activities and to emerging fields where there exist real prospects for Dutch industry.

3.2.2 *Encouragement of innovation*

This study is based on the premise that the present market economy and freedom of commercial intercourse will be maintained, whereby production depends on the ability to find or attract buyers for the product in question, provided that product does not entail any unacceptable risks for the community at large. In many cases a decisive factor will be whether a product has an edge in terms of quality on competing products from abroad. This applies particularly to

Dutch products since the domestic market is limited in size and because exports are generally up against international competition. In the case of technical products there are additional requirements in the form of high-quality, efficient servicing with a sufficiently extensive network in export markets, as well as prompt delivery times. In the case of the foodstuffs industry, prompt delivery times means and effective distribution system (i.e. freshness and keeping-quality guarantees). If, as would appear to be the case, it should turn out that Dutch products have lost an appreciable share of the export market, the question will have to be explored as to whether the government can, in the context of innovation policy, take measures in the domestic market to stimulate technical improvement in order to recapture export prospects for the product in question or to enable new products to be brought onto the market. This only applies, however, in those cases where there exists a realistic chance of technical improvement. One possible way of achieving such stimulation is by means of government procurement policy (taking due care to avoid protectionism); other possible methods include subsidies or temporary taxation relief designed to provide an incentive for industry to improve the quality of existing or new products. It would come as no surprise if this study reached the conclusion that in the case of many technical products, the Netherlands was in danger of losing the race towards technological innovation against foreign competitors. A small country with a small domestic market inevitably means that 95% of all technological developments will be invented or commercialized abroad. The leaders in this field are West Germany and especially the United States, with Japan emerging strongly in recent years. One factor in favour of the Netherlands, however, is the large number of highly-qualified scientists and technologists it possesses, who are unquestionably able to keep abreast with developments in other countries and to apply these in the Netherlands given the right circumstances.

For the remainder of this chapter industrial activities may usefully be split into two categories:

a) large, internationally active industrial companies;

b) small- and medium-sized firms manufacturing solely within the Netherlands.

Category a)

Large companies – especially the multinationals established in the Netherlands – have an extensive research and development (R & D) capacity and are moreover able to draw on technological information from other countries quickly and effectively. Such companies are able to carry out market research and to test consumer reaction, and R & D are closely integrated with other apects of the company. This is of major importance for the introduction of new or improved products, industrial processes and advanced distribution systems geared to changeable consumption habits. These companies are less dependent on the domestic market in applying the results of their R & D since new products and processes can also be tested elsewhere, possibly finding their major application in other countries. The Netherlands has a particularly high concentration of multinational R & D institutes, which are able to carry out a wide range of work themselves. At the same time it would be unwise to neglect the importance of government stimulatory measures for this category, since there is no doubt that there are great advantages in conducting activities 'close to home' rather than elsewhere. These R & D establishments are, moreover, of major importance for the industrial and technological infrastructure in general. They represent a significant source of employment for highly-qualified personnel, whose expertise has a flow-on effect on other parts of society; this applies particularly to the generally well-developed system of interaction with the basic research carried out at tertiary education establishments.

If the government should only wish to consider the stimulation of innovation among the 'giants' if this would be of demonstrable benefit to the country in general, there would still be a number of interesting options. These include such fields as environmental protection, energy, public health, communications, traffic and agricultural systems. After an initial domestic gestation period, innovation in these fields could result in new industrial export prospects and the transfer of knowledge and expertise to developing countries. Government

stimulation can, for example, take the form of the subsidization of specific projects or procurement guarantees for a limited period for new product systems. With a view to industries of a multinational nature whose R & D is concentrated in the Netherlands but which also have R & D facilities elsewhere, it is as well to keep the factor of relative costs firmly in mind.

At the moment the relative costs for research laboratories of reasonable size in the United Kingdom, the United States, West Germany and the Netherlands, expressed in average costs per man-year, are estimated to be as follows: 100: 200:230:240.

Operating a research laboratory in the Netherlands is thus nearly two and a half times as expensive as in the United Kingdom. If the high rate of inflation in the United Kingdom in relation to the Netherlands and West Germany should persist, this difference will be reduced in the coming years. Nevertheless it should be borne in mind that there will be a considerable incentive in terms of cost to set up new research projects in the United Kingdom or even the United States rather than in the Netherlands. Taken overall, the present situation is not as yet a cause for acute concern, since the large multinational enterprises based in the Netherlands would only be hurting themselves if they were to dismantle their long-established and carefully built-up R & D facilities in the Netherlands. There is, however, little room for manoeuvre left. These industries too are suffering from lower profit margins and lower earning power, and are being forced to cut back on research. There is a striking tendency for long-term projects to be given lower priority and for company emergies to be devoted in a more defensive sense towards maintaining market shares for existing products, inter alia by the improvement of labour productivity. There can be no doubt that the present economic climate is to blame for this, since the R & D potential for long-term developments still exists among these corporations in the Netherlands. In general, extremely high development costs must be added to research costs in the case of new products or processes.[5] These factors, together with the associated risks (reduced profit margins, lengthy pay-off periods and declining earning-power), are responsible for the present caution.

Category b)

In general small and medium-sized firms lack or have only limited research and development facilities of their own. There is therefore comparatively little chance of major new technological or scientific ideas being developed within this sector of industry itself. While there are very good prospects for new applied combinations of existing technological and scientific knowledge being developed through individual inventiveness, even this must be regarded as increasingly problematical short of intensive government support and guidance. This is particularly true on account of the increased technical content that new products must have if they are to make their way in international markets. Dutch exports depend particularly heavily on the quality and technical performance of export commodities, for which reason well-designed support in the form of technical assistance can be especially effective. This brings us to a central aspect of long-term government policies with respect to innovative activities and measures, which form the subject of the rest of this chapter.

There can be no doubt that the recent oil crisis only accelerated awareness of a process that had in fact got under way earlier (in the mid-1960s): the saturation of the market for many chemical products. This was linked with increasingly intense competition, characterized by the ever-increasing incorporation of technical 'extras' designed to maintain or strengthen consumer loyalty. Many extras once paid for separately have now become part of the standard equipment of motor cars, washing machines, kitchen appliances, do-it-yourself equipment, etc. For this reason profit prospects for these products have often been exhausted. This has undeniably been partly at the expense of profit margins, forcing companies to compensate by capturing as large a share of the market as possible, which has in turn seen the merger or even disappearance of many small manufacturing plants.

[5] See for example on the chemical industry: Edwin Mansfield et al., *Research and Innovation in the Modern Corporation*, New York 1971, p. 118.

The period following the Second World War was marked by the application of new technology in a consumer society that had by no means reached saturation point, and in which it was possible to sell virtually any new product. The Netherlands was able to take advantage of its high level of development and trading expertise to be one of the leaders in the international field and, for a country lacking raw materials, to carve out an excellent export position for itself.

The commencement of natural gas exports and domestic consumption in the 1960s had the effect in later years of camouflaging the negative trend that had by this stage begun to set in in Dutch exports. It would be a great error to regard innovation as a magic remedy which could have the desired effect with the aid of a few stimulatory measures without taking more general macro-economic factors into account as well.

Only through highly selective application can government funds be responsibly used in order to maintain or create employment with any chance of continuity, and to pave the way for new activities, including ancillary activities. This 'corset' or straitjacket can be enlarged if the government resolutely attempts to break the technical impasse by stimulating and giving shape to the increasing requirement on the part of small-scale technological companies for effective technological and scientific guidance and support.

It is of particular importance that this should be preceded by a sound analysis of the prospects for particular types of product in the domestic and export market. 'Business input' of this kind is essential for any market strategy; otherwise there is the risk of following blind trails in which technological innovative activities are all too easily wasted. If the market survey is properly conducted, this will establish the basis for a dialogue with technologists leading to a suitable technological (R & D) strategy. In this phase, too, it is possible that the expectations for the product in question will be adjudged too slender and that the proposed innovation concept – based on the prima facie technical merits of the project – will be shelved. This is discussed in more detail in section 3.2.3.

3.2.3 *Operational characteristics of the process of technological innovation*

Any account of the process of innovation must begin with the extensive body of experience accumulated by the big international corporations established in the Netherlands. The latter have reached a high stage of development in this field, although this may not always be evident to the outsider.

It is often assumed that research and development at the laboratory and pilot production stages forms the main vehicle for the commercial realization of a technical innovation. Experience indicates, however, that while R & D is essential for the process of innovation, it generally forms only one link in a chain in which a number of totally different activities are of at least equal importance. Only rarely does laboratory R & D lead directly to a new product or process without a number of intermediate steps. In most cases expertise of a different kind must also be brought to bear. In general it is true to say that R & D, which is by definition directed towards technological innovation, is highly dependent on early dialogue with non-technical disciplines if it is to be channelled into effective directions; as soon as a technical idea or conception emerges within the R & D organization it needs to be evaluated and analysed in conjunction with experts in non-technical fields. If this is not done R & D will run the risk of developing products or processes of which it becomes evident only at a very late stage that they are impracticable or not commercially viable. This means a waste of money and effort. Harsh experience has taught large corporations to establish clear organizational guidelines with respect to R & D, designed to ensure that there will be close dialogue in any R & D project between the technical and economic expertise over which the company presides. This system is characterized by the term Interface Management.

Over the last few decades this system has acquired increasing shape and content; in many companies it is now regarded as a sine qua non for keeping the inherent risks to the minimum. There has been increasing recognition in the industrial research sphere of the necessity for bringing in economic, financial and marketing expertise at an early stage although this concept initially met with

considerable resistance among research workers themselves, who regarded it as a threat to their creativity. It should be stressed in this regard that interface management is primarily concerned with that section of commercial R & D dealing with the application and further refinement of know-how. At the same time, in the interests of developing new knowledge for the future, there must remain a good deal of room in these R & D establishments for more unstructured, exploratory or pure research. In general terms these two R & D categories (applied as against basic research) divide in terms of the resources devoted to them into a 3:1 ratio.

The absolute level of R & D depends heavily on the type of products in question. In the case of the foodstuffs industry, for example, R & D amounts to less than 1% of total turnover; in the pharmaceutical industry the figure is 20% while in the aviation industry it is 40%.

In a 'corporation R & D model', basic research tends to occupy a fairly independent place, with consultation and discussion within the organization following less formal lines than those developed in the case of applied research.

Basic or pure R & D is largely shaped in line with the overall long-term strategy of the corporation in question. There also exists a process of interaction between the two in that scientific or technological inputs from the research side of the organization can affect long-term corporate planning. This process of interaction tends to take place at a fairly high level of abstraction.

This is not true in the case of applied R & D. In most industrial concerns, R & D tends to be closely integrated with various other aspects of the organization with regard to internal product and process development. Organizational links are explicitly established between the research department and the so-called product-line organization responsible for the company's production and marketing.

In addition these concerns have their own central organizations in the fields of marketing, economics, finance, personnel, etc., whose expertise can be drawn on as required as a research project progresses. Needless to say the product line organization will play a dominant role, since it bears the ultimate cost of the risks taken.

To be effective, project administration should be a dynamic arrangement. In practice this comes down to a well-disciplined team operation, with the composition of the team subject to change as and when required. Constant interaction is required between technologists and others. The relevant organization has become increasingly professionalized over time, especially during the last decade, in response to the pressure of economic circumstances. The substantial sums of money involved in the R & D side of a development project, together with the associated risks, can no longer be left to the 'old boy' network. The present system is based on explicit agreements from which the relevant parties are unable to withdraw on emotional or other loose grounds. The premature termination of a project must be based on consensus, resulting for example from unacceptable results that only emerged as the project progressed.

Experience indicates that project failures cannot always be avoided, but it is clear that risks can be significantly reduced if the various stages in the innovation process are conducted in a more rigorous, serious and professional manner. This applies particularly to the gestation period leading up to the final decision to go ahead with an innovation project.

In most concerns it is estimated that some 80-90% of initiatives originate within R & D departments, but even if an initiative stems from the operational sphere the R & D department will generally have to be consulted to some extent before taking the idea any further. In the case of new products or processes, extremely careful analysis is required before embarking on an innovation project. In general there will still be various available options at this stage, the selection of which will depend on company priorities. Whereas it is up to the research organization to demonstrate the technical feasibility of a particular product or process, the product-line organization will have to assure itself of the marketing prospects for the product. This calls for intensive consultations of an exploratory nature during the pre-project phase between the various parties concerned in which, according to the nature of the subject, financial and economic experts should sit at the same table as technologists. Only in this way can the project outline required for decision making be worked out. This phase is

often a drawn-out one, in which specific aspects of the concept are referred back to specialist divisions for further elaboration, and more detailed market segment surveys, investment studies and the like are commissioned. This phase too therefore calls for structured consultations in the interests of sound commercial decision-making. Otherwise the risk of failure may assume unacceptable proportions.

In brief, the decision to proceed with a technical innovation project goes through two phases:

1. the analytical, evaluation phase.

This can lead either to rejection or acceptance of:

2. the practical step-by-step implementation of the project.

Both phases require professional input of both technical (i.e. scientific) and non-technical expertise (financial, economic, marketing, sales, distribution and personnel aspects). This will in turn require teams to be appointed, the composition of which will vary as the project progresses, with the relative weights depending on the nature of the project.

On the basis of these corporate R & D models, the following conclusions may be drawn with regard to applied research and development of technological innovations on behalf of small and medium-sized firms in the Netherlands:

1. The operational framework in which the research is conducted should measure up to the structural requirements spelled out above, both in the exploratory and the implementation phases.
2. The project should be conducted from its inception in a team context, with active participation by both the firm itself and the R & D organization in question. If the research is being conducted by a government facility or by a facility receiving government subsidies, the government should lay down specific requirements in order to ensure a suitable organization structure of a binding nature.
3. The body providing the subsidies should be equipped with the necessary expertise to ensure that these conditions are observed.
4. If the two contracting parties (the firm and the R & D institute) do not between them preside over the necessary expertise, that expertise will have to be mobilized from external sources.

These points are elaborated in more detail in chapter 5.3.4: 'A research and development organization for small and medium-sized firms'.

3.3 Sketch of certain representative branches of industry

3.3.1 *Introduction*

The following branch studies aim, at a disaggregated level, to provide an indication of the current position of and prospects for a number of Dutch industries. Because of their indepth nature these studies form an important supplement to the more general economic analysis of Dutch industry presented earlier. Three branches of industry have been selected for special analysis. The selection has been made in such a way as to ensure that a number of significant developments will be explored which are of relevance for industry as a whole and that a substantial segment of industrial activity as a whole will be covered.

The industries selected are:

- the chemical industry, as an example of an industry that exercised a locomotive function in the 1960s but which will probably find life much more difficult in the 1980s;
- the electronics industry, where significant technological breakthroughs may be anticipated in the coming years (e.g. in micro-electronics).
- the furniture industry, as an example of a craft industry.

The reports on each of these industries seek to provide a general impression of likely developments in the next ten years. This has been done by analysing the current position in relation to the remainder of industry and relevant foreign countries and in relation to relevant developments in the economic situation, the market, technology etc.

Given their place in the study as a whole, treatment of these industries had to remain confined to a general outline.[6]

3.3.2 *The chemical industry*

Current structure

As may be seen from the following survey of the situation in 1978, the chemical industry occupies an extremely important position in the Netherlands.

Table 44. Importance of the Dutch chemical industry (in absolute terms and as a percentage of total Dutch industry in 1977)

		Chemical industry	As % of total Dutch industry
Turnover	in N.Fl. bns.	21.3	12
Value added	in N.Fl. bns.	8.5	11.3
Exports	in N.Fl. bns.	18.6	
Imports	in N.Fl. bns.	11.1	
Investment	in N.Fl. bns.	2	21
Employees		94,000	8.5

Source: Netherlands Chemical Industry Federation, 1978, Annual Report.

If these figures are corrected for transit trade it turns out that about two-thirds of the turnover value of the chemical industry is exported. Data supplied by the Netherlands Chemical Industry Federation indicate the EEC to be the major export region, taking some 65% of Dutch chemical exports. Europe as a whole accounts for over 80% of total Dutch chemical exports. West Germany is the largest customer, taking some 25% of Dutch exports.

The Dutch chemical industry manufactures a wide variety of products, such as fertilizers, synthetic resins and materials, points and pigments, basic chemical materials such as alkenes and aromatics, synthetic fibres, drugs, soaps, waxes and cleaning materials, and pesticides. Chemical manufacturing in the Netherlands is mainly focussed on base chemicals, fertilizers and synthetics, including synthetic fibres.

One of the major feedstocks for the Dutch chemical industry as a whole is naphtha, which is principally produced as a by-product from oil refining. In recent years the use of gas oil, another refined product, has been increasing. This applies equally to natural gas condensates, although its use in the chemical industry is still on a small scale (a few percent).

The structure of the chemical industry is highly complex. On the one hand, there are the bulk chemicals, with very large production plants for base products such as ethylene, with a very long life-cycle; on the other hand there are plants such as small paint factories that regularly change their product. The chemical industry is highly integrated in nature. Chemical manufacturing often involves a number of by-products, which are disposed of separately, while many different raw materials and ancillary materials are required, which are produced in other more or less specialized chemical factories. In this way there is a high degree of mutual interdependence among chemical manufacturers in the form of intra-industry supplies. Production is highly automated.

As mentioned earlier, the chemical industry is heavily international in orientation. Easily the greater part of production is in the hands of transnational corporations; it is estimated that some 60% of the turnover of the Dutch chemical industry is produced by Dutch multinationals. The chemical industry is relatively know-how intensive. In the heavy chemicals industry, total R & D expenditure is put at 4% of turnover, and in the pharmaceutical industry at 12%.

[6] A more detailed report is contained in the following working documents which may be obtained on request from the Council:
J. Oudshoorn and J.C. van Ours: *Elektrotechnische industrie* (Electronical Engineering)
J.C. van Ours: *Meubelindustrie* (Furniture Industry)
G.E.G.M. Grünning: *Chemische industrie* (Chemical Industry).

The industry grew vigorously until the early 1970s, with a marked emphasis on product and process innovation and increases in scale, especially in bulk chemicals. During the 1960s investment ran at between 15 and 20% of turnover per annum. Labour productivity is high as a result of far-reaching automation. In 1977, per capita turnover was approximately N.Fl. 230,000.[7] Per capita value added in that year was around N.Fl. 100,000 per annum.

The emphasis on bulk chemicals in the Netherlands is evident from the following survey.

Table 45. Share of various product groups in total Dutch chemical industry (turnover in N.Fl. millions, 1976)

	1976 turnover in N.Fl. millions	
Total chemical industry		20,498
Fertilizer industry	1,528	
Synthetic resins etc. industry	1,993	
Pigments and dyes industry	380	
Other heavy chemical and chemical fibres	11,751	
Total heavy chemical	15,652 = 76%	
Other product groups (final chemical products)		
Paints, lacquers, varnished and printing inks	898	
Drugs and surgical dressings industry	1,716	
Soaps, waxes, cleaning materials, perfumes and cosmetics	1,168	
Chemical pesticides	365	
Other chemical product groups	699	
Total other product groups	4,846 = 24%	

Source: Ministry of Economic Affair, *Bedrijfstakken verkend 1977* (Industry Survey 1977), No. 9, Chemical Industry.

On average, therefore, each of the five remaining product categories accounts for 5% of sales. Of these the drugs and surgical dressings industry is the largest, with an 11% share of chemical sector sales.

Various classifications of the chemical industry are used, e.g. base and final products, bulk and fine chemicals, the chemicals and chemical-products industry. These classifications have not been clearly defined. They assume that in comparison with the end-product chemical industry, bulk or heavy chemicals are characterized by larger units of production, greater capital intensity, higher labour productivity, a lower wages and salaries component and higher raw materials share, higher energy consumption and greater environmental impact.

Given the available statistical data, a distinction will henceforth be drawn between heavy chemicals and end-product chemicals. Some comparative figures for 1976 are shown below.

[7] Central Bureau of Statistics, *Produktiestatistieken, Chemische Industrie 1977* (Chemical Industry Production Figures 1977), The Hague 1980.

Table 46. Comparative data for heavy chemicals and end-product chemicals, 1976

	Total	Heavy chemicals	End-product chemicals
Number of companies	346	96	250
Number of employees	87,568	55,696	31,872
	N.Fl. bns.		
Sales of industrial activities	20.0	15.6	4.4
Of which invoiced abroad	6.6	4.3	2.3
Domestically	13.4	11.3	2.1
	N.Fl. 1000s		
Industrial activities: data per employee			
Sales	230	280	140
Difference in value	95.8	106.3	76.6
Labour costs	42.8	44.5	39.3
	%		
Industrial activities Share in value of production of:			
consumption value (purchases + change in stocks)	59.3	62.6	47.3
labour costs	18.2	15.7	27.3
other costs + depreciation + operating results	22.5	21.7	25.3
Total	100	100	100

Source: Central Bureau of Statistics, *Produktiestatistieken, Chemische Industrie 1977* (Chemical Industry Production Figures 1977), The Hague 1980.

The above figures illustrate the considerations referred to earlier with regard to the breakdown into heavy and end-product chemicals. The figures on difference in value per employee are particularly striking. The concept adopted by the Central Bureau of Statistics, which broadly speaking amounts to the value of production less the consumption value, is close to the concept of value added. The difference in value per employee is some 30% lower in the case of end-product chemicals than it is for heavy chemicals. The share of value added in relation to the value of production, however, is 38% in the case of base chemicals, and 55% for end-product chemicals.

There are a number of significant negative aspects to the chemical industry. The first of these is the high consumption of energy, especially oil and gas. This applies universally to the chemical industry, but energy consumption is particularly high in the Netherlands on account of the particular structure of the Dutch chemical industry. Total energy consumption for both feedstock and fuel purposes in 1977 amounted to 62% of energy consumption by industry and 22% of total energy consumption in the Netherlands. Natural gas and crude oil products accounted in that year for 34% and 50% respectively of total energy consumption in the chemical industry.[8]

An estimate is provided in the report 'Economic structure and the environment'[9] of total fuel consumption per sub-sector, i.e. including fuel consumption for feedstock purposes. This revealed that the fertilizer industry accounted for approximately 23%, other heavy chemicals for some 75% and end-product chemicals for around 2% of fuel consumption by the chemical industry. The value of production at that time was distributed as follows: fertilizer industry 9%; other heavy chemicals 66%; and end-product chemicals 25% of the total value of production of the chemical industry. This once more underlines how energy-intensive the fertilizer industry is, while end-product chemicals, by contrast, are relatively energy-extensive.

Another deleterious side-effect of the chemical industry consists of its impact

[8] Central Bureau of Statistics, *De Nederlandse Energiehuishouding 1977* (The Netherlands Energy Budget 1977).

[9] Ministry of Health and Environmental Protection, *Economische structuur en milieu* (Economic Structure and the Environment), VAR series no. 7, The Hague 1979.

on the environment. An estimate of the environmental impact of Dutch industry as a whole in 1973 in the case of air and water pollution, sub-divided into biologically biodegradable oxygen-binding substances and heavy metals, put the share of the chemical industry at between 15 and 30%. The share of the end-product chemical industry in pollution caused by the total chemical industry is much lower than its share in the value of production of the industry as a whole.

Developments to the present time

During the 1960s, the chemical industry underwent a rigorous transformation throughout the Western industrialized world. A great many new products and production processes were discovered and applied. Costs were reduced and efficiency increased by the design and construction of ever bigger production units. In Western Europe, the existence of an extensive refinery industry able to supply relatively cheap raw materials (especially naphtha) in sufficient volume was one of the reasons for the growth of the chemical industry.

Apart from technological developments, factors of importance on the market side included economic growth and the substitution of chemical products for other materials. Western economies grew vigorously during the 1960s, with a concomitant increase in demand for chemical products.

The Dutch chemical industry benefitted clearly from this growth. Between 1963 and 1973 the average annual increase in turnover was approximately 5% higher than in the EEC as a whole (the Netherlands 13-15%, EEC 8-10%). During the 1960s the Netherlands successfully capitalized on its comparative advantages. A strong chemical industry was built up with a marked emphasis on base chemicals and intermediate products. The importance of the chemical industry for the Netherlands was noted in chapter 2.1 and 2.2, e.g. its knowledge-intensive nature, thus providing for relatively capital-intensive employment (high R & D), the scale of employment provided, its large share in Dutch exports and total investment in the Netherlands. After 1970 a number of developments took place which suggested that the future for the Dutch chemical industry would be rather different from what it was in the 1960s. The volume of production began rising less rapidly. Production in 1977 was at approximately the same level as in 1975. In certain industries (e.g. synthetic fibres) there were signs of structural excess capacity; environmental and safety regulations became increasingly stringent, while there was a sharp rise in the price of energy. In addition, refineries and petrochemical products began to get off the ground in a number of countries where the chemical industry had until then been on an insignificant scale. The Netherlands was in a particularly exposed position because of the strength of the guilder. Although no in-depth studies have been made of the subject, there are signs that the productivity of labour in comparable factories is lower in the Netherlands than in other industrialized countries such as West Germany and the United States. This too serves to undermine the competitiveness of the Dutch chemical industry. A number of developments of significance for the future of the Dutch chemical industry are examined in greater detail below.

Relevant trends for the future of the chemical industry

General

It is fair to assume that during the next five to ten years, the rate of economic growth in industrialized countries will be lower than it was during the 1960s. In many areas of application, chemical products have achieved a far-reaching degree of penetration. As such it may be assumed that there will be less growth resulting from substitution. While there are still fields where there are good prospects (e.g. plastics in the motor vehicle industry and engineering plastics), it may be anticipated that with the rise in energy prices, the penetration curve for PVC, synthetic fibres and synthetic rubbers will flatten out.[10]

It is regarded as an accepted fact that the price of energy and raw materials in

[10] A. J. Droppert, 'De chemische industrie in West-Europa' (The Chemical Industry in Western Europe), *Economisch Statistische Berichten*, July 19, 1978.

the chemical industry will rise in the next few years. Furthermore, substantial investments will be required in relation to environmental protection measures. Chemical products are subject to increasingly stringent testing for any pathogenic properties. Greater research will be required in this field before a product is put on the market. All these factors will lead to a significant increase in the cost of chemical products, while there could also be an increase in entrepreneurial risks.

Basic research is being conducted in the fields of biochemistry, physical chemistry and photochemistry in various places in the world. Both from the literature and from discussions with experts in industry it may be concluded that any major, large-scale manufacture of fundamentally new products during the next five to ten years may be virtually ruled out.

There is, however, still a good deal of scope for the improvement of production processes (e.g. reduced raw materials and energy consumption) and product quality.

A large part of the modern chemical industry is based on the processing of the crude-oil fraction naphtha. As has been said, naphtha was available in large quantities at the beginning of the 1960s. At that time it was more or less regarded as a by-product from the production of heavy fractions such as fuel oil, gas/diesel oil and petrol. Following the oil crisis the demand for heavy fractions declined while that for naphtha continued to rise, so that naphtha ceased to be a cheap by-product and instead became a much sought-after major product. A comparison of the forecast demand for naphtha during the 1980s with oil refining capacity suggests that there will be an appreciable shortage in the EEC in the mid-1980s.[11]

For this reason it appears likely that a new generation of crackers will appear during the 1980s which will be capable of using heavier fractions as well as naphtha as feedstock. Similarly it is expected that there will be further integration between oil refining and the petrochemical industry. Once natural gas condensates are available on a large scale they will be increasingly applied either in specially constructed units or as part of the raw materials for convertible cracking plants. This will lead to greater flexibility in the use of raw materials.

In the long term other raw materials, such as coal and biomass, could assume importance. So much research and investment is however still required on these techniques that no major shifts are to be expected in the next ten years.

Various studies have been made of likely quantitative changes in the chemical industry.[12] These produce different results. They are, however, agreed that the rate of growth of consumption will slacken in relation to former years. On average the following growth figures are forecast for consumption in Western Europe during the period 1977-1990:

End products	2-3%
Synthetic materials	3-4%
Heavy chemical	3-4%
Total chemical products	3-4%

The assumed macro-economic growth rates behind these figures are often not specified. As such the figures should only be taken as a rough indication.

Regions

Given the major share of Dutch exports taken by Europe, likely developments in that region are of obvious importance. In assessing trends in Western Europe use has been made of data drawn from OECD reports.[13] Western Europe will have to take account of increasing competition from Eastern bloc countries, OPEC countries and newly industrialized countries. In view of the existence of excess capacity in a number of sub-markets (e.g. that for synthetic fibres) and

[11] Euroeconomics: 'Western European petrochemicals into the 1980s': The Changing Environment, Paris 1978.

[12] A. J. Droppert, op. cit., Economic Commission for Europe, 'Market trends for chemical products, 1970-1975 and prospects for 1980', ECE/CHEM/22/Vol. 1, Geneva 1978.

[13] OECD: *Facing the Future: Mastering the Probable and Managing the Unpredictable,* Paris 1979.

the sluggish growth of demand, a decline in the volume of investment may be anticipated.

Nevertheless a number of countries in Western Europe are planning to construct or expand large petrochemical complexes (e.g. Portugal, Italy, Spain, Greece, the United Kingdom, Ireland and Scandinavia). Political considerations often count for more than economic factors. Cartel formation and/or protectionism cannot be ruled out. Existing industry will probably respond in the form of product improvement and improved production processes. The signs are that West Germany, Switzerland and to a lesser extent the United Kingdom will be able to maintain their position and even to consolidate it further, especially by investing in the United States.

Eastern Europe may be expected to make further advances in the fields of heavy chemicals, plastics, fibres, pesticides and pigments. In doing so it will require the aid of Western technology, finance and project management. The pattern of acquisition on the basis of future supplies of products may be expected to continue.

Large-scale oil-refining projects are being implemented in OPEC countries. The next step will undoubtedly be the establishment of petrochemical complexes. It appears unlikely, however, that this will have a significant impact on Europe before the end of the 1980s.

In general it may be expected that there will continue to be a balanced growth in demand and supply in the United States on account of the large size of the market. US enterprises are in a strong position with regard to R & D in view of the enormous potential in the fields of electronics, space travel, energy and defence. There may, however, be some withdrawal from other products and fields where they are less strong.

It is difficult to judge to what extent the United States will be able to sustain the significant export gains it has recorded in recent years in certain sectors of the chemical industry. In industrial circles it is thought that in two years' time the United States will be exporting as much as Europe. Two years ago, the United States was exporting only half as much as Europe. Given the politically determined lower oil and gas prices in the United States, US companies are able to compete in the international market and to export their surpluses.

Japan is unlikely to make inroads in the petrochemical sector on account of its environmental problems and its dependance on imported raw materials and energy. It is attempting to collaborate in this field with oil-producing countries, and to encourage domestic diversification, especially in fine chemicals specialization. Japanese companies are becoming more active in marketing production processes and know-how.

During the next few years there will be a substantial growth in the petrochemicals field in third world countries (e.g. Brazil, Mexico, Argentina, Iran, China, India and Indonesia). These countries are seeking to expand industrial development, e.g. by the production of heavy chemicals, for which the availability of raw materials is a great advantage. On the other hand they are handicapped by a lack of skilled personnel, poor infrastructure, political instability, lack of experience in quality control, marketing and organization, and high capital costs.

Taken as a whole it is anticipated that the creation of new capacity in these countries will generate substantial production surpluses in the next few years which will have to be disposed of in export markets. This applies particularly to fertilizers, methanol, aromatics and plastics.[14] In the medium to long term, domestic markets may be expected to grow and absorb at least some of the surplus.

Future development of the Dutch chemical industry

General

Industry will have to deal with a lower rate of growth of demand and increasing competition from other countries, especially in the field of heavy chemicals. The Dutch chemical industry consists in large part of heavy

[14] OECD, op. cit.

chemicals, which involve high energy consumption and significant environmental pollution. Measures in these areas and with regard to safety and health could result in an appreciable increase in costs. During the 1980s, the energy situation in the Netherlands, which is at present still relatively favourable, may be expected to become less favourable.

At the same time, the Netherlands has managed to build up a strong position for itself in the chemical industry on account of such factors as the available infrastructure (refining capacity, storage and transshipment facilities, ancillary industries, R & D facilities, education and training), and location (gateway to Europe and West Germany with its well-developed chemical industry), which will continue to have a positive impact in the future. The Dutch chemical industry possesses specialized knowledge in various sectors and has built up ties with purchasers.

In view of these factors it might be concluded that the Dutch chemical industry will be able to maintain its position until the mid-1980s. An average annual rate of real growth of the same order as the anticipated growth in European demand of 3-4% would seem feasible. Thereafter turnover is likely to stabilize and could even decline.

For the present, the annual growth in the volume of turnover can be met by taking up surplus capacity in the industry. Account should also be taken of the rise in labour productivity; an average annual increase of 5% would seem reasonable. Given an anticipated increase in the volume of turnover of 3-4%, this necessarily means that the number of jobs will fall. The extent to which this might be countered by shorter working hours and a five-shift system is difficult to say.

Investment

During this period of consolidation and stabilization, especially in heavy chemicals, there will be increasing pressure to keep costs down. In the first place this will be directed towards raw materials and energy consumption, since these account for a large share of costs and have risen sharply in price. Secondly, investment will be directed towards rounding off industrial and chemical clusters and towards improving product quality and production processes. In addition investments will take place to enable existing facilities to use a wider rang of raw materials (e.g. naphtha, gas oil and natural-gas condensates).

Expansion investment is not expected to be on a significant scale in the next few years. The prospects for replacement investment are considerably more difficult to assess. Replacement is by no means an unambiguous concept in the chemical industry. Large and complex installations, in particular, are not simply closed down and dismantled and then replaced by new plants. In practice components are usually renewed, provided the costs of the installation as a whole remain competitive.

Since a good deal of expansion investment took place in the late 1960s and early 1970s, and the general amortization period is between 10-15 years, decisions will have to be taken in the second half of the 1980s about continuation or otherwise.

This is likely to be accentuated by the fact that new industrial technologies are expected to come on stream on a large scale during this period (e.g. the use of biomass as a raw material, coal technologies, the use of methanol). It may therefore be assumed that there will be major changes at the end of the 1980s and especially in the 1990s. The extent to which the Netherlands takes part in these changes will depend on the existence of comparative advantages and the strength or weakness of the Dutch chemical industry at that time.

Investments will become more directed towards product redevelopment, where there is still a great deal of potential. It is difficult to indicate this in broad terms, since this sector of chemical industry consists of many separate parts with widely different prospects. The pharmaceutical industry may be regarded as the most know-how intensive. The future position of the three major Dutch companies in this sub-sector warrants attention because they are comparatively small. This imposes certain conditions on marketing (e.g. narrow range and a

wide geographical distribution), while the potential for R & D is necessarily limited.

Integration

As part of the process of consolidation, there has been a discernible trend towards greater integration. Producers are becoming more concerned to ensure future supplies of raw and auxiliary materials and/or to arrange their own marketing and processing. In strategic terms, companies are seeking to increase their flexibility and to reduce risks. At the operational level, transport costs and risks can be reduced by a sound choice of location. Oil companies are examples of highly integrated petrochemical producers.

Integration, especially that geared to end-products, is being particularly pursued by manufacturers of base products, such as the Dutch State Mines. This can entail organizational problems. Mass-producers used to large-scale forms of production have a totally different organizational structure and management mentality from small-scale producers, who must generally be able to operate flexibly in the market and who deal with products that generally have a shorter life-cycle. These differences can put a brake on the degree of production and product integration achieved.

Concluding remarks

In view of the macro-economic objectives discussed earlier in this report and the contributions that various chemical activities can make towards them, there would seem a case for a genuinely selective development of the Dutch chemical industry. A selective development of this kind would have to entail product and production techniques redevelopment in the Dutch chemical industry. In this regard government policies can be directed towards supporting the process of stabilization and consolidation in appropriate and valuable parts of the chemical industry, and to encouraging the processing of raw materials into more specialized intermediate products, semi-manufactures and end-products.

The complete dismantling of the base-chemicals industry would, however, certainly be premature. Where there exist economic opportunities for further refinement, greater specialization, quality improvement, drastic reduction in environmental pollution and reduction of energy and raw materials problems, these should be exploited and, where necessary, supported by the government. In doing so long-term options should also be kept open.

It deserves to be underlined that the environmental problems associated with the decentralized manufacture of chemical end-products should not be underestimated. The redevelopment of the Dutch chemical industry, with regard to both products and production processes, should therefore be carefully conducted within the confines of an effective and if necessary selective official framework.

3.3.3 *The furniture industry*

Introduction

The report on the furniture industry, which forms the basis of this section, was based on a survey of the literature supplemented by twelve discussions with entrepreneurs and trade union officials from the industry.

References in this section to the 'furniture industry' refer to the wooden furniture industry. In turnover terms this industry is nearly four times as large as the metal furniture industry. The wooden and metal furniture industries may be different in nature, but they face analogous problems.

Characteristics

The furniture industry in the Netherlands is of only limited importance.[15] Dutch furniture factories are small-scale; many fall into the category of family businesses. The industry is widely spread out, the main centres of employment being in Gelderland, North Brabant and South Holland.

The main furniture products include bedroom furniture, storage and wall furniture, cupboards, upholstered seating furniture, tables and chairs, occasional furniture and panelling. Production methods in the furniture industry tend to vary. On the one hand there is solid or natural wood conversion, and on the other the conversion of manufactured boards. Natural wood conversion is characterized by small-scale, labour-intensive production methods in which use is made of universal wood-working machines suitable for producing a wide variety of products.

In the board-conversion industry production is often automated, with the machines forming 'transfer lines' in which they are linked to one another by means of conveyor belts or other forms of transport.

Small-scale production methods in the furniture industry generally require little capital: entry barriers in this sector are low.

Adjustment to changes in the market usually takes the form of the entry of new firms and the elimination of old ones. Competition takes widely different forms. In the case of cheaper furniture, price and delivery times are of great importance, while for more expensive pieces design and finish are more important.

Furniture is sold through the intermediary of the trade. The furniture industry is among the weakest sectors of the Dutch economy: in 1978 one in four factories were running at a loss. The industry is subject to severe foreign competition. The weak position of the Dutch furniture industry in relation to other countries may be seen from the high level of imports, which is not fully compensated for by furniture exports. In 1978 the deficit on furniture trade amounted to over N.Fl. 1.1 billion.

Past trends

After the Second World War the Dutch market grew rapidly as a result of pent-up demand and a rise in per capita personal disposable income. This boom period for the furniture industry lasted until around 1965. During this period there was a good deal of investment in factors of production such as land and buildings but little attention was devoted to such matters as promotion, product development and management. Once the pent-up demand had been satisfied competition became more intense, the share of the domestic market declining in the face of a growing level of imports from West Germany in particular and, to a lesser extent, from Belgium. The board-conversion industry faced particularly stiff competition from abroad since other countries enjoyed advantages of scale in production. One of the major categories of imports consisted of bedroom furniture falling into the medium price or cheaper range.

The intensified competition led to a reorganization of the board-conversion industry. In the second half of the 1960s this affected bedroom furniture producers; in recent years producers of storage and wall furniture and cupboards have been hit. The motives of the Dutch furniture trade for turning to imports centres on the fact that foreign suppliers were cheaper, delivered exclusively, were more concerned about design, had a greater range and had more reliable delivery times.

During the 1970s consumer spending on furniture grew significantly in the Netherlands, although in recent years there has been an appreciable decline in the rate of growth of expenditure. Dutch industry was only able to benefit from this growth in part since there was a marked rise in imports. Some 60% of these imports came from West Germany, while Italy emerged as a strong competitor:

[15] The turnover of N.Fl. 1.5 billion in 1978 amounted to less than 1% of total turnover of Dutch industry. The number of workers in the industry is about 16,000, or approximately 1.5% of the total industrial workforce.

in some sectors of the industry Italy's share of Dutch imports rose from a few per cent in 1970 to several dozen per cent by the end of the 1970s. Imports consisted particularly of modern furniture, bedroom furniture, teenage furniture and cheap furniture.

Exports also rose in the 1970s but not by as much as imports, so that the trade deficit in furniture grew.

Employment in the industry fell during this period, not so much because of productivity gains but because of the drop in the share of the domestic market.

Problems

The difficulties with which the Dutch furniture industry is confronted may be reduced to a small number of closely interrelated problems: the limited (domestic) market, small-scale production methods, and management and staffing. Given the small size of the Dutch market and the fact that little furniture is exported, the Dutch furniture industry has a smaller market than (for example) the German furniture industry. Since the demand for furniture is highly diversified, demand for a particular model can be very limited. For this reason production batch quantities in the Netherlands tend to be small. This is of particular relevance in the cheap furniture segment of the market, where price is primarily determined by the scale of production and the scope for automation, as for example in the case of chipboards furniture.

In the case of board-conversion, the German furniture industry has a significant production edge on its Netherlands counterpart in terms of scale and hence of price. Competition with West Germany is accordingly intense. Batch size is less important in the case of natural-wood furniture construction. In the first place, the use of natural wood lends itself less to automation. Secondly, factors such as furniture design and finish count for more than possible cost advantages resulting from increases in scale.

The management of the small-scale Dutch furniture factories are often much more concerned about production aspects than about furniture design and marketing. The result is that management often has little feeling for the market. These factories must have a flexible production set-up if they are to respond quickly to changes in fashion. The weakness of small furniture factories lies in their lack of market insight, so that they lag behind market developments. The market is skimmed off by others. These factories often produce much the same sort of furniture. The lack of a large management team and their low overheads do, however, mean that they are able to produce furniture cheaply. Larger furniture factories, on the other hand, with their more extensive management, are able to pay more attention to design and marketing. These factories concentrate on creating a 'special image' to help them withstand shifts in the market. Taken as a whole, however, the range of furniture on offer is limited. In the lower price categories the reason often consists of lack of market insight. In the higher price categories this is due to the problems manufacturers have in creating a 'special image'.

The result of this lack of diversity in the Dutch furniture industry is that stockists seeking to offer a distinctive range are often forced to import.

Furniture dealers in the Netherlands tend to operate through buying groups which, together with the presence of large chain stores, means that demand in the Netherlands is concentrated. Consequently, the furniture industry is in a weak position in relation to the trade. This finds expression in exclusive supply arrangements, the displacement of normal stocking functions from the trade onto producers and the anonymity of furniture.

Similar problems arise in the export field because of the small-scale structure of the Dutch furniture industry. These difficulties are reflected in staffing problems. Low pay and the bleak outlook for the industry have led to an exodus of skilled labour to other industries, so that the labour market has become tight.

In summary, the problems may partly be described as structural in origin. The limited size of the domestic market and the small-scale production methods are factors about which the Dutch furniture industry can do very little. This does not, however, apply to the remaining problems: management and staffing. In the past, management concentrated exclusively on the technical aspects of

furniture manufacture, to the detriment of the market side, i.e. market analysis, furniture design and marketing policies. The lack of competitiveness of the Dutch furniture industry and associated low pay levels led to considerable tension within the labour market. The industry's structural problems led to a drop in the share of the domestic market for furniture in the cheaper range, while its other problems led to a drop in the market share in the 'superior' categories.

The former decline in the market share may have been unavoidable, but this is less evident in the second case. In a branch where adjustment to market developments essentially takes the form of the entry and elimination of firms, this drop in the market share means that the equilibrium between entry and elimination has been disturbed. In the case of the furniture industry the elimination of firms on structural grounds was not sufficiently compensated for by the entry of firms able to hold their own against foreign competitors in the field of 'superior' furniture.

Outlook

There are signs of saturation in the Dutch furniture market, which will lead to a further intensification of competition both among manufacturers themselves and with foreign manufacturers. An important factor in this regard consists of the narrow range of furniture produced in the Netherlands and the problems experienced by manufacturers in establishing a 'special image'. For these reasons the degree of self-sufficiency in furniture is likely to continue to fall for the present.

Allowing for a certain lag, developments in the case of bedroom furniture are representative of the furniture industry as a whole. This sector of industry underwent a process of reorganization as a result of which the degree of self-sufficiency has remained steady in recent years at the low level of 25%. This stabilization in the degree of self-sufficiency is likely to take place throughout the industry as a whole, because (a) there are companies that remain able to compete effectively against foreign manufacturers, and (b) consumer demand is so diversified – and sometime so specifically Dutch – that foreign furniture factories are unable to satisfy the entire range of demand. Employment is likely to continue to fall, less because of technical developments than from a combination of saturation in the furniture market and a declining degree of self-sufficiciency.

Government policy

Government involvement in the furniture industry consists of the provision of subsidies, e.g. for participation in foreign trade fairs ad hoc aid for companies in difficulty and more specific assistance in the form of support for the 'branch survey' and the 'quality plan'. The 'branch survey' consists of an annual index-figure survey among Dutch furniture manufacturers; this centralizes the available data on the Dutch furniture industry and provides individual manufacturers with a basis of comparison. A shortcoming of the branch survey is the fact that it concentrates exclusively on the supply side of the furniture industry and fails to provide data on market conditions and technological developments and prospects. The 'quality plan' is an experiment conducted by the Ministry of Economic Affairs to tackle attention to quality in furniture factories systematically. The plan is experimental in nature and will run for two years. What will happen at the end of this period is uncertain since the prolongation of the plan depends on government subsidies. On drawback of the quality plan is that it concentrates on technical aspects of furniture manufacture but pays little attention to factors such as design, marketing or promotion.

In summary it may be argued that current government policies towards the industry are in need of review. Policy is excessively ad hoc in nature. Companies in difficulty are aided without sufficient research into their future prospects, with the consequence that many of these companies disappear some time later after all. In addition government policy tends to concentrate on less urgent aspects of

furniture-making, such as the improvement of production techniques and furniture quality.

If its policies are to be adequate it is vital for the government to formulate and approach towards the prospects of the Dutch furniture industry. In the first place this will require insight into the problems currently confronting the furniture industry and the situation it is in, and secondly into likely market trends. In an industry where adjustment to market processes takes the form of the entry of new firms and the elimination of old ones, stimulatory government policies must be geared to the industry as a whole. Government policy should therefore be designed to stimulate the entry of new firms and should concentrate on those aspects of the industry that were largely neglected in the past: furniture design, market analysis and marketing.

In summary it may be reasoned that government policy should not so much be concerned with technical aspects of furniture manufacture but with an overall 'revitalization' of the sector. This means that the main focus should be on market developments.

3.3.4 *The electrical engineering industry*

Electrical engineering occupies a key position in modern industry. The wide range of electrical power available is reflected in the great diversity of products. Power stations are concerned with 100-1000 Megawatts; in micro-electronics we are dealing with perhaps only a few microwatts per circuit element.

Electrical engineering is the third largest industry in the Netherlands, behind the chemical and metallurgical industries.

Table 47. Characteristics of the Dutch electrical engineering industry (1978)

Turnover	14.6	bill. guilders
Exports	9.2	bill. guilders
Imports (for comparative purposes)	9.9	bill. guilders
Investment	680	mill. guilders
Number of employees	113,000	

Source: WRR.

The Philips group has its head office in the Netherlands, and is also active on a large scale there: in 1978 it had 84,000 employees in the Netherlands (out of a world total of 388,000) and sales of N.Fl. 3.3 billion (out of production totalling an estimated N.Fl. 8 billion).

This corporation, with a world turnover of N.Fl. 33 billion, dominates the electrical engineering scene in the Netherlands.

The electrical engineering industry is of importance to the Netherlands not only because it supplies the domestic market but also because of its exports, which go a long way towards offsetting the high value of imports in this important field. The employment generated and the industry's R & D activities are of significance both qualitatively and quantitatively. In recent years turnover has consistently increased by around N.Fl. 1 billion p.a. (an average of 8% p.a. since 1963). Imports have increased, while the volume of production has risen by an average of 4% p.a.

The electrical engineering industry has been responsible for a spectacular decrease in the amount of power used by modern electronic components. The existence of a strong electrical engineering industry means that the Netherlands benefits directly from the growth of this sector.

Technical characteristics

Two principal categories may be distinguished in electrical engineering:

- high-voltage engineering, power generation and distribution, and motors (for driving machines, pumps, traction, etc.).
- 'Intelligent equipment' (communications, data-processing, computers,

instruments, electro-mechanical equipment, medical appliances, etc.). These contain a great deal of electronics.

Power supply sector

At present the Netherlands has an adequate power supply system. A maximum load of 9.7 Gigawatts was envisaged in 1979/1980; given the required reserve margin of 27%, this makes a required generating capacity of 12.3 Gigawatts. Present generating capacity is 15.6 Gigawatts, but despite firm proposals for building further power stations the surplus capacity is expected to be absorbed in the second half of the 1980s. By 1989/90 the required power generating capacity is expected to be 17.3 Gigawatts, while according to current plans and orders, capacity will then be 17.2 Gigawatts (see the Electricity Plan 1984/85 of the SEP, Arnhem). Investment in this field has been running at N.Fl. 1-2 billion p.a. in recent years. At present, however, orders for new facilities have declined. It is possible that requirements will be topped off in the 1990s with nuclear power.

The turbo generators used in large power stations (i.e. 500-1000 MW) as well as in the smaller power plants (e.g. 10-50 MW) likely to be increasingly linked up with district heating in the future, contain advanced technology which only a few economic giants are able to apply commercially.

While competent, the Dutch firms in this field (e.g. RSV, VMF, HOLEC) are at a disadvantage in relation to the large US, Japanese and other European firms. The specifications to which the products are required to measure up necessitate large-scale production. Expensive development programmes are required in order to satisfy the increasingly exacting design requirements. Nevertheless the potential construction of nuclear power stations and the possibility that conventional power stations might switch back to coal should lead to orders in which Dutch industry will be able to participate.

Electricity is transmitted and distributed by means of expensive cables of varying weight, either overhead or underground, at various voltage levels. Distribution substations and transformer stations also make use of considerable quantities of advanced technology. Dutch companies exist capable of supplying these types of cables (e.g. NKF, Draka, TKF, Pope) and major components (e.g. HOLEC). The expertise of the KEMA laboratories is of major importance in this regard. The domestic market is in the order of N.Fl. 1 billion, but in addition there is the export market. Despite signs of saturation and the shrinking market caused by the energy situation this remains an active industry, e.g. in the field of maintenance and replacement with technologically superior components. Significant new products have been developed in this country, e.g. a new type of closed distribution substation, which have succeeded in export markets. Research into the sensitivity of the national grid system (i.e. instability at peak loading) has led to new safety systems with improved measurement and regulation techniques.

In the area of large electric motors the market is closely tied to the level of investment in machines of all kinds, and Dutch companies have watched their exports in this field fall. In the case of traction Dutch activity has been virtually wiped out; the only products likely to be able to hold their own against competition from low-wage industrializing countries are those advanced products in which the Netherlands should be able to retain a lead for some time. The rapid application of power electronics will be important in this respect. Small electric motors, including for domestic use, which can be manufactured by computerized mass-production methods, is another important field.

In 1978, imports by category 1 of the above classification totalled approximately N.Fl. 2 billion. This item was not fully offset by exports. The deficit on this item in the balance of trade amounted to approximately N.Fl. 400 m.

Intelligent equipment: electronics

These products and systems have seen some particularly spectacular devel-

opments, to the point that some people would refer to the dawning of a new industrial revolution.

These developments have large multiplier effects. The presence of a large multinational active in this field is of great importance to the Netherlands. However, only a quarter of this enterprise's production takes place in the Netherlands, compared with over half its R & D. On account of productivity gains and the comparative advantage enjoyed by other countries, employment in the Netherlands has for some time been dropping by 1-2% p.a.

A number of major technological innovations have given a totally fresh impulse to the manufacture of components in the electronics industry. These innovations have brought about the reliable and inexpensive products of today based on integrated micro-circuitry – circuitry which, in its earlier macroscopic and disintegrated form, would have taken up a billion times as much room and possibly a million times as much power, while its cost would have been thousands to millions of times higher. If combined with sensors and actuators (result indicators) and suitably arranged to handle logical functions and memory operations, micro-circuitry is capable of fulfilling all sorts of 'intelligent' tasks (e.g. computation, regulation or control, data storage and processing, etc.).

As was formerly the case with separate electronic components and functional sub-assemblies, a price erosion is currently taking place in the field of micro-electronics as the result of economies of scale and improved production techniques. The pace is being set by a number of electronic giants which are gradually placing a great range of complex micro-circuitry on the market for suitable application in all sorts of industries (including the electronics industry itself). This then forms the background for the far-reaching changes in the application of electronics. These changes will take the form of both new products and new methods of production, with as a general characteristic more 'intelligence'. A special aspect consists of the penetration of what may be termed the information industry. Dutch industry is up against stiff international competition in this field, but in view of the increases in scale effectuated in an international context, should be able to maintain its position in this expanding field.

Household appliances form another expanding market, but international competition is particularly intense and Dutch industry is under great pressure because of high labour costs. There is some interesting industrial activity in the Netherlands in the field of instrument manufacture, including in a number of small, healthy firms, with substantial exports – with even greater prospects if the potential for micro-processors is exploited in good time and the necessary attention is paid to the development of sensors. The manufacture of medical equipment, especially large diagnostic systems, is of high quality and has achieved high export levels (Philips' share in this field is nearly 20%). Growth is hampered by increasing competition and the trend in many countries to slow down investment in large-scale equipment. Developing countries are more interested in cheaper equipment. The manufacture of electromechanical systems is an emerging field, but to date the development of genuine robotics has scarcely got off the ground in the Netherlands.

The telecommunications industry is of world class but, like the power engineering industry, often has to contend with protectionist tendencies in export markets, while the domestic market is limited. Nevertheless there is a substantial surplus on this item in the balance of trade, due in increasing measure to exports to developing and OPEC countries. The advent of micro-electronics has altered technical specifications in this field as well. The consumer market for mass-communication appliances (video and sound receivers and recorders) is still expanding but is threatened by Japanese imports. A number of interesting Dutch innovations are being developed, but some of the industrial activity in this field is taking place outside the Netherlands. Optical telecommunications based on glass-fibre cables is opening up new prospects both for telephone communications and video cable networks. It is as yet unclear whether the Dutch cable industry will enter the growing market for glass-fibre cables.

Another growth area consists of data-processing equipment using computers and all sorts of peripheral equipment. Micro-electronics are opening up the possibility of inexpensively performing all sorts of activities in the work-place and in the home: needs and functions with regard to safety and comfort, administration and supervision, education and recreation, efficient process control and automated manufacturing. The 'information society' will manifest itself not only in the professional sphere of banks, hospitals or government bodies, but also in the family: for example Viewdata and Teletext.

Dutch industry is reasonably strong in the second major category identified at the outset of this section and has well-developed R & D facilities. Turnover in 1978 amounted to some N.Fl. 6 bn., with a deficit on this item in the balance of trade of approximately N.Fl. 0.5 bn.

Developments and problems

The power engineering industry is grappling with the consequences of the slump in economic growth. Protectionism in countries with their own large enterprises has traditionally made it difficult for companies to consolidate themselves internationally. In the Netherlands, a certain degree of support from the government and electricity companies to industry with regard to deliveries of new facilities and the replacement and maintenance of power generation facilities is an extremely interesting possibility, which certainly deserves attention with a view to employment creation and maintaining a domestic advanced technology capability. Problems could however arise if government assistance seriously distorted the pattern of competition.

Provided that quality and price can be adequately controlled, openings do exist in this field for Dutch industry, possibly in collaboration with companies in other countries – particularly for the sale of medium-size equipment, e.g. 25 MW generators and large transformers. There could in the future be a growth in demand for medium-size generators of this kind for dispersed energy systems. Account should also be taken of the growing market for power in developing countries (e.g. Indonesia), which will for the present remain dependent on industrialized countries for the construction of power stations.

Enterprises in this field are to a certain extent holding back on account of uncertainty over future energy supply arrangements and the government's policies in this field. A strong R & D programme (including at ECN and TNO) is indispensable and would benefit greatly from intra-industry collaborative arrangements. R & D should cover the need to control SO_2 emissions, the development of new types of furnaces and providing fresh impetus for coal gasification, and the adaptation of the infrastructure to handle coal transport and processing, which will require large-scale investment. These aspects will soon require urgent action if gas and oil become scarcer (at present 5 m. tonnes of coal are already consumed annually in Dutch power stations), especially if nuclear power fails to come on stream as planned.

Certain expectations have been built up in the Netherlands with regard to alternative sources of energy. A considerable market has already been developed for central district heating systems (an estimated 25 networks, totalling approximately N.Fl. 2½ bn.), in which the waste heat from power stations would be used. The appropriate technical specifications should be decided upon quickly, so that alternative forms of energy generation and conservation are given proper scope. MHD conversion (i.e. the direct generation of electricity by subjecting the ionized gas in a high velocity flame to a strong magnetic field) has not yet reached an industrial stage of sufficient size and reliability, but there exists R & D expertise in the Netherlands. The scattered generation of electricity by means of windmills will never make a significant contribution to the national grid, but windmill generators remain of interest for specialist purposes, especially as a possible export article. For the present, the large-scale conversion of solar energy into electricity by means of photo-electric cells remains uneconomic. On the other hand there is a future for the use of solar heat, especially for domestic heating, particularly if the price of oil should

continue to rise and if solar heating were combined with proper insulation. If Dutch industry is to be in a position to produce alternative energy generation systems, this will require purposeful preparation, including on the part of the government.

Despite recent mergers and the introduction of collaborative arrangements, the Dutch power systems industry remains ill-equipped to benefit from likely future developments. One difficulty consists of the fact that for many products the domestic market is too small and that dumping is no longer an uncommon practice in international markets. 'Simple' products are under increasingly stiff competition from low-wage countries. The conclusion would appear to be that there is only hope for Dutch firms in this sector provided that far-reaching collaboration is undertaken and that the product range is extended.

Finally at the technical level there are also a number of innovations. There is a growing trend to replace unsightly overhead cables with underground cables – an operation costing N.Fl. 1-2 m. per kilometre. R & D is being conducted into loss-free power transmission by means of superconducting cables and into the application of power electronics designed to achieve greater stability and regulability as well as energy conservation in machinery. Attractive prospects for Dutch industry unquestionably exist in this field once it is ripe for commercial exploitation – but this comes down to the basic entrepreneurial problem of timing. In the meantime sound working relations have been established between R & D facilities and industrial groups.

The basic problem confronting industry with regard to developments in the field of electronics is that the emerging areas of application for micro-electronics are extremely broad. This diversity makes it improbable that a few commercial giants would be able to dominate the entire field, even if they were able to monopolize the manufacture of micro-circuitry. The wide range of interesting possibilities for micro-electronics is something that can only be explored by the host of medium-sized and small firms, each concerned with its own products and production problems. The rapid extension and accumulation of knowledge in this field, with the accent on application, is vital if the Netherlands is not to drop behind and if potential sales are not to be lost to foreign competition, with the familiar and undesirable effects on the balance of payments.

The response of multinationals in times of rapid technological change is determined by factors of scale. They are already well down the 'learning curve' and are obliged to consolidate their position in the international competitive field. Any national industrial policy must take account of these governing principles.

The growth of computerization caused by the electronic revolution, which is of such importance for the future of industry, imposes stresses on the socio-economic system. Changing cultural values and labour patterns in a society where information, communication and computerization have all increased greatly, will have to be adjusted to – in the same way that society had to adjust in previous centuries to the introduction of new technologies: metal working, sea-travel, railways, electricity, etc. The scope opened up by new techniques has disturbed past certainties. Social patterns will only resume equilibrium once solutions are found for the disruption and 'future shock' is accepted; this may well take longer than the incorporation of innovation itself.

Employment opportunities can readily fail to adjust to the accelerating penetration of computerization being witnessed at present. The benefits of computerization in administration and production are not, however, to be overlooked. These benefits consist in particular of greater reliability and precision in manufacture and the saving of labour. Such changes may be regarded as progress in the expectation that the manpower released will enable new and attractive objectives to the pursued. The essential problem consists of creating new jobs and adjusting expenditure patterns accordingly. It is virtually impossible to make a quantitative estimate of the displacement and redeployment of labour. The creation of new jobs depends on the speed with which entrepreneurial talent seizes new opportunities and on the level of understanding on the part of all concerned. It is a problem of imaginative power with regard to new products and services – and of course of financing and organization. The scope for successful entrepreneurship in the Netherlands is, however, often under-assessed. The

availability of risk-bearing capital is disappointing. International competition demand innovation and price restraint, but this proves to be difficult. The task of the future consists of ensuring that industry is poised to convert the outcome of R & D efforts into practice.

Finally a few words on the development of robotics, i.e. knowledge concerning electronically operateds robots or machines that perform programmed operations. Far-reaching computerization of industrial processes is required. As noted earlier, the requirements of precision, reliability and cost-savings are increasing, and there is the desirability – or indeed the necessity – of replacing human labour by robots in unhealthy situations. Examples already exist of robot workplaces where the introduction of robots was properly prepared and where the appropriate adjustment of batch size, setting-up times and the nature of the product enabled an adequate rate of return to be achieved within two years. The market for robots is growing rapidly. In due course it may be expected that more difficult operations, such as complicated assemblage, will be performed by robots. Considerable technical research is still required to this end, especially with regard to rapid image interpretation, scanners and software. Factories with experience in the field of advanced mechanical construction and numerical control are well placed to enter the field of robot manufacturing.

Policy aspects

There exists scope for greater collaboration within Dutch industry in the power engineering sector and the associated large-equipment construction industry. Companies should ensure that full benefit is taken of national R & D efforts in the field of power-engineering technology and energy supply systems. The government can perform a coordinating role in this regard. Prompt clarification is required on the important question of the policies to be adopted with regard to the increasing consumption of coal.

The central problem in the electronics sector consists of the fact that at this moment there is a lack of specialist knowledge among medium-size and small firms, especially with respect to the application of micro-electronics. Arrangements could be made for a network of professional instructors who would be responsible for disseminating relevant information to these companies, thereby enabling them to benefit from the knowledge accumulated in the major Dutch research centres, along the lines of the consultancy system operating in the fields of agriculture and manufacturing industry. It would appear desirable for such an instruction organization to be under the auspices of employers or trade organizations and the Netherlands Central Organization for Applied Scientific Research (TNO). Innovation can also be promoted by the activities of advisory engineering bureaus and with the help of experienced staff from large, technologically-advanced corporations. By supervising an advisers' register, the government could contribute towards the process of industrial redevelopment in the Netherlands.

4. INTERMEDIATE OBJECTIVES

4.1 Introduction

Since the publication of the White Paper on Selective Growth[1] it is no longer possible to conceive of economic policy without taking 'intermediate' objectives into consideration. These new objectives of economic policy include international division of labour, natural resources and energy, physical planning and environmental policy, and help shape the guidelines for the structure of production, and indeed impose certain constraints on economic activity.

Only energy and environment are examined in detail in this chapter. The promotion of a more balanced international distribution of labour forms an implicit part of this report; the more capital, skills and research-intensive that the Dutch structure of production becomes, the more scope it will create for developing countries.

Physical planning may be regarded from two aspects:

- the promotion of a more balanced distribution of population and sources of employment throughout the country;
- promoting improved space utilization: more economical use of land, maintenance of open spaces, improved infrastructure, urban redevelopment, town planning, land use, etc.

The first of these points is considered in sections 2.3 and 3.1. With regard to the second point it will suffice to note that industrial sites take up very little space (only 1% of the total land area) and that there is spare capacity for the next twenty years (assuming 3% annual growth, corresponding with that during the period 1967-1976). For other aspects the reader is referred to the Central Bureau of Statistics' publication 'Indicators of selective growth'.[2]

The quality of work and the workplace have not been taken into consideration in this study as an ancillary condition. Apart from the difficulties of defining this indicator precisely – which includes such factors as income level, educational level, sickness absenteeism and the incidence of accidents – this concept applies more to individual professions than it does to industries. It is therefore debateable whether industries can be distinguished in terms of this indicator to the point that boundary conditions might be derived from it. A modest qualitative assessment (as discussed in chapter 6) is all that is possible. The quality of work is also being examined in the 'Labour' project being conducted by the Council as one of the options for improving the operation of the labour system.

Raw materials have not been discussed. There are two aspects to this objective: the international raw materials situation and Dutch mineral resources. These two aspects are investigated in the Council's 'A Policy-Oriented Survey of the Future'. This study proceeds from the assumption that as far as international prospects for raw materials are concerned, it will be less a problem of their physical availability (i.e. stockpiles and reserves) than of supply shortages and price increases stemming from their uneven geographical distribution and the oligopolistic structure of the market.[3] Uncertain times lie ahead for surface-quarrying in the Netherlands and associated industries (the marl, gravel and cement industries, clay, industrial ceramics, etc.). This is not so much because reserves of these materials are becoming exhausted but because the development of new quarries runs into increasing environmental objections, while transport costs are too high to permit importation from abroad.

[1] *Nota inzake de Selectieve Groei (Economische Structuurnota)* (White Paper on Selective Growth), Second Chamber, 1975-1976 session, 13955, nos. 1-3.

[2] *Indicatoren selectieve groei* (Indicators of Selective Growth), Central Bureau of Statistics, The Hague 1979.

[3] See also the OECD's: *Facing the Future: Mastering the Probable and Managing the Unpredictable*, Paris 1979.

4.2 Environment

4.2.1 *Introduction*

If non-economic objectives are to be incorporated into economic planning it is essential that they be quantifiable. Only then can they fulfill the role envisaged for them in the policy report on economic structure, of boundary conditions or standards that may not be transgressed.

The following logical steps would then become possible:

1. selection of indicators;
2. quantification of the indicators by linking them to the structure of production and industry characteristics;
3. identification of target values and standards as presently applied by the government;
4. assessment in relation to economic objectives (i.e. optimalization).

The selection of indicators is justified in the text. Considerable concessions had to be made in this regard towards pragmatic considerations such as the availability of statistical data. Existing government objectives (in the form of quality standards or discharge levels) have also been adopted in the selection of indicators.

Considerable attention is devoted to apparently trivial matters such as the availability of data and the way in which they were ultimately obtained. Here and there data have been provided which will be familiar to experts in the field. This is unavoidable since an attempt has been made to reduce the body of available data to a common denominator (the standard industrial classification). This compilation was made with assistance of the Financial Statistics Division of the Central Bureau of Statistics (CBS), the Institute for Environmental Studies (IVM) of the Free University, various sections of the Ministry of Health and Environmental Protection, and the Institute for Waste Disposal (SVA).

The quality standards or discharge levels have been derived from government policy papers, administrative orders and legislation etc. As in the case of economic objectives, existing objectives within the present framework of government intervention have been adopted; in particular the Indicative Multi-Year Programmes for Water and Air Pollution, the Phosphates Report, and the SO_2 policy framework plan have been used.

The aim of optimalization consists of clarifying the available choices between economic and non-economic objectives. Contact was only taken up at a late stage of the project with a group from the Erasmus University Rotterdam, which had constructed a suitable model for our purposes. Lack of time did not permit the indicators, target values and standards, and industry characteristics outlined in this section to be incorporated into their model. For this reason the results of the optimalization analysis do not go beyond a general outline of the available choices.

4.2.2 *Availability of data*

It must be conceded that after just under a decade of 'environmental consciousness' (and the resultant flood of publications) and five years after the selective growth concept was first introduced, there is still little understanding of the relationship between environmental pollution and the structure of production.

Certain forms of environmental pollution are well documented. Precise data exist for example on water pollution by organic materials; and this has seen the introduction of levies on this type of pollution.

On the other hand the available data on water pollution by heavy metals and the like (i.e. non-degradable substances) are less precise. The CBS recently published data on this subject for the first time. Most water-pollution control administrations have imposed levies on heavy metals, although less systematically than in the case of organic materials.

Data on air pollution, which is not as yet subject to a system of levies on discharges from chemical processes, are extremely rudimentary.[4]

Better documentation exists on discharges resulting from the combustion of fossil fuels in stationary sources. This is generally done by means of conversion factors (i.e. discharge factors linking the consumption of energy to pollution). Transport discharges are also reasonably well known (again calculated by means of discharge factors, in this case in vehicle kilometres), but these discharges have not been distinghuished according to individual economic sectors.

The scale of air pollution and the share of the various sources are shown in table 48.

The substantial variations between the two surveys are largely attributable to differences in the scope of the surveys. The variations are also partly due to the fact that the figures refer to different years.

Table 48. Scale of air pollution (in kg mlns. and as a percentage of the total)

	Dust	%	CO	%	SO_2	%	NO_x	%	HC	%
A. *I.V.M. 1973*										
Stationary combustion	28	13.6	71.3	4.2	513	86.5	184	44.1	31	7.7
Of which industry	20	9.7	4.3	0.2	460	77.6	163	39.1	22	5.5
households	8.0	3.9	67	4.0	53	8.9	21	5	9	2.2
Mobile combustion	13.6	6.6	1413	83.9	28.5	4.7	205.4	49.2	179	44.8
Of which industry	8.5	4.1	670	39.8	25	4.2	150	35.9	85	21.3
households	5.1	2.5	743	44.1	3.5	0.5	55.4	13.3	94	23.5
Chemical processes	165	79.8	200	11.9	52	8.8	28	6.7	190	47.5
Total	206.6	100	1684.3	100	593.5	100	417.4	100	400	100
B. *CBS, Ministry of Health and Environmental Protection*										
Stationary combustion (1977)	30	22.5	37	2.4	313	86	173	38.9	6.4	1.3
Mobile combustion (1977)	13.7	10.3	1316	87	26	7	247	55.3	178	36
Chemical processes[1] (1972)	90	67.3	160	10.6	25	7	25	5.6	310	62.7
Total	133.7	100	1513	100	364	100	445	100	494.4	100

[1] More recent data are not available from the CBS or the Ministry of Health and Environmental Protection.

Source: Own calculations from data compiled by the Institute for Environmental Studies (I.V.M.) published in the V.A.R. series 1979 no. 7: *Economische structuur en milieu* (Economic Structure and the Environment); from the CBS: *Statistisch Bulletin 1979* (Statistical Bulletin 1979), nos. 43 and 80; and from the Indicative Multi-Year Programme on Air Pollution issued by the Ministry of Health and Environmental Protection. Adjustments made in table 48 included additions for discharges resulting from space heating (i.e. by stationary combustion in households) for domestic purposes and discharges resulting from private transport (i.e. combustion by private transport). The I.V.M. was primarily interested in the effect of the structure of production on the nature and scale of pollution, and has as such not included the former category, and the second only for 1/3; the supplementary data are from the CBS.

On the basis of its survey and its selected weights,[5] the IVM reached the conclusion that process discharges were easily the most significant, followed at a considerable distance by fuel and transport discharges. In making these comparisons the IVM notes that it should be borne in mind that in contrast to (stationary) fuel discharges, process discharges generally occur at a low height and can therefore produce comparatively high concentrations. The height at which discharges occur and the resultant regional variations in concentration have not been taken into account in the weights.

[4] In the White Paper on Environmental Levies and Charges, Second Chamber, 1978-1979 session, 15 658, nos. 1-2, it is indicated that such a levy is not to be expected in the short term (p. 82).

[5] Ministry of Health and Environmental Protection, *Economische structuur en milieu* (Economic Structure and the Environment), VAR series no. 7, The Hague 1979.

The weights used by the IVM were calculated on the basis of marginal values (indicative of harmfulness), supplemented by own estimates: CO 0.0018; SO_2 0.015; NO_x 0.015; dust/aerosols 0.013; hydrocarbons 0.2-0.025. The set of weights in the Indicative Multi-Year Programme on Air Pollution of the Ministry of Health and Environmental Pollution, on which the stated percentage of 85% is presumably based, is: CO 0.1; NO_x 2; SO_2 1; aerosols/dust 1; hydrocarbons 0.2, i.e. NO_x for example counts for twice as much as SO_2.

By contrast the Ministry of Health and Environmental Protection considers that some 85% of all pollutant substances discharged into the atmosphere are the result of fuel combustion.[6] This contradiction in their findings is largely attributable to the different fields covered by the respective emission surveys and the differences in weights. A comparison of the set of weights compiled by the IVM and that of the Ministry of Health and Environmental Protection indicates that the IVM attached more importance to hydrocarbons and less to carbon monoxide. A sensitivity analysis conducted by the IVM on its own weights produced the conclusion that it had it correctly established process emissions to be of dominant significance.

Until recently only the Institute for Waste Disposal (SVA) collected data on chemical wastes. The SVA had its own chemical wastes classification (KICA), based on types of waste and the type of industrial process; the classification was, however, scarcely disaggregated according to branches of industry. Recently a new division of responsibilities was agreed under which the SVA confines itself to monitoring data on domestic waste. The Ministry of Health and Environmental Protection now monitors the level of chemical wastes, obtaining its data under the compulsory reporting requirement in the new Chemical Wastes Act.

A new classification of waste categories (A-D) has been included in the Chemical Substances and Processes Order, which does not correspond properly with the KICA classification of the SVA, and which has been in operation for such a short time that hardly any data are available, let alone data disaggregated for individual industries. The distinction drawn under the Chemical Substances and Processes Order between chemical and non-chemical wastes is often subtle and disputed. Some experts, including from the SVA, consider it likely that the processing of non-chemical wastes will cause more problems than the processing of chemical wastes. The collection of data on non-chemical industrial wastes is the responsibility of the CBS. The results of an initial survey were recently published. The category of non-regulated, environmentally harmful chemical compounds was not separately identified. This is the category of possibly hundreds of thousands of compounds produced in varying quantities as a result of a wide variety of processes and activities, the properties of which (e.g. mutagenicity, carcinogenicity, teratogenicity) are little understood, the distribution and presence of which in the environment is unknown, and for which no regulations exist. Many experts believe that these compounds present the major environmental problem of the future.[7] The IVM has drawn up national estimates for two compounds (namely mercury and cadmium).

The 'discharges registration' project (being conducted by the Ministry of Health and Environmental Protection and the Organization for Applied Scientific Research, TNO) is not yet completed. Two reports have now been published: South Limburg (1973 data) and South Holland (1974 data); a third, North Holland, is under way. This rich future source of information could not therefore be drawn on in this study. The only comprehensive survey was the IVM study referred to earlier. The compilers of this report were also handicapped by the lack of data; many of their data are based on estimates. A further drawback is that the data are somewhat dated (1973).

Much has happened since then that might have a bearing on these figures (energy crises, the introduction of the Chemical Wastes Act and the Solid Wastes Act, the purification of hydrocarbons in the Rhine Delta and the treatment of major water pollutants, etc.).

4.2.3 *Selection of relevant characteristics and indicators*

Environmental pollution and nuisances have been classified on the basis of the receiving environmental compartments: water, air and soil (although we are well aware of the interrelationships between these compartments).

[6] *Nota Milieuheffingen* (White Paper on Environmental Levies and Charges), op. cit., p. 82.

[7] See for example: Shapo, M.S., *A Nation of Guinea Pigs: the Unknown Risks of Chemical Technology*, New York/London 1979, and the discussion of the US Toxic Substances Control Act.

Two sources of air pollution have been distinguished, namely emissions resulting from the combustion of fossil fuels in stationary installations and process emissions. Transport emissions have not been recorded as a separate source, although in a few of the surveys these emissions have been ascribed to particular economic units. Pollutants have been divided into carbon monoxide (CO), sulphur dioxide (SO_2), nitrogen oxydes (NO_x) and aerosols. The arguments for this selection are partly pragmatic (i.e. the availability of data) and partly based on the seriousness and scale of the pollution caused by these compounds and groups of substances (for example photochemical air pollution).

In the case of water pollution the classification is wholly based on the nature of the pollution, namely organic materials and heavy metals. The ions of nitrates and phosphates have been left out of consideration since this study concentrates on industrial pollution.[8] By means of assigning weights the group of heavy metals was reduced to a common denominator, namely the heavy metal equivalent (HME), with the metals on the 'black list', i.e. mercury (Hg) and cadmium (Cd), given a value of 1 and the metals on the 'grey list', namely cromium (Cr), copper (Cu), zinc (Zn), lead (Pb), nickel (Ni), vanadium (V), selenium (Se) and arsenic (As), a value of 0.1. Differentiated weights did not appear justified.

In the case of land and soil pollution, use has been made of data supplied by the SVA, CBS en IVM, there being no data on chemical wastes in the sense of the Chemical Wastes Act. These data relate to various classifications of solid and chemical wastes. A complicating factor is the fact that little is as yet known about the way in which wastes find their way into the environment. The figures therefore relate to the production of wastes and not to the seriousness of pollution. Other forms and causes of land and soil pollution have not been taken into account.

In most cases the figures are given as pollution per million guilders of production. Preference was given to this emission coefficient in order to provide an impression later in the study of the regionalization of pollution. The amount of pollution in a given region can be determined by multiplying the emission coefficient by the value of production at a given point in time. This therefore assumes a direct linear relationship between the value of production and pollution; no account is taken of tightened discharge standards, improved techniques of production, etc. The regional incidence of pollution cannot be determined by using an emission coefficient based on pollution per final production. This coefficient, which is the one generally used by the CBS, provides an insight into the amount of additional pollution resulting from the growth of a final sales category (calculated by input-output methods). The same value of the guilder has not been used in all categories; where there are variations the value in question has been specified. This imperfection is the result of imperfections in the available data.

The characteristics of individual branches of industry as discussed above are shown in tables 49, 50, 51 and 52.

[8] Origin of eutrophying compounds:

	Nitrogen[1] (tonnes)	Phosphates[1] (as Ptonnes)	Phosphates[2]
Industry	25,000	15,000	4,500
Households	53,000	20,000	19,800 à 22,800
Imports (Rhine, etc.)	175,000	53,000	59,500

[1] IVM data for 1973.

[2] *Fosfatennota* (Phosphates Report), Second Chamber, 1978-1979.session, 15 640, nos. 1-2; the net phosphates balance (i.e. inflows minus outflows) shown here amounts to 21,500 tonnes p.a., which is absorbed by fresh surface waters (excl. rivers). In addition some 2,000 tonnes p.a. are absorbed in the soil or are extracted by treatment.

Table 49. Air pollution from fuel combustion and transport and process emissions

No.	NO_x 73[1] kg m.	SO_2 73[1] kg m.	tonnes[2] NO_x/ N.Fl. m.	tonnes[2] SO_2/ N.Fl. m.	proc. A.P.[3] proc. $10^{12} \cdot m^3$ p.a.	tot. A.P. $10^{12} \cdot m^3$ p.a.
1. Agriculture, forestry and fishery	26	64	1.4	3.5	—	1.8
2. Foodstuffs industry: - livestock products	5.4	5.1	0.4	0.4	—	0.4
3. - Other products	20	13.4	1.1	0.7	0.1	1.0
4. Beverages & tobacco	2.1	1.5	0.5	0.3	—	0.1
5. Textile industry	2.7	3.3	0.5	0.7	0.2	0.4
6. Clothing, leather & footwear industry	1.4	1.2	0.5	0.4	—	0.0
7. Paper industry	5.4	1.6	1.8	0.5	0.1	0.2
8. Printing & publishing	1.0	1.8	0.2	0.3	0.4	0.5
9. Timber & furniture industry	4.1	2.6	1.2	0.7	0.1	0.3
10. Construction materials	16.1	11.0	4.6	3.2	1.5	2.1
11. Chemical & rubber industry	51.5	83.5	3.3	5.3	8.8	10.3
12. Basic metals industry	13.2	33.1	1.4	3.5	1.7	2.4
13. Metal products and optical industry	4.3	3.6	0.3	0.2	3.4	3.6
14. Electronics industry	2.2	1.4	0.2	0.1	0.1	0.3
15. Transport facilities industry	1.7	2.0	0.2	0.3	3.1	3.2
16. Petroleum refining	25.6	199	2.6	20.6	1.0	4.6
17. Mining	5.6	21.5	1.2	4.9	0.0	0.7
18. Public utilities	72.6	65.5	10.0	9.0	0.0	2.5
19. Construction industry	47.2	10.4	1.9	0.4	2.3	4.0
20. Housing	—	—	—	—	—	—
21. Commerce	16.1	5.0	0.5	0.2	1.3	2.6
22. Shipping & aviation	0.0	0.1	0.0	0.3	0.6	0.6
23. Other transport & warehousing	4.4	1.1	0.5	0.1	0.0	0.5
24. Communications	0.4	0.5	0.1	0.1		0.0
25. Banking & insurance	1.1	0.7	0.1	0.1		0.1
26. Business services	0.8	0.8	0.2	0.2		0.2
27. Medical veterinary services	2.6	2.5	0.3	0.3		0.2
28. Other services	7.0	4.1	0.40	0.2	0.5	2.7
Total	337	536			25.2	45.2
Average			1.2	1.9		

[1] These figures are aggregated fuel, process and transport discharges by industry and government. Domestic space heating as well as two thirds of transport discharges from passenger traffic have not been included.

[2] Unit: discharge tonnes/N.Fl. m. of production; value of production taken from the National Accounts, 1973 guilders.

[3] Unit: 'weighted' $m^3 \cdot 10^{12}$ p.a.; figures relate solely to process discharges. The various forms of pollution have been reduced to a common denominator by a weighting procedure.

A.P. weights: discharge tonnages have been divided by the following weights: SO_2 65; NO_x 65; CO 550; HC (CL/F) 2.5; aromatics 5; HC (O) 25; HC (N/S) 2; unpurified HC 50; purified HC 40; F 1; Hg 0.05; inorg. comps. 3; inorg. substances 75; organic substances 75; PB 0.75.

[4] The contribution to A.P. from the various categories (transport, process and fuel) is as follows:
Total A.P. = process A.P. + fuel A.P. + transport A.P.
45.2 = 25.2 + 13.0 + 7.0

Source: Ministry of Health and Environmental Protection, *Economische structuur en milieu* (Economic Structure and Environment), op. cit.

Table 50. Air pollution from fuel discharges from stationary furnaces in kg m.

No.	1977[1]						1975[2]
	CO	NO_x	SO_2	Aerosols	ald.	HC	SO_2
1. Agriculture, forestry & fishery	0.9	8.3	7.3	0.4	0.1	0.2	8
2. Foodstuffs industry: – lifestock products	0.1	2.1	3.5	0.2	0	0	3.9
3. – Other products	0.1	2.4	5.4	0.3	0	0	4.3
4. Beverages & tobacco	0	0.5	0.4	0	0	0	1.2
5. Textile industry	0	0.7	1.8	0.1	0	0	3.7
6. Clothing, leather & footwear industry	0	0.1	0.8	0	0	0	0.8
7. Paper industry	0.1	1.8	2.2	0.1	0.0	0	1.1
8. Printing & publishing							
9. Timber & furniture industry	0.2	5.0	1.3	0.7	0.1	0.1	13
10. Construction materials	0.2	3.4	6.6	0.5	0	0.1	
11. Chemical & rubber industry	0.9	16	32	1.9	0.2	0.6	57
12. Basic metals industry	3.0	16	28	6.5	0.4	0.5	22
13. Metal products & optical industry	0.4	1.7	2.9	0.5	0	0	2.1
14. Electronics industry	0.1	1.3	1.7	0.3	0	0	1.3
15. Transport facilities industry	0.1	0.5	0.6	0.1	0	0	0.6
16. Petroleum refining	0,7	20	136	4.7	0.4	0.9	151
17. Mining	0	0.9	0	0	0	0	0
18. Public utilities	0.9	69	50	11	0.5	0.8	30
19. Construction industry	0.4	0.5	1.8	0.1	0	0.1	2.9
20. Housing	0	0	0	0	0	0	0
21. Commerce	2.9	1.9	4.0	0.4	0.1	0.3	4.9
22. Shipping & aviation	0.2	0.1	0.3	0	0	0	0.3
23. Other transport & warehousing	1.0	0.7	1.4	0.1	0	0.1	1.7
24. Communications							
25. Banking & insurance	3.6	2.3	4.8	0.5	0.1	0.4	5.9
26. Business services							
27. Medical veterinary services	2.4	1.6	3.3	0.3	0.1	0.3	4.1
28. Other services							
Total	18	153	301	28.3	2.3	4.5	338

[1] 'Other industries' in the CBS classification have been included under the timber and furniture industry (9).
If households are included total emissions (in kg m.) become: CO 37; NO_x 173; SO_2 313; aerosols 30; aldehydes 2.8 and hydrocarbons (KWs) 6.4.
[2] The total of 338 m. kg SO_2 includes household discharges (20 m. kg).
Source: Central Bureau of Statistics, 1979.

Table 51. Water pollution

No.	biodegradable pollution		i.e./ N.Fl. m.[3]	HME[4]	HME[5] kg/ N.Fl. m.	HME[6]
	1975[1] (in 1000 i.e.)	1976[2] (in 1000 i.e.)	prod. (1975)	1973 (tonnes)		1976 (tonnes)
1. Agriculture, forestry & fishery	208	158	10.2	2	0.11	
2. Foodstuffs industry: - lifestock products	1,100	7,996	70.1	—	—	1.8
3. - Other products	7,000		330.2	—	—	
4. Beverages & tobacco	1,400		265.7			
5. Textile industry	115	501	22.5	1.25	0.24	1.4
6. Clothing, leather & footwear industry	129	105	42.2	3.0	1.0	3.8
7. Paper industry	1,247	869	340.7	—	—	0.6
8. Printing & publishing	55	56	7.6	1.9	0.33	1.1
9. Timber & furniture industry	57	37	15.6	—	—	
10. Construction materials	47	29	12.5	—	—	0.2
11. Chemical & rubber industry	81	71	4.1	91.4	5.85	93.5
12. Basic metals industry	177	197	16.3	173	18.46	71.8
13. Metal products & optical industry	542	323	29.0	54	3.62	+0.3 (rest ind.)
14. Electronics industry	134	91	11.5	—	—	
15. Transport facilities industry	95	67	10.7	0	—	
16. Petroleum refining	2,779	2,971	107.0	0.15	0.02	
17. Mining	9	6	19.1	—	—	
18. Public utilities	94	52	7.6			
19. Construction industry	409	292	14.1			
20. Housing	24	18	2.6			
21. Commerce	572	409	15.2			
22. Shipping & aviation	40	27	6.9			
23. Other transport & warehousing	182	129	15.8			
24. Communications	73	54	15.5			
25. Banking & insurance	162	119	12.4			
26. Business services	166	120	25.9			
27. Medical veterinary services	699	787	53.4			
28. Other services	1,618	1,672	64,6			0.3
Total	19.3 m. i.e.	17.2 m. i.e.		327 tonnes p.a.		174.6
Average		43 i.e./ N.Fl. m.	55 i.e./ N.Fl. m.		1.2 kg/ N.Fl. m.	0.44 N.Fl. m.

[1] Central Bureau of Statistics, Water Quality Control, 1978.
[2] Central Bureau of Statistics, Statistical Bulletin no. 4, 1980. The distribution between 11 and 16 is distorted because returns for the chemical industry (11) have been included under the petroleum refining (16). The true distribution is more likely to be in the region of 1 m. and 1.7 m. inhabitant equivalents (i.e.) respectively. In the 1976 table 11 and 16 have been added together.
[3] 1975 production values from the National Accounts, 1975 guilders.
[4] HME, heavy-metal equivalent, in weighted tonnes, that is, discharges of metals on the 'black list' (i.e. Cd, Hg) are divided by 1; discharges on the 'grey list' (Cu, Pb, Zn, Cr, Vn, Sn, Mb and As) by 10.
[5] 1973 production value from the National Accounts, 1973 guilders.
[6] Central Bureau of Statistics, Statistical Bulletin no. 4, 1980. Own calculations on basis of footnote 4.
Source: Central Bureau of Statistics; Ministry of Health and Environmental Protection.

Table 52. Chemical and industrial waste

No.	Industrial waste[1] 1978 (kilotonnes)	Production of Chemical Wastes 1973[2]	Tonnes chem. waste per N.Fl. m. prod.[3]	Chemical wastes[4] SVA 1973 (tonnes)
1. Agriculture, forestry & fishery		0	—	
2. Foodstuffs industry: - lifestock products	3,597	8,147	0.6	47,700
3. - Other products		19,219	1.1	
4. Beverages & tobacco		2,781	0.6	
5. Textile industry	48	8,492	1.7	6,750
6. Clothing, leather & footwear industry	9	4,408	1.5	
7. Paper industry	103	4,700	1.6	26,500
8. Printing & publishing	85	3,600	0.6	750
9. Timber & furniture industry	123	100	0.0	
10. Construction materials	224	1,400	0.4	350
11. Chemical & rubber industry	291	169,000	23.6	263,600
12. Basic metals industry	67	63,000	6.7	89,250
13. Metal products & optical industry	411	180,000	12.1	
14. Electronics industry	53	14,100	1.4	8,200
15. Transport facilities industry	80	106,300	14.6	
16. Petroleum refining	84	80,700	8.4	
17. Mining		8,700	2.0	
18. Public utilities	43			
19. Construction industry				
20. Housing				
21. Commerce				
22. Shipping & aviation		4,500	1.0	
23. Other transport & warehousing				
24. Communications				
25. Banking & insurance				
26. Business services				
27. Medical veterinary services				
28. Other services		22,700	1.3	
Total	5,218	894,500		452,600
Average			3.2 tonnes/ N.Fl. m.	1.6 tonnes/ N.Fl. m.

[1] Central Bureau of Statistics, Statistical Bulletin no. 97, 4 December 1979. Industrial waste is defined as substances released by industry that have no further commercial value and which can no longer be used in the industrial process or elsewhere in the plant in question, excluding however industrial wastes coming under the Chemical Substances and Processes Order of the Chemical Wastes Act; radioactive wastes; construction and demolition wastes; and substances discharged in waste water or into the air. The data consist of provisional figures for enterprises with fifty or more employees.

[2] The data refer to the production of chemical wastes, i.e. those chemical wastes in 1973 that were not already taken up in either an artificial or a natural cycle. Apart from dumping and discharge these substances are processed by means of combustion, treatment, distillation etc. The question of which part of these substances finds its way into the environment either directly or indirectly (e.g. as discharges from a waste treatment facility) has been left to one side.
The Chemical Wastes Act which has been in force since 1 August 1979 contains a compulsory notification procedure. The Ministry of Health and Environmental Protection has not, however, as yet issued any data. The data in the above table are the most recent and detailed available. Certain qualifications are in order with regard to the interpretation of these statistics. For example, the combustion of chemical wastes at sea declined during the period 1973-1979 from 40,000 tonnes p.a. to 2,000 tonnes; there was also a substantial reduction in discharges at sea (Seawater Pollution Act): the volume recorded in 1973 was 25,800 tonnes, while that in 1978 was only 8,000 tonnes. The figures exclude gypsum from fertilizer production (approx. 1 m. tonnes) and construction and demolition wastes (approx. 4 m. tonnes).

[3] 1973 value of production, 1973 guilders.

[4] Waste Disposal Institute, SVA/1177, April 1976. Excludes gypsum derived from fertilizer production, industrial wastes (approx. 90,000 tonnes p.a.), and chemical wastes discharged by process or waste water flows (approx. $17.5 \cdot 10^6$ tonnes p.a.). The figures are derived from survey results.
In the accompanying text the SVA put the possible true quantity at around 1 m. tonnes p.a., of which 530,000 tonnes were treated on the spot and 470,000 elsewhere; these figures also exclude discharges into surface water, which come under the Pollution of Surface Waters Act (WVO), and gypsum waste. The total estimated quantity is approximately 2½ times as high as the reported quantities (the questionnaire was completed by 640 firms).

Source: Central Bureau of Statistics; Ministry of Health and Environmental Protection; Waste Disposal Institute.

4.2.4 *Determination of standards*

The most important instrument of present environmental control policies consists of the permits system, under which individual permit applicants are treated on their merits. To some extent the system is also based on national standards, e.g. discharge ceilings, environmental quality standards and product standards, etc. Apart from the determination of national standards the guidelines established by the EEC are also of great importance, the majority having been incorporated in Dutch administrative orders.[9]

These national standards form the frame of reference for answering the central question with which this chapter is concerned, i.e. the extent to which environmental considerations will provide an obstacle towards or impose boundary conditions upon industrial development. Up to the present there are only a very limited number of national standards in force: under the Noise Abatement Act maximum noise levels of 55 dB (A) have been laid down; a sulphur dioxide discharge ceiling of $500 \cdot 10^6$ kg p.a. has been imposed under the Indicative Multi-Year Programme on Air Pollution; the Order concerning the sulphur content of combustible fuels lays down a maximum sulphur content for heavy fuel oils of 2%; and a maximum lead content in petrol of 0.4 grammes per litre has been imposed under the relevant Order. With regard to environmental quality standards for air, marginal limits have been suggested by the Health Council for nitrogen oxides, sulphur dioxide in combination with standard smoke, and carbon monoxide. These marginal limits have not as yet been legislatively laid down (section 54 of the Air Pollution Act). Nor are there any national standards for water pollution or water quality. Guidelines only can be issued to lower levels of government based on the Indicative Multi-Year Programme on Water Pollution.[10] Finally mention should be made of the two Rhine Delta purification programmes. The first of these concerns leakages and evaporating losses of hydrocarbons from storage tanks (this programme ran from 1974 until 1 January 1978). The second programme laid down guidelines for odorous open liquid flows; this programme came into force in 1977. Both programmes form the basis for permit policies in the Rhine Delta. In the remainder of this section various further forms of pollution are examined separately that have been used in the characterization of individual industries.

Air pollution

The major source of sulphur dioxide (SO_2) pollution is the combustion of fossil fuels containing sulphur. Sulphur dioxide and its secondary products derive their notoriety from the fact that they tend to reduce lung capacity and to increase the acidity of rain and surface water.

As noted previously, a discharge ceiling of $500 \cdot 10^6$ kg p.a. has been set for SO_2 under the Indicative Multi-Year Programme on Air Pollution 1976-1980. This ceiling was retained in the 'Sulphur dioxide policy framework plan'[11], with the proviso that a temporary transgression of the limits is accepted. The plan notes that these limits are already being exceeded as a result of the transition from clean natural gas to sulphur-containing oil and coal; the government's efforts are directed towards getting back to former discharge ceilings by 1985. As a guideline for an air quality standard for the protection of public health a 50 percentile of 75 $\mu g/m^3$ was selected and a 95 percentile of 200 $\mu g/m^3$, calculated over an one-year period. During the eighteen days that the 95 percentile could be exceeded, 'emergency levels' would come into force under which average SO_2 concentrations during a 24-hour period would not be permitted to exceed 500 $\mu g/m^3$.

[9] For a review see: *EG-milieuregelingen* (EC Environmental Regulations), Second Chamber, 1978-1979 session, 15 729, nos. 1-2.

[10] A legislative amendment was tabled in the Second Chamber on 8 March 1978. The amendment established the ability to impose central standards for the discharge of particular substances and water quality standards.

[11] 'SO_2 Beleidskaderplan' (SO_2 Policy Framework Plan), Second Chamber, 1979-1980 session, 15 834, nos. 1-2.

With regard to nature conservation, consideration is being given to a 50 percentile of 30 $\mu g/m^3$ calculated over twelve months. The maximum sulphur content of heavy fuel oil has been set at 1.2% for 1985 and approximately 0.3% in 2000.

Data gathered by the National Air Pollution Recording Network[12] indicate that these air quality standards are consistently being exceeded. During the review year, the marginal value for the 98 percentile[13] (250 $\mu g/m^3$) recommended by the Health Council was exceeded at 42 monitoring stations in the Rhine Delta, Zealand-Flanders, North Brabant and Limburg. The level of 830 $\mu g/m^3$ specified by the Council as the maximum permitted hourly average was exceeded on 74 occasions. The highest permitted daily average level (or 'emergency level') of 500 $\mu g/m^3$ was exceeded thirteen times. The recorded measurements were significantly affected by the exceptional period of frost combined with atmospheric conditions unfavourable for dispersal and large 'imports' of SO_2 from Germany and Belgium.

A further source of pollution is nitrogen oxides (NO_x results especially from combustion processes). Unlike in the case of SO_2 it is not so much a matter of nitrogen being present in fuel but of nitrogen in the atmosphere that is oxidized. Consequently the scale of such pollution is not determined by the nitrogen content of the fuel in question but by the temperature at which it is burned and the size of the combustion facility. Apart from having a directly harmful effect on health and increasing the acidity of rain and surface water, nitrogen oxides are a major source of smog.

Nitrogen oxides play a major part in photochemical reactions. NO_2 is particularly harmful, but NO is slowly converted into NO_2 in the atmosphere. No marginal limits have as yet been laid down in the Netherlands. Recommendations were however submitted by the Health Council in 1979.

Table 53. Recommended marginal values for NO_2

Percentile	NO_2 in μ/m^3			
	No adverse effect level		Recommended values	
	1 hour	24 hours	1 hour	24 hours
50	100	110	50	50
95	240	220	110	100
98	300	260	135	120
99.7 (1 day p.a.)	—	360		150
99.99 (1 hour p.a.)	700	—	300	

Source: Ministry of Health and Environmental Protection, Nitrogen dioxide, recommended limits for the quality of the open air, V.A.R. series 36, The Hague 1979.

Data from the national monitoring network indicate that the highest nitrogen dioxide concentrations occur in urban areas. In six cases the 98 percentile limit was reached with levels of between 100 and 110 $\mu g/m^3$ NO_2. The 50 percentile limit (50 $\mu g/m^3$) was exceeded at five monitoring stations: Rotterdam, Utrecht, Nijmegen, Geleen and Haarlem. After little change in absolute annual concentration levels over a number of years, increasing levels are now being recorded at certain monitoring stations. This might be related to an increase in the density of traffic. A comparison with CBS data[14] for the period 1960-1977 reveals that the share of mobile sources of NO_x discharges from the combustion of fossil fuels increased by 40% in 1960 to 60% in 1977, during which time there was a gradual increase in discharges from 225 m. kg to 425 m. kg. The Indicative Multi-Year Plan on Air Pollution suggests that there is likely to be a doubling of 1970 discharge levels (approx. $200 \cdot 10^6$ kg) by 1985, and that this will bring concentrations (in 1970 an annual median in urban areas of between 30 and 60 $\mu g/m^3$) to close to the maximum permitted levels from a health viewpoint. In

[12] State Institute for Public Health, April 1978/1979 report; NML-RIV series, no. 16.

[13] Percentile limits indicate the proportion of time during which a particular standard may not be exceeded. Thus a 98 percentile of 250 $\mu g/m^3$ indicates that during 0.98 = 358 days of the year this limit may not be exceeded, while on the remaining 7 days it may.

[14] Central Bureau of Statistics, *Statistisch Bulletin* (Statistical Bulletin) 1979, nos. 43 and 80.

1975 discharge levels were 175-180. 10^6 kg, producing averages of 30-50 $\mu g\ NO_2/m^3$ and 15-20 $\mu g\ NO/m^3$.

No upper limits have been imposed on nitrogen oxide discharges. It is, however, possible by means of approximation to determine where such a ceiling should be. As in the case of SO_2 there exists a more or less linear relationship between discharge levels and air quality.[15]

The proportionate increase of total discharges and local concentrations is brought about by the reasonably homogeneous distribution of discharge points (both high and low sources: house chimneys, factories, car exhausts, etc.). On the basis of the percentile limits for concentrations, the total discharge ceiling would have to be in the order of 400. 10^6 kg. This limit is already being exceeded, as are the Health Council's recommended limits.

The significance of carbon monoxide (CO) as a source of air pollution is declining. Approximately 90% of discharges stem from motorized transport. The Indicative Multi-Year Programme does not anticipate a rise in CO discharges but rather a decline. This means that in the short term CO is not a cause for serious concern. CO discharges levels have been declining from as early as 1970. No discharge ceilings need therefore be set. During the last year the standard for CO suggested by the Health Council was not exceeded.

The major emitters of hydrocarbons are the petrochemical industry, refineries (including from evaporation from storage in tanks) and the transport sector. The clean-up programme in the Rhine Delta referred to earlier concentrates particularly on hydrocarbons. Measures to reduce discharges are contained in the Motor Vehicles Air Pollution Sample Testing Order. In view of the large number of compounds and their dissimilar effects (ranging from smelliness to carcinogenic effects) it is difficult to establish general measures. The effect of hydrocarbons on smog formation is a particular source of interest at present.

Included under the collective heading of photochemical air pollution are ozone (O_3), NO_2, peroxyacetylnitrate (PAN), aldehydes, nitrates, sulphates, etc. These compounds are produced by the action of sunlight on NO_x, methane-containing hydrocarbons and the like, and are more damaging than the original compounds. During periods of smog formation, ozone concentrations in the Netherlands have been known to rise to four times the air quality standards recommended by the World Health Organization and to nearly twice as much as the emergency levels in force in Japan.

In 1977 ozone concentrations recorded in the Netherlands stood at 30-60 $\mu g/m^3$ (50 percentile) and 100-250 $\mu g/m^3$ (98 percentile) respectively. The smog situation in the Netherlands is expected to become considerably worse. These gloomy forecasts are accentuated by indications that SO_2 can be converted more rapidly by photochemical means into much more toxic compounds, and that SO_2 concentrations are beginning to rise again sharply. The Health Council was recently requested to recommend quality standards with regard to photochemical air pollution. In quantitative terms, ozone is the most important compound formed in this way. The World Health Organization's standard is 120 $\mu g/m^3$ (0.06 ppm), while the United States has laid down a limit of 160 $\mu g/m^3$ (0.08 ppm) as an hourly average, which may be exceeded once a year (99.7 percentile). If it were desired to meet these standards by 1985, and assuming an annual increase in discharge levels of 5% (of NO_x and hydrocarbons), this would mean that a reduction in discharges of over 90% would be required in relation to 1978. This is neither technically nor economically feasible.

Table 54. Ozone concentrations in $\mu g/m^3$ in 1985

No reduction	50% reduction in hydrocarbon discharges	50% reduction in NO_x discharges	50% reduction in hydrocarbon and NO_x discharges
50 perc. 320	250 (—22%)	180 (—44%)	180 (—44%)
95 perc. 550	480 (—13%)	390 (—29%)	380 (—31%)

Source: R. Guicherit, TNO Project, no. 7/8, 1979.

[15] Advised privately by Dr. P. J. H. Builtjes (specialist in distribution models, TNO Apeldoorn).

The natural capacity of surface waters to break down waste substances is put at 3.5 to 5 m. inhabitant equivalents. (This population equivalent is based on the chemical oxygen demand of the discharge of waste water from households.) The Indicative Multi-Year Programme on Water Pollution bases the required measures on water quality requirements with a view to the functions and use made of surface water. In this respect it will no longer be possible to count on the self-purifying capacity of surface water. The latter capacity should instead be regarded as a reserve for (a) the discharge of effluents (waste water still contains an average of 10% of the original pollution after passing through a purification plant)[16], (b) catastrophes, and (c) cases which are either extremely difficult to supervise (e.g. water recreation) or which can only be remedied at high cost (e.g. linking up isolated buildings to mains sewerage). Moreover, the technical ability does not exist at present to eliminate the pollution contained in international rivers. In brief, all industrial discharges will in principle have to be treated beforehand.

The following table provides a survey of gross and net discharges up to and including 1976, together with expectations for 1980 and 1985.

Table 55. Gross and net discharges into surface waters in the Netherlands with oxidizing agents (x m. inhabitant equivalents)

	1969	1975	1976	1980	1985
- Households	12.5	13.3	13.1	13.8	14.2
- Industry (incl. recreation	33	19.7	17.1	14.3	9.7
Total	45.5	33	30.2	28.1	23.9
Net discharge into surface waters	40	24.3	20	15.3	4.4

Source: Ministry of Transport, Water Control and Public Works, combatting the pollution of surface water, Indicative Multi-Year Programme 1980-1984, September 1979 (draft).

Net discharge (i.e. the burdening of surface waters) consist of direct, untreated discharges and the effluent from purification plants. In 1976, 37% (compared with 30% in 1975) of waste water was sent to collective (i.e. public) biological purification plants and 9% (against 8% in 1975) to mechanical purification plants. The average degree of purification in collective plants was 75%.

In the recent Phosphates Report[17] the following target discharge standards and marginal limits for water quality were laid down:

- it is sought to limit discharges to a maximum of 0.5 to 1.0 gr. of phosphates (P)/m^2 of surface water a year;
- this would enable the marginal limit of 0.3 mg/l as specified in the Indicative Multi-Year Programme on Water Pollution to be achieved.

The breakdown according to sources is as follows:

Table 56. Gross discharges into Dutch surface waters (in 10^6 kg P p.a. 1976)

Domestic sewage	6.5- 9.5
Detergents	8.8
Industry	3.0
Agriculture	1.5
Soil (run off)	0.7
Precipitation	0.3
Total Netherlands	20.8-23.8
Imported (rivers)	29.5
Overall total	50.3-53.3

Source: Ministry of Health and Environmental Protection, Phosphates Report, op. cit.

[16] This applies to the biochemical consumption of oxygen for biological purification plants (oxydation tanks and ditches). Average yields are, however, somewhat lower.
[17] *Fosfatennota* (Phosphates Report), op. cit.

A large part is taken directly out to sea by rivers, while some ends up in sewage sludge after biological treatment. What remains is the actual net discharge into surface waters subject to eutrophication, i.e. approximately 25×10^9 gr./P p.a. = 6 gr. P per m^2 of surface water.

Industry is only a minor source of phosphate discharges. Industrial emissions are moreover highly localized, namely in the foodstuffs industry and the phosphate industry. A large proportion of these emissions are discharged at sea, leaving a net discharge into surface waters of approximately 1.8×10^6 kg P p.a. Small companies pass their discharges to municipal sewage systems or to collective purification plants; large companies are required to take their own measures.

Non or scarcely degradable substances

In conformity with the chemicals treaty,[18] non or scarcely degradable substances are classified into:

- a black list, which includes substances that are toxic and non-degradable and which tend to accumulate in organisms. Discharges of these substances must be gradually reduced to zero; substances on this list include mercury (and compounds), cadmium (and compounds), the 'drins' (aldrin, dieldrin, endrin) and certain chlorinated hydrocarbons;
- a grey list of substances the discharge of which must be limited; these include: copper, chromium, lead, nickel, zinc and zinc compounds, phenols, chlorophenol, phosphate, nitrate and nitrite.

Under the administrative order (section 1, article 3) of the Pollution of Surface Waters Act, scope is created for the imposition of a complete ban on the discharge of harmful substances. Otherwise the central government is limited to laying down guidelines for the water quality plans drawn up at local government level.[19] The imposition of conditions on discharges is solely a matter for local government. Apart from substances on the black list there are no national standards.

Table 57 provides a survey of current discharges (gross and net) into surface waters. The CBS recently issued figures for the first time on discharges of heavy metals (see table 57, column for 1976 discharges). In 1976, companies paid levies to water control bodies for the discharge of 260 tonnes of heavy metals, while 1,156 tonnes were discharged into State waters (which are not subject to levies).

Table 57. Gross and net discharges into surface waters in the Netherlands of certain non-oxidizing agents (in tonnes p.a.)

Substance	1974	1975		1976	1980		1985		1973	1978
	gross	gross	net	gross	gross	net	gross	net	imported by large rivers	imported by Rhine & Meuse
- Mercury	4	4.8	4.6	2.9	0.84 (0.5)	0.70	0.45	0.41	80	20
- Cadmium	25	31	29	29.5	16	15	11	10	175-300	150
- Zinc	1,500	1,600	1,400	781	1,100 (500)	900	560	300	15,000-20,000	12,000
- Copper	40-50	210	150	88	170	120	140	90	2,000	1,400
- Nickel	20	85	80	65	44	40	41	35	800-900	1,400
- Chromium	200-300	400	350	373	150 (100-200)	110	120	100	3,000-4,000	2,900
- Lead	200-300	350	280	113	270 (100)	200	90	50	2,000-3,000	1,600
- Phosphates (as P)		31,000	28,000		28,000	24,000	16,000	12,000		57,000
- Mineral oils	2,000	16,000	13,000		12,000	8,000	5,500	3,500	50,000	23,000
- Phenol	275 (375)				75				2,000	
- Arsenic	15-20				7-12				400-500	
- Molybdenum	5-10				25					
- Tin	50									
- Titanium	1,000									
- Fluorides	30,000								20,000	

Source: The table has been compiled from data in the I.M.P. for water 1975-1979 and the draft I.M.P. 1980-1984. The columns on gross discharges in 1974, imports by large rivers in 1973, and the data on phenol, arsenic, molybdenum, tin, titanium and fluorides, as well as the bracketed figures in the column showing 1980 discharges, have been taken from the I.M.P. 1975-1979. The column showing 1976 gross discharges has been taken from: Central Bureau of Statistics, Statistical Bulletin 4 (1980).

[18] Agreement concerning the protection of the Rhine against chemical pollution, Bulletin of Acts, Orders and Decrees 1978, 417, in force since 1 February 1979; signed by the 5 riparian states of the Rhine and by the EEC.

[19] See footnote no. 10.

The Chemical Wastes Act came into force on 1 August 1979. The Chemical Substances and Processes Order of that Act[20] specifies the substances and processes covered by the Act and any applicable standards, etc. The Chemical Substances and Processes Order distinguishes four categories of chemical wastes. In order to fall into a particular category, a set of chemical wastes must contain one of the elements or compounds according to the specified concentration limits.

Category A has a concentration limit of 50 mg/kg. This category includes a number of black-list substances, such as arsenic (and its compounds), cadmium (and compounds) and mercury (and compounds). Category B has a concentration limit of 500 mg/kg and includes lead, lead and copper compounds and various organic compounds.

The concentration limits for categories C and D are 20,000 and 50,000 mg/kg respectively.

The Act contains regulations concerning the transmission of chemical wastes to third parties and the processing of that waste. Somewhat different regulations apply in the case of use oil. In view of the fact that used oil originates in many more places than chemical wastes, regional collection centres have been established. The above regulations are linked to permits issued by the Ministry of Health and Environmental Protection; the Ministry is also empowered to grant exemptions. The Act also contains a levies and reporting system. Finally mention should be made of the Polychlorbiphenol Order and the Biodegradability of Surface-active Detergent Substances Order. Waste substances outside the scope of the Chemical Wastes Act fall under the Solid Wastes Act, which also has a system of permits and levies. The Act is administered by the Central as well as municipal and provincial governments.

Provincial executive councils provide overall permits for dumping, incineration, recycling etc., taking into account not only the effectiveness of the particular processing method but also other aspects of environmental control. This does not apply to the Noise Abatement and the Air Pollution Act. Applications for permits are treated on their merits; no national standards have been laid down for this aspect.

4.3 Energy

With respect to energy, individual branches of industry are generally characterized in terms of energy consumption per million guilders of gross production and the energy ratio, defined as the percentage of energy costs in relation to the gross value of production. A distinction may also be drawn between the consumption of sources of energy as fuel or as feedstock. There is a striking variation in these characteristics among the various industries: 73% of total energy consumption occurs in two branches of industry, namely chemicals and base metals.

Table 58. Industrial consumption of energy in two industries in (mtoe and as a percentage of total industrial energy consumption)

		%	%
Total	20.8		
Chemicals	12.6	60.6	
of which as feedstock	7.75		61.5
Base metals	2.58	12.4	

Molag et al.[21] have shown that 60% of the growth of industrial energy consumption between 1961 and 1976 was attributable to the increase in output of eleven base products. In comparison with neighbouring countries, energy elasticity – the average annual growth in primary energy consumption divided by Gross National Product (volume) – in the Netherlands was relatively high during

[20] Bulletin of Acts, Orders and Decrees, 1977:435.

[21] M. Molag et al. 'Energie en industriële produktie' (Energy and Industrial Production), *Economisch Statistische Berichten,* 10 January 1979, p. 38ff.

Table 59. Energy consumption

No.	Energy consumption per N.Fl. m. gross production		Energy ratio 1977[3]	Energy consumption as % of total industry[4]
	1973[1]	1976[2]		
1. Agriculture, forestry & fischery	775	670		
2. Foodstuffs industry: - lifestock products	175	184	2.0	15.3
3. - Other products	254	251		
4. Beverages & tobacco	175	176		
5. Textile industry	276	306	2.9	2.7
6. Clothing, leather & footwear industry	175	214	2.2	0.4
7. Paper industry	834		8.8	4.9
8. Printing & publishing	180	440	1.0	1.1
9. Timber & furniture industry	292		1.9	1.2
10. Construction materials	1,320	763	10.8	4.5
11. Chemical & rubber industry	3,153	3,863	9.1	38.1
12. Basic metals industry	1,237	1,358	13.2	10.0
13. Metal products & optical industry	108	134	1.6	5.8
14. Electronics industry	168	109	1.1	3.3
15. Transport facilities industry	92	197	1.3	2.7
16. Petroleum refining	1,843	1,948		
17. Mining	796	310		
18. Public utilities	6,014	3,997		
19. Construction industry	55	293		
20. Housing		—		
21. Commerce	167	398		
22. Shipping & aviation	1,781	3,272		
23. Other transport & warehousing	580	649		
24. Communications	136			
25. Banking & insurance	93	176		
26. Business services	172			
27. Medical veterinary services	246	322		
28. Other services	196	502		
Average	688	769		

Source: Central Planning Office; Ministry of Economic Affairs, Ministry of Health and Environmental Protection.

[1] Energy consumption per N.Fl. m. of production in 1973 (1973 prices, units GJ/N.Fl. m.). Own adaptation of I.V.M. data from: *Economische structuur en Milieu* (Economic Structure and Environment). Energy consumption excluding own transport and including energy as a raw material.

Total energy consumption	1,908	PJ (45.5 mtoe)	
of which energy as raw material	331	(7.9)	= 17.4%
of which chemicals (11)	285.5	(6.8)	
metals (12)	45.5	(1.1)	

[2] Energy consumption in GJ per N.Fl. m. of production in 1976 (1972 prices), Central Planning Office, in *Energienota* (Energy Report), p. 66.
Business services (26) have been combined with other services (28).

Average industry (2-16)	913 GJ/N.Fl. m. of production
Average manufacturing (2-18)	1,064
Average services (21-18)	532
Average enterprises (1-28)	769

[3] The energy ratio is defined as energy costs as a percentage of the total value of production (1977) excluding the use of energy sources as a feedstock. This ratio tends therefore to be on the low side, especially in the chemical industry. Derived from the production figures issued by the Central Bureau of Statistics, as published in the *Sectornota*, p. 11. (*Voortgangsnota Economisch Structuurbeleid*, Progress Report on Structural Policy, Second Chamber, 1979-1980 session, 15818, nos. 1-2.)

[4] Energy consumption as a percentage of total industrial energy consumption in 1977, again excluding the use of energy sources as feedstock. It is striking that 70% of industrial energy consumption is concentrated in three industries, namely foodstuffs, beverages and tobacco; chemicals; and the base metals industry. Derived from production figures issued by the Central Bureau of Statistics as published in the *Sectornota*, p. 11.

the period 1960/1979: 1.65 for the Netherlands as against an OECD average of 1.05. Similarly it is revealing that 43% of Dutch exports stemmed from the energy-intensive sectors. Energy characteristics are set out in table 59 and the overall consumption of energy in 1977 in table 60.

Table 60. Overall consumption of energy in 1977 (in mtoe)

Consumption	Coal	Crude Oil	Natural Gas	Electricity	Nuclear Energy	Other heat	Total
Households and government							
1. Heating, lighting etc.	0.1	1.9	10.0	1.5			13.5
2. Transport		2.2					2.2
3. Sub-total households and government (1+2)	0.1	4.1	10.0	1.5			15.7
Enterprises							
4. Industry (excl. E-sector)[1]	1.5	8.5	8.6	2.2			20.8
5. Services		1.6	2.7	0.6			4.9
6. Agriculture & fishery		0.4	2.1	0.1			2.6
7. Construction industry		0.8		0.1			0.9
8. Transport (incl. own transport		5.7		0.1			5.8
9. All enterprises (excl. E-sector) (4-8)	1.5	17.0	13.4	3.1			35.0
10. Total final domestic consumption (3+9)	1.6	21.1	23.4	3.1			50.7
11. Consumption by E-sector[2]	1.6	4.4	9.9	4.5	1.0	0.2	12.6
12. Total domestic consumption (10+11)	3.2	25.5	33.3	0.1	1.0	0.2	63.3

Source: WRR calculations on basis of figures issued by the Central Bureau of Statistics (Nederlandse Energie-huishoudingen, The Netherlands Energy Budget) and the Central Planning Office (Energiebalans 1977, 1977 Energy Balance Sheet).

[1] Industry details

Foodtuffs, beverages & tobacco		0.214	1.258	0.240			1.712
Textiles		0.043	0.200	0.047			0.29
Paper		0.044	0.426	0.134			0.604
Chemicals	0.176	7.140	4.509	0.777			12.602
of which non-energy	0.115	5.664	1.834	0.134			7,747
Construction materials	0.043	0.146	0.787	0.092			1.068
Basic metals	1.230	0.312	0.496	0.545			2.583
Other metals	0.021	0.195	0.647	0.238			1.101
Other industry	0.028	0.377	0.276	0.147			0.828
Total	1.5	8.5	8.6	2.2			20.8
of which non-energy	0.142	5.942	1.834	0.134			8.052

[2] Specification of the energy sector

Net losses by coke industry, oil refineries, mining	0.6	3.4					4.0
Operation of conventional power stations (and company generators)	1.0	1.0	9.9	—4.2		0.2	7.9
Operation of nuclear power stations				—0.3	1.0		0.7

The characteristics of individual industries in terms of certain forms of air pollution (e.g. SO_2, NO_x and hydrocarbons) are closely related to the energy intensity of those branches. This relationship is at its most marked in the case of public utilities. Part 2/Coal of the recently published Energy Policy Report examined the environmental implications of the 'coal option' in some detail, as well as the implications of the 'basic' policy for the reintroduction of pit coal for the provision of energy in the Netherlands, that is, the policies considered by the government to be essential irrespective of the outcome of the public debate on

the provision of energy. In line with the first part of the Report, two scenarios have been worked out (in general terms a 2% and a 3% growth scenario).

By the turn of the century the maximum consumption of coal for power generation could amount to 12-14 m. tonnes of coal units. For industrial underfiring a maximum is envisaged of 5 m. coal unit tonnes. By the year 2000 pit coal consumption by coke factories and blast furnaces could rise to 5.4 or 7.4 m. coal unit tonnes.

Table 61. Estimated coal consumption (in m. coals unit tonnes)

Coal consumption	1977	1985		1990		2000	
		high	low	high	low	high	low
Industry	1.75	0.5	0.5	1.0	1.0	5.0	1.0
Blast furnaces	3.2	4.5	4.3	5.5	4.9	7.4	5.4
Power generation	1.5	4.2	4.2	9.1	6.5	15.1	12.2
Total	6.45	9.2	9.0	15.6	12.4	27.5	18.6

Source: Energy Policy Report, Part 2/Coal, Second Chamber, 1979/1980 session, 15 802, nos. 6-7.

No standards have been set in the strict sense in the energy sector as they have for example for certain environmental aspects. A ceiling for maximum annual oil imports has, however, been agreed in the EEC context, limiting oil imports for the period 1980-1990 to the 1978 level of 472 million tonnes oil equivalent (MTOE). For the Netherlands this would amount to approximately 50-52 MTOE. This value was not exceeded in either of the Central Planning Office's scenarios for the period in the Energy Policy Report Part 1[22], at least as far as total domestic consumption was concerned. The significance of this ceiling is unclear, and is not explained in the above report, which observes only that the availability of energy is becoming increasingly decisive. This means a shift in policy with respect to the first report, in which energy policy was premised on assuring the supply of energy, subject to certain restrictions (see 5.4.3). Despite the lack of clarity, the above ceiling will be retained in this report as an indicative boundary condition.

A second form of regulating the consumption of energy by enterprises consists of the policy on natural gas sales to large consumers. The *Gasafzet-plan*[23] announced a continuation of sales for high-value industrial applications and decoupling the gas network from industrial underfiring and power stations. The following sales policy has been determined with respect to the 'underfeed' market:

- upon expiry of their contracts, large industrial users (with an annual consumption exceeding 30 m. m^3) will be limited to an annual maximum of 30 m. m^3 up to the end of 1983;
- consumers taking less than 10 m. m^3 p.a. will be able to extend their contracts once they expire up to the end of 1983;
- deliveries to consumers of less than 10 m. m^3 will be continued.

During the period to the end of 1983, new ten-year contracts will be concluded with industry for high-value applications, while existing contracts will be extended.

The selective arrangements with regard to differing consumer groups and end use places those industries with a large requirement for gas underfiring in a vulnerable position. They have become exposed to fluctuations in international energy markets, which could in the long term affect the Dutch structure of production.

[22] *Nota Energiebeleid* (Energy Policy Report) part 1/General, Second Chamber, 1979-1980 session, 15 802, nos. 1-2.

[23] NV Nederlandse Gasunie, *Plan van Gasafzet 1979* (Gas Sales Plan 1979), p. 5ff.

4.4 Optimization

4.4.1 *Introduction*

This chapter has so far considered the selection of indicators for non-economic objectives, linking these indicators up to individual branches of industry, and the determination of target values and standards (the boundary conditions).

The question next arises whether in reconciling non-economic and economic objectives, it is possible to determine the optimal structure of production. In this regard use was made of a model developed by the Erasmus University of Rotterdam.[24,25] After certain modifications, this model measured up to our requirements. The model consists of an input-output model of seventeen traditional sectors and five pollution control activities, translated into a linear programming model. It covers part of Western Europe and a period of ten years. The model incorporates a procedure whereby a number of potentially conflicting environmental control objectives can be introduced in an interacting manner.

Given the starting position (i.e. the economic structure) and certain conditions incorporated in the model that remain constant throughout the optimization procedure, the limits of the target variables. By means of a series of iterations (or computation steps), lower and/or upper limits for the target variables can be juxtaposed in selected contexts, while determining at each step which target variable should be accorded the highest priority. The values of the target variables were not the sole point of interest but also how the solution was arrived at in economic terms: the level of investment in pollution-control activities and changes in the structure of production over the ten years. In particular we were interested in the choice made by the model between (in the simplest terms) investment in environmental control and industrial redevelopment.

The results should only be taken as indicating the general direction of a solution. To some extent this is because of the nature of the model: the linear programming may be envisaged as a form of enforced regulation in the economic sphere.

Because it covers the entire span of the ten years and incorporates absolute control over investment, the model is able to optimize the target variables by means of a subtle and complicated pattern of investment in expansion and environmental investment and by cutting back the size of certain sectors.[26]

To some extent the limited value of the results is also due to the nature of the data:

- the basic economic data consist of the table of technical coefficients for Western Europe and the structure of production of the Netherlands in 1965;
- the discharge coefficients for the seventeen branches of industry date to 1973 as do the prices for environmental control techniques[27] and the energy characteristics. The Ministries of Health and Environmental Control and of Economic Affairs recently brought these figures up to date in a policy report due to appear shortly on the costs of environmental control policies, but unfortunately these revised figures came too late for the purposes of the optimization exercise;
- five 'environment-production sectors' (i.e. anti-pollution activities) have been included: public and company water purification, desulphurization, the disposal of solid wastes, and the adaptation of motor vehicles (petrol engines with horizontally opposed cylinders). A number of types of pollution and their control have been left out of account, principally because the cost price was unknown or the techniques did not exist. The most important of these are:

[24] J. A. Hartog, P. Nijkamp and J. Spronk, 'Operational Multiple Goal Models for large economic environmental Systems'; being published in K. Iracki (ed.), *Proceedings of the 9th IFIP Conference on Optimization,* Lecture Notes Series, 1980.

[25] G. J. van Driel, J. A. Hartog and C. van Ravenzwaay, *Limits to the Welfare State,* The Hague 1980.

[26] For details and specification of the model see footnotes 24 and 25. See also J. A. Hartog and J. Spronk, *Een modelstudie naar de relatie milieu-economie* (A Model Study of the Environment/Economy Relationship), WRR, Preliminary and Background Studies, The Hague 1980.

[27] Taken from: Central Planning Office, *Economische gevolgen van bestrijding van milieuverontreiniging* (Economic Consequences of Environmental Protection), monograph no. 20, The Hague 1975.

reducing the emission of nitrogen oxides, hydrocarbons and aerosols; non-regulated compounds; the costs of combatting non-degradable water pollution, the costs of radioactive waste disposal and reducing noise and thermal pollution.

- In the model the unit costs of environmental control have been taken as constant. In reality the unit costs of environmental control tend to rise the greater the degree of environmental control. This limitation is, however, unlikely to affect the results significantly since we have not stipulated the complete elimination of any of the emissions, and since technological progress is likely to see a further reduction in unit costs.

4.4.2 *The target variables*

In this report, the primary objectives of government policy have been derived from the present system of official economic policy: full employment, external equilibrium, economic growth and the non-economic boundary conditions. It is these that form the target variables in the optimization problem. They are:

1. employment, defined as aggregate wages and salaries (including social security contributions) over the ten plan-years. In 1965 total wages and salaries amounted to N.Fl. 34.4 bn. The sum of N.Fl. 350 bn. has been taken as the bottom limit for aggregate wages and salaries during the entire period under consideration;
2. annual growth of total production: a target of 3% has been selected. This means that a tendency for 3% annual growth has been built in, while a limit has been imposed on maximum deviations from the growth path. A limit of N.Fl. 10 bn. p.a. has been selected as the maximum permitted deviation from the projected growth path;
3. pollution: in each category declining levels have been assumed.

water pollution	10% per annum
sulphur dioxide (SO_2)	5% per annum
solid wastes	10% per annum
motor vehicle exhausts	0% per annum

This reduction in pollution has been spread out in the model over a time-frame of ten years. Limits have been imposed on the maximum permitted path. After a number of iterations maximum deviations from the time-frame were fixed at 5% of the level of pollution in the base year. There are arguments both for and against such a time-frame. It is our impression that the realization of this time-frame required greater effort than the eventual reduction in pollution as such. On the other hand it could be argued that otherwise pollution would only have been tackled in the last few years of the plan period;

4. the balance of payments on current account: the export surplus is compared in each year and for each sector with the corresponding surplus of the base year. Changes in a particular sector in a given year have been subjected to maximum limits. This target variable has a strongly stabilizing effect on the structure of production. A maximum change of N.Fl. 1 bn. p.a. has been selected;
5. stability of consumption habits. In order to avoid the possibility of implausible solutions, such as the rapid dismantling of industries in the face of enormous corresponding imports, the annual decline (or increase) of consumption in a particular sector has been subjected to minimum (or maximum) limits. A lower limit of 1 N.Fl. 100 m. p.a. has been selected, i.e. consumption may not fall by more than N.Fl. 100 m. in a given year;
6. overall balance of payments equilibrium: over the ten plan years, maximum limits have been set for balance of payments deficits. Initially a limitation was imposed that balance of payments deficits/surpluses should not exceed N.Fl. 10 bn. over the ten-year period; in subsequent iterations this was reduced to N.Fl. 5 bn.

In addition to these target variables two further restrictions have been introduced:

- annual changes in output levels in each standard sector have been restricted to the range of −5% to +10%;
- the minimum growth in consumption has been taken as 1%; this amounts to the minimal maintenance of per capita consumption levels.

4.4.3. *The iterations*

As noted in section 4.4.1, new values for each of the six target variables can be introduced as limits in a series of iterations. After it had been shown that a particular set of values was 'realizable', these values were taken as limits, with maximum (and minimum) limits being determined for each of the target variables. These 'optimal' values for the target variables then served in turn as the basis for a new set of marginal values, etc.

Table 62 sets out the last two iterations, with the two sets of limiting values, A and B, which set maximum limits for the target variables 3, 5 and 6, and minimum limits for 1, 4 and 5. The iterations A.5, A.6 and A.3 were required to conform to the limits in set A, and the iterations B.1, B.4 and B.5 with those in set B. All figures are in billions of guilders (1965), apart from those for variable 3 (which are percentages).

Table 62. Results of the iterations: values of the target variables

Target variable subject to max. or min. limits	Limits set	5	6	3	Limits set	1	4	5
Iteration number	A	A.5	A.6	A.3	B	B.1	B.4	B.5
1. Wages & salaries bns., over 10 years	350	439	350	350	350	513	350	439
2. Max. growth target (bn. p.a.)	10	10	8.3	10	10	10	10	10
3. Deviations from time-frame for environmental control (in %)	5	5	5	4.6	5	5	5	5
4. Export surplus per sector (bn. p.a.)	1	1	0.4	1	1	1	0.33	1
5. Consumption per sector (bn. p.a.)	5	0.33	0.08	0.233	0.1	0.1	0.1	0.3
6. Bal. of payments equilib. (bn. over 10 years)	10	10	0	0	5	5	0	5

Source: WRR.

A comparison of these two iterations indicates that if emphasis is placed on the stabilizing economic target variables (2, 4 and 6), this tends to be at the expense of employment prospects. Naturally employment will rise and high growth rates will be achieved if wages and salaries are set at the maximum limit or if consumption grows at the maximum rate. If deviations in environmental control are to be kept to less than 5% from the trend-line, this also exacts a toll in terms of employment.

It was soon evident that the limits set out above were feasible and could be realized in a number of ways. Having reached this point it was decided not to proceed further in looking for the 'optimal' solution, since the target variables had not been formulated in a sufficiently refined manner. This applied especially to variables 2 and 3. Target variable 2, as formulated above, was subject to enormous margins: as an extreme maximum there would be annual percentage increase in production of 8.3%, resulting in production more than doubling during the period under consideration, while at the other extreme an annual percentage decline in production of 7.7% p.a. would be possible, resulting in production being cut by more than half.

This lower value would never be approached with respect to employment objectives, but the upper value would be closely approached if aggregate wages and salaries were to reach the upper limit (the full-employment approach). Target variable 3, i.e. environmental objectives, appears to be readily realizable in all iterations: as noted earlier it is our impression that the time-frame for combatting pollution (an annual 10% reduction) was more exacting than achieving the desired final result.

We were not only interested in the values for the target variables (table 62) but also how the solution would be arrived at in economic terms (table 63): i.e. changes in the structure of production (sectors 1-17) and investment in environmental protection activities (sectors 18-22).

Table 63 also shows:

- average annual growth in total production (value);
- the total value of production in the final period (growth in N.Fl. bns.);
- the scale of production in sectors 18-22 in the final period;
- the share of sectors 18-22 in total production;
- total environmental investment over the ten years.

Table 63. Results of the iterations: changes in the structure of production and the level of environmental investment

	Iteration	B.1	B.4	A.6	B.5	A.5	A.3	
	target variable subject to max. or min. limits	1	4	6	5	5	3	
	effective production in base year	% annual growth of output	% annual growth of output	% annual growth of output	% annual growth of output	% annual growth of output	% annual growth of output	average annual growth
1. Agriculture	9,770	0.5	−2.7	−4.8	7.2	7.2	−4.7	0.45
2. Energy	7,247	6.4	−2.25	1.7	1.4	1.3	0.8	1.55
3. Basic metal/non-ferrous	3,530	8.7	7.1	1.2	0.2	0.3	−2.4	2.5
4. Construction materials	1,546	9	4.3	1.3	7.4	7.4	−0.4	4.2
5. Chemicals	5,578	8.4	−3.4	−4.7	6.8	6.8	−3.6	1.7
6. Metal products	12,674	9	3.9	1.7	4.6	4.7	5.3	4.9
7. Transport facilities	2,534	8.4	3.8	7.2	5.3	5.3	4.0	5.6
8. Foodstuffs	16,898	6.1	−1.5	−3.5	6.7	6.7	−3.3	1.9
9. Textiles	5,919	8.4	−1.6	−3.7	8.4	8.4	3.1	3.8
10. Paper	3,714	8.4	−3.2	−2.2	8.5	8.4	−3.6	2.7
11. Other industry	2,291	9	−2.5	3.5	9.0	9.0	−5.1	3.8
12. Construction	11,551	9	6.9	6.9	−3.1	−3.0	−0.4	2.7
13. Commerce	14,035	9	0.2	−0.5	5.8	5.8	−1.1	3.2
14. Transport	8,851	9	1	3.0	6.0	6.0	3.5	4.75
15. Banking & insurance	2,465	9	−0.5	3.7	2.7	2.7	4.3	3.7
16. Other commercial services	9,144	−1.8	−3.2	−4.1	−5.1	−5.1	−3.6	−3.8
17. Government services	11,414	7.3	−3.4	−3.0	−0.5	−0.5	1.3	0.2
		Investment (in N.Fl. bn.) in the five areas of environmental control						
18. Public water purification		11.4	3.0	2.9	3.9	3.9	3.2	
19. Private water purification		1.5	0.7	0.7	1.0	0.95	0.7	
20. Desulphurization		3.4	1.7	2.7	0.75	0.8	0.02	
21. Waste disposal		1.0	0.66	3.0	0.5	0.5	0.55	
22. Vehicle modification		20.4	—	—	2.7	2.8	—	
Average annual growth of total production		7.26	0.6	0.3	4.4	4.4	0.15	2.85
Value of production in period 10		260	137	132	198	198	131 (bn.)	
Scale of production in 18-22; period 10		1.3	0.7	0.68	0.9	0.9	0.64 (bn.)	
Share of sectors 18-22; period 10		0.5	0.5	0.5	0.46	0.46	0.48 (%)	
Total environmental investment over 10 years		37.7	6	9.3	8.8	8.9	4.5 (bn.)	

Source: WRR.

With due caution, the following conclusions may be drawn from the above model results:

A great many further solutions are possible within the set limits for the target variables. To some extent this is because of the wide limits set for the target variables, but also – especially in relation to the environmental objectives – because the differences (or inherent contradictions) between the effect of the target variables is not excessively great. In general terms the iterations may be classified into two groups.

The first group of iterations (B.1, B.5 and A.5) are characterized by a fairly high to high growth in the total value of production and aggregate wages and salaries (i.e. growth in employment), coupled with moderate to very high environmental investment.

The second group of iterations (B.4, A.6 and A.3) are characterized by a limited growth in total production and wages and salaries, and generally lower environmental investment.

This division also applies to a certain extent at sectoral level. In the first group there is above-average growth in the value of production in agriculture and foodstuffs, energy, metals, chemicals, construction materials, metal products, transport facilities, textiles, paper, other industry and transport and commerce. These are industries that are almost without exception to a greater or lesser extent pollutant in nature but which also make a significant contribution towards income and employment.

In the second group there is above-average growth in banking and insurance, transport and transport facilities and metal products, and a relatively pronounced decline in agriculture and foodstuffs, chemicals, paper and commerce. These are respectively high-income low-pollution and high-pollution industries.

It may be noted that the relationship between the value of production in sectors 18-22 and the total value of production, i.e. the share of environmental industries in total production, remains fairly constant in all iterations, namely 0.46%-0.5%. In terms of the above division a high rate of growth in total production is associated with a commensurate increase of production in environmental-control industries, and a low rate of growth of total production with a correspondingly low increase in the level of activity of sectors 18-22.

A number of sectors stand out in a sector-by-sector examination of average growth in all the iterations: in the case of the transport facilities industry, metal products, transport, construction materials, other industry, textiles, and banking and insurance average growth exceeded 3.7% p.a. Industries supplying intermediate goods do not appear in this summary; the emphasis is on the capital and consumer goods industries and on services (including local services). The outstanding sectors are transport facilities and metal products, whose share rises in all iterations.

Two results in table 63 may be regarded as model artefacts, namely those for sectors 16 and 17 (modification of motor vehicles, especially in iteration B.1). Sectors 16 and 17 cover the letting of immovables and health services. These activities involve large amounts of capital and will therefore suffer if there are competing claims for capital investment. As a result of the imprecise formulation of target variable 5 (consumption per sector) this restriction does not apply to sectors 16 and 17, with the consequence that these sectors have markedly negative growth rates.

Similar considerations apply to sector 22 in iteration B.1. The combination of the restriction of a minimum growth of consumption of 1% per annum with target variable 5 (balanced growth of consumption per sector) produces problems at high growth rates: the model found a solution in the form of enormous growth in sector 22, an industry with low direct consumption and without a labour cost ratio.

Finally a restriction was introduced limiting the annual increase in productive capacity in sector 2, energy, to a maximum of 2%. In the preceding optimization the increase in sector 2 (as in other sectors) had been limited to a maximum of 10% a year; this restriction did not however become operative. The rate of growth for the final consumption of energy has been set at a minimum of 1% a year, thus leaving a maximum of 2% p.a. growth in energy consumption for intermediate supplies. With regard to the preceding iterations a new restriction was introduced that no capital destriction could occur (i.e. negative growth was not permitted). Target variable 1 was then maximized in the light of these restrictions. The results of the iteration are set out in table 64.

Table 64. Iteration with energy restriction: average annual percentage growth rates

1. Agriculture	2
2. Energy	2
3. Basic metal/non-ferrous	1
4. Construction materials	2
5. Chemicals	1
6. Metal products	1
7. Transport facilities	0
8. Foodstuffs	1
9. Textiles	3
10. Paper	3
11. Other industry	2
12. Construction	2
13. Commerce	1
14. Transport	2
15. Banking & insurance	10
16. Other commercial services	1
17. Government services	8
Average annual growth of total production: 3.87	

Source: WRR.

Economic growth remains possible under this new restriction: namely an annual growth in wages and salaries (being taken as an approximation of employment) of 3%. It is however questionable whether any growth could be realized in practice given the time-frame for sectoral investments. The pattern of investment required to achieve optimal values for the target variables is exceedingly complex. In particular, surplus productive capacity is generated in the environmental control industries (18-22), since these activities require a great deal of energy. It is also striking that the 'sensitive industries' sectors (e.g. clothing and textiles) form some of the few manufacturing industries in which there are above-average growth rates. This serves further to underline the policy option of revitalizing this crumbling branch of industry – an option previously endorsed in the model studies (2.3). It comes as no cause for surprise that the 'intermediate sectors' are the hardest hit by limitations on the consumption of energy. The reconstruction of these industries offers new perspectives to the extent it is linked with an improvement of their environmental characteristics and a reduction in energy intensity. The fact that capital-goods industries are heavily hit in this optimization is an indirect effect. These industries are highly sensitive to the growth in overall productive capacity. The limited rate of growth in other industrial sectors leads to a limited rate of growth in the capital-goods sector, especially since exports in this field are limited. This indirect effect overshadows the generally favourable energy and environmental characteristics of this sector. Non-economic objectives do not represent a barrier to the stimulation of this sector.

5.1 Economic policy and structural policy

5.5.1 *Foundation of forward looking structural policy*

Introduction

If so desired, the question of the foundation for structural policy could be sidestepped on pragmatic grounds by pointing to the fact that such policies are conducted not only by the Dutch government but by virtually all governments in OECD countries.[1] Until recently such policies were implemented without reference to specific underlying principles or criteria, and with the aid of poorly coordinated ad hoc measures. The justification for such policies has, accordingly, hitherto left a great deal to be desired. Linking such policies to specific objectives and strict rules would, therefore, in itself be a welcome development.

Nevertheless a number of fundamental aspects would not come properly into their own if such a pragmatic line were to be taken. The first and most important of these is that the structural policies which governments in Western countries have so far been implementing in response to the farce of circumstances have been defensive in nature rather than forward-looking. We are primarily concerned with the latter, for which reason an appeal to current practice will not suffice. Furthermore, the responsibilities assumed by a government in the context of anticipatory structural policies are sufficiently far-reaching to justify going back to first principles. In this respect, our starting point, as discussed in detail in chapter 2, is that the economic structure of the Netherlands is partly dependent on unvarying features such as geographical location, but that it is at the same time capable of modification, in response both to not-controllable determinants (e.g. the pattern of international competition) and to controllable factors (such as the Netherlands position in the international constellation of forces). The logical extension of this approach is that the Netherlands is partly tied to comparative advantages inherent in the more permanent structural features of the country, but that these may also be interpreted actively and dynamically within the defined limits, i.e. the creation of comparative advantages that lie within the bounds of practical feasibility.

In these terms the main functions of structural policy taken as a whole could be:

- clarifying the contours of the future economic structure, thereby providing both the private and government sectors with the means of reacting effectively;
- promoting the proper planning of government policy by improving the coordination between:
  - innovation and science policy,
  - economic policy,
  - labour market policy,
  - policy with regard to intermediate objectives.

In this sense structural policies would provide the framework for activating and mobilizing the country's potential by indicating a possible and desirable path for future development.

Although such policies should be properly planned, this does not amount to a planned economy. In the course of this section the limits to which structural policies are for a variety of reasons subject will be gradually brought to light. Such policies should, moreover, incorporate a strategy laying down possible responses to unpredictable developments, since it is clear from the outset that government policy will have to contend with unforeseeable factors.

[1] To the extent that the OECD has deemed it necessary to lay down rules for such policies: OECD, *The Case for Positive Adjustment Policies,* Paris 1978.

The remainder of this section is concerned with considering the potential merits of structural policies, weighing up the advantages and disadvantages (to the extent they are of a fundamental nature) as accurately as possible, and where necessary critically analyzing some customary considerations with regard to structural policy.

Arguments for and against forward-looking structural policies

Economic policy forms one of the government's concerns because of the latter's responsibility for the prosperity and welfare of its subjects. Particularly since the Second World War, the protection and promotion of a country's sources of prosperity have become part of government activity. Given this responsibility, the government has been obliged in recent years to provide intensified assistance to companies and industries in difficulty.

In this respect one might justifiably speak of a 'reserve' function for the state, i.e. a function that becomes activated only when circumstances so demand.

If this is then taken as the starting point, it means for the purposes of this study that the government can only be justifiably urged to conduct forward-looking structural policies if it can be shown that the structure of production:

- is of vital importance for the future development of prosperity and welfare (i.e. priority);
- is in principle susceptible to government regulation within the limitations set out in section 1.3.1. (i.e. feasibility).

The answer to the former question depends on the results of the preceding chapters. Given the necessity for specialization and product differentiation in a small economy such as that of the Netherlands, to what extent can the structure of production be said to be related to the fulfilment of the three classical objectives, namely growth, full employment and balance of payments equilibrium? Do technological developments add the further factor that a concentration of research and development activities is desirable? What implications do environmental considerations hold for the structure of production? An attempt will be made in this section to answer the second question, that of the fundamental acceptability of structural policies within the confines of the Dutch social and cultural system. In this respect the market economy occupies a central position in the Netherlands. Given the fact that structural policies involve a certain degree of government intervention, this study cannot escape dealing with the acceptability of official intervention in a market economy. The operation of any economic system, including the market economy, may be characterized in terms of the tasks, functions and activities of the allocation system. These are set out diagramatically below.

Tasks, functions and activities of a system of allocation

Tasks	Functions	Activities
a. propensity to invest (choise of consumption or investment)	a. Coordination (harmonization of behaviour & expectations at micro-level)	a. Entry & elimination of suppliers
b. Factor intensities (which combination of production factors?)	b. Initiative (incl. innovation)	b. Determination of offer (price formation & determination of conditions of supply)
c. Product mix (structure of production)	c. Dealing with risks and uncertainties (anticipation)	c. Behaviour control (use of mechanisms in the exchange of goods and services)
		d. Feedback; positive & negative incentives (incl. rewards to factors of production)

In judging the operation of a particular economic system, the time-horizon is also of vital importance: within which time-horizon are allocation decisions taken? This question is closely related to what Lowe has termed a condition of 'pre-stabilized harmony'.[2] Such a situation is characterized by a more or less stable and coherent relationship between macro and micro objectives and activities on the one hand, and the use of instruments on the other, all based on an accurate assessment of the data and within a prescribed time-horizon. Under these circumstances it may reasonably be expected that the dispositions of actors and enterprises will converge.[3]

That we are not just dealing with theoretical concepts, and that structural policies can play an important part in this context, is evident from the following evaluation of post-war industrialization, in which great weight was attached to this aspect:

'The fact that the government deliberately stressed the significance of industrial policy as a central component of its economic policies during the Marshall Aid period was in itself of considerable significance for the propensity to invest, even though it may not be possible to quantify this. One would not be doing the facts justice if events such as the establishment of a separate Directorate-General for Industrialization, the appointment of a Central Committee for Industrialization and the publication and widespread distribution of official reports on industrialization were not seen in this light. The Directorate-General, which was responsible for the execution and coordination of government policy on industrialization, was of course primarily a matter of organizational effectiveness; equally, the appointment of the Central Committee, in which representatives from the various sections of industry and special experts (from CIVI, TNO, etc.) collaborated with officials from various Departments in advising the Minister of Economic Affairs on key aspects of industrial policy, was principally designed to provide the government with an expert advisory body; the official industrialization reports were primarily written for the information of Parliament. This does not alter the fact that these factors all helped in their own way to contribute towards the right 'climate' for industrial activity. On the one hand, they drew specific and documented attention to realistic prospects and opportunities open to both individual entrepreneurs and the national economy as a whole. On the other hand they underscored the seriousness with which the government was intent on creating favourable conditions for private investment.'[4]

In the case of serious disruption such as that being witnessed at present in Western market economies, coordination becomes impaired. This then becomes expressed in the avoidance and passing on of risks, which in turn leads to loss of initiative. By means of conditioning (i.e. altered expectations of micro-units) this leads to such a shortening of time-horizons that immobility and defensive postures result.[5] Apart from Lowe, Klein has also been intensively concerned with the operation of the system of allocation.[6] His approach differs from that of Lowe, and his observations provide an important complement on a number of points. In particular, the concept of 'pre-stabilized harmony' might give the impression that the status quo is taken as a guideline. Nothing could be further from the truth: the function of the system of allocation in an open economy is to preserve a proper balance between static and dynamic efficiency. The former relates to the execution of well-defined tasks and anticipating foreseeable occurrences, while the latter concerns the capacity to cope with unforeseeable occurrences by means of technical and organizational innovation.

[2] A. Lowe, *On Economic Knowledge*, New York 1965.

[3] In a critical evaluation of the British experience, P. Meadows ('Planning', in F.T. Blackaby, ed., *British Economic Policy*, Cambridge 1978, p. 414) arrived at the following conclusion: 'Indicative planning as a way of accelerating growth rates may have failed; it remains true that investment plans based on assumptions of low growth rates will help to bring low growth rates about.'

[4] W. Brakel, *De industrialisatie in Nederland gedurende de periode der Marshall-hulp* (Industrialization in the Netherlands at the time of Marshall Aid), Leiden 1954, p. 111.

[5] These phenomena are by no means confined to enterprises, but apply equally to all decision makers in the system of allocation (e.g. consumers, employees and government). The 'guilt question' does not therefore apply in this context.

[6] Burton H. Klein, *Dynamic Economics*, Cambridge Mass., 1977.

Stability can only be expected at the macro level provided that both these aspects come into their own, in the knowledge that this will to a certain extent have to be combined with instability at the micro level. 'Defensive' policies can instead achieve the opposite of that intended because they lead to a reduction in the capacity for dynamic adjustment.

With regard to the American economy, which has traditionally been regarded as a leading model of dynamism, Klein believes that a tendency towards more static development has recently set in: 'Through examination of cases and evidence in the framework of the theory of dynamic economy, this chapter will develop an argument that the US decline in productivity growth can be traced to a declining rate of technological innovation.

This decline, in turn, will be explained in terms of declining propensities toward risk taking and entrepreneurship, and these declines will be traced to the declining entry of new firms and to the development of a political system that favors preservation of the status quo.'[7]

In other words, the system of allocation of the United States – and the same applies more generally to Western economies as a whole – is not functioning optimally; feedback and the entry and elimination of firms are not working properly.

The question then arises whether it is possible to improve the operation of the system of allocation and whether the major functions of initiative and anticipation can be left to the privat sector or whether the government can or should play an active and stimulatory part. In the Netherlands, primacy not only tends to be accorded to the role of private enterprise in thinking about allocation problems and social order, but these matters are often seen in personified terms, as if to suggest that individuals in their capacity as entrepreneurs were the sole vehicles for initiative and risk-taking. Such notions fail to do justice to the long-established prominence of large enterprises. Because of the increased complexity of national production, the operation of the system of allocation has – in conformity, it may be noted, with market laws – to a significant extent shifted from individuals to institutions; while managers may still make a large personal contribution, and be major sources of initiative and bear substantial responsibility, they do not incur any financial risk. Moreover a large element of the coordination of economic decisions has in fact been withdrawn from the market, because such coordination now takes place within large enterprises.[8] If this is realized and if account is also taken of the fact that in parallel with this shift the government has acquired the responsibility[9] for determining the macro-economic framework (i.e. tasks a. and b. in the diagram), this inevitably leads to the conclusion that the institutional framework must form part of the system of allocation. For this reason internal and external company reorganization need not necessarily represent a challenge to the entire social and cultural order.

The institutional framework also affords the possibility of adjustment to new circumstances and challenges.[10] A reorganization of this kind has once again come to the fore, in this case the return to 'pre-stabilized harmony.' In organizing our production, how do we:

– make allowance for the new data with which we are confronted (e.g. technology, scarcities, international specialization)?

[7] Burton H. Klein, 'The Slowdown in Productivity Advances: A Dynamic Explanation', In C.T. Hill et al. (eds.), *Technological Innovation for a Dynamic Economy,* New York 1979.

[8] By means of the application of the grouping principle in order to reduce risks. See: F.H. Knight, *Risk, Uncertainty and Profit,* Boston 1921.

[9] It has been a major struggle both to clear the political way to this end, and to equip the government appropriately. See: H.M. Hirschfeld, *Actieve Economische Politiek in Nederland in de Jaren 1929-1934* (Active Economic Policies in the Netherlands during the years 1929-1934), Amsterdam 1946.

[10] Alexander Gerschenkron has written a stimulating essay on the historical determinism of the fulfilment of allocation functions in market economies: 'The Modernization of Entrepreneurship' in *Continuity in History and other Essays,* Cambridge Mass. 1968.

Particularly apt is his suggestion that institutional arrangements can play a decisive part in shaping entrepreneurship and that personal qualities are not the be all and end all. See also: H.W. de Jong's contribution on the significance of the corporation in the economic development of the Netherlands in *Het Nederlandse structuurbeleid* (Structural Policy in the Netherlands): 'De zichtbare vinger aan de onzichtbare hand' (The visible finger on the invisible hand), in WRR series 'Voorstudies en achtergronden' (Preliminary and Background Studies), The Hague 1980.

- convert into specific terms the long-term tasks that are designed to fulfill our socio-economic objectives?
- give institutional shape to the fulfilment of functions?
- decide on the lengthening of planning horizons?

In this context the structure of production must at the present time form a major focus of attention since that structure provides a means of assessing the feasibility of macro-economic objectives and can also provide a detailed frame of reference for micro-units in the economy.

Part of such an approach also consists of:

- identifying the comparative advantages the Netherlands will have to establish with a view to the production and the products that may be regarded as indispensable for the Netherlands structure of production;
- how greater certainty could be achieved with regard to certain essential features of the investment climate;
- which risks will have to be assumed by the government where these exceed the capacity of individual companies.

This does not therefore mean that the market is eliminated. In particular, if the economy can be adjusted by official means to the problems of the day (i.e. dynamized) the operation of market forces will if anything be strengthened at the level of concrete activities and private initiative. Examples include the stimulation of the entry of new firms and of competition, and allowing responsibilities to come more fully into their own.

There are further, subsidiary reasons why it is of great importance for a new orientation towards economic policy to be arrived at in a small economy such as that of the Netherlands. There are a number of trends of importance for the Netherlands in the international context:

1. On the basis of the Japanese model, the newly industrializing countries are gradually turning towards planning and mobilization as principles of economic development. This formula has now been demonstrated to be succesful in a number of instances, and is of particular significance for our own cultural region because it contains a synthesis of cooperation and competition.
2. Large and highly-developed economies such as those of the United States, West Germany and Japan have evolved a form of structural policy which, while it might be put forward as technology policy, is no less effective in relation to structural problems, and which is inherently forward-looking. In this regard one expert observer has even termed the United States as one of the most centrally-planned economies in the world.[11] Hauff has shown in detail how technology policy in West Germany is in fact structural in nature.[12] Given the exclusive position occupied by the large and highly-developed economies in the world in a technological sense, these economies can afford to exploit their comparative advantages in this regard and for the rest to administer defensive structural policies.[13] Thus the official West German attitude against government intervention may be regarded as being partly prompted by the country's own interests, secure in the fact of the economy's market position and its appropriately geared technology policies.

The Netherlands must determine its attitude and select an international position with regard to these two phenomena. Given the Dutch pattern of specialization, policies along the lines of the major industrial powers would not be feasible – despite the importance of technology policies for bringing about change in that pattern – while policies based on planning and mobilization would not appear consistent with present Dutch circumstances.

Nevertheless it should be realized that the appeal and the competitive power of the latter policies form a significant factor. However sceptical we might be concerning the range of such policies ('only a suitable formula for copying

[11] J.C. Smit (Chairman, Board of Directors of Holec), in *NRC-Handelsblad*, 20 December 1978.
[12] V. Hauff, 'Technologiepolitik als Strukturpolitik (Technology policy as structural policy), *WS-Mitteilungen*, Vol. 29, H. 10, October 1976.
[13] H.R. Peters, 'Konzeption und Wirklichkeit der Sektoralen Strukturpolitik in der BRD' (Theory and Practice of Structural policy in the FRG), in: G. Bombach et al., *Probleme des Strukturwandels und der Strukturpolitik* (Problems of Structural Change and Structural Policy), Tubingen 1977.

developed countries'), we will nevertheless feel their impact in export markets. This does not necessarily mean that we should embrace a similar formula, but it does mean that we should take account of the significance of the cooperation principle in addition to that of competition.

The claim that this would not fit into our culture may be rejected by reference to the extensive literature and body of practice built up on the subject. Stark refers in this context to 'antagonistic cooperation' as an obvious means of reconciling competition and cooperation in our culture.[14] And does not such a synthesis form the principle on which large enterprises are based? These enterprises consist of components which may be in competition with one another ('antagonism') but which are at the same time directed towards a common goal ('cooperation').

It is not clear why this institutionalized arrangement should not be capable of being extended more widely (on condition that the overall result is a functional one).

The major objection levelled against forward-looking structural policies in the Netherlands was expressed in the Selective Growth Policy Report.[15] The attitude taken in that report was confirmed as a basic policy premise by the Minister of Economic Affairs in September 1979 when submitting the 'Sectoral Report':[16]

'The drawing up and implementation of a detailed, quantitative structural plan run into many difficulties in our system. In this respect the substantial openness of the Dutch economy is a significant factor. A quantitative blueprint for our economy is not feasible' (p. 9).

The same point was made in a somewhat different way in a recent German study:

'Die Möglichkeiten einer präventiven Strukturpolitik, die in solch weiten Grenzen die Produktionsstrukturen beeinflusst, sind allerdings begrenzt. Da in dem offenen marktwirtschaftlichen System immer wieder neue, unerwartete Ereignisse auftregen, können strukturelle Entwicklungen völlig anders als prognostiziert verlaufen. Eine auf konkrete Gestaltungsziele ausgerichtete präventive Strukturpolitik muss sich daher darauf beschränken, offenkundigen grösseren Fehlentwicklungen zu begegnen. Umso wichtiger wird folglich eine Ordnungspolitik, die ein präventives und schnelles Handeln der marktwirtschaftlichen Akteure überhaupt erst ermöglicht und zugleich dazu zwingt'[17].

The question with which we are concerned is whether these views establish the fundamental impossibility of forward-looking structural policies; in both the above cases, the arguments put forward are taken as decisive objections towards the possibility of forward-looking structural policies.

Now we would acknowledge from the outset that this forms the Achilles heel of structural policies.[18] This is not, however, because this weakness is specific to this type of policy: a rapid change in circumstances forms a complicating factor for any type of policy, while at the same time forming a motivation for government policy. If the changeability of circumstances – to which the Netherlands is particularly susceptible in view of the openness of its economy – is so great as to vitiate structural policies, the Netherlands would be condemned to being a 'predator economy'. In this case the investment of very large sums in the framework of technology policy would be futile. Changeability not only

[14] W. Stark, *Fundamental Forms of Social Thought,* New York 1973. This book deals solely with Western thinking.

[15] *Nota inzake de Selectieve Groei (Economische Structuurnota)* (White Paper on Selective Growth (Economic Structure Report)), Second Chamber, 1975-1976 session, 13 955, nos. 103.

[16] *Voortgangsnota Economisch Structuurbeleid (Sectornota)* (Progress Report on Structural Policy (Sectoral Report)), Second Chamber, 1979-1980 session, 15 818, nos. 1-2.

[17] *Staatliche Interventionen in einer Marktwirtschaft* (Government intervention in a market economy), BMWI Studies series 24, para. 94.

[18] Unless care is taken it can lead to the socialization of losses. See Hauff, op. cit. Recent events in the Dutch shipbuilding industry have shown how such expectations can be converted into reality. Industrial activities in this sector have even become formally classified along such lines that only loss-making aspects receive government support, while profit-making sections are treated separately.

affects the government as policy formulator but, equally, private investors as well.[19]

Any form of investment policy, including structural policies concerned with investment, is subject in practice to the optimization principle, including relevant 'pay-back' periods.[20] The shape of such policies will differ fundamentally according to sectoral differences in pay-back periods, especially if such variations are pronounced – take for example a steel plant or a clothing factory.

At most, the arguments quoted above amount to the fact that forward-looking structural policies must be conducted in a differentiated and vigilant manner, but do not invalidate the basic feasibility of such policies.

To reformulate it in different words:

1. Investment risks are ultimately borne by society, whether or not the government becomes involved through structural policies. The fact that risks are incurred is not therefore a sound argument against structural policies.
2. There are two sorts of risks. There is not only the risk that investment may turn out wrongly, but also the risk that essential investment is neglected. These risks must be weighed up against one another (the optimization process). Forward-looking structural policies are far more geared towards compensating for the second category of risks, because less weight is or can be generally attached to such risks by the private sector. To emphasize the former category of risks to the exclusion of the second is therefore scarcely an adequate form of argumentation.

A second objection concerns the expansion of government intervention associated with structural policies, irrespective of the basic merits of those policies. This argument draws on the empirical observation that once the government moves into a new field it tends to do so for good. This leads representatives of various persuasions to view structural policy critically if not to reject it altogether. Such considerations take the form that private enterprise should not be smothered by the government or that the pluralism of power (i.e. a balance of forces that forms a precondition for the functioning of democracy) threatens to be disrupted by the excessive coalescence of what is now regarded as a 'trilateral monopoly' (i.e. the state, private sector and the union movement).

Thus Mogendorff suggests in his report[21] that the maintenance of the basic freedom and responsibility of the entrepreneur to take the ultimate decision is an essential condition for the proper functioning of our economic order. If these basic elements are interfered with, the entrepreneur becomes no more than an implementor of decisions taken elsewhere that leave insufficient room for personal entrepreneurial insight and initiative. The result is stultification and the steady growth of bureaucratization. The role of government should be primarily confined to establishing the surrounding conditions or general framework within which private sector activity takes place. The fact that governments should confine themselves to measures of general application does not mean that no priorities need be established. Choices must be made with regard to the form and the general trend of the infrastructure, education, labour market regulations, government assistance for R & D, etc. Consultations between the government and the private sector are required in order to provide the government with the necessary data for policy administration and the determination of priorities.

In Inja's view,[22] the realization that economic problems can no longer be dealt

[19] It is noteworthy that in the study in question (para. 98) it is urged that costs be weighed up or compared on the basis of total social costs. The same wider social viewpoint is of relevance with regard to the acceptance of risks.

[20] The specific contribution of structural policy for individual investment decisions consists of eliminating avoidable or compensating for unavoidable uncertainties so that investment can be undertaken that would otherwise not be undertaken.

[21] See M.L. Mogendorff, 'Plaats en Toekomst van de Nederlandse industrie' (The place and future of industry in the Netherlands), in WRR series 'Voorstudies en achtergronden' (Preliminary and Background Studies), The Hague 1980.

[22] C. Inja, *Sectorstructuurbeleid: Instituties en instrumenten* (Structural policy: institutions and instruments), WRR series 'Voorstudies en achtergronden' (Preliminary and Background Studies), The Hague 1980.

with by means of general macroeconomic measures demands that we recognize the limits to growth and the need if the environment and living climate are to be protected for a more central and interventionist role by government. Under his approach the government should be regarded as a body with the task of influencing the economic activity of individuals, institutions and organizations and where necessary controlling them. To this end the government should have an overall and consistent view of the desired scale and path of development of the national economy. This view should be based on the specific contours of its socio-economic and intermediate objectives. The political choices made must be clear, public and definite, and should act as a guideline and frame of reference for government measures.

Structural policies, which involve intervention in industry and differential treatment of individual sectors, are characterized by the correction of problems and by guidance and stimulation where feasible. Government intervention should not in practice amount to the overall guidance and planning of all entrepreneurial activity but should involve the application of corrective, guiding and regulative instruments related to the problems and possibilities identified.

It is also possible to adopt a pragmatic approach to economic policy making and to defend the premise that the current situation is in many respects less than optimal, thus leading to the present policy impasse. In his report Inja discusses what he regards as the required sharp distinction of responsibilities with regard to allocation decisions. Such a demarcation would be promoted if the government were to define its responsibilities clearly, thereby rendering them susceptible to democratic and parliamentary control. Arguing along these lines it is possible to reach the conclusion that government intervention, provided it is subjected to clear conditions and restrictions, would not under the present circumstances derogate from private initiative and responsibility but could in fact throw them into greater relief.

It is our view that the appropriate degree of government intervention cannot be fully determined on the basis of theoretical considerations. A certain trend towards institutionalization is evident in society, related to the growing complexity of social activity. There are two mutually conflicting tendencies within the process of institutionalization. On the one hand, there are increasing rigidities, which are at the expense of individual initiative. On the other hand, possibilities are opened up for individuals that they would be unable to achieve by themselves. In the final analysis, confidence that these two tendencies will remain in equilibrium, including under conditons of increasing institutionalization, rests on an assumption or, in policy terms, on a political choice. It may be noted that the acceptance of state intervention at sectoral level doest not in any way imply that one would be obliged to accept institutionalization as permanently and universally unavoidable, or to put up with the trend towards greater rigidity.

In our view Stark's concept of 'antagonistic cooperation' referred to earlier provides a good characterization of an approach to this question in which ambivalence and vigilance would both come into their own.

This means that the functions of initiative and anticipation can be strengthened in the system of allocation and that, in certain circumstances, a positive contribution to that end may be expected from the government. This would of course have to be subject to adequate safeguards. The appropriate qualifications are set out in detail in 5.1.3 and 5.1.4.

5.1.2 *The place of preventive structural policy in overall economic policy*

The theoretical basis for structural policy: a meso theory?

Economists, in particular, are concerned with the theoretical foundation for structural policy: a concern not infrequently prompted by scepticism about such policies. It is therefore as well to examine this point in some detail.

The question of the need for a meso theory has been dealt with in two recent

publications.[23] In terms of economic policy, it is customary to draw a distinction between competition policy, global macro-economic or demand management, and structural policy. The latter covers both sector-specific and regional policies. Micro economic theory is generally accepted as forming the basis for competition policy, while macro theory is taken as underpinning demand management policies. This approach is often combined with the view that this is a theoretically 'firm' foundation. Gahlen, however, has rejected this view in a notable manner. His approach amounts to the fact that there exists at most a certain cross-fertilization between practical policy and particular conceptual approaches, and that one cannot really speak of 'firm' foundations. Seen in this light, the question arises: is there a complex of ideas within economic theory on which structural policy can draw?

Such a complex of ideas does exist and has been precisely outlined by L. Klein (op. cit.). It concerns the integration of the well-tried and accepted Leontief Input-output model and a production function system providing room for energy and intermediate inputs in addition to the primary factors of production of labour and capital. This specification of the supply side of the economy creates room for an analysis of structural problems and bottlenecks, while also being capable of numerical solution through being linked to the demand side. This has been specifically done in the United States with the aid of the so-called Brookings model and later with successive versions of Wharton models (L. Klein, op. cit.). Similar model analyses have been conducted in the framework of this study, as discussed in chapter 2. It is also of interest to note the linking up of structural models and growth theory, which has given rise to such concepts as dynamic growth paths (i.e. a dynamic Leontief model). This concept is of particular interest from a policy viewpoint, as noted previously in chapter 1.2.2.

Reference should also be made to the field of industrial economics, in which empirical research has for some time been fruitfully conducted on the basis of a synthesis of micro and meso theoretical perspectives. Such research may be restricted to the behaviour of and within particular industries, but the insight it provides is indispensible for the subject under consideration and the elaboration of structural policies.

The question as to whether there exists a theoretical basis for structural policies may therefore be answered in the affirmative. The basis for structural policies exists as it does for the two other forms of policy, except that in the case of macro policies there is a longer history and greater body of experience. The renewed interest in structural problems in both theory and practice should provide fertile ground for obtaining further and especially more detailed insight.

Complementarity of the three types of policies

In discussing this subject the point of departure should be clearly stated: there exist structural problems that must be solved partly by means of official policy. The question then arises of which optimal combination of policy measures should be employed by the government to that end. In this respect structural policy forms an option that should be viewed in conjunction with the other policy options. A number of cogent arguments apply in this respect.

1. Dutch structural problems also consist of a number of general aspects related to the country's competitive position that are much more responsive to overall (i.e. macro-economic) policies.

The prime examples include controlling cost factors (e.g. labour and capital costs, the latter including interest rates and tax deductability provisions, including investment allowances) and other stimulatory measures. This amounts to the argument (which virtually speaks for itself in the Dutch situation) that structural policies should not be substituted for macro policies. In other words, it will not be possible to 'buy off' macro policy with structural policies.

[23] B. Gahlen, 'Probleme des Strukturwandels und der Strukturpolitik' (Problems of Structural Change and Structural Policy), in G. Bombach et al., op. cit.
L. Klein, 'The Supply Side', *American Economic Review*, 68, pp. 1-7.

2. But policy instruments are not a 'free good'; they not only have yields in the sense of desired effects, but also costs in the sense of undesired side-effects. The more exclusively or heavily one relies on policies of a general nature, the more that undesired side-effects will have to be coped with (including in an relative sense, i.e. relation to the desired effects). This subject has in fact tended to dominate public debate in recent years. Wage control can run into local and sectoral scarcities in the labour market co-existing with high unemployment at the macro level.

Equally, in many major industries wage control need not necessarily lead to the creation of jobs. The relationship can even be a negative one. A third example concerns import leakages, as a result of which general measures may fail to have the desired impact.

These considerations are all related to the necessity discussed in section 2.1. of reallocation on the basis of specialization and product differentiation. As long as such reallocation fails to occur in the desired form and obstacles are not removed, the process of industrial disintegration can continue despite cost control. In other words, this lends support to the proposition that current structural problems cannot be solved by macro-economic policies alone.

3. Selective policies – which structural policies are to a greater extent than macro policies – are designed to increase the effectiveness and efficiency of the total package of policies, that is, to help reduce discrepancies between individual sectors in an appropriate manner, thereby:

- rendering macro-economic policies more effective for a given input of instruments;
- enabling a lower input of macro instruments to achieve a given effect.

4. Depending on the circumstances in a particular industry, structural policies and government intervention can be directed towards promoting competition, especially entry into the market. On this account competition policy may be deemed to form part of structural policy, certainly to a greater extent than hitherto.

The content and significance of the complementarity approach set out above will be examined in greater detail in chapter 6 in relation to the solution of current problems.

5.1.3 *General conditions for implementing structural policies*

If the essence of structural policy is regarded as 'antagnostic cooperation', related both to relationships between enterprises themselves and to the relationship between the government and the private sector, it will be evident that this interaction is tied to a number of specific conditions. The system of intervention can only be made successful if it can take root in the right socio-political setting.

To put it differently, it must be ensured that structural policies do not become strongly politicized and do not become a hostage to party-political conflict as has happened in the United Kingdom. Unless there is a minimum of administrative stability, the positive effects that might otherwise be expected will be totally nullified. Economic and political realities must be properly faced up to.

On the one hand, therefore, there must be due willingness to adopt a pragmatic approach, to the extent that the application of 'economic laws' is recognized and the need to leave the market mechanism intact accepted in order to promote the effectiveness and efficiency of economic activity.

On the other hand the principles of objectification and democratic control should be given primacy, whereby the community assumes far-reaching obligations through the government.

These two conditions need by no means be in conflict with one another. On the contrary: practical experience in recent years has indicated that governments allocating large sums of money without taking proper account of the principles of objectification and democratic control tend imperceptibly to eliminate a large element of the market mechanism. This is because they compensate for the consequences of bad management and take on the resultant

losses without having properly determined beforehand what effects this will have. In its assessment of past policies of government support for individual companies, the Sub-Committee on Government Support for Individual Companies reached a particularly damning verdict (see section 5.1.4). The consequences of such policies are not confined to the specific instance of compensating for losses but extend to a much wider field. As a consequence of the one-sidedness of government policy – i.e. the fact that it accepts responsibility only for the negative results of risk-bearing – the private sector has come to anticipate this possibility and has begun to pass on risks. To go further down this path would indeed lead to the socialization of losses. This development has been favoured by the lack of objectification of and control over government policies. We accordingly believe that sound structural policies should place much greater emphasis on openness, accountability and supervision of results.

A second major requirement concerns the competence of the government machinery, especially in relation to industrial (including structural) problems. This amounts to expertise, initiative and skill in formulating operational objectives and forms of cooperation. In theory this requirement will be self-evident, but in practice it is not so easily fulfilled. Japan's success in this field, for example, is ascribed by observers to this very aspect, i.e. the government's professional expertise in this field, allied to a certain independence in relation to the political system.[24] This independence should of course be viewed in conjunction with the objectification of government policy if the latter is to be acceptable in a democratic sense.

A lack of competence can lead to the government having the wool pulled over its eyes and subsequently being shunned by strong corporations as an unreliable partner because the advantages of financial aid – the only asset the government can fall back on in these circumstances – do not measure up against the risks of amateurism and bureaucratic muddle.

In our view very substantial weight should be attached to the requirement of government competence if sectoral policies are to succeed.

This does not mean that the government should (or should be able to) take over the role of business management, but that it should be in a position to evaluate companies and industrial projects and to assess their inherent risks. Furthermore its understanding of the structure of production and of international industrial developments must be 'up to date'. Where the government does not itself preside over the requisite specialist knowledge, arrangements must be made enabling it to mobilize such knowledge at will. This requirement for competence on the part of government provides a safeguard with respect to the grounds on which commitments are entered into or projects are rejected. In this regard it must be ensured that preferential treatment and the ability to manipulate the government set-up are ruled out.

In additon we would support a number of subsidiary conditions formulated in the German literature referred to earlier[25]:

- decisions about structural measures and alternatives will have to be taken on the basis of cost-benefit analyses and – where that is not feasible – at the least on the basis of a comparison of overall/social costs;
- structural measures should be regularly evaluated in terms of the set goals and be examined for any undesired side-effects. Periodic supervision of results of this kind should form an integral part of government policy;
- the allocation of subsidies and other financial benefits should be subjected to administrative supervison of the use to which they are put.

It is of great importance in policy terms that these rules of conduct, which are fully consistent with the general requirements stipulated above, be explicitly formulated.

[24] Japan, Asia's New Giant, op. cit.

[25] *Staatliche Interventionen in einer Marktwirtschaft* (Government Intervention in a Market Economy) op cit. para 98.

5.1.4 *Implementation of forward-looking structural policies: the framework of intervention*

Structural policy and sectoral policy

With regard to the framework of offical intervention, a distinction should be drawn between structural policy and sectoral policy. The former is directed towards the overall structure of the economy, in which growth potential and specialization and product differentiation form an implicit part. The structure of the productive capacity in the Netherlands can form a major factor in helping adjust to shifts in the international economic order. On the basis of the sorts of activities open to the Netherlands in the next few decades it becomes possible to formulate our future functional position in the international market. That position can reflect not only our possibilities but also our ambitions. If the necessary will exists to work towards that end and to eliminate possible bottlenecks and obstacles, this can act as an inspiring conception of the future.[26] Seen in this light, one of the major contributions of structural policy can be to re-establish a 'pre-stabilized harmony', without which any form of reasonably balanced growth is inconceivable.

Whereas structural policy is concerned with relationships between sectors, sectoral policies are concerned with relationships between sectors, sectoral policies are concerned with relationships within specific sectors. At the policy implementation level the stress will lie on sectoral policy. But sectoral policies should be developed and assessed in terms of the desired structure of production. This in turn means that the structure of production should be consistent with projections of a macro-economic nature. By taking account of meso-economic and technological considerations, the implicit structure of production is made explicit, thus enabling a complex of operational objectives to be derived from the general objectives. The forward projection of the structure of production and the continual adjustment of such projections form the starting and finishing points of forward-looking structural policies.

A comparison of objectives and likely developments in the event of unchanged policies provides insight into bottlenecks, discrepancies and possibilities, which can form the point of application for active government involvement. We would therefore stress that the government should from the outset confine itself to interfering in those areas where government action appears justified, i.e. those industries where there exist major problems or possibilities which would not be solved or fully exploited in the absence of government action. The latter will only take concrete shape by means of selective policies geared to specific sectors.

Intervention modalities: a possible approach

In his report De Jong distinguishes five modalities for sector-specific policies:

1. selective government stimulation (establishment of key industries);
2. selective government intervention (restructuring of industries);
3. selective nationalization;
4. properly planned guidance of the economy on an integrated basis (indicative planning);
5. over-lapping industry organization on a corporative basis.

The first two are capable of being implemented in conformity with market principles as can the third, provided it is applied incidentally and not as a basic aspect of official policy. 'In conformity with market principles' means in this context that the enterprise in question remains primarily responsible for the decisions it takes and must also bear the full range of consequences. As such the government would refrain from protecting unsuccessful entrepreneurs, while a clear distinction would continue to be drawn between the responsibilities of employers and employees. In this context the union movement

[26] This is the position taken by Dr. I.A. Pannenborg in an interview in *NRC-Handelsblad* (6 October 1979): 'That is a totally different approach: it says let's put our shoulder to the wheel: as part of our national goals we have said that we want to occupy a good position in this field and that's just what we're going to do...' (remarks on German technology policy).

would not be forced to accept any responsibility for decisions that belong to the sphere of company management and the providers of capital. In this way the union movement would retain its complete freedom of manoeuvre for fulfilling its basic functions.

On the basis of these considerations, i.e. the desirability of adjusting the Dutch economy in line with international competitive forces, and the avoidance of rigidities and bureaucratization, the discussion below is confined to modalities 1 and 2 and, on an ancillary basis, to modality 3, i.e. stimulation and intervention in conformity with market principles.

Sectoral policy

We would stress the fact that the type of sectoral policies undertaken by the government are quite distinct from the forms of sectoral consultations that have been independently set up in certain industries.

The problems, responsibilities and powers differ so greatly in the two cases that any attempt to link them up would seem inadvisable. This may be clarified by reference to a particular aspect (admittedly one of major importance): the entry of new competitors and making the provision of official aid and facilities conditional upon evidence of sound entrepreneurship. In the case of branch consultations and cooperation this may legitimately be regarded as a potential breaking-point, while in the general context of government measures and the stimulation and generation of new entrepreneurship – for example by the establishment of new companies – it can form one of the most important instruments.

In more general terms reference should be made to the need for a clear division of responsibilities and precise demarcation of the government's sphere of competence, the latter resting on a proper legislative foundation. The specific responsibilities should also be clearly reflected in the institutional arrangements created for the purpose.

With respect to sectoral policy we believe that a conscious distinction should be drawn up in terms of different forms of intervention. The choice will depend on the market structure and on the extent to which intervention is deemed necessary in a particular branch of industry.

The particular type of market structure may be determined in terms of such criteria as barriers to entry (minimum efficient scale with regard to production and/or sales, absolute volume of required investment, technological thresholds, etc.), price formation, degree of product differentiation, and scale of forward and backward integration. The more the market structure takes the form of heterogenous oligopoly, the greater or 'heavier' the form of intervention required; to the extent that the market structure approaches perfect competition, only a light form of intervention would be justified in terms of industrial economics.

The priority criterion (i.e. the degree of urgency) should always be applied in such a manner that a 'lighter' form of intervention may be selected than that perhaps indicated in strictly economic terms, but not a heavier one.

All this is of course on condition that the desirability of intervention – in whatever form – should be positively established beforehand (for an answer to the question as to who should establish this see section 5.1.6), while the participation of enterprises should continue to be based on the principle of voluntariness. In those cases where official policy threatens to be undermined by lack of cooperation from existing companies resort can be had to selective stimulation. This naturally also applies to the encouragement of activities that have scarcely got off the ground in the Netherlands.

The criterion for differentiating individual branches of industry should consist of the volatility of the market in which a particular industry operates and the extent to which individual enterprises are in principle able to cope with such volatility and to respond to it in organizational terms.

One of the basic errors of past policies of official support for individual enterprises has been the inadequate consideration given to these distinctions.

In the ready-to-wear clothing industry, for example, there is a highly

developed degree of competition, linked with high mobility and short pay-back periods. The replacement value of an individual company in this industry is accordingly very little more than its actual book-value. In terms of business economics support for individual companies in difficulty would be exceedingly risky, and of questionable merit in national terms. The desire to preserve existing companies that are out of line with market forces would fail to have the desired effect since it is precisely by a high degree of entry and elimination of firms that such industries adjust to market forces. Impeding the elimination of firms from the industry by means of financial support only frustrates entry into the industry, since newcomers are confronted with less favourable conditions of entry. The provision despite this support for individual companies can weaken an industry. By way of analogy with the science of communications one could speak in this context of a 'two-step-flow of innovation'. Innovation and change – including where attention is directed towards an industry as a whole – should primarily be brought about by means of policies geared towards innovational pioneers.

Heavy metals form a diametrically opposed case. In this industry the barriers to entry are high, there is little mobility and there are long pay-back periods. The social replacement value of a steelworks is significantly higher than its operational book-value, for which reason there is a sound case in principle for providing support to individual enterprises of this kind.

The necessity for government aid to industry should be subjected to critical examination in terms of general welfare criteria. These critera should, moreover, be rigorously related to the future: in view of the limited funds at the government's disposal, the allocation of substantial assistance to languishing industries can simply no longer be justified.

The operational significance of the sectoral level

The operational significance of the sectoral level inevitably arises in any discussion of the merits of sectoral and structural policies. The doubts in this regard – on the basis of which sectoral policies are often rejected out of hand as unfeasible – exist at three levels, namely:

- the marked differences in profitability between individual enterprises in the same branch or industry: it is possible to find strong companies in declining industries, and weak ones in flourishing industries;
- the fact that market and industry demarcations do not always correspond: companies within the same branch of industry may be active in sub-markets that differ in structure and development;
- the mobility and changeability of business activity, as a result of which an industrial classification can be conducive to rigidity or have a 'stigmatizing' effect, thereby reducing flexibility and having the opposite effect to that intended. This factor (it is argued) is accentuated by imminent technological breakthroughs (e.g. micro-electronics).

None of these factors can be challenged in themselves; the question is however whether they undermine the operational significance of the sectoral level to such an extent that official policies at that level would simply fail to get off the ground. We shall deal with this question first. A second question which must then be tackled concerns the limitations that should be imposed on the formulation and execution of sectoral policies in the light of these factors.

With respect to the principal question the following considerations may be said to apply. If the operational significance of the sectoral level may be regarded as limited, this would mean that in practice there should exist no forms of cooperation, for the simple reason that such cooperation would lack any economic rationale. In practice, however, the situation is entirely different. De Jong has examined this subject in some detail in his report[27], and has the following to say:

'We are, however, concerned with a most widespread phenomenon that occurs in all conceivable forms in various industries, and which is of great significance for the implementation of virtually any type of policy, whether by the

[27] H.W. de Jong, op. cit. See also his 'Kartels' (Cartels) in *Samenleving en onderzoek* (Society and Research), Leyden 1979.

government or by industry itself. Cartels are able to regulate output, investment, prices, product range, specialization, exports, imports, etc. and are able to assist but also to frustrate official policy (...).

The reason for my dwelling on the subject of cartellization is that it is often pointless to set store by official structural policies when the degree of cartellization is as high as it is in many Dutch branches of industry. In other words, private industry has itself already tackled structural problems and shaped them in a direction designed to bring about the solutions it desires.'

Such a different picture emerges from the real world that one is forced to assume that – despite all manner of complications – the operational significance of the sectoral level with a view to the relevant market size cannot be doubted, while industry itself has developed similar forms of cooperation, partly in order to deal with structural problems. The real question, therefore, is whether this leaves a role for the government. The remainder of this section is concerned with this fundamental question; the operational significance of the sectoral level would not appear to form an insurmountable handicap.

This is not to deny that the factors referred to above imply at least the following limitations:

- in demarcating the sectoral level primacy should be given to the operational significance as a criterion;
- the application of common and binding regulations on individual sectors should be approached with the utmost restraint;
- the risk of rigidities should be taken seriously.

An analysis of the reasons for the failure of NEHEM[28] provides further support for our approach.

The need for prior formulation of criteria and guidelines: the significance of a monitoring system and the objectification of policy

The report by the Sub-Committee of the Standing Parliamentiary Committee on Government Expenditure,[29] which evaluates the policy of official aid for individual enterprises, contains a number of valuable lessons. The report contains conclusions with regard to assistance to individual firms and also the overall policy framework. With regard to assistance to firms the report concludes that:

- it is very difficult to pin down the criteria on which the policy of assistance is based;
- the effect of such assistance (e.g. the direct effect on employment) is virtually beyond official control;
- financial supervision, i.e. the control exercised over the actual disbursement of financial aid, is inadequate.

With regard to the overall policy framework the report suggests that:

- the legislative framework (i.e. administrative orders etc.) for the provision of assistance is defective;
- the minimum requirements of public accountability, both towards parliament and parties directly affected (because of distortions in the pattern of competition) are not fulfilled;
- institutional arrangements (for example in the case of NEHEM) have not been sufficiently developed;
- the provision of aid was scarcely subject to any on-going evaluation or adjustment, for the simple reason that no provisions to that end have been made. This leads the Sub-Committee to conclude that although the provision of aid to industry had been essentially intended as complementary, it has in fact produced substitution effects. This has paved the way for the passing on of risks to the government.

[28] H.W. Vrolijk, 'Ervaringen van de NEHEM' (The NEHEM experience), address to the circle of Amsterdam economists on 9 May 1980.

[29] Sub-Committee on Government Support for Individual Companies, *Steun aan Individuele Bedrijven* (Support for Individual Companies), 7 December 1979.

Evaluation and adjustment of aid to industry policy did not in fact occur until the Sector Report,[30] and then only in a manner open to criticism. The tenor of the extremely summary evaluation of official policy (p. 36) does not correspond at all with the report of the Sub-Committee. The suggestions for policy adjustment (pp. 37-39), as set out in the reformulation of the appropriate criteria, do not go far towards meeting the deficiencies noted in the Sub-Committee's report.

In the Sectoral Report, the regional labour market situation remains the main criterion (although admittedly it has been tightened up) while policy continuity is treated as a side restriction. From the viewpoint of policy effectiveness the reverse order would seem more advisable. The Sectoral Report does, it is true, express the right intentions with regard to another of the Sub-Committee's wishes, namely that aid to individual firms should to a greater extent be placed in the context of sectoral policy. But under the existing regulations it remains unclear whether pressure to intervene in crisis situations can if necessary be resisted. This may be compared with the lesson to emerge from the Sub-Committee's report that the provision of government support on ad hoc grounds in crisis situations in virtually bound to fail.

Similar conclusions have been reached for Britain by Mottershead.[31] In doing so, he wrote, in a spirit of understatement:

'But if the aim is to intervene better, there are various improvements which can be suggested. First, crisis interventions require swift decisions with little time to consider alternatives; a better industrial monitoring system to provide early warning of impending problems therefore seems worthwhile. Secondly, criteria for selecting the interventions most likely to benefit the economy, established in advance of any specific rescue, would reduce ad hoc decision making. Thirdly, the creation of a single mechanism of intervention might improve on a situation where each case requires separate legislation and individual organisation. Fourthly, a systematic check on the results of intervention would seem to be required.'

In our view a fundamental reappraisal of government intervention is called for. The way it has been conducted to date it would have been preferable for there to have been no intervention at all.

We are well aware that these conclusions – in relation to both Dutch and British experience – raise the question as to whether the government is capable of doing much better. Is it not illusory to imagine that an improvement in the administrative infrastructure will lead to the desired effect, and is it not clear that the government will consistently fail to measure up for the simple reason that it is operating beyond its sphere of competence? The answer to this question depends on the extent to which one is prepared and able to objectify and – to anticipate section 5.1.6 – to professionalize government intervention. This is not of course to derogate in any way from democratic decision-making or public supervision. On the contrary: a sharp distinction between the determination of the broad lines of government policy on the one hand and its operationalization and execution on the other can in fact – because of the necessary process of objectification – lead to greater clarity in decision-making and can increase the scope for public supervision of government policy. For the latter it is necessary that responsibilities be laid down in detail beforehand.

The operationalization and execution of government policy should be placed in professional hands. On the basis of the experience accumulated to date we would impose the following binding conditions on government intervention:

1. Government intervention should be based on operational programmes derived from the government's overall goals, i.e. policy should be anticipatory in nature. We have in mind here the policy analyses which were considered in chapter 2, and which gave rise to the formulation of possible forms of selective stimulation and intervention?
2. Before proceeding to the actual implementation of policy, a complex of

[30] *Voortgangsnota Economisch Structuurbeleid* (Progress Report on Structural Policy), op. cit.
[31] P. Mottershead, 'Industrial Policy', in: F.T. Blackaby (ed.), op. cit., p. 481.

'intermediate' and final effect variables or indicators should be specified for each sector with which government policy is in principle concerned. With a view to the anticipatory nature of government policy such 'intermediate' effect variables[32] are very important because in many cases the final effects will only be measurable at some stage in the future. By localizing and spacing the desired effects more precisely in time, government policy becomes more susceptible to control and direction.

3. Intervention should be formulated in terms of clear regulations and conditons, in the interests of the legal security of the parties directly involved.

4. There is a requirement for a monitoring system enabling developments to be followed. In this way the impact of the inevitable uncertainties can be contained. Given these uncertainties, there should be a built-in element of flexibility in government policy. Frequent monitoring will enable government policy to be evaluated and adjusted as necessary.

5. The standards by which policy is to be judged (e.g. effective costs per job created, turnover and profitability) should be specified beforehand. Unsuccessful policies should not be persisted with.

The framework of intervention at sectoral level

Given these basic premises for government intervention, the question next arises as to how they might be given institutional shape.

A schematic survey of possible forms of intervention is given below. By way of example, these have been related to specific sectors; this does not however amount to a one-tone relationship. The distinctions are based on the criteria discussed above, namely market structure and the degree of urgency. The classification into three forms is not absolute, but the division into three groups does bring out clearly the scope for differentiation.

1. heavy form	basic and comparable industries
2. light form	consumer goods industries (furniture, footwear, clothing, graphic products).
3. intermediate form	engineering industries (metal products and machinery industry, electrical engineering and optical industry).

In assessing these frameworks of intervention it should be borne in mind that they remain essential even when the actual sphere of operation is only partial, if only because of possible side-effects, and also with a view to the desired objectification of policy. Partial application includes:

- where participation in a particular sector is not complete in that it does not cover all enterprises in the sector;
- where the regulations only apply to a part of the activities/markets in which participants are active.

1. Sectoral intervention framework: heavy form

1. Appointment of a sectoral committee at industry level answerable to the Government Commission[33] which would after consultation draw up guidelines with regard to:
   - the desired level of capacity;
   - the desired level of employment, partly on the basis of specialization;
   - the desired scale;
   - the acquisition of technological knowledge and know-how;
   - distribution of labour;
   - division of labour with regard to research and development.

   All this would be based on explicit quantitative and qualitative sales targets

[32] This term has been taken from the field of commercial economics. The effectiveness of government policy should also be assessed in the short term, although many effects do not manifest themselves until the long term. In order to facilitate a running check on policy effectiveness use is made of 'intermediate effect variables' (such as brand identification in the case of advertising, whereas profits and turnover are the real effect variables).

[33] See section 5.1.6.

and efficiency and innovation standards etc. at the level of individual branches of industry and of individual participants.

This complex of objectives and provisions for control should be constantly monitored on the basis of national and international developments and if necessary adjusted in the context of a continuous information and control system.

2. The formulation of a package of measures including financial aid, taxation facilities, export promotion, government purchasing policy and investment using public funds.

The provision of tax facilities should be made explicitly dependent on the fulfilment of the goals and standards laid down.

3. Surveillance of the market structure and performance by the sectoral committee and adjustment on the basis of administrative determinations and sanctions. Thus persistent failure to meet the required standards should lead to the withdrawal of concessions and to the active recruitment of new entrepreneurship.

4. Appointment of an executive body which would amongst other things exercise supervision over:

- the solvency of participants;
- the application of facilities and investment funds for specific purposes;
- the fulfilment of sales and efficiency standards;
- redemption of loans and repayment in the case of royalties, etc.

2. Sectoral intervention framework: light form

1. This is virtually confined to industries as a whole.
By means of a sectoral committee – which would be answerable to the Government Commission – measures would be devised designed to bring about the following:

- analysis and surveillance of international competitive position;
- model policy administration in the fields of administration, cost estimation and company supervision;
- information on technological developments, market trends and quality control;
- specialist advisory and research facilities for the information of individual firms and comparative interfirm research.

2. Stimulation of new entry and improvement of entrepreneurship[34]:

- training and schooling facilities;
- business establishment facilities;
- study trips and training abroad.

3. Concentration and promotion of industrial design[35];

- encouragement of training and schooling;
- exhibitions and provision of awards and prizes;
- monitoring system with regard to international trends in tastes and fashions.

4. Concentration and promoting of export activities:

- establishment of export centres for specific industries;
- international presentation;
- carrying out of specialized export surveys;
- assistance in establishing contacts.

5. Establishment of an independent check on the actual use made of the facilities provided and determination of the efficiency and effectiveness thereof; formulation of quantitative standards and linking of support facilities to these standards.

[34] It would also be possible in the case of 'light' branches of industry to think in terms of the acquisition of entrepreneurship under a formula similar to that already applied on a large scale by *Vrijwillig Filiaal Bedrijven.*

[35] This is of particular importance in the consumergoods industry, where the absence of a centre for industrial design is a definite lack. We do not wish to contest the decision to abolish the Centre for Industrial Design, but the gap has not been adequately filled. In this context see for example J. Beljon, *Industriële vormgeving als noodzaak* (Industrial Design as a Necessity), Amsterdam 1959 and the report by the panel of the Stichting Amsterdam Fonds upon the awarding of the Kho Liang Je prize in 1980.

3. Sectoral intervention framework: intermediate form

1. As a mixed form this is concerned both with industries as a whole and with individual enterprises, expecially in the fields of innovation and technological change and quality control (i.e. working in accordance with strict quality controls).
2. Appointment at the level of specific branches of industry of sectoral committees which, under the aegis of the Government Commission and after due consultation with for example KEMA and TNO:
- draw up technical quality criteria;
- formulate standards with regard to these criteria and draws up certificate categories after making appropriate enquiries among firms that satisfy the quality standards and the supervision of those standards.
3. Formulation of assistance and purchasing provisions for innovation and technical change by individual firms on the basis of detailed proposals the substance of which would be subject to scrutiny in the form of published standards and requirements.
4. Promotion of entry of young entrepreneurs on the basis of technical and economic qualifications in the form of:
- development loans/participations;
- advice in the field of control and management.
5. Export promotion by means of mediation in order acquisition/ad hoc export combinations.
6. Appointment of an executive body which would supervise:
- The assessment of applicants for government support.
- the extension of support in relation to the objectives set;
- redemption of loans/repayment in the case of royalties, etc.

5.1.5 *Limits with regard to government policy: a recapitulation*

Following the line of thought developed in the preceding sub-sections it is as well to conduct a recapitulation on one point, namely in relation to the limits that should be imposed on government policy.

These limits have been formulated in the form of conditions and stipulations. This enables their fulfilment and fundamental feasibility to be examined once again separately. This will be done in the concluding, summary chapter.

In the first place the implementation of selective structural policies is tied to specific circumstances: they have a reserve function that only becomes activated when the economic situation and circumstances demand (section 5.1.1) and are correspondingly discontinued when the necessity is past. Secondly emphasis has been placed on the general conditions for managing structural policies, i.e. competence and administrative stability (section 5.1.3). Thirdly, from the various possible intervention modalities a choise has been made in favour of operating in accordance with market principles (section 5.1.3). Fourthly, government policy has been circumscribed at the operational level by subjecting it to considerations of market structure and urgency (section 5.1.4). Finally it has been made conditional upon professionalization and objectification (section 5.1.4).

5.1.6 *Arrangements and administrative organization*

A number of institutional arrangements and changes in the political and social sphere will be required if the policies described in broad outline above are to be implemented in practice. These arrangements and changes would cover the following fields:
- financing (formation of funds) and associated determination of priorities;
- the administrative framework;
- the mobility of the factors of production;
- the economic climate.

The two latter points fall outside the scope of this chapter and are taken up in chapter 6.

Financing (funds formation)

In connection with the White Papers issued by the government last year[36] an annual sum of approximately N. Fl. 1.4 billion (at current prices) has been set aside for financing during the period 1980-1984. In relation to the sums originally allocated in the multi-year estimates of N.Fl. 450 m. (N.Fl. 650 m. for 1980 only) this represents an increase of some N.Fl. 950 m., of which N.Fl. 515 m. has been made available from the WIR fund. Seen in these terms this is a considerable increase. However, a comparison of the sums set aside in the context of sectoral and innovation policy and government aid to individual firms during the period 1975-1978 (N.Fl. 4.8 bn. over 4 years) indicates that the increase has in fact been very modest: from 1.2. to 1.4. bn. on an annual basis. A qualification appropriately exists in relation to aid to individual firms which, with the specific provisions made for the transport facilities industry, has accounted for the lion's share of financial assistance in the recent past. The sums set aside for this purpose may be extremely modest, but an additional recourse to public funds is not ruled out in the event of serious need. As far as the sums currently allocated are concerned it should also be borne in mind that the specific provisions for shipbuilding (i.e. interest bridging-loans and other forms of support) will continue during the period 1980-1984, accounting for an estimated N.Fl. 200 m. p.a. of the sums set aside. The amounts available to be disbursed freely are therefore rather lower than the allocations would suggest. Depending on the tasks with which the Netherlands will be confronted in the field of structural policy during the next decade, the sums allocated will need to be a corresponding order of magnitude. If, for example, it is stipulated that the number of jobs in industry should increase by 1% instead of declining, as suggested by the model studies, this would require an additional volume of investment which, in chapter 6, we put at N.Fl. 7 bn. a year, of which an estimated N.Fl. 2 bn. would have to be provided by the government. This indicates that it is necessary to think in terms of quite different figures. Special funds would accordingly have to be established for the redevelopment of Dutch industry, possibly derived from (increased) natural gas revenues.

We do not wish to arouse the impression that the merits of structural policies should be confined to the release and subsequent allocation of funds. Effective, coordinated action and the systematic elimination of obstacles are at least as important. Experience has however indicated that a government should on the one hand possess means of sanction and that on the other the allocation of funds provides a means of expressing the government's own input and responsibility.

The administrative framework: new policy bodies

It does not form part of the Council's brief to examine administrative aspects in detail. This section is accordingly only concerned with the broad outline of the institutional framework. In this respect the Council attaches considerable importance to:

- a clear demarcation of responsibilities, in the sense that political decision-making about the basic nature of structural policy should be a matter for the government and Parliament;
- a high degree of expertise and reasonable freedom of action so that the operationalization and execution of policy can be conducted efficiently within the prescribed limits.

Recent experience has indicated that the government is not properly equipped to implement sectoral and therefore also structural policies. The government has lacked the necessary knowledge and expertise to develop forward-looking structural policies and the actual implementation of its policies has been heavily influenced by interest groups. In order to overcome these deficiencies an independent body should be set up in which the necessary knowledge and expertise could be concentrated, and which would be responsible for policy

[36] *Voortgangsnota Economisch Structuurbeleid* (Progress Report on Structural Policy) and *Innovatienota* (Innovation White Paper), op. cit.

formulation and, once the political decision-making process had been completed, for policy implementation.

A centre for research and policy formulation of this kind could be given practical shape by the appointment of a Government Commission for structural policy. This nomenclature has been deliberately chosen in order to avoid any suggestion of corporatism, and to emphasize the government's responsibility. At the same time we would see it being set up for a confined period of time: the Government Commission would be established in response to a specific, current need.[37] The Government Commission would have its own permanent secretariat, which would have three principal tasks:

1. The accumulation of knowledge and technical expertise.

This would include the coordination of research at meso economic level and the accumulation of information as already conducted by the Central Planning Office, the Ministry of Economic Affairs, the Central Bureau of Statistics and various industrial bodies.

There is a lack of proper coordination at present between these bodies and their research is not always geared to policy requirements. By means of a better distribution of activities and greater policy relevance a Policy Information System could be devised without detracting from the autonomy of the bodies in question. This would also cover the independent accumulation and/or provision of access to technological know-how and expertise presently lacking within the government set-up.[38]

2. Policy operationalization.

This would include the drawing up and up-dating of structural projections and the development of adequate policy instruments, advising on a coordinated approach to structural questions and making due allowance for ancillary policy considerations and non-economic objectives. It would also cover drawing up policy programmes for selective stimulation and intervention.

3. Policy implementation and supervision.

The implementation of detailed policy programmes for selective stimulation and intervention at sectoral level and supervision of their fulfilment.

The socio-political composition and orientation of the Government Commission would need to be such as to ensure it had widespread support within the community and in industry (among both employers and unions). Appointment to the Commission should however be primarily based on expertise and disinterestedness.

As far as its activities are concerned, strict conditons would have to be imposed on the Commission from the viewpoint of both the balance of competitive forces and democratic control.

In terms of policy implementation at sectoral level, the inception of a National Economic Development Council would appear indispensable.

De Jong's report contains an interesting comparative analysis between BKA (West Germany), IRC (Britain) and NEHEM (the Netherlands). The differences in working methods he notes in such development corporations strike us as highly relevant, as does his analysis of the failure of NEHEM. A detailed examination of the NEHEM experience has also been conducted by Vrolijk (op.cit.).

On the basis of these analyses we are forced to conclude that the NEHEM formula would not be suitable for the aims we have in mind and that it would not lend itself to an attempt to devise a 'new-style NEHEM'. The working methods of the National Economic Development Corporation that we envisage are shown diagrammatically below.

[37] In chapter 6 it is recommended that the Government Commission be initially given restricted terms of reference, namely that of the short-term drawing up on behalf of the government and Parliament of an operational policy programme and the necessary institutional structure.

[38] See the interview with Dr. A.E. Pannenborg (Philips Board of Directors) in *NRC-Handelsblad*, 6 October 1979. The development council set up by the Ministry of Economic Affairs does not quite measure up to what one might expect in this regard.

Features of a new National Economic Development Corporation

1. Autonomy	yes, on the basis of policy guidelines drawn up by the Government Commission for Structural Policy (operationalization and implementation)
– funding	yes, operates with own budget
2. Composition of board/management	professionals (no tripartite consultation)
3. Working methods direct towards	
– industry level	yes, see intervention framework at sectoral level (possibly with groups of enterprises within branches of industry)
– company level	yes, including both existing and specially established enterprises
4. Provision of facilities	to sound existing enterprises and to new projects/ enterprises regarded as sound
5. Regulation of facilities	strict objectification and supervision of results
6. Terms of reference	promotion of competition by new entry, promotion of investment in new directions, where necessary improvement of management
7. Supervision and control	on the basis of policy guidelines and the publication of detailed reports

Administrative framework: demarcation of responsibilities and powers

In the administrative framework proposed by the Council the following bodies would be entrusted with functions in the field of structural policy:

1. the government
2. the Government Commission for Structural Policy;
3. the National Economic Development Corporation;
4. the Sectoral Committees (see under 'The framework of intervention at sectoral level').

The appointment of the Government Commission would need to be legislatively enacted. The legislation would establish the broad terms of reference, with the Commission being appointed on a temporary basis, e.g. for a period of five years. The broad terms of reference would cover the drafting and implementation of a stimulation programme designed to improve the structure of the Dutch economy while taking account of non-economic objectives, i.e. the limiting conditions.

The specific priorities and constraints which the government wished to take into account could be laid down in an Administrative Order; the budget would obviously be determined in the appropriation act. These powers could be filled out by providing the government with the further power of drawing up supplementary regulations and subjecting the Government Commission's executive decisions to government approval in certain instances to be defined. In order to preserve the proposed independent nature of the Government Commission, however, these latter powers would have to be rigorously controlled in case the government wished to deviate from decision that had been taken in principle.

In devising the administrative requirements, the main guiding consideration has been that of ensuring the objectification and professionalization of government intervention. We would accordingly argue in favour of a fairly rigid demarcation between the determination of the broad outline of policy on the one hand, and its operationalization and execution on the other. This could be subject to the criticism that it is not possible for policy formulation and implementation to be separated so rigidly. Although such criticism avoids the fact that there is nearly always a certain division between the two, and indeed that this has definite advantages, it nevertheless contains a germ of truth. A verity rigid demarcation can entail disadvantages.

In any case, it may be questioned whether, once the broad lines of policy have been laid down, the implementation of policy can in fact be completely

objectified, in the sense of forming the proper province of experts alone. Various interests have to be weighed up in each separate decision. In the case of structural policy, various aspects play a part: long and short-term perspectives; financial aspects; employment, environment, and so on. However clearly it is sought to draw up policy guidelines beforehand, the final decision will still contain an element of choice. It is as well to re-examine the three functions of the Government Commission in this light.

In the first place the Commission will be concerned with the concentration of knowledge and experience. In principle this is a function that lends itself particularly well to a more or less independent body.

The second task specified was that of policy formulation. This concerns an exacting advisory function, namely that of converting the broad terms of reference laid down in legislation into a detailed policy programme, within the policy confines laid down by the government (priorities, boundary conditions, the budget, etc.). In this respect the Government Commission would be regarded as an advisory body, except that its role would be laid down in procedural regulations; if the government should wish to disregard its advice it would need to bear the full responsibility, including externally.

The third task of the Government Commission would consist of drafting a government programme of selective stimulation and intervention at the sectoral level and the supervision of its implementation. This would involve policy-shaping powers of such a nature that other bodies such as the National Economic Development Corporation, which may be regarded as the Commission's executive body, and the Sectoral Committees coming under the Commission would be bound to them.

At this level the government's influence would be felt in the form of its powers to introduce supplementary regulations and the required governmental approval of major executive decisions. Under this arrangement policy responsibility would remain with the government, while at the same time providing for a distinction between policy formulation and execution. Under this arrangement the National Economic Development Corporation and the Sectoral Committees would be responsible to the Government Commission, with the lines being kept as short as possible. This has been deliberately done in order clearly to demarcate the government's powers and to designate the Government Commission as the body responsible to it. This also makes for clarity from the viewpoint of parliamentary control, in that the responsibility assumed by the government with respect to structural policy would be unambiguous.

The element of public control should be further strengthened by requiring the Government Commission and the National Economic Development Corporation to bring out an annual report of their activities and new commitments entered into, etc.

Both bodies would of course be subject to supervision by the Audit Office, by the latter should also be given the responsibility of supervising the actual use made of funds provided to individual enterprises. This is of course an obligation that would primarily reside with the National Economic Development Council but the Audit Office should be empowered to ensure that this is done properly.

Finally there would need to be a procedure for handling appeals against decisions taken by the Government Commission and the Sectoral Commitees coming under it. In view of the desirability of independence on the part of the Government Commission it would appear inappropriate to appoint the Minister of Economic Affairs as the tribunal of appeal. It would instead be preferable for an independent arbiter to be appointed, in this case the Council of State of the Industrial Appeals Board.

5.1.7 *The proposed framework of intervention against the background of EC law: possible obstacles*

The Netherlands is a party to the Treaty of Rome, which can impose certain limitations on national structural policies that involve government intervention. Specifically, it may be asked whether and to what extent the framework of intervention outlined in section 5.1.4. is compatible with the relevant legislation of the European Community. A special report on this subject was commissioned because it is a question that consistently arises whenever structural policy is

discussed.[39] The results of this study may in our view best be examined at two levels, namely:

1. the general level: the 'spirit' of the Treaty;
2. the specific level: the 'letter' of the Treaty.

In VerLoren van Themaat's view, the EC Treaty should not be regarded as a confession of faith in the free market mechanism. Nevertheless careful account will have to be taken of the fact that in view of the primary object of the Treaty – the establishment of a common market among the member states with the same features as national markets – and given the existing, predominantly market-oriented economic and political policies of the member states, it follows that national intervention leading to the artificial distortion of competitive forces in relation to other member states would not be acceptable in principle. This is further underlined by the second object of the EEC Treaty, namely the 'progressive approximation of the economic policies of Member States' by means of the coordination of national policies and the relevant legislation. In addition the European Commission's competition policy is distinctly market-oriented, especially with regard to the extension of assistance by member states. This amounts to the fact that any policy characterized by:

1. active intervention;
2. permanence;
3. a systematic and comprehensive character, and which resulted in a modification of competition, would generally require Community agreement.

In this respect it is of importance that the EEC Treaty renders the legitimate and appropriate use of sector-specific measures more difficult than the application of instruments of a general kind. In the former case there must exist a clear need, which will often have to be demonstrated towards the European Commission.

In very general terms, therefore, it is fair to say that EEC law imposes particular limits on national policies if the latter have the effect of artificially modifying the conditions of competition. If this in turn results in the restriction of competition and/or barriers to trade between the member states, this is bound to bring national policy into direct confrontation with the EEC Treaty.

Reviewing the intervention framework we have proposed, it may be observed that:

- the market-oriented approach we have proposed need not necessarily conflict with the objectives and policies of the European Communities;
- there would be no question of any restriction of competition or of intra-Community trade;
- the proposed intervention is neither permanent in nature nor systematic and comprehensive.

Apart from the spirit and application of the EEC Treaty we do not see any serious obstacles towards the framework of intervention outlined earlier. The actual policy margins for national economic policy will however depend on the specific case: there must be clarity concerning the nature, scope and (often unintended) consequences of any policy instruments under consideration, in the light of the relevant Community regulations and their interpretation in jurisprudence and/or the Commission's policies.

At the specific level there may well be certain problems, but we consider these can be resolved. In this regard it may be noted that the provisions of the EEC Treaty are not always fully clear. In the light of the analysis conducted in previous chapters of the Dutch economic situation, we do not think a cautious stance would be advisable. In view of the need for action it would instead seem appropriate to formulate domestic structural policies, where necessary to the maximum extent required, unless this would be clearly at variance with EEC law.

[39] P. VerLoren van Themaat, 'De mogelijkheden voor nationale gecoördineerde en gemeenschappelijke sectorpolitiek in de Europese Gemeenschappen' (The scope for national, coordinated and common sectoral policies in the European Communities), WRR series 'Voorstudies en achtergronden' (Preliminary and Background Studies) The Hague 1980.

The Treaty provisions on the free movement of goods, persons, services and capital (arts. 9-37 and 48-73 of the Treaty of Rome) mean that it would not be possible for national sectoral policies to be screened off against competition from other member states, or for these policies to be furthered by government support to industry if that support entailed discrimination against enterprises in other member states. Now that the relevant provisions of EEC law are either of direct application or are (or must be) reflected in national legislation, any parties affected would generally be able to resort to direct legal action in the state concerned.

The free movement of goods does not just cover a customs union prohibiting customs duties on importation and exportation but any trading regulations that represent an actual or potential barrier, either directly, to intra-Community trade. Thus product regulations, for example, may not discriminate against enterprises from other member states, although reasonable measures are admissable if these are based on non-economic considerations (e.g. consumer or environmental protection).

The free movement of persons, services and capital is primarily based on the equal treatment of persons or enterprises from other member states as that of one's own nationals. This applies in particular to the right of establishment throughout the Community, although this does presumably leave the question of assessing the extent of any restrictions on establishment or investment to national parliaments.

Now that legislative provisions have been introduced eliminating restrictions on the free movement of capital within the Community, it is no longer possible to prevent direct investment by other member states. The principle of equal opportunities also applies to government purchasing and ordering, which has been worked out in the EC guidelines on the harmonization of legislation and administrative practice in the member states. The scope of the EEC Treaty effectively prevents the introduction of any instrument designed to bring about import substitution.

Account should be taken of the fact that the European Community itself already conducts sectoral policies in a number of fields. These include agriculture and transport (arts. 38-47 and 74-84 respectively of the Treaty of Rome) and coal, steel and nuclear energy (ECSC and Euratom). National policies are not permitted to come into conflict with EC policy in these fields.

In addition the EC has, partly on the basis of the Treaty, coordinated national sectoral policies in the member states, for example in shipbuilding.

The rules governing competition applying to enterprises (arts. 85-91) effectively prohibit agreements, decisions or any concerted practices by associations of enterprises that are likely to affect trade between the member states and which have as their object or result the prevention, restriction or distortion of competition within the Common Market.

In particular these consist of:

a. the fixing of purchase or selling prices;

b. the limitation or control of production, markets, technical development or investment;

c. market-sharing or the sharing of sources of supply;

d. the application to parties to transactions of unequal terms in respect of equivalent supplies;

e. the subjecting of the conclusion of a contract to the acceptance by a party of additional supplies which, either by their nature or according to commercial usage, have no connection with the subject of such contract.

These prohibitions apply particularly to the screening off of national markets, including agreements ect. between enterprises of the same country. The provisions are of direct application in the member states and have overriding legal force with respect to agreements and decisions. Parties concerned are therefore free to challenge any prohibited practices in national courts. The above provisions may however be declared inapplicable if the agreements contribute to the improvement of the production or distribution of goods or to the promotion of technical or economic progress, provided this is to the benefit of consumers and there is no serious distortion of competition. VerLoren van Themaat notes that

the Commission has not to date provided exemptions for capacity limitation or price-fixing agreements. Such exemptions are preceded by an administrative process in which applicants are required to demonstrate that the stipulated conditions have been satisfied, but the Commission enjoys wide discretionary powers and is free at any time to decide whether there has been a change in circumstances.

In this respect it is important that national governments may not encourage or force enterprises to adopt agreements or practices at variance with the prohibitions stipulated above; this means that the enterprises in question would not be able legally to challenge the fact that the government had made the provisions of aid to industry conditional upon such an agreement.

In those cases where the proposed framework of intervention is not based on compulsory participation in the three forms of intervention that were distinguished, these arrangements would leave room for a private form of organization with government support. Under such an arrangement there is however the problem of the nature of the agreements, decisions and concerted practices. As has been said, article 85 essentially prohibits such arrangements, subject to certain exceptions.

In the light of current Commission policies it is likely that the provisions of article 85 would where necessary be declared inapplicable or that dispensation would be granted under section 3 of that article with regard to the proposed measures falling under the 'light' form of intervention. By contrast some of the measures proposed under the 'heavy' form could, depending on the shape they took, come into direct conflict with the prohibitions contained in article 85. Any agreements or similar arrangements designed to control prices, production and investment with a view to structural adjustment or reform are almost bound to be viewed by the Commission as a distortion of competition. It would not, therefore, be possible for the framework of intervention to have this object. It would therefore only be possible to bring about the desired structural improvements within this framework by drawing up an indicative programme for structural adjustment, the practical shape of which could take the form of agreements between the National Economic Development Corporation and individual enterprises.

The scope for the granting of aid by the State (arts. 92-94) to industries or individual enterprises is limited by the prohibition against 'aid granted by a Member State or granted by means of State resources, in any manner whatsoever, which distorts or threatens to distort competition by favouring certain enterprises or certain productions... to the extent... it adversely affects trade between Member States.'

The most important exceptions to this prohibition consist of the following four categories of aids, which may be deemed by the Commission to be compatible with the Common Market:

a. aids intended to promote the economic development of regions where the standard of living is abnormally low (e.g. Sicily) or where there exists serious unemployment;

b. aids intended to promote the execution of important projects of common European interest or to remedy a serious disturbance of the economy of a Member State;

c. aids intended to facilitate the development of certain activities and of certain economic regions, provided that such aids do not change trading conditions to such a degree as would be contrary to the common interest;

d. such other categories of aids as may be specified by decision of the Council acting by means of a qualified majority vote on a proposal of the Commission.

Furthermore it may be noted that the Commission keeps a close watch on the aid practices of the Member States and that private parties are able to challenge the observance of article 92 in cases where aids are implemented without prior consultation with the Commission.

Of these four categories, the aids specified in category c. would appear to have the most immediate relevance for national structural policies. It is, however,

difficult to be specific about the extent to and means by which it would be permissable for an effective structural policy to be implemented on the basis of State aid to enterprises. Once again there is the basic premise that any aids may not result in the distortion of competition between the Member States, or at least that the disadvantages of such aids for the common market may not exceed the benefits to the EC. Since the Treaty provisions on this point are rather vague, the policies pursued by the Commission in this regard are of considerable importance. To date the Commission appears to have viewed the provision of government aids as an instrument to be wielded in an ad hoc and temporary manner, the prime purpose of which is to bring about a flexible and socially acceptable reform of the market mechanism.

For the rest we may follow VerLoren van Themaat's outline of the sorts of measures considered admissable in principle by the Commission. Government aid to weak sectors would be possible for purposes of modernization and restructuring, where it was the aim to maintain or reduce productive capacity or to switch to different, profitable forms of production. New forms of activity could also be stimulated, together with the introduction of energy-saving measures and the application of new capital-intensive technology and innovation by industry.

In principle the main emphasis could be on investment support rather than on export assistance or production support designed to reduce costs. Any proposed measures will, however, be subject to scrutiny by the Commission in terms of the criteria laid down in article 92, while the existence of any competition-distorting effects sets limits to the aid that can be granted by government.

This report has argued in favour of a general stimulation programme for Dutch industry concentrating on:

- the revitalization of sensitive sectors,
- the redevelopment of the chemical industry, and
- strengthening of the equipment sector.

Provided that the nature and scope of such a programme is properly worked out, it should be consistent with what the Commission regards as admissable, as outlined by VerLoren van Themaat.

5.2 Structural policy and trade policy

5.2.1 *Introduction*

This section considers the ways in which the objectives and implementation of trade policy could be more closely integrated into structural policy. Consideration is given to the recent deterioration in the balance of payments and its possible causes, followed by an examination of policy responses to this development. This situation is then projected into the future, partly on the basis of the industrial problems discussed in chapter 2, with a distinction being drawn between the short and medium term. Extensive use has been made of recent studies of the Netherlands export position as well as of recent studies concerned with a more general analysis of the determinants of international trade between industrialized countries.

The balance of payments on current account has witnessed a sudden and unexpected change. In 1976, there was a surplus of N.Fl 7½ bn; in 1978 this had turned into a deficit of N.Fl. 2¼ bn. In its annual report for 1978, the *Nederlandsche Bank* (the Dutch Central Bank) noted that more detailed analysis of this trend was required, and that it was to be feared something was seriously amiss with the Dutch economy.[40] Similarly the central economic plan for 1979 suggests that balance of payments problems are likely once again to assume primacy, particularly in view of the decline in natural gas receipts.[41] This section focuses on the way government policy can and should respond to likely developments. For a proper understanding of the available policy options, this

[40] *De Nederlandsche Bank N.V., Verslag over het jaar 1978* (Report for the year 1978), p. 17

[41] Central Planning Office, *Centraal Economisch Plan 1979* (Central Economic Plan 1979), The Hague 1979, p. 17.

section examines the main features of previous policies and the various causes and background factors responsible for the turnabout in the balance of payments on current account.

Use is made of existing studies and observations on both future developments and the possible causes of the deterioration in the Netherlands' position in export markets. As far as possible these conclusions have been translated into practical policy options. In so doing use has been made of a somewhat artificial division of export changes into components, namely the general trend of world demand, the composition of exports, the geographical distribution of exports and competitiveness. This classification has the advantage (assuming that the determinants of the change in exports can be reduced to these components) of being able to demonstrate the aspects with which policy will have to be concerned.

It should further be noted that export policy will be examined in this section from the point of view of structural policy. This means that the aspects of export composition and geographical distribution will be given a good deal of weight, while attention will also be given to the structural implications of the 'competitiveness' factor.

5.2.2 *Areas of policy focus*

The areas on which government policy has focussed will be examined in terms of the classification into various components given in 5.2.1. In this respect it is important to note that export-policy instruments can often be classified in more than one way. For this reason we begin with a general, not-exhaustive description of government policy, proceeding from there to examine ways in which it might be classified.

Until well into the 1970s, the Netherlands had a so-called classical export promotion policy. This general policy was confined to the provision of information to Dutch industry, the provision of help and support for foreign companies and government bodies, and the modest promotion of Dutch know-how in foreign markets.[42]

In addition an arrangement dating from 1967 existed between the *Nederlandsche Bank* and the private banks. This export financing arrangement (EFA), which was designed to lower the costs of export finance for capital goods, was extended during the 1970s in response to the growth in demand. Under the EFA, export finance can be offered at reduced rates by means of relending or rediscounting.

In 1976 an allocation was made for the first time in the budget of the Ministry of Economic Affairs designed to enable Dutch industry to compete on equal terms in instances where orders would otherwise have been lost as a result of the superior financing conditions offered by foreign competitors.[43] In order to qualify for subsidies of this kind, capital-goods exporters had to be able to demonstrate the existence of competition distortion. The facility is known as the matching fund. It may be noted that this measure was initially regarded as temporary; it was, and still is, considered to be at variance with Dutch interests for the Dutch government to join in the international scramble to establish competition-distorting export conditions. The 1976 budget estimates for the Ministry of Economic Affairs even note that while export subsidies might provide export advantages in the short term, these did not counterbalance the disadvantages of disturbing the pattern of competition that were associated in the long term with the provision of financial assistance.[44] The temporariness of this measure has proved a fiction. This item now appears year after year as part of export policy, and the facility was not only increased financially in 1978 but extended by making the fund available to exporters of non-capital goods.

The years 1977-1978 may be regarded as the turning-point in export policy. Up to that point, government policy had been geared towards boosting exports by establishing and supporting as free a system as possible; after this date

[42] Ministry of Economic Affairs, Budget Estimates; Second Chamber, 1978-1979 session, 15 300 chapter XIII, no. 2., p. 25.

[43] Ibid.

[44] Ministry of Economic Affairs, Budget Estimates; Second Chamber, 1975-1976 session, 13 600 chapter XIII, no. 2, p. 96.

government policy also becomes concerned with strengthening the country's competitiveness. To this end more selective, less general policies were considered necessary. The explanatory memorandum attached to the 1978 budget estimates of the Ministry of Economic Affairs moreover suggests that greater government involvement in export promotion is required because of the changes in the direction and composition of exports connected with the problem of industrial restructuring.[45] This applied both to the national strengthening of the structure of the economy in the framework of selective growth and to international restructuring with a view to the postition of developing countries.

One year later the improvement of the structure of Dutch production was taken up in the 1981 Medium Term Plan ('Bestek '81'). The basic premise behind this approach, as noted previously in the explanatory memorandum of the Ministry of Economic Affairs for the year 1979, is that the government cannot be expected to implement the sorts of policies whereby the composition and geographical distribution of exports become determined.[46]

The above intentions took the shape of an extension of the classical export-promotion instruments and specific measures in the field of export conditions and of export finance as referred to earlier. The extension of export-promotion instruments have included the following: improved advisory and information activities; support for export penetration in promising markets; selective support to medium and small-sized firms in the form of advice, guidance and assistance in starting up exports as well as in product presentation; and encouraging the exchange of experience and promoting education in the field of export techniques.[47] As far as export conditions are concerned, reference may be made to government support for combined export initiatives and the provision of guarantees covering the costs involved in preparing tenders for turnkey projects.

The provision with regard to export initiatives consists of the fact that companies in the one industry which collaborate in developing new markets outside the EEC qualify for reimbursement of up to 40% of the costs (to a maximum of N.Fl. 500,000) of their joint activities. Programmes to develop new markets are taken as comprising (among other things) market research and exploratory trips.

The guarantee provision with regard to turnkey projects provides for the reimbursement of half the preparatory costs for an unsuccessful tender. As an extension to the turnkey project provisions, similar guarantee provisions will be made available from 1980 onwards in the case of technical design and advisory activities.

As far as export financing provisions are concerned, reference should also be made to the credit-line and mixed credits. The credit-line is an arrangement enabling other countries to purchase Dutch capital goods up to a certain sum on credit, the rate of interest being below ordinary market rates. The mixed-credit facility was established in 1979 and creates the possibility of financing export transactions for development purposes.

If an attempt is made to classify the various export promotion measures, it becomes apparent that a large part of the above measures fall into the category of measures designed to improve or maintain competitiveness. The bulk of the measures are concerned with creating equivalent conditions for Dutch exporters as those applying to foreign competitors. A number of measures are of course directed towards specific markets or products, or even both.

With regard to structural measures it is fair to say that policy-implementation is still at an early stage. This does not mean that there are no structural measures at all. One example consists of the restructuring measure to improve the Dutch economy and the position of developing countries in international trade. This measure with a development dimension was designed to promote new, replacement economic activities in the Netherlands that would generate employment, while at the same time encouraging the gradual elimination of activities that were no longer profitable. It is striking that this measure dates to as early as 1975.

[45] Ministry of Economic Affairs, Budget Estimates; Second Chamber, 1977-1978 session, 14 800 chapter XIII, no. 2, p. 111.
[46] Ministry of Economic Affairs, Budget Estimates; Second Chamber, 1978-1979 session, 15 300 chapter XIII, no. 2, p. 27.
[47] Ibid.

To summarize, export policy may be said to have been limited to classical export promotion measures up to 1977-1978. After that date there was a rapid growth in the number of policy instruments, the main emphasis being on improvement of the competitive position and on enabling Dutch entrepreneurs to remain competitive. Export policy is little concerned with the restructuring of the Dutch export package (see table 65).

Table 65. Survey of export measures

Measures in respect of:

the product-mix	geographical distribution	competitiveness
export promotion policies	export promotion policy	export promotion policy EFA
restructuring with a development dimension		matching fund turnkey projects credit-line for joint export initiatives mixed credits

Other classifications are possible depending on the approach selected. One example consists of an article by Van de Visse,[48] who maintains that Dutch export promotion is to a significant extent directed towards capital goods (e.g. EFA and the matching fund) and to exports to non-EEC countries (e.g. joint export initiatives).

5.2.3 *Some comments on the export position*

The 1973-1974 oil crisis is generally regarded as the point when the growth in world trade began to decline. Between 1967 and 1973, trade between OECD countries grew at an average rate of 10.8% a year; after the oil crisis the figure fell to only 3%.[49] The consequences of these changes in the international economy were particularly serious for the Netherlands. Up to the oil crisis, the Netherlands was able to match and even to exceed the growth in world trade, but after 1974 it began clearly to lose ground to its competitors. After 1976 there was even an escalation in the rate of loss (see table 66).

Table 66. Growth in the volume of exports of goods less growth in the weighted[1] volume of world imports (% changes)

	1973	1974	1975	1976	1977	1978	1973/78 cumulative
United States	8.2	2.2	0.4	−2.5	−4.9	4.1	7.5
United Kingdom	0.9	−1.5	0.6	−3.2	2.7	−0.5	− 1.0
France	−1.2	6.9	−2.5	−3.5	0.7	−0.4	0.0
West Germany	2.9	9.0	−6.8	0.9	−0.5	0.6	6.1
Italy	−9.4	3.6	3.1	−1.5	1.1	5.3	2.2
Netherlands[2]	2.2	−1.8	−3.6	−1.9	−6.0	−1.5	−12.6
Belgium	1.7	−1.0	−4.7	0.0	1.2	−2.9	− 5.7
Japan	−5.7	10.6	2.7	9.8	0.0	−8.0	9.4

[1] Weighted on the basis of the geographical composition of exports.

[2] Corrected for natural gas.

Source: Ministry of Economic Affairs, Budget Estimates, Second Chamber, 1979-1980 session, 15 800 chapter XII, no. 2, p.'10.

What is the explanation for the reversal after 1973 and the deterioration in 1977?

According to the Central Planning Office competitiveness forms a significant factor in accounting for the lower market share.[50] The concept of competitiveness covers many not always quantifiable factors such as export price levels, domestic price levels, the quality of exports, the image of Dutch export articles, labour unrest, labour productivity, profitability, the relationship between export prices and those of competitors, the geographical distribution of exports and the export product-mix.

[48] A.A. van de Visse, 'Recente ontwikkelingen in de Nederlandse exportbevordering' (Recent Developments in Dutch Export Promotion), *Economische Statistische Berichten*, 18 October 1978, p. 1056.

[49] R. Dick, N. Nicke, 'Determinanten des Industrieländerhandels' (Determinants of International Trade), *Die Weltwirtschaft*, 1979, vol. 1.

[50] Central Planning Office, *Centraal Economisch Plan 1979* (Central Economic Plan 1979), p. 15.

Instead of examining each of these factors separately, an approach has been selected in which competitiveness is taken as the third explanatory, aggregate factor in addition to the geographical distribution of exports and the export product-mix. This means that the loss of export markets may be attributed to structural factors such as geographical distribution and the package of export goods, as well as to the loss of competitiveness, as an over-arching term for all other factors.

An analysis taking the above factors into account has been conducted by De Ridder.[51] Table 67 reveals that until 1973, competitiveness and the export product-mix exerted a positive effect on the volume of exports of goods, while after 1973 these factors exerted a negative influence.

Table 67. Influence of 'competitiveness' and the export product-mix on the export of goods by the Netherlands

	1963/1973 average annual %	1973/1978 changes
volume of world trade	9.5	5
competitiveness and export product-mix volume	2.5	−2.5
volume of exports of goods	12.0	2.5

Source: P.J. de Ridder, 'De Nederlandse uitvoer; een macro-economische beschouwing' (Dutch exports: a macro-economic survey), *Benelux* 79/3, Brussels 1979, p. 65.

With regard to the export product-mix as a factor in itself, De Ridder notes that the shift in world import demand after 1973 towards less energy-intensive products was disadvantageous for the Netherlands with its relatively energy-intensive exports.

The Ministry of Economic Affairs has approached the subject in a way that throws more light on the separate influence of the product-mix and competitiveness.[52] By means of regression analysis, this study examined in detail such aspects as the export of goods after 1962. On the basis of this research a table (68) has been drawn up which indicates the influence of the specified factors after 1972. It should, however, be noted that the concept of competitiveness as used in this report does not occur in the Ministry's study. Instead that study refers to Dutch export prices in relation to foreign competitors, unemployment, the labour come ratio as a substitute for profit margins, and export credits; these four factors have been drawn together in this section and equated with competitiveness.

Table 68. Sources of the changes in market share of Dutch exports, in N.Fl. billions

	Change in market share in export markets of relevance to the Netherlands	Influence of the product-mix	Influence of competitiveness
1973	1.16	−0.34	1.50
1974	−1.05	−2.15	1.10
1975	−2.22	−2.11	−0.11
1976	−1.11	+0.36	−1.47
1977	−3.92	+1.09	−5.01
Cumulative	−7.14	−3.15	−3.99

Source: WRR calculations on the basis of table 1 in W. Groot and J.J.L.M. Jansen, op. cit.

The above table indicates that until 1976, the loss of export markets was primarily attributable to the relatively unfavourable composition of the package of exports; from 1976 onwards the loss was much more associated with a decline in competitiveness. Taken over the period as a whole the two factors more or less balance out.

[51] P.B. de Ridder, 'De Nederlandse uitvoer; een macro-economische beschouwing' (Dutch Exports: a Macro-Economic Survey), *Benelux* 79/3, Brussels 1979, p. 55.

[52] W. Groot and J.J.L.M. Jansen, 'Goederenuit- en invoer: een empirisch onderzoek' (Exports and Imports of Goods: an Empirical Survey), *EZ-discussienota 7901*, The Hague 1979.

The Central Planning Office has also tentatively confirmed the loss in competitiveness. The central economic plan for 1979 suggests that despite the characteristic structure of Dutch exports (marked specialization on aspects of the food, drink and tobacco industry, chemicals, oil products, base metals and electrical engineering; other industries are comparatively under-represented) the impact of the package of exports in the years 1977 and 1978 was of subordinate importance.[53]

Reference should also be made in this context to a recent study on the Netherlands by Gerards and Jager.[54] This study – in which particular attention is paid to the sensitivity of the disaggregation methods used to differences in specification – also confirms that a deterioration in competitiveness formed a significant factor, especially in recent years (1977/1978).

These analyses of the Dutch export position do not fully correspond with regard to the quantification of the various determinants. As noted above, the disaggregation methods used depend to a great extent on specification differences.

Despite this sensitivity, which is a cause for caution in interpreting the results, it is fair to say that, particularly in recent years, the loss of export markets may to a significant extent be attributed to the loss in competitive power. The results in relation to the impact of the package of export goods are less conclusive, although it is clear that this determinant had an impact – in a negative sense – during the period 1973-1978. This point, which plays an important part in our study, is based not only on the results of abstract disaggregation analysis but also on information lending itself to highly practical interpretation.

In this respect the position of the Netherlands in the West German market forms a particularly useful starting point. Bilateral trade between the Netherlands and West Germany is particularly intensive; at a value of DM 59 billion in 1978 it amounted to the fourth largest bilateral flow of trade in the world, while within the EEC Germany has been the most successful in adapting to changed international economic relationships. The latter point has been well documented in recent studies based on a wide range of indicators.[55]

The trading relationship with West Germany may be described in terms of complementarity. Vertical complementarity indicates a situation in which Dutch exports move into markets being abandoned by West German industry. Horizontal complementarity indicates a similar phase in economic development: in this regard the position of the Netherlands in the West German market forms a good yardstick of the extent to which the Netherlands, while perhaps not leading the field in adjustment to changed international circumstances, has nevertheless managed to adjust by being pulled along in the slipstream of its major trading partner. Between 1973 and 1978 there has been an overall drop in the market share of 1.2%.[56] This decline has been concentrated in the category of manufactured goods which not only form the major category in total West German imports but which are also the fastest growing: chemical end-products, textiles and clothing, metals, metal products and capital goods.[57] In the category of agricultural products, by contrast, gains have been recorded. The trading relationship appears, therefore, to be evolving towards one of vertical complementarity.

This picture of the Dutch export position not only indicates that the export package is of definite significance but also that there exists a link between the

[53] Central Planning Office, *Centraal Economisch Plan 1979* (Central Economic Plan 1979), p. 156.

[54] J. Gerards and H. Jager, 'De structurele ontwikkeling van de Nederlandse uitvoer; een toepassing van CMS-analyse' (The Structural Development of Dutch Exports: an Application of CMS Analysis), *Economisch Statistische Berichten*, no. 3238, 16 January 1980, p. 64.

[55] EEC, *Die Entwicklung der sektoralen Strukturen der europäischen Volkswirtschaften seit der Erdölkrise 1973-1978* (The Development of the Sectoral Structures of European Economies since the Oil Crisis 1973-1978), Brussels 1979. See also *Report on the competitiveness of European industry 1979*, European Management Forum, Geneva 1980 and *Future Structural Changes in the Industry of the Federal Republic of Germany*, UNIDO Working Paper on Structure Changes, No. 6, 1979.

[56] See on this point H. Hennies-Rautenberg, 'Die niederländische Exportwirtschaft kann sich auf dem westdeutschen Importmarkt zunehmend weniger behaupten' (Dutch Exports Steadily Losing Ground in the German Import Market), *Profit*, no. 6, Nov./Dec. 1978 pp. 8-10. See also the press releases issued by the Netherlands-German Chamber of Commerce, S-4269 (The Hague 7 March 1979) and S-4442 (The Hague 27 September 1979).

[57] Hennies-Rautenberg, op. cit., p. 10.

competitive position in the domestic market and that in export markets, in that the same types of industries are losing ground in both markets.

5.2.4 *Starting points for a future export policy*

Volume of international trade and openness of the Dutch economy

The development of international trade forms an exogenous factor for Dutch policy: and given the high degree of openness of the Dutch economy, it forms a significant starting point for the growth of Dutch exports. This openness is abundantly clear if measured in terms of the share of imports and exports in gross domestic product (see table 69).

Table 69. Volume of imports and exports expressed as % of GDP

	Total imports as % of GDP	Total exports as % of GDP
Small European countries 1977[1]	29.9	24.0
Medium-sized countries 1977[2]	21.6	21.3
Large countries 1977[3]	9.0	9.0
Netherlands 1977	42.9	41.1
Belgium 1977	49.1	45.7

Source: OECD Observer, March 1979.

[1] Austria, Norway, Sweden, Switzerland, Denmark.
[2] Canada, Germany, Italy, France, United Kingdom.
[3] Japan, United States.

The background to such a high degree of dependence on international trade is generally that small countries are obliged to export in view of the limited size of their domestic markets and the scale of production required to obtain economies of scale. In addition for the Netherlands there is its location in relation to neighbouring EEC countries, which has enabled it to build up a strong position within the category of intermediate goods (e.g. chemicals and petroleum refining).

If the relationship between total exports as a percentage of GDP and per capita income is examined, the Netherlands turns out to occupy a special position among small, industrialized countries. In 1965, for example, this relationship was nearly 50% higher than would be associated with the 'normal' pattern.[58] This is also true of Belgium, although to a much less marked extent. The main factor responsible for this is the volume of primary product exports.

It is clear that the openness of the Dutch economy forms a major starting point for government policy, since a significant part of the economy is dependent on exports. As a percentage of output, the value of exports often lies well above 50%, especially in manufacturing industries. In policy terms this means that the government must continue to strive for the liberalization of international trade. But this openness also has another side, namely the openness of the domestic market. The connection between the country's export position and the domestic market was noted in the previous section. In the case of sensitive industries, this relationship takes a dramatic form in the Netherlands. If present expectations are fulfilled, these industries will be subject to such a deterioration on both fronts that they will be of scarcely any further significance in the Netherlands in five years time.

The government's trade policies will therefore have to pay greater attention than in the past to the strategic relationship between the competitive position in the domestic market and that in export markets.

The export product-mix

Table 70 provides a survey of the development in exports in individual industries during the period 1963/1979, which may be compared against the forecasts for the period 1979/1985.

[58] H.B. Chenery and M. Syrquin, *Patterns of development 1950-1970*, Oxford 1975.

Table 70. Growth in the volume of exports (in average annual growth rates)

	1963/73	1974/79	1979/85
- Agriculture	6.5	6.6	4.2
- Foodstuffs			
• animal products	8	5.4	4.5
• other products	8.5	4.8	4.5
- Beverages & tobacco	13	10.4	4.2
- Textiles	6	— 2.4	0
- Clothing, leather and footwear	10	0.9	1.1
- Paper and graphic products	11.5	2.5	2.9
- Timber and construction materials	11.5	4.6	2.1
- Chemicals and rubber	18.5	4.6	2.5
- Basic metals	12.5	2.3	1.8
- Metal products & optical industry	11	6.3	3.1
- Electrical engineering	11.5	6.8	3.9
- Transport facilities	10.5	0.8	0.8
- Petroleum			
• Central Planning Office	13.5	— 2.8	1.6

Source: Columns 1 and 2: Central Planning Office, *Centraal Economisch Plan 1979* (Central Economic Plan 1979).
Column 3: L.B.M. Mennes, K.A. Koekoek, J. Kol and D. Sinke, 'De industriële uitvoer van Nederland in 1985' (Manufacturing exports by the Netherlands in 1985), Centre for Development Programming, Erasmus University Rotterdam, WRR 'Voorstudies en achtergronden' (Preliminary and Background Studies), The Hague 1980.

The most striking features of the above table are the virtual disappearance of exports by 'sensitive industries' in the coming years and the expected severe decline in exports in virtually all intermediate industries and the transport facilities industry. The industries that appear best placed to maintain their position include primary products, processed raw materials (foodstuffs, beverages and tobacco), metal products and electrical engineering.

If these trends did in fact materialize, it would mean that the Dutch package of exports would be subject to regression, in the sense that the share of primary and processed products would begin to rise again, instead of falling, as might be expected in the case of a highly industrialized country.

Geographical distribution

A significant proportion of Dutch exports go to other EEC countries. This is by no means unusual in the Western European context. It is, however, fair to say[59] that the geographical distribution of exports has failed to adjust satisfactorily to the new, rapidly growing markets (see also 2.2.4). This should probably be seen in conjunction with the package of export goods, a high proportion of which are subject to high transport costs. Additional factors consist of the underdeveloped nature of sales outlets and marketing facilities in foreign markets. Finally there is the fact that the emphasis in the rapidly growing markets lies more on integral, large-scale projects than on individual products. The relatively small scale of the Dutch capital goods industry accordingly makes it difficult to obtain a commensurate share of these markets.

Competitiveness

As noted earlier, the decline in competitiveness has been a significant factor behind the loss of export markets by the Netherlands after 1973. This does not, however, answer the question as to which of the underlying causes is responsible for this loss. Among the underlying determinants of competitiveness are both price and non-price elements. The latter include such factors as image, quality, marketing and credit facilities. The question is which of these determinants plays a major role; this is not something that can be answered directly from the literature or from existing surveys.

If we begin by taking price as a determinant, for which export price levels may

[59] R. Dick and H. Dicke, op. cit.
J. Busschaert, 'De exportpositie van de Benelux' (The Export Position of Benelux), *Benelux* 79/3, p. 39.

be taken as a general indicator, we find ourselves confronted with findings that do not at first sight appear reconcileable.

To begin with the impact of prices (i.e. export price levels) on fluctuations in countries' export market shares is not regarded as very high. One either encounters reasonably hig values for price elasticity[60] in econometric analyses, but with a low degree of reliability, or the values for price elasticity are low;[61] in the case of the most recent period (1973-1978), with which this report is primarily concerned, it is impossible to establish a clear causal relationship between changes in relative prices and market shares for countries in general.[62]

Later in this section we shall indicate why it is difficult to demonstrate the existence of such straightforward relationships by econometric means. The explanation implicitly acknowledges that there is a definite degree of price sensitivity on the part of Dutch exports. This is consistent with the conclusions reached by the Central Planning Office. These conclusions may be some 15 years old, but Muller et al.[63] obtained a value of 1.14 for the long-term price elasticity of exports in a recent estimate of comparative export performance in a macro model. This figure corresponds exactly with the weighted average of industry elasticities shown in table 71.

Table 71. Export price elasticities in selected industries

Industry	Elasticity	Industry	Elasticity
Foodstuffs		Chemicals and	
• animal products	—0.6	chemical products	—1.2
• other products	—1.2	Metal products and	
Textiles	—1.6	mechanical engineering	—1.3
Clothing and footwear	—1.1	Electrical engineering	—1.1
Paper and paper products	—1.5	Other sectors	—2.6

Source: Central Planning Office, The Netherlands Economy in 1970, table 4.2.

Although it is not possible to demonstrate the existence of any sensitivity in the volume of exports to prices for the world as a whole, ther can be little doubt about the impact of labour productivity on countries' general export performance.[64]

During the period 1967-1977 changes in the market shares of industrialized countries turn out to be strongly correlated with variations in changes in labour productivity. The study referred to above was concerned with changes in labour productivity in the enterprises sector as a whole. This provides support for the supposition that it is not just the productivity of export industries that matters but that of the enterprises sector as a whole. This needs to be viewed in relation to intra-industry supplies.

In order to indicate the impact of labour productivity on export performance, one would be inclined to think in terms of the effect on price formation. The price studies referred to earlier do not, however, directly confirm this. A recent study of Dutch export performance moreover indicates that price trends in recent years have not exerted a negative influence on the volume of exports, while there are indications that the productivity of labour during that period has lagged behind that in countries such as Japan, West Germany, Austria and France.[65] The latter is not fully borne out in the EEC's study.[66] Be this as it may be, it is possible to formulate a hypothesis on the connection between export shares and labour productivity that accounts for the apparent inconsistency between these findings.[67] According to this hypothesis exporters are forced by the balance of competitive forces to adjust their prices in line with prevailing international price

[60] Elasticity of the market share in relation to the relative export price level

[61] R. Dick, H. Dicke, op.cit.

[62] Ibid.

[63] F. Muller, P.J.J. Lesuis and N.M. Boxhoorn, *Een multisectormodel voor de Nederlandse economie in 23 bedrijfstakken* (A Multisectoral Model of the Dutch Economy in 23 Branches of Industry), Institute for Economic Research, Erasmus University Rotterdam, WRR 'Voorstudies en achtergronden' (Preliminary and Background Studies), The Hague 1980, p. 30.

[64] Ibid.

[65] Dick and Dicke, op. cit., p. 93.

[66] EEC, 1979, op. cit., p. 106.

[67] See also Groot and Janssen, op. cit.

levels. At the same time, the extent to which exporters are exposed to such price pressures depends partly on their position in relation to non-price factors such as marketing, prompt delivery, after-sales service and product quality. Lower productivity levels and/or a relatively high cost level can, however, undermine profitability to such an extent that firms are forced to discontinue production. This 'sales effect' was noted previously in chapter 2.1.2. The recent loss in export markets may be seen in this light. In chapter 2.3, which discussed the model studies, it was noted on the basis of empirical data that Dutch export prices have lagged behind the rise in import prices in recent years. From this it may be ascertained that the Dutch position in relation to non-price elements has not been such as enable the Netherlands to escape price competition.[68] This interpretation is thus based on a more complex relationship between the various determinants in question, in which price and non-price factors interact in a manner that makes it difficult to demonstrate a direct relationship between price changes and changes in quantity by econometric means. In view of these circumstances it is fair to conclude that Dutch exporters have recently been exposed to price pressures that cannot be adequately fended off by means of non-price factors and that this – given the level of costs – has necessarily led to the withdrawal of exporters from various markets.

In summary, it may be said in relation to competitiveness that it is important for supply factors to be taken into account in the determination of appropriate export policies for the Netherlands.

5.2.5. *Future export policies in broad outline*

A number of aspects were discussed in section 5.2.4 of relevance for the determination of future export policies. These include the openness of the Dutch economy, specialization on and within certain branches of industry and the associated comparative advantages enjoyed by the Netherlands in relation to other countries, the relatively dated structure of the export product-mix, the geographical concentration and relative rigidity in the geographical distribution of exports, and the importance of other supply-side factors for the success of the export sector such as market position and labour productivity. These starting points also provide a basis for the question as to how far an export promotion policy should be formulated against the background of the need for structural policies. An export policy of this kind may be defined as a policy designed to bring about the most desirable structure of Dutch exports and also of imports in terms of satisfying the socio-economic objectives of full employment and external equilibrium.

The restructuring policies that have so far formed part of the policy debate do not offer a particularly satisfactory frame of reference.[69] The measures under consideration in that context were geared towards a largely non-existent problem, namely the threat posed to domestic industry by developing country imports, while these measures did not go far enough towards ensuring a functional place for the Netherlands in the new pattern of international trade and production.

What then are the parameters within which the Netherlands will have to operate in the future pattern of international trade? The fact that a sifnificant part of the economy is exposed to foreign developments means that it is imperative for the country to respond as well as possible to likely changes. In other words, the Netherlands will have to exploit its existing advantages in relation to other countries or – although this applies only to the longer term – the Netherlands will have to anticipate changing circumstances and as it were create the required comparative advantages. As far as export policy is concerned the extreme openness of the Dutch economy means that the concept of

[68] Direct support for this proposition emerges from the study on the furniture industry carried out for the purposes of this survey (see WRR, working paper *Meubelindustrie* (Furniture Industry), J.C. van Ours, The Hague 1980). In more general terms support for this proposition may be found in the description of the Netherlands export position contained in the report by European Management Forum, op. cit.

[69] L.B.M. Mennes, 'Sectorstructuur- en handelsbeleid' (Structural and Trade Policies), WRR, 'Voorstudies en achtergronden' (Preliminary and Background Studies), The Hague 1980. The same has been empirically established for West Germany. See UNIDO Working Paper, op. cit., p. 51.

liberalization will have to be stressed. A country with such a high level of exports in relation to gross national product is obliged to do what it can to eliminate international barriers to trade. Such efforts by the Netherlands could be effective; a study by the Weltwirtschaftliches Institut at Kiel, 70 for example, indicates that the removal of trading barriers in Western Europe would have a marked impact on the flow of trade.

In addition we shall need to bear in mind to a greater extent than before that the prospects for maintaining prosperity levels in highly developed countries will depend increasingly on their competitiveness. In view of the high cost levels with which most developed countries are confronted, this handicap will have to be compensated for by an appropriate set of export products and a vigorous approach towards non-price factors such as sales, marketing, delivery times, after-sales service and product quality. These requirements boil down to two factors: specialization and product differentiation. The Netherlands has never stood out in Europe on these points. In an international opinion survey[71] conducted in 1963 the Netherlands emerged as a country with a weak industrial image, while West Germany was regarded as a pace-setter. These positions were confirmed in the recent survey conducted by the European Management Forum[72] – which goes to show that a country's industrial image is something that applies over a very long period.

For a broad outline of more operational industrial objectives the reader is referred to chapter 2.

Timing of policy

In the short term there will not be a great deal of scope for government policy to achieve reorientation. The dated structure of Dutch exports and the limited geographical distribution will, instead, have to be taken as given during that time frame. At the same time, however, attention should be paid to the prospects for the present product-mix and to the extent to which a reorientation is required.

In this sense both stages of government policy should interlock strategically (see also section 5.1.5) and also be conducted in parallel. The latter is important for at least two reasons:

- the effects of structural policies will only be felt after several years, assuming that a start is made straight away with the necessary policy preparation and implementation;
- the degree of cooperation on the part of the various socio-economic parties, especially during the first phase, will partly depend on the content and timing of the second phase.

This brings us to the following approach, as set out below.

An outline of future export policies

	Short term	Medium term
Nature of policy	Concentrated and reactive: exploitation of existing potential and assets	Differentiated and anticipatory; creation of new comparative advantages and a new functional position
Areas of policy concentration	1. Competitiveness : cost control and improvement of company profitability 2. Emphasis not only on export markets but also on domestic market 3. Concentrated approach directed towards principal importing countries 4. Improvement of marketing and streamlining of organizations 5. Government procurement policy geared towards export prospects of Dutch industry[1]	1. Structure-shaping determinants, export product-mix, geographical distribution 2. Stress on new export industries 3. Differentiated approach 4. Adequate adjustment of image and organization (image as an industrialized country) 5. Dynamization of government procurement policy[1]

[1] This approach towards procurement policy is subject to certain reservations, on two grounds.
Such policies are a two-edged sword, because the ability of Dutch industry to secure foreign government orders depends in part on the extent to which domestic procurement policy is opened up to foreign competition. In addition the Netherlands is subject to certain international agreements in this regard (see also section 5.3).

[70] R. Dick, R. Loertscher, 'Unausgeschöpfte Spielräume im innereuropäischen Handel' (Untapped Potential in Inner European Trade), *Die Welwirtschaft*, 1977, vol. 1.
[71] Reader's Digest, *Products and People*, London 1963. The reputation of 9 countries as manufacturies, tables 45-50.
[72] Op. cit.

5.3 Innovation: an analysis of the technological and scientific base, the dissemination of technology and government policy

5.3.1 *Introduction*

This section containts an analysis of:
a. various aspects of the Dutch technological base;
b. the functions currently fulfilled by the technological base;
c. the organization and possible exploitation of that potential.

This analysis will be concerned with formulating policy questions with regard to the promotion of technological innovation on behalf of Dutch industry. This will comprise the basic elements of the process of technological innovation as dicussed in chapter 3.2. This amounts to an analysis of the strengths and weaknesses of the current constellation and indicating ways in which obstacles towards the exploitation of the country's technological base may be removed, including the possible role for government. In doing so use will be made of the guidelines and recommendations contained in the Innovation White Paper[73] published in autumn 1979. The analysis applies particularly to small and medium-sized firms. With regard to large enterprises the stress has been placed on the right conditions for maintaining the large research input in the Netherlands.

5.3.2 *The base of scientific knowledge: higher education*

Universities

In 1979 some N.Fl. 6 billion was spent on scientific activity in the Netherlands. This corresponds to 2% of Gross National Product. Of this N.Fl. 3 billion was government funded, of which about half was directed towards research in Dutch institutions of higher education. The scientific research conducted at Universities is primarily oriented towards academic training rather than towards applied research. The main emphasis at various levels is on pure scientific research. The social significance of such research derives principally from the functions it fulfills with regard to the training of academic graduates, who are then able to place these skills at the disposal of society in a wider domain. In these terms, the specific areas in which pure research is conducted is irrelevant. What is essential, however, is that such research should take place in areas in the forefront of scientific endeavour, so that forming original associations and deductions constitutes an integral part of such training.

As in any organized activity, care must be taken in the case of scientific research to avoid fragmentation and duplication of effort. The range and utility of research can be enhanced by the promotion of cooperation between parallel and especially complementary disciplines. This is of particular significance at the level of student training. Such cooperation makes for a broader outlook and provides insight into interrelationships and a sense of teamwork that are essential given the highly-developed degree of specialization characteristic of the natural sciences. In the case of inter-disciplinary collaboration, there is a tendency for projects to be selected in terms of their social relevance; typical areas of study include energy problems, environmental problems, and the like. This is not necessarily a bad thing. University research should, however, concentrate on fundamental scientific problems rather than on applied aspects. This does not mean that the ability to apply the results of such research is ruled out, but it does not form a necessary condition.

Unfortunately the universities are poorly organized in the research sphere to promote collaborative arrangements (either intra- or inter-university). Funds allocated for scientific research under the direct government grants channelled to universities and institutes of technology through the Ministry of Education and Science (the so-called 'first stream') are not generally used for this purpose. Provisions to this end were first made with the introduction of the 'second stream' of funds, which are channelled through the Netherlands Organization

[73] *Technische Innovatie* (White Paper on Technological Innovation), Second Chamber, 1979-1980 session, 15 855, nos. 1-2.

for the Advancement of Pure Research (ZWO). This had led to the establishment of working associations in a number of fields of pure scientific research, both inside and outside universities. Major fields include chemistry, physics, biology and medicine. In view of the uncertainty surrounding the future organizational structure of ZWO, and given the limits to government financing, the notion is growing within universities themselves that more selective use will have to be made of funds in the 'first stream'. Initiatives in this direction 'outside', which have been stimulated by the Royal Netherlands Academy of Science and the Academic Council, have gradually had an impact in the fields of chemistry and biochemistry at university level. Both the Academic Committee for Chemistry (ACC) and the Biochemistry and Biophysics Committee (CBB) have made progress towards developing close links between the various chemistry sub-faculties in the country. This includes the selection of the broad fields of study, the prevention of unnecessary duplication, the possibility of stressing certain aspects, and coordinated advice with regard to the nomination of senior academies appointed by the Crown.

Counterpart arrangements exist in the Ministry of Education and Science in the form of the Chemistry Review Committee, the recently appointed Biochemistry Review Committee, and in ZWO, where selected areas of policy concentration are under consideration. These are significant efforts, but they are still in the early stages; they do not mark the dawning of a new spring.

The recently published White Paper on University Research (the BUOZ Report)[74] has taken too long to produce; there has been a lack of well-defined, purposeful policies with regard to this aspect of government expenditure.

The stock of knowledge at universities and institutes of technology, and the utilization of that potential, are of relevance for the place and future of industry in the Netherlands.

The stock of knowledge may be divided into the following components:

a. the accumulation of knowledge;
b. the processing of knowledge;
c. the generation of knowledge.

As has been said, the social and industrial application of the available stock of knowledge cannot be primarily a task for tertiary education institutes. These bodies are not organizationally geared towards handling such a function; their structure and organization do not permit them systematically to transfer their knowledge to bodies in a position to make use of it. The transfer of knowledge generally takes place in a loose, unstructured manner, through personal, accidental contacts with industry or government bodies rather than by a structured exchange.

A number of questions have recently (and in our view appropriately) been raised in relation to the fees paid for academic consultancy work. Because of the lack of any regulations, the economic importance that such contacts have has threatened to fall into disrepute. This problem was taken up in the Innovation White Paper. The reservoir of knowledge and intellectual ability in the universities is of such size and quality that the Netherlands must ensure it is put to good use, in terms of application outside the field of academic research.

Institutes of technology

So far the main emphasis of this discussion has been on universities.

Do different criteria apply in the case of Institutes of Technology?

The term 'Hogeschool' (literally 'high school' or college) indicates that these bodies are not universities in the strict sense. They are confined to selected scientific fields, at least as originally conceived. In other countries these colleges may be termed 'Institutes of Technology' (e.g. the MIT, Boston) or 'Technical Universities' as in Britain (in the case of certain redbrick universities). The term Institute of Technology is used in this section, being the closest equivalent to the Dutch institutes in question.

An examination of the history of the Delft Institute of Technology indicates that the substance and quality of the research conducted there often comes close to pure scientific research. This is also the case at the other two Dutch

[74] Ministry of Education and Science, *Beleidsnota Universitair Onderzoek* (University Research Report), Second Chamber, 1979-1980 session, 15 825, nos. 1-2.

Institutes of Technology. The education of engineers, for example, is concerned with the technology and practice of engineering, with as high a degree of relevant theoretical understanding as possible. In this respect the practical application of the knowledge acquired is of much greater import than in the case of university education in general. The construction and operation of technical equipment and systems of production demand a certain level of practical knowledge, including business administration and management at and above shop-floor level. Economic considerations have to be included.

In various areas of non-technical scientific specialization, especially at Delft, research has become of a highly independent nature concerned with the advancement of basic knowledge, right up to the final stages of the course. The Delft Institute of Technology, for example, has a reputation for producing extremely competent microbiologists, biochemists, analysts and organic chemists, who are generally more oriented towards basic research than towards industrial application. Many have ended up in large research laboratories, where they measure up in standard to university-trained specialists. They tend, however, to display little interest in technology. Without questioning their value to society, the question arises whether the teaching at institutes of technology should not be more concerned during the final stages of study with production techniques and control (e.g. bioprocessing, industrial hygiene, computerization, information systems and instrumentation) rather than with basic pioneering research detached from technological problems. As it is basic scientific research is already well covered in the universities.

This pattern may well be responsible for the widespread view that recent engineering graduates often require a great deal of time to acquire practical experience in the technical aspects of industry, and that graduates form Senior Technical Schools compare rather favourably in the initial stages. On the other hand, as may be seen from the high proportion of senior academics appointed by the Crown with practical experience in industry, the underlying emphasis on technology makes the academic community at institutes of technology more responsive than universities to the industrial application of knowledge. Institutes of technology have highly specialized departments that are well-placed to develop contacts with industry. Thus the Delft Institute of Technology maintains close relations with the TNO Technical Physics Services. It should not be concluded from the above that pure research should play no part in the training of engineers – but there should be an appropriate interaction with technology. It is here, however, that the practical application of the knowledge held by institutes of technology (and their comparative 'unapproachability' as far as industry is concerned) tends to correspond with that at universities.

The establishment of institutes of technology at Eindhoven and Twente was designed to meet regional needs. Twente, in particular, was organized along different lines. An important aspect consisted of producing bachelors of science along Anglo-Saxon lines. This took the form of courses of relatively short duration (approx. 3½ years) with a stronger practical orientation. These efforts may be said to have failed, in that they did not lead to a new category of engineers midway between technical college graduates and 'classical' engineers. The difficulty of finding suitable employment in industry or elsewhere led the great majority to proceed to a normal, comprehensive engineering course. The reasons for this failure are complex. On the one hand, bachelors of engineering came into direct competition with technical college graduates, while another undoubted factor were the excessive status expectations associated with proper 'academic' training. On the employers' side there was a failure to fit the new category into the organizational structure, while the Government failed to integrate academic with higher vocational technical education.

In Anglo-Saxon countries, bachelors of science are placed at assistant manager level without automatic promotion to academic levels. In the Netherlands, the business sector was at a loss what to do with bachelors of engineering, partly because higher vocational training was already being conducted at the Technical Colleges. Given the introduction of the two-phase study in higher education, this problem might have been solved by the integration of higher vocational and academic technical education.

A similar sort of dilemma will arise in relation to students who terminate their

university studies after the first phase. In the case of delayed or non-uniform introduction similar problems of fitting in could arise.

An attractive feature of the increase in the number of institutes of technology is that it will enable there to be a general distribution of functions in scientific research at these bodies. Where certain trends have already developed within particular institutes, the obvious thing would be for these to be stimulated selectively under government science policy.

Thus the proximity of the Eindhoven Institute of Technology to the comprehensive electrical engineering industrial complex of Philips would provide a reason for strongly stimulating the existing concentration there on solid matter physics; this would of course be done in interaction with similar, established activities at the two other institutes of technology. In this way a natural interaction could be brought about, for example in the form of the appointment of professorial and academic staff with industrial experience.

Interaction of this kind would be of benefit to both research and training in a field containing many technological options for the electrical engineering industry. This industry in the Netherlands includes many small and medium-sized firms (see also chapter 3.1 on 'Technology'). An obvious course of action would be to promote cooperation between the Eindhoven Institute of Technology and those at Delft and Twente (information systems). In terms of science policy, the chances of a meaningful selective research and training strategy at the three institutes, of which two are still comparatively recent, must be regarded as high. The mobility of research workers should also be encouraged, including in a wider context than the universities alone. Finally we would stress the importance of certain aspects of training with a practical orientation at the three institutes, namely industrial planning and business management. These are factors with which young engineers are required to grapple from the outset in industry. In this regard he must know his way about, i.e. possess sufficient basic knowledge.

Agricultural Research

The Institute of Agriculture (LH) at Wageningen occupies a special place.

In the light of its diversity the LH resembles a university rather than an institute of technology (i.e. an agricultural university), but about one third of its research is directed towards the agricultural sector.

The LH differs from other institutes of higher technical education in that it comes under the Ministry of Agriculture and Fisheries, with which there is direct interaction; this finds expression in the extent to which this ministry presides over technical expertise. This means that there is a high degree of professional expertise in official policy formulation. Collaboration has developed naturally between the Agricultural Research Service (DLO) and the LH, in which respect the National Council for Agricultural Research (NRLO) fulfills an important bridging function under the auspices of TNO and helps to establish contacts with other research bodies. This has led to a pronounced emphasis on applied research (i.e. innovation), but in this regard another factor enters in which is typical for the Dutch system of production, namely the cooperative structure in the agricultural sector, which is in marked contrast to the world of industrial manufacturing.

Arable and livestock farmers do not compete against each other in the way that there is competition within and between the various branches of manufacturing industry. Thus there exists the Netherlands Institute for Dairy Research (NIZO) at Ede, which works on behalf of the Netherlands dairy industry as a whole. NIZO is active in a broad field of product and process development and plays an important part in innovation, including in the field of quality improvement (e.g. new types of cheese, continuous cheese production processes and butter cold-storage problems). The institute has direct access to areas of research covered at the LH Wageningen and there is an exchange of knowledge with experimental dairy stations throughout the country. The well-run agricultural information services further strengthen the exchange of knowledge in the agricultural sector.

A consideration of the government's involvement in technical matters outside the agricultural sector must begin with the Ministry of Economic Affairs. This department does not, however, bear any responsibility for research in higher education, in contrast therefore to the Ministry of Agriculture and Fisheries, which the LH Wageningen comes under. The financing of Institutes of Technology is handled by the Ministry of Education and Science in conjunction with the Directorate-General for Science Policy. The latter, however, carries little financial weight.

The government (i.e. the Ministry of Economic Affairs) suffers from a marked lack of clarity in its policies towards the active exploitation of scientific and technological know-how. The great diversity of technological and industrial activity, individual interests and the competitive position of a great number of private firms render it impossible to develop a reasonably well-defined structure. This has not proved possible with regard to the institutes of technology, or with regard to the Ministry of Economic Affairs itself. The Ministry regards the recruitment of technically-versed experts as essential. To some extent it has succeeded in doing so, but nevertheless the Netherlands lags behind other industrialized countries in this regard. Insufficient attention is paid within the government set-up to the factor 'technology'. In this respect the present government set-up in the Netherlands may be regarded as underdeveloped.

One possibility would be to establish a Ministry of Industrial Technology. Such a Ministry could bring together the various aspects of science policy of relevance to applied technology and forge them into an integrated technological and industrial policy in conjunction with the three institutes of technology and perhaps also the LH at Wageningen, as far as production techniques (i.e. raw materials processing) are concerned. Such a Ministry – in which the emphasis would be on technology rather than on economic aspects and business administration – could be expected to have a sounder grasp of developments in science and technology, which could be of decisive importance for private industry and public utilities. The Ministry would be able to assess the long-term policy implications of such developments and to stimulate them by creating the right conditions. This would require a large-scale set-up with due technological expertise. It would be much easier to attract experts with industrial experience for such a Ministry than is the case now. A Ministry of this kind would be much better placed to play an active policy role in the field of applied science. It would be able to structure the required bodies or institutes effectively in close interaction with industry.

In the light of the above the place and function of the Directorate-General for Science Policy should be critically examined. This body deals with policy concerning fundamentally different aspects of scientific activity (i.e. basic science and scientific endeavour with a view to practical application) with, as noted earlier, two different forms of social relevance. In the Netherlands these interests have been combined in the one Directorate-General for Science Policy.

There is no Ministry in the Netherlands responsible for the application of technological know-how in industry similar to the Ministry of Research and Technology (BMFT) in West Germany, which is generally regarded as highly effective.

In the case of the Netherlands there can be no doubt about the importance of the closest possible coordination between the Directorate-General for Science Policy (Ministry of Education and Science) and the Ministry of Economic Affairs with regard to government involvement in technological innovation and industrial policy.

The extent to which industry might be prepared to act collectively if government involvement were made more clearly defined and effective was taken up in chapter 5.1.

5.3.3 *The transfer of know-how with a view to industrial application*

Although a substantial amount of research is conducted in the Netherlands for a population of its size and in relation to other developed countries, much knowledge and fresh insight comes from abroad. The scientific research carried

out at institutes of higher education in the Netherlands covers a broad field. This has the disadvantage of small-scale fragmentation but it also provides the advantage that there are many points of contact to acquire knowledge from outside, even if that know-how is often highly unstructured and unorganized and does not lend itself to practical application. Such transfer of research findings as there is from the universities and institutes of technology to industry generally takes the form of accidental personal contacts. This is accentuated by the fact that the interests of small and medium-sized firms in technological developments tend to be disparate rather than unified. Promoting the transfer of kwowledge forms a logical area for government activity. These activities should not be confined to the field of higher education but should include government and semi-government bodies.

This would apply to the following research bodies:

a) research bodies coming under the Royal Academy of Science:
Central Bureau of Mould Cultures
International Embryological Institute (Hubrecht laboratory)
Institute for Ecological Research
Limnological Institute
Delta Institute for Hydrobiological Research
Netherlands Institute for Brain Research

b) bodies carrying out contract-research for various government departments:
Netherlands Central Organization for Applied Scientific Research (TNO)
Netherland Energy Research Centre (ECN)
Soil Mechanics Laboratory (LGM)
Hydromechanical Laboratory (WL)
Netherlands Shipbuilding Pilot Station (NSP)
National Air and Space Travel Laboratory (NLR)

c) government and semi-government bodies:
Royal Institute of Public Health (RIV)
Netherlands Cancer Institute
Royal Institute for Drinking-Water Research
Royal Tropical Institute
Agricultural institutes.

Further details may be obtained from the survey in the Technological Innovation White Paper, Second Chamber, 1979-1980 session, 15 855, nos 1-2. annex 6.

Like the universities and institutes of technology, these government bodies have accumulated a significant body of scientific knowledge. By virtue of their administrative structures, they are better placed to launch scientific cooperation programmes and to evaluate or rechannel research or to look into possible new areas of research. Their activities are in other words more geared towards multi-disciplinary team work, that is work in fields in which the research carried out in various institutes may alternatively be of a highly theoretical nature or be more concerned with practical application. Even so, many small and medium sized firms do not have a clear idea of the available body of knowledge at these institutes, or find it rather inaccessible.

The less that companies undertake their own research and development, the greater the gap or the likelihood that knowledge obtained by 'accidental' means will fall on barren ground. For the majority of small and medium-sized firms, this forms the weak link in the chain between the possession and application of knowledge, i.e. basic, basic-oriented and applied research.[75]

This does not apply to industrial enterprises with well-developed research capabilities of their own. These enterprises are familiar with the accumulation, generation and processing of knowledge and are able to provide the third link in the chain (i.e. applied research) themselves. Large enterprises with their own information processing systems are able to stay in touch with scientific and technological developments in their own country and abroad, and are therefore able to develop effective contacts. This is particularly true of the large multinationals of which a number still carry out a significant level of research in the Netherlands. These enterprises account for a major share of total R & D

[75] Terminology according to the definitions of the European Industrial Research Management Association (EIRMA).

activity in Dutch industry (approx. N.Fl. 3 billion in 1978).

In this regard it is useful to examine the 'industrial R & D model', i.e. arrangements in multinational enterprises that rely to a large extent on their own research and development, as well as the requirements associated with the promotion and realization of technological innovation. This was done in chapter 3.2

A frame of reference was accordingly outlined in terms of which R & D problems for small and medium-sized firms might be examined. This was designed to demonstrate the extent to which the government could and should play a constructive role. It is not sufficient to look into ways whereby existing research of a theoretical nature could be broadened into applied research on behalf of small and medium-sized firms. Other factors in the chain of technological innovation come into play as well. These have been discussed in chapter 3.2.

This means that it must be decided what potential and what set of policy instruments the Netherlands has at its disposal in order to continue playing a significant part in the increasingly competitive international world of technology. The question is whether the system functions adequately in the Netherlands at present and whether shortcomings can be overcome. The specific target group in this chapter are the several thousand small and medium-sized firms.[76]

And these form an important category of firms: the share of total employment in manufacturing industry in these firms rose from 47% (in 1970) to 56% (in 1976). In terms of innovation these firms get high marks. US studies have revealed that small firms (i.e. 100-200 employees) are responsible for many radical innovations. Over 50% of all discoveries and innovations take place in these types of firms, although the share is admittedly falling now that technical redevelopment is becoming more complex and demanding a greater degree of expertise than hitherto. Care should be taken in supporting the innovational capacity of small and medium-sized firms to ensure that the flexibility so characteristic of these firms is preserved or increased. Similarly care should be taken in applying the conclusions of the 'Industrial R & D model' to small and medium-sized firms.

It is obviously essential for entrepreneurs in this category to be alert to opportunities if they are to make good use of know-how and innovation developed elsewhere. This applies both to 'quick followers' and 'leaders' in a market, where a distinction must once more be drawn between 'leadership' of a national or a more transnational nature.

In the latter case access the innovations developed elsewhere is often linked to licenses (including exclusive licences) and the acquisition of know-how, and the entrepreneur enters the arena of international competition, for example in the European Community. It is therefore important to ascertain the extent to which Dutch small and medium-sized firms make use of or are dependent on licences obtained from foreign interests, and the conditions generally attached to the granting of licences. Where exclusive licensing rights are concerned, more exacting conditions will be laid down by licensors with regard to the technological and economic position of the licensee than in the case of non-exclusive licencing agreements. In the former case, licensors are staking everything on a single horse, and the competitive strength and stage of technological advancement of the firm in question (for example in relation to the EEC) will obviously be a major factor.

These aspects will have to be examined separately in conjunction with an analysis of the Dutch position on patents. At this stage it will suffice to note that we should not limit our horizons to R & D of domestic origin (either within companies or assisted). Know-how obtained from abroad will continue to account for a large share of total innovational activity among small and medium-sized firms. It is quite impossible to arrive at a realistic impression of the extent to which small firms have an effective 'antenna' system for obtaining foreign know-how. The great number and diversity of such firms makes it equally difficult to determine the various ways in which this is done. The simple fact that

[76] Apart from the extremely intensive provision of R & D to firms forming part of large concerns operating their own R & D facilities in the Netherlands there are a number of enterprises in the Netherlands whose R & D facilities are located elsewhere, such as ICI, General Electric, Dupont, ITT, Siemens etc. Small and medium-sized firms associated with these groups are not included under our definition of small and medium-sized firms.

they exist and account for a significant share of Dutch exports, indicates that the degree of private initiative in these firms should not be underestimated.

This does not however absolve us from the responsibility of examining whether and in what ways small and medium-sized firms could be given greater support in domestic terms for these activities. This applies to the dissemination of information on a broad front. This chapter, however, is confined to the promotion of technological information and assistance in a structured context, i.e. supplementary to initiatives by individual entrepreneurs. Obviously the provision of technological information must rest on available sources of knowledge, but this is not a particularly helpful observation unless these sources are identifiable and capable of organizational input.

Among universities and the institutes of technology in particular, and among a number of government bodies, there is virtually no access to structured information suitable for purposes of practical application.

This applies particularly to entrepreneurs who, in the absence of research facilities of their own, are unable to track down a relevant specialist or who are unable to translate theoretical elements of knowledge into practical application. If this gap were to be plugged one could think in terms of a bridging function that would act both as a signpost and as a catalyst.

At first sight it would seem logical to set up a special organization for this purpose. This is however illusory if one takes into consideration that:

a) the generation of knowledge in Dutch universities, institutes of technology and government institutes forms only a fraction of total world activity;

b) the monitoring of new information and translating it into practical application are two very different things;

c) the accumulation of existing knowledge for purposes of practical application only obtains real point and relevance through the involvement of research worker(s) or adviser(s) drawn in for a specific purpose.

These observations are based on the fact that the gathering of information on new scientific developments (e.g. monitoring and inventarization) (or retrieval)) is increasingly computerized in form. In this way it has become possible to stay abreast of developments in specialist fields, which has become increasingly essential in view of the burgeoning number of technical and scientific publications.

Knowledge accumulated in this way only becomes of practical value once it has been sorted, read and digested by experts interested in a specific area of research or specialized possibilities of application. These functions are readily available in Dutch industry in the research laboratories of large coporations, but they exist to a much lesser extent in small and medium-sized firms which do not have their own R & D facilities, in the same way that they do not exist in the individual subsidiary firms forming part of these large corporations.

It will be evident that the processing of know-how with a view to practical application tends to take a highly focussed form. The knowledge 'processor' is the appropriate person for fulfilling the bridging function between the available body of knowledge and the ultimate user(s) of that knowledge. The experience gained in industrial R & D indicates that there is no requirement (and indeed no particular merit) in setting up a separate structure for the purpose within the R & D framework in which the numerous individual knowledge-transfer functions are organizationally (i.e. formally) concentrated.

The same applies to the contacts desirably maintained between R & D workers and external sources of knowledge. Once again this is not something best handled by a special organization but is highly personal in nature. In the broad field of science and technology, the processing and translation of know-how for industrial purposes requires a large number of workers and a management that ensures there is a proper system of information retrieval.

We would therefore conclude that there is no point in establishing a formal bridge for the transfer of knowledge from the universities to industry. As noted earlier, the organization and functions of the institutes of technology renders them more accessible to small and medium-sized firms than the universities. The establishment of 'transfer points' at the three institutes of technology as recommended in the Innovation White Paper might improve the degree of accessibility, but this would not apply in the case of the universities.

5.3.4 *An R and D organization for small and medium-sized firms*

Taking the foregoing considerations into account with regard to the need for government support of technological innovation in small and medium-sized firms in the Netherlands, this would point in the direction of an 'R & D organization' for 'Netherlands Inc.' which would conduct its activities along the R & D lines practised in large enterprises as described in chapter 3.2.

This model would have to be given an additional dimension because there is no such thing as an over-arching, collective business strategy in the case of small and medium-sized firms, but instead highly diverse and often conflicting interests.

This complicating factor in an 'Industrial R & R model' leads us to take a highly cautious and critical approach towards the above suggestion. In the first place the question must be answered whether, given the structure of small and medium-sized firms, the terms of reference might not be so complicated as to make the scheme organizationally unfeasible. If the answer should be no, this would be in total variance with the terms of reference of the long-established TNO organization.

TNO was originally established with a view to conducting applied scientific research on behalf of Dutch industry and of Dutch society in a wider sense (i.e. 'the Netherlands Inc.' as well as social and governmental interests).

On the one hand it is possible that in establishing the TNO the Netherlands took a far-sighted step from which it is particularly well-placed to reap the benefits now that technology has come to assume such an integral part of society. On the other hand it may be noted that over forty years later, this path has not been pursued in other countries (or only here and there and partially). And thirdly it may be noted that, whether or not it is justified, there is a good deal of criticism about the effectiveness of TNO. There are also a number of other semi-government research bodies apart from TNO, which are able to perform a similar function. In addition there are a great number of competent private advisory and consultancy bureaus that do not form part of the government sector and which make an important technical contribution to the operation of private industry.

Which problems would the 'Industrial R & D model' produce, if the government were to adopt this model in relation to TNO and other comparable government and semi-government institutes in the interests of the heterogenous assortment of small and medium-sized firms?

1. Until recently TNO has had to serve many masters in the government at once. There was not question of 'one TNO'.
2. TNO is unable to develop an overall industrial research strategy in view of the highly fragmented nature of its customers (i.e. small and medium-sized firms).
3. In comparison with the 'industrial R & D model', TNO operates at a significant distance from industrial parties.
4. There have been only sporadic exchanges of personnel between industry and TNO; in consequence TNO has acquired little practical experience of the operational structure required for development projects.
5. TNO comprises a large number of institutes which have actively sought independent research contracts. This has worked against an optimal use of the talent available elsewhere in TNO.
6. There is no coordination in this sense, as is reflected in the lack of a systematically designed matrix-project organization within and between TNO institutes.
7. With respect to the acceptance of contract research, there exist no minimum requirements within TNO with regard to market research and cost-benefit analysis that must be satisfied before such research is undertaken.
8. The central TNO management has not regarded interface management, project selection and internal institutional project organization as one of its essential functions, or given these aspects any direction from the top. As a result TNO is lacking in the required manpower in these respects.
9. There is an equal lack of central coordination of the exploratory research essential for any form of industrial R & D activity; such research is instead tackled to a significant extent in the separate institutes. This has led to fragmentation and duplication or to untied and unfocussed basic research.

The fact that over 50% of the government's basic subsidy to TNO is of a general, unspecified kind is an indication of the actual situation.

The government will therefore have to ensure that the necessary organizational (i.e. administrative)) adjustments are made within TNO with a view to achieving a more clearly coordinated and centrally directed administration.

A serious obstacle consists of the structure of the industrial partners: where small and medium-sized firms lack the required marketing and market-analysis expertise, a fatal gap can arise in the chain of innovation, for which TNO cannot itself reasonably be expected to compensate.

Similarly the R & D facilities of large concerns would not themselves be able to provide the links of market analysis, testing consumer reaction and commercial and financial expertise. These can only be provided by specialist companies and centralized company services. Where these services cannot be adequately supplied by small and medium-sized firms themselves, the only feasible alternative is to engage third parties, either by involving them in projects of some size or consulting them on smaller contract projects between TNO and small and medium-sized firms.

If it is not possible to develop clear policies and requirements in respect of the operational conditions in this respect, it must be questioned whether the effectiveness of TNO for small and medium-sized firms is sufficient to justify its existence.

We are, however, convinced of the large potential of knowledge and expertise within TNO and of the possibilities opened up by the recent appointment of a Board of Directors for the organization as a whole. As such we believe these arguments should be reversed, as follows:

Many small and medium-sized firms have no choice but to resort to TNO for assistance with technological innovation. It is therefore essential to create conditions whereby gaps in the process of innovation can be filled, both organizationally within TNO and by laying down conditons with regard to obtaining or engaging the required expertise from external sources.

This call for a new-style TNO therefore embraces a number of very fundamental organizational changes within TNO. It will also mean that the relevant guidelines laid down by the government will have to be reformulated.

Technological innovation forms one of the ways of improving the Netherlands balance of payments. Small and medium-sized firms in the Netherlands occupy a relatively exposed position in the respect in view of the accelerating pace of technological change in the large industrialized countries made possible by their large domestic markets and the significant levels of official support for industrial research and development. In the United Kingdom and the United States this stands at roughly 40-45% of total government research funds; in the Netherlands only 5% is ear-marked to industry. It is of course true that large sums are spent in the United States on large-scale projects in the fields of space exploration, defence and alternative energy systems. The Netherlands is unable to undertake such expenditure on its own account. The importance of energy systems or satellite communication, for example, may be clear, but progress can only be effectively made in this field in conjunction with other countries, expecially in the EC. This means that, at least in proportional terms, government funds must be allocated for these purposes. The Innovation White Paper published in 1979 suggests that for a number of additional stimulatory measures the stated percentage should be boosted from 5 to 15. This could either be done through the medium of the total 'cost capital' allocation of N.Fl. 150-160 m. or by means of 'venture capital' totalling N.Fl. 10.5 m. in extra provisions. With regard to the former category the Innovation White Paper leaves open the option as to whether this should be done by the subsidization of labour costs or by subsidizing the costs of contract research. We believe that the former option would not lead to any appreaciable stimulation of innovation among most small and medium-sized firms and would at most lead to some reduction in costs in the medium term. Moreover the provision of subsidies of this kind would risk coming into conflict with EC regulations. For this reason we would favour the second option, namely the placement of government contract work with mission-oriented institutes. If this path were to be concentrated on it

would have to be indicated how the mobilization of the knowledge potential in the Netherlands could be brought about; the Innovation White Paper does not throw sufficient light on the actual implementation of such policies. We shall return later to the second point of stimulation by means of venture capital.

Small and medium-sized firms lacking any R & D facilities of their own to speak of are obliged to seek the technical assistance of specialist research organizations, of which TNO is easily the largest. Less than 20% of the budget of this government organization, which has a staff of around 4,800, goes on contract research for industry – although ironically this is the purpose for which it was established (apart from conducting research on behalf of the government). It enjoys a substantial basic government subsidy of over 50% for unspecified research purposes, while around 25% of its work consists of government contract work. The low percentage of research specifically for industry is a lack that seriously calls into question the effectiveness of TNO.

As far as the Innovation White Paper is concerned, it would have been more logical to have stressed the fact that N.Fl. 200-250 m. is allocated to TNO alone for unspecified research purposes. Priority should therefore be given to specifying the purpose to which these funds should be put, without the need for any increase in the level of public funding.

The Innovation White Paper notes the desirability of expanding contract research at TNO. It suggests that such research might rise from 20% to around 30%, with an annual increase of 4%. The report does not, however, indicate how this might be achieved. The practical form that such policies might take is outlined in the annex to this chapter. Based on the experience of large enterprises with their own R & D facilities, the process of technological innovation was described in chapter 3.2 as a chain of operations in which non-technical expertise also plays a vital part and needs to be operationally integrated in a team context.

A range of expertise should be brought to bear before a project gets under way in order to reduce the risk of mistakes being made in project selection and definition. Important aspects include market surveys, cost-benefit analysis, the financing of the proposed stages of the project, and planning.

In general successful projects are characterized by the fact that as they progress they focus increasingly on production aspects. The process of innovation is a dynamic one requiring professional 'interface management' and intensive 'project management' within the R & D organization. In these respects it may be necessary to change the composition of the team as the project progresses. A project matrix system is frequently employed in industrial R & D laboratories concerned with applied research. Such a system cuts 'horizontally' across the 'vertical' administrative hierarchy under the supervision of the project leader. In general, non-specific or pure research of an exploratory and future-oriented kind accounts for only some 10-30% of the R & D work done in industrial laboratories, while the remaining 70-90% consists of applied research.

Leaving aside some N.Fl. 100 m. in the form of government contract-research, this relationship is reversed for the remainder of TNO's budget of approximately N.Fl. 330 m. (1979); instead of being 1:3, as in the case of industry, the ratio at TNO is 3:1. If industrial R & D is taken as a yardstick for the way in which TNO should operate, this would mean that the present level of industrial contract-research should be increased by a factor of around 2.5. This allows for a maximum input of scientific expertise within the one TNO, without compartmentalization into its various sub-groups (e.g. the Central Organization, Manufacturing Organization, Foodstuffs Organization, Health Organization and National Defence Organization). The following percentage distribution of government contract work, basic subsidies and industrial contract work has been assumed.

	Government contracts	Basic subsidies	Industrial contracts
CO	50	25	25
MO + FO	—	25	75
HO	35	40	25
NDO	50	25	25

Given an overall budget for TNO of N.Fl. 432 m., this means: government contracts - N.Fl. 100 m.; basic subsidies - N.Fl. 128 m.; industrial contracts - N.Fl. 214 m.

The reason for drawing the Health Organization into industrially-oriented research is based on the importance of being able to benefit from the rapid advances being made in the fields of applied molecular biology and biotechnology, especially at the Medical and Biological Laboratory of TNO. In comparison with the sums currently allocated for industrially-oriented projects the proposed breakdown would mean an increase by a factor of 2.7. If the National Defence Organization were to be left out of account - which, given the supporting value of its expertise for other activities, would not seem justified - the factor would fall to 2.4.

The fact that the current situation differs so markedly is primarily attributable to operational shortcomings rather than to a lack of scientific know-how. Such know-how is available in TNO over a broad spectrum of the natural sciences. Possible measures whereby the situation could be improved are discussed in detail in the annex to this chapter. Both the financial structure and operational aspects of TNO, and their mutual interrelationship, are examined in the annex.

Finally we should like to examine in more detail the sums specified in the Innovation White Paper with regard to venture capital and cost support. An additional N.Fl. 10.5 m. has been allocated to small and medium-sized firms. In addition the existing development credits totalling N.Fl. 70 m. will henceforth be available only to these types of firms. An additional N.Fl. 160 m. is being made available for large enterprises, although these firms will no longer be able to draw on the N.Fl. 70 m. development credits. The cost-support allocation for contract R & D on behalf of small and medium-sized firms totalling N.Fl. 153 m. (1980) raises a number of questions. This R & D work will of necessity have to be done in existing institutes, most of which already receive appreciable government subsidies. Since it is not possible for these 'extra' subsidies to lead to any direct increase in capacity, they will have to take the place of basic subsidies. In this way the government will be taking away with one hand what it gives with the other. The proposal elaborated in the annex of making certain essential operational arrangements in TNO and channelling some N.Fl. 200 m. of its present subsidies through industry would therefore appear more realistic. It would moreover open up the attractive possibility that this budgetary item, which currently falls under the heading of 'cost support' for small and medium-sized firms, could be used for different purposes, especially the involvement of technical advisory and consultancy bureaus in innovation projects undertaken by such firms. The very important function that these private bureaus are able to fulfill deserves to form a major aspect of government strategy to stimulate innovation.

The Innovation White Paper fails to touch on the point that a sum of N.Fl. 250 m. is already allocated annually to TNO alone for research of a non-project nature: the report equally fails to acknowledge that much of the R & D conducted on behalf of industry in government institutes, especially TNO, suffers badly from operational inadequacies.

5.3.5 *Large enterprises with their own R and D facilities*

In the above discussion of small and medium-sized firms, the operational conditions on which technological innovation is dependent were derived from the model of 'industrial R & D' and 'industrial interface management'.

This section considers in detail the large enterprises with their own R & D facilities. The data reveal that some 80% of total R & D expenditure in the private sector in the Netherlands occurs in a limited number of companies which operate internationally such as Shell, Philips, AKZO, Unilever, Hoogovens, Gist Brocades and the State enterprise Dutch State Mines (DSM) which, particularly as regards its foreign establishments, operates along private lines. The total research activities of this group alone exceeds that conducted at TNO by a factor of two. If development efforts are included one might reach a factor of three to four.

These R & D organizations are a major source of recruitment for specialists with lower, intermediate and higher training in the technical and natural

sciences and also – to a lesser extent – the 'gamma' sciences (e.g. sociology and social psychology).

In relation to neighbouring countries, the concentration of multinationals in the Netherlands in terms of R & D activity may be regarded as high. Dutch private industry is predominantly of a small-scale nature, but industrial R & D may be said to be on a large scale. There is, however, a basic difference in comparison with multinationals based for example in the United States, in that the latter have a large domestic market: this applies only to a very limited degree to international groups conducting R & D that are based in the Netherlands. Even within the EC context there is no real comparison in view of the remaining barriers between the countries.

We are not concerned with determining why these research facilities should have been established in the Netherlands and maintained there over the long term. What is important is whether there is still a reasonable degree of continuity or whether the tide might turn. With regard to the latter there are certain circumstances that give pause for thought.

1. high wage/salary costs, including social security payments;
2. limited R & D tax concessions in comparison with other countries.

In comparison with research on a similar scale in other countries, the cost of research and development in the industrial research laboratories in large enterprises in the Netherlands is between 2 and 2.5 times as high as in the United Kingdom, and between 1.2 and 1.5 times as high as in the United States. In the European context the Netherlands heads the league with Sweden, although the difference with West Germany is fairly small (10%).

In relation to the English-speaking world, which forms the source of the great majority of technological and scientific developments used in the Netherlands, research in the Netherlands has, in contrast to the 1950s and early 1960s, become extremely expensive.

The currently lower level of costs in the United Kingdom is partly due to financial assistance from the government, which can be as high as 45%. Government subsidization of R & D in the United States is on a similar scale. The major difference with respect to the United Kingdom consists of the differences in labour costs, but this gap looks like being reduced in the next few years by the upward trend in UK salary levels and the higher rate of inflation.

In the case of groups with research laboratories in both the Netherlands and the United Kingdom, this difference in costs is bound to have an impact on the allocation of new research initiatives and to hold back an increase in activities in the Netherlands. This should not take a dramatic form, since, as far as we can establish, a direct transfer of activity is not (or not yet) an explicit part of the policies of these companies. There is, however, a general tendency to close down small research units, both here and in other countries, and to switch to operate in large centres. This is being done for reasons of research effectiveness and greater efficiency in a team sense (a single location offering cost savings per research unit which, in the long term, outweigh single, additional investments). What is clear is that these research facilities in the Netherlands benefit from healthy and sufficiently extensive industrial acitivity of their own in this country and from companies able to conduct market surveys for a wide variety of new products both within the Netherlands and elsewhere.

This certainly applies to Philips, as the second largest employer in the country besides the government, and also to the other large concerns such as Unilever, whose research results are often applied in other countries but for which the home industry forms an important testing ground.

Taken as a whole the field covered by these concerns is extremely broad. It covers both heavy and fine chemicals, organic and inorganic chemicals (Shell, AKZO, DSM and Unilever), pharmaceuticals (AKZO, Gist Brocades), food, drink and tobacco,and detergents and cosmetics (Unilever, AKZO), the plastics and fibres industry (Shell, AKZO, DSM), catalysts (DSM, AKZO, Unilever), energy sources for transport, power generation and heating (Shell), ferrous and non-ferrous metals (Hoogovens, Shell, DSM), electrical and electrical-engineering construction for both household capital goods and communications, information systems, data processing (Philips) environmental systems (DSM, Philips, Shell) and energy systems (Shell, DSM).

The non-European activities of multinational corporations, especially those in the United States (both in the field of R & D and in the market itself) mean that the significance of the R & D conducted in the Netherlands by these companies is rather greater than the sheer number of employees might suggest. These activities provide the companies with:

- information on market developments abroad;
- international experience with regard to the relationship between research costs and the costs of industrial application (i.e. development costs);
- international experience with regard to economies of scale in relation to the volume of sales;
- international mobility of specialists for project development.

In the case of technological innovations of any significance, the costs of the underlying research, up to and including the feasibility stage, generally fade into insignificance in relation to the development costs required to bring the new product onto the market and to introduce a new step in a company's production process (varying from a factor of 5 to multiples thereof). This means that despite the relatively high cost of research in the Netherlands (e.g. in comparison with the United Kingdom), these costs generally form only a small part of the overall project costs. The threat of an international relocation of research activity need not therefore be taken too seriously, provided that the quality of the research remains at a high level.

This does not apply in the case of development costs; whether or not these are undertaken is directly related to the size of the market, in which respect the Netherlands is decidedly at a disadvantage. In view of the economies of scale associated with the likely volume of sales, many new developments will tend to be introduced in other countries instead; and in the long term, this obviously does represent a threat to research activity in the Netherlands, which could dry up if it were to be conducted at too great a distance from the market or markets of actual application.

Particularly in terms of employment opportunities, the government has every interest in creating the most favourable possible circumstances for the application of research work in the Netherlands. As the largest consumer in the domestic market the government has a certain amount of scope to this end, although the fact that the Netherlands has a small domestic market and operates in an open economy imposes limitations.

The government will have to make a concerted effort to provide aid or attractive credit facilities (i.e. venture capital) for technical development projects, linked where necessary to purchasing guarantees under its procurement policy, without however distorting the pattern of international competition. This would promote both the future position of industrial research (not just among the large concerns) and employment in the Dutch productive sector, and would improve the export position. This form of stimulation would have to be rigorously implemented on the basis of specific and carefully considered projects, and the Ministry of Economic Affairs would have to be properly equipped to that end. This system would also have to be geared to projects among small and medium-sized firms which had become viable as the result of research collaboration with (for example) TNO.

Government aid in the above form of venture capital can be made clearly selective. In the long term this would appear preferable to pouring capital on an ad hoc basis into enterprises in difficulty in which, given the pressure to re-structure, technological innovations that would increase the market share barely manage to see the light of day.

In view of the scale of its resources and the number of research workers, industrial R & D in the Netherlands is comparatively flexible in nature and therefore able to react promptly and selectively to new scientific and technological developments. Examples include finding ways of applying micro-processors, the acquisition of facilities and recruitment of specialists for conducting research in the field of alternative energy systems and molecular biology, especially DNA recombination research into the preparation and use of enzymes as a means of arriving at a new generation of catalytically guided chemical processes (i.e. biotechnology, both by means of fermentation and in reaction columns) and into the preparation of proteins with a high utility value (e.g. hormones and pharmaceuticals). In the interests of providing employment

for higher (i.e. academic) and intermediate (i.e. senior technical college) graduates, research and training at institutes of higher education and of higher vocational training will have to respond to such developments in good time, with the government (i.e. the Directorate-General for Science Policy, Education and Science, and the Netherlands Organization for the Advancement of Pure Research (ZWO)) playing a watchful part.

It will be evident from the above that there is a close correspondence of interests between full-scale industrial R & D and university research geared to high-level training. This applies to a great many fields other than those specified above, which, with the exception of nuclear physics, are less spectacular in nature and less in the public eye, and therefore less the subject of discussion.

This section on Large Enterprises has deliberately been kept brief because this report is primarily concerned with the interests of small and medium-sized firms. The R & D model of large concerns has been taken as the starting point because the 'interface management' characteristic of such enterprises plays such a large role in technological innovation. The preservation of these large research laboratories is an important matter for the Netherlands and easing the cost burden along the lines of the United Kingdom or West Germany deserves proper attention by the government. In this respect the Innovation White Paper is a disappointment. The proposed level of venture capital is decidedly modest. Nor does the White Paper make any substantial provision of a cost-support nature. The extent to which the level of R & D conducted by the large enterprises continues to be eroded will depend to a large degree on costs. Easing this burden will therefore also require an overall strategy with regard to wages and taxation.

5.3.6 *Background considerations to government procurement policy*

Government innovation policy at industry and enterprise level can take various forms, such as:

a. improvement of the stock of knowledge and the infrastructure;
b. government regulations: prohibitions and injunctions;
c. government subsidies: tax concessions, provision of venture capital, development credits;
d. government demand: prototype development, feasibility studies, national programmes such as the Delta works.

Points a. to c. have been discussed above.

Apart from the fact that government regulations with regard to energy conservation and environmental protection can provide an impetus for innovation (see 5.4.2), the government's procurement policy should also be considered carefully. On the one hand, the government is often a major shareholder or supplier where private industry is concerned, while on the other government procurement policy will favour the lowest bidder, even if this means placing an order abroad. To be critical of this does not necessarily mean that the Dutch government's procurement policy should favour Dutch industry, or that we would advocate a form of disguised protectionism.

In favouring procurement policies geared towards Dutch industry, we have in mind more strategic objectives and a more strategic approach. We are not so much concerned about the procurement of existing products but with the supply of products and systems yet to be developed. This means that in conducting a cost-benefit analysis of its procurements the government would take account of the fact that by this means know-how could be built up in industry, on which it would be possible to capitalize at a later stage. In this way the government would be contributing to the creation of comparative advantages for Dutch industry. A good example of a dynamic procurement policy of this kind in the Netherlands consists of the coastal radar project, which has enhanced the capability of the Dutch electronics industry and created export potential. Capitalizing of the know-how generated by means of government procurement policy can lead to new export opportunities for expertise, systems (e.g. software) and engineering. Government procurement policy has to date been highly fragmented and has not been designed to stimulate the direction and pace of technological innovation. The commissioning of feasibility studies and the

development of prototypes could be of major importance in the context of a selective innovation strategy.

If the government wishes to anticipate the consequences for the structure of production of its procurement policies, the government will have to possess the necessary know-how to assess those effects.

A related consideration is that it is not simply a matter of the government's placing an order with Dutch industry, but that it can stimulate the business sector to prepare itself for and take advantage of future sales prospects. The provision of information on the government's requirements means that the business sector can adjust accordingly.

Certain qualifications are in order with regard to the scope afforded by an innovation-oriented government procurement policy. In the first place the Dutch domestic market is not very big in comparison with other industrialized countries. Secondly there is not available structure whereby this policy instrument could be systematically employed, since the lower levels of government are independent with respect to procurement policy. Thirdly, government expenditure is subject to strict rules by means of the 'non-discrimination provision' of the EEC Treaty, e.g. procedural rules governing publication (in the Government Gazette) and rules on the selection of bids.

The first and third qualifications taken together create a new option: one possibility would be to consider pushing for a stricter observance of the relevant EEC provisions in order to open up a wider market. In view of the marked export-orientation of Dutch industry, procurement policies amounting to disguised protectionism might well on balance prove counter-productive as a result of counter-measures taken by the other member states.

A further subject that should be taken into consideration is the lack of worker mobility in the business sector. This is of particular interest because of the international sphere of operation of the multinationals and the comparatively small number of their employees who are prepared of their own accord to take up other positions in the Netherlands. The bulk of the migration occures within these enterprises themselves. An important factor consists of the lack of coordination of pension arrangements, which makes it disadvantageous for persons with extensive training and experience to move to other organizations. The introduction of uniform, national pension provisions would go a long way towards preventing job rigidity and lack of movement over a broad front in industry and elsewhere in society. This would enable experience to be used where appropriate to a much greater extent than it is at present, even among equally paid positions in industry and TNO, the government and the various labour sectors.

5.4 Constraints on economic policy

5.4.1 *Observations on the regulation of scientific, technological and industrial developments*

The Council considers that a general examination of the regulation of the growth processes in science, technology and industry should form an integral part of this study of the place and future of industry in the Netherlands. The section below is intended in these terms. It forms an introduction to section 5.4.2 and provides a foundation for the report as a whole. Rather than specifically examining the objectives of socio-economic policy in general, as elaborated in the White Paper on Selective Growth (and in the Sector Nota), the starting point selected in those reports has been adopted here. The industrial component of the Netherlands economic structure is essentially assessed in positive terms.

Our concern here, however, is to approach the concept of the scientific, technological and industrial complex in such a way as does justice to its great importance for society and at the same time to the vital questions of controllability and control. The various considerations do not all point in the same direction; the question has been in too great a state of flux in recent years. The whole subject is taken up and examined from a variety of angles in a later WRR report, the *Beleidsgerichte Toekomstverkenning* (A Policy-oriented Survey of the Future). In this section we are concerned to draw out certain points with logical implications for the rest of the study.

These aspects have become the subject of intense discussion in all industrialized countries. This is only as might be expected now that the disadvantages of and limits to the process of growth have become widely evident.[77] The subject was touched on in the introduction to this report (see chapter 1.1.5). This section examines the development process in general, the driving forces in science, technology and industry, and the prospects for controlling these processes in terms of setting limits and long-term planning. We recognize the important social phenomenon of declining confidence in science. For that reason this section critically reviews the process of the accumulation of knowledge as well as its assimilation and application in practice.

Developments

To begin with we may briefly examine the natural phenomena with which man has to deal, including the origins of the universe and the conditioning of mankind. We form part of an expanding universe, which modern science believes to have been formed more than 10 billion years ago from a small primordial fireball with an inconceivable concentration of energy. In that explosive process, matter appeared after a few seconds in its familiar form of electrons and other elementary particles. After a few minutes there was a large, extremely hot cloud of hydrogen and helium, in which the conditions for the possible formation of heavier elements had deteriorated to such an extent that virtually no such formation was to take place, at least for the time being. Gradually gravity brought about localized concentrations within the cosmic gas cloud, out of which there finally arose the many billions of galaxies, each consisting of billions of stars. Presumably many of these, like our sun, are furnished with planets. Nuclear reactions take place within the interior of these stars, and during a process taking billions of years heavier atoms and radiation arise. After a very long time the stars become burned up and often explode in a final display of unusual brilliance, in which matter is dispersed over cosmic distances. The interstellar medium gradually becomes enriched with the heavier elements dispersed by these explosions; these elements then occur in the stars formed later in the process of condensation. It is assumed that our own solar system originated after a stellar explosion of this kind some 6 billion years ago and that the chemical composition of the earth provides evidence for this. In earthly terms the present universe is extremely large and generally of very low density. Where these cosmic developments are leading is as yet unclear; possibly, at some stage, there will be a reversed process of contraction lasting billions of years, back towards a point of concentration similar to that from which the universe began.

Nature is not in a stable state but in one of continual movement and change. In this respect the radiation emitted by stars is of great importance and can have interesting consequences as a pace-maker for natural processes. Our planet is sufficiently close to the sun to benefit from its radiation, which makes the average temperature of the surface of the earth's surface some hundred times higher than that of the now greatly cooled-down universe. This has enabled a series of physical and chemical reactions to take place that have made the earth's surface into the highly-varied whole that it is now – including the existing forms of life. The development of life on earth goes back some 3 billion years and evolution, which must have been influenced scores of times by radiation from stellar explosions in the vicinity, is not yet completed.

On the evolutionary time-scale man may be regarded as a late-comer. Whatever one's philosophy or ideology, there can be little disagreement about the major role played by homo sapiens in recent times. During the last few centuries the earth's appearance has changed radically as a result of man's activities, especially farming. The world's population has increased dramatically. The ancestors of the world's present inhabitants date from the end of the last Ice Age, when the world's populations was approximately 4 million. Ten thousand years later, at the time of Christ's birth, the figure had risen to 170 million. Now

[77] See for example 'Nederland en de grenzen aan de groei' (The Netherlands and the limits to growth), Utrecht/Antwerp 1975: a report of a symposium entitled 'Taking Stock 1975' held in the Royal Palace, Amsterdam.

it is 4 billion. In the case of the area occupied by the Netherlands the figures are approximately 2000 during the Mesolithic period, approximately 0.2 million at the time of Christ, 2 million during the period of French rule, and now 14 million. Ours is a world of growth.[78]

The pattern of permanent settlement has now become virtually universal, often associated with specialization of labour. Knowledge is becoming disseminated throughout all cultures: new answers to all sorts of questions, or information on what happens in other countries. Although there is a pattern of territorial demarcation of the peoples of the world, intensive international contacts and transfer of knowledge have also developed. Social organization has gradually come to assume all sorts of forms. Social solidarity manifests itself not only in the form of the nuclear and extended family, race or creed, but also in the work-community. Enterprises, the state and economic communities provide a means for personal individual skills and talents to be marshalled in a social context and for mobilizing expertise and the transfer of knowledge. This dynamic process, the scientific and technological aspects of which are discussed later in this section, could be broadly regarded as an economic process, i.e. the attempt to maximize the satisfaction of wants in a world of scarcity with a minimal input of labour. But certain historical factors should also be taken into account, such as population growth, which is often correlated to the transition from a hunting to an agricultural society, and from an agricultural to an industrial society, with population densities of roughly 0.1 inhabitants per km^2 and 20 inhabitants per km^2 respectively. An even more important consideration is the fact that people are actuated by more than economic motives alone.[79] The urge for continuous development is at the heart of modern social systems. Man thinks ahead, and is a seeker, doer and organizer. He strives after change and improvement. He tries to be efficient, and is dissatisfied with his existence if he believes it can be improved.

Taking the origins of the universe, evolution, social progress and human instincts into account along the above lines would suggest an ineluctable process of continual development and progress. To some extent this is a compelling image, particularly for those active in the field of science, technology and industry.

At the same time a balance must be struck. The benefits of growth and progress are often – even at a personal level – seen as problematical. The current system of production and technological discoveries, especially in the military sphere, are perceived as chaotic threatening. The effectiveness of our social order has come to be challenged because many people consider the purpose of human existence to have been fundamentally called into question. Attention is increasingly focussed on the unacceptabel squandering of resources and energy, on the destruction of nature, on the poor condition in which millions of people are living, and on the power factors that determine relations within and between the peoples of the world. There has, traditionally, been a conflict between normative, ethical thinking about human activity and the technological imperative. Many signs suggest that there is a general desire for the former to be strengthened.

There is widespread concern that science and technology form independent forces to which human beings must subordinate themselves. There is a desire that technology, as an independent force, and the power experts derive from their knowledge, should not become legitimized as uncontrollable privileges. Naturally it is possible to point to the benefits of greater control over nature, which has meant higher productivity and a more comfortable life for many people – something not to be underestimated. But, as has been repeatedly observed, doubts have arisen over the balance between constructive and destructive forces, as a result of which legitimation on the basis of limited utility considerations is now regarded as inadequate. Instead the consciousness that things might go wrong has led to the conviction that science and technology must be subject to a certain degree of control. The starting point for such considerations is that man should be able to channel progress along the desired

[78] Colin McEvedy and Richard Jones, *Atlas of World Population History,* Harmondsworth 1978.

[79] See for example Abraham H. Maslow, *Motivation and Personality,* New York, 1970 (with an introduction to the Dutch translation by Prof. H.C.J. Duyker).

lines, and that man is able to select and to take decisions and thus to shape the future. In this regard the government can play a collective and stimulatory role. The phenomenon of social progress, and the technological development which forms part of it, may be regarded as an adventurous process of exploration, exploitation and organization, but which is also guided in a particular direction, with an attempt to maintain a certain dynamic equilibrium, so that the process of development does not come fatally unstuck. In particular, technocracy must be kept within bounds: an uncontrolled, insidious force that can impose technological structures on society at variance with such social norms as established order, security and democratic control over the system of government.

The question of the freedom of scientific endeavour is discussed later on when science is examined in more detail as the driving force in society. Science is a cultural asset of the greatest importance and is indispensable for society. The concept of control is examined especially in relation to the practical application of scientific knowledge. In this respect it is of great importance that there should be a greater degree of integration between science and society. Scientists themselves bearing a large measure of responsibility for it.

It is possible to adopt a pragmatic approach and to examine whether there exists a correlation between the social order as it is and the developments of which the direction and controllability have become the subject of concern. The question may also be asked as to what sort of society the inhabitants of the modern industrial state would themselves like to live in.

The type of social order is however less important than it might appear at first sight. The problems examined by the Club of Rome (scarcities, especially with respect to energy, and disequilibrium in the pattern of growth) are of much greater import. The danger of technocracy may be recognized by adherents of highly different social systems, but much the same technocratic tendencies may be observed in the countries where these systems have taken root.

In this respect it may be noted that one particular circumstance virtually rules out the possibility of absolute control, namely the international distribution of science and technology, on which the modern industrial state rest. What is discovered, applied and considered desirable and efficient in one country, thereby becoming incorporated into the general concerns of that society, become adopted a few years later in other countries. The complexity of the system makes it very difficult to put a conscious brake on such developments. There are historical examples of cultural isolation in which foreign influence was literally kept back at the border, for example 18th century Japan under the shoguns, and possibly modern China during the Cultural Revolution. But such isolation does not prove tenable over the long term; in this respect the world has indeed become an entity. In the short term, however, there is some scope for slowing down or postponing change, for example for safety reasons, especially as far as large technological systems are concerned for which the government bears direct responsibility.

Political choices with regard to the social order would appear to have little bearing on the prospect that modern industrial states will establish themselves throughout the world, especially in the more densely settled areas. Industrialization has become the almost universally accepted means of rapidly eliminating severe poverty and of improving living standards. The characteristics include increased production with gradual decline in human labour; the input of science and technology together with the intensive (although often inefficient and wasteful) use of energy and raw materials; and the extension (and maybe disruption, of problematical alteration) of social organization, including the provision of a wide variety of services, especially education. Many Third World countries are already well down this road. Control of the development process is often regarded in the Third World as guided progress. Incorporating this process into existing cultures, with their religious traditions and tribal customs, often proves particularly difficult. Growth remains important in highly-developed countries, but there is increasingly a spirit of guided restraint prompted by certain side-effects that are perceived as undesirable.

Nor is it possible in this report to answer the critical question of the sort of society that people wish or are able to live in. Certain normative observations may, however, be made. First and foremost mankind will be concerned to survive, to ward off threats, to establish certainties and at the same time to

preserve freedoms. Social inequalities and the large variations in living standards throughout the world will have to be reduced. A more higly-developed ethos will be required for the processes of cooperation and conflict in which progress manifests itself. The belief that progress and the development of technology are identical is beginning to lose its hold in many parts of the world. Looking to the long term, it is conceivable that the world's population might stabilize in a century's time, which would remove a major disruptive factor. Further research and education could help – or more accurately, are essential – to provide insight into the margins within which mankind must operate and the required balance between stability and change.

In the short term many countries will have to adjust to two factors. In the first place they will have to adjust to the prospect of roughly stable populations. This will not only mean that there will be no need for the investment occasioned by the growth in population, but that the age structure will become less of a pyramid and more cylindrical in form; and this will mean a change in the scale of the task of the working population. Secondly, as has happened before in history, adjustments will have to be made to scarcities, in this case energy shortages.

If the threat of severe energy shortages can be averted – and there are sound technological reasons for believing this to be possible over time – reasonable levels of prosperity would be possible for the world as a whole, particularly if certain raw materials were to be used on a re-cycling basis. This would however require an organizational and political effort in which the rich countries of the world made far greater sacrifices than at present, and in which there would be no margin for any major military conflict.

The driving force in science

Reliable and transferrable knowledge concerning the material phenomena about us – i.e. nature – has existed for thousands of years. If conveys the very experience of our ancestors. In the last few centuries the pace of scientific endeavour has accelerated, in the sense that there is a more systematic attempt to come to grips with all sorts of aspects of reality. Understanding or insight has now become subject to systematic assessment in order to establish whether that knowledge is of a consistent and verifiable nature.[80] In recent times, scientific endeavour has become highly professionalized. In the field of the natural sciences alone there are millions of qualified specialists in the world. They form part of one large global intellectual collective governed by universal criteria, while at the same time being virtually all employed either by governments, industrial organizations or educational institutions. These have become instrumental for the three processes characteristic of scientific enterprise, namely the accumulation, application and distribution of the body of knowledge. Human society is no longer conceivable in the absence of these basic functions.

We are aware that science has fallen into general disrepute. Popper's criticism, and Kuhn's paradigm theory, for example, have introduced new and controversial elements into the philosophical discussion of the phenomenon of science.[81] The Marxist notion of science as a factor of production of a purely social nature finds little support, and is scarcely defensible when one is dealing with important scientific developments such as the theory of relativity, quantum theory or modern astronomical research. Similar observations may be applied to Kuhn's revolutionary moment in switching to a new paradigm, in which Kuhn kept open the possibility of scientific progress being influenced by external factors of a social, economic, cultural, political or religious nature; here too such influences are by no means always discernable in the case of the accumulation of theoretical understanding of nature. On another level, the government can use its powers to influence the selection of programmes in government-subsidized research or the inclusion of scientific findings in educational curricula.

[80] Of the many books on the development of scientific thinking towards nature we would cite just one, namely E.J. Dijksterhuis, *De Mechanisering van het wereldbeeld* (The Mechanisation of Man's View of the World), Amsterdam 1950.

[81] See for example Herman Koningsveld, *Het verschijnsel wetenschap* (The Phenomenon of Science), Meppel/Amsterdam 1976.

The political debate about the position of science in our culture has become concentrated on the question which yardsticks and policy instruments should be used in science and research policy. This proceeds from the starting point that there is no longer any blanket faith in science among the populations of industrialized countries. Particular allowance must be made for an increasing sense of insecurity prompted by the prospect of the application of new scientific understanding. In practice, both government-subsidized and private industrial research take place within the framework of certain policies. But the call for the politicization of science is becoming stronger. Public information on research programmes and improved popularization of newly-acquired scientific insight can at least help reduce the feelings of insecurity and mistrust. Because we are ultimately dealing with an almost unmanageable flow of information, to which may be added the complicating problems of summarization, abstraction and certainty, it may be assumed that there will have to be a strong and general basis of confidence separate from science itself. This is an aspect of the current complicated cultural system that complicates political decision-making with regard to scientific research programmes and the application of technology.

We may now examine in more detail the three aspects of scientific enterprise referred to earlier of the accumulation, application and distribution of the body of knowledge. The growth in the reservoir of knowledge is the result of pioneering research, often of a highly-advanced nature. A universal methodology is pursued in an effort to approach the idea of sound science, i.e. a proper understanding of reality. The central question now arises as to the way in which the flow of objectives and plans originating both from among research workers themselves and from the 'by standers' benefitting from the results of that research should be assimilated and ordered. Those required to make decisions at various levels must weigh up priorities, including the appropriate areas of research, and assess quality.

In general, assessing the relative importance of areas of research or of scientific disciplines (i.e. science policy) will take place at a 'higher' level, and be more influenced by planning considerations and political factors, than the assessment of quality within a given field (i.e. research policy), for which specialist knowledge and experience are required.

Research programmes may originate in one of two ways. Research may be conducted purely out of scientific curiosity without any particular interest in the application of the findings (i.e. intrinsic research programmes), or the programme may be concerned with application from the outset, for which certain as yet unavailable elements of knowledge are required (extrinsic programmes).

Scientific curiosity is an independent human impulse which penetrates the real world by means of imagination and intelligence and which seeks to increase our existing understanding of nature. Intrinsically programmed, or, as it is sometimes termed, basic theoretical research, can have an unforeseen impact on society. This is the case when, for example, scientific findings not made with any view to application nevertheless prove over time to have important technological implications. An example from recent times concerns the discovery and understanding of the process of nuclear fission. The consequences of this discovery might, as has been the case, lead one to the conclusion that a stop should be put to the continual pushing back of the frontiers of scientific knowledge if disastrous applications in the real world to be averted. In these circumstances the increasingly scientific nature of society, and society's control over science, can come into conflict.

This touches on a problem of the utmost relevance for the subject of controllability. What is at issue is the freedom of research, which is defended by many persons active in the field of science and by many others as well. At issue is not freedom in the sense of undisputed right of access to research facilities and funds, since there will obviously be financial limits and priorities that will qualify that right of access, but freedom in the sense of non-prohibition. If in the interests of positive control it were considered desirable for the total research capacity in the Netherlands to be confined to certain subjects, and if such a decision became a 'hard' fact, then there would still remain scientists with an intense interest in other basic, theoretical problems, which they would make it their business to pursue if at all possible. It would obviously be a dramatic state

of affairs if research into such problems became stigmatized as incompatible with the prevailing ethical code in society.

This problem is beginning to penetrate into the current processes of social consciousness and critical scrutiny. For the present it would appear that scientific endeavour of an intrinsically programmed kind still enjoys sufficient support within our culture and that, with certain reservations, there is still an intuitive appreciation of research into new questions – questions that have indeed arisen because of the advancement of knowledge. Many scientists are also concerned about the repressiveness that could seep into society if basic, free scientific research were to be curtailed, and point to historical instances of conflict with religious or ideological forces supported by the state (e.g. Galileo and Lysenko). To these people science, including in its most abstract and 'pure' form, itself contains certain ethical values.[82] It should be borne in mind that research of a purely intrinsic nature, and which is regarded as an independent cultural 'asset', may have originated from earlier applied research (e.g. astronomy). The converse also happens. At the same time, the selection of fields of intrinsic research does not have to be left entirely to the experts. Curtailing freedom of research may be legitimized by the need to ensure the harmlessness of the research in question, to impose reasonable limits on the available funds, and to set standards for the research itself, including both the implementation of the programme and the reporting of research findings. These requirements would then establish an acceptable framework within which unpoliticized scientific endeavour could take place with due democratic support.

The assessment of intrinsically-programmed research can also be influenced by subsidiary considerations such as the desire to have a reserve of skilled researchers who could if necessary be used in a technological capacity. In the case of many people who support the concept of disinterested, pure research, however, there is also a vague expectation that it might at some stage yet lead to worthwhile application. Be this as it may, there must be a certain margin within society for research of an intrinsic nature. The generation and dissemination of theoretical understanding of the world about us, in the most general sense, are cultural factors of vital importance

Scientists often point to their experience that scientific progress is not ultimately controllable, in either a positive or a negative sense. The system of scientific knowledge cannot be subordinated to planning in a strict sense of the word, because we are concerned with an international adventure into unknown territory.

The essence of the problem surrounding research of an intrinsic nature is the possibility that the results of that research might later be misused, though that was not of course, the original intention. The point is that where there are consequences in the sphere of practical application, they are usually both good and bad. If one wished to determine the decisive moments at which basic science had moved in directions that have made the present-day industrial and military situation so oppressive, it would not be possible to point to anything that was specifically pernicious or sinister in the pioneering research in question. For this reason nearly all scientists would regard a certain degree of freedom for theoretical research as axiomatic. It would, of course, be desirable to look into the future and to determine which scientific developments of the present day might lead to social disasters (if such a direct link could be established), so that appropriate measures could be taken and these developments arrested. But such concern would amount to tyranny and form a totally unacceptable policy if it led to a fundamental prohibition on knowledge and learning. A serious concern to define the responsibilities of researchers and those who apply research findings might be desirable but is anything but straightforward. It has certainly not produced a consensus, either among scientists and technicians or in the public debate, about the scope for imposing a ban on research in a particular scientific field (apart from certain restrictions based on safety considerations). It is therefore fair to conclude that the responsibility for the possible misuse of scientific findings of an 'intrinsic' nature lies with those who apply them – or, one might say, with society itself.

[82] A worthwhile article on the demarcation between science and technology, which also covers the standpoint of the scientific philosopher Michael Polani, is J.R. Baker, 'In the Cause of Freedom of Science', New Scientist 83, no. 1163 (12 July 1979), p. 108.

We may next consider extrinsically programmed research, or research directed towards eventual application. This forms an entity with product development, for which reason research and development (R & D) are often mentioned in the same breath.

While intrinsic scientific research is concerned with pushing back the frontiers of scientific understanding, industrial R & D is concerned with application and making discoveries that can lead to new products and methods of production. R & D is the source of many technological improvements and the seedbed of innovation. It is here that new objects and systems with a utility value are conceived: although we may note that in many cases the want is not established until the advantages of application have become clear. The power of imagination responsible for such innovations is directed towards certain desirable functions, but at the same time rests on knowledge of limitations and processes discovered in the past and of natural laws and material properties. The R & D laboratories in a modern industrialized state are not only concerned with a basic extension of knowledge and expertise in the field of actual production but are also concerned with the exploration of promising new areas where discoveries are anticipated. For this purpose these R & D organizations must be sufficiently strong, for example to enable them to keep abreast of the external, international stock of knowledge. The driving forces behind technology and industry are discussed in more detail below.

The success of a discovery, whether it is a new product or a new method of manufacture, is not revealed until it is confronted with the real economic world. Will the product be considered interesting and find a market? Does the improved technique of production in fact cut costs or lead to an improvement in quality? The chain of innovation is a long one, stretching from the moment of discovery up to and including a succesful introduction in the market. The optimization of product specifications and the introduction of reliable and efficient manufacturing processes take a great deal of effort and expense. It is therefore essential for there to be a continuous interchange between applied research and product development and experts familiar with the market. This will enable a new technological concept to be assessed for its feasibility and, if it is positively assessed, for preliminary steps to be taken in the fields of manufacture or marketing. Conversely the market or governmental requirements may give rise to incentives which, however vaguely formulated, may provide the inventor with fresh avenues to explore.

A network of relationships and cooperation of this kind exists within the large industrial enterprises. It would seem desirable for a similar structure to operate on behalf of a larger segment of Dutch industry if the latter is to remain in sound shape. This would provide scope for scientific bodies in the government sector to help, although entrepreneurs and companies can of course cooperate in other ways.

It is apparent that universities and institutes of technology are not well-placed (nor is it their primary object) to concentrate selectively on industrial innovation. If such an organization felt it had devised an interesting R & D programme it would have to address itself to the problem of its further application; in practice this would mean concluding agreements wiht a company that would take over the responsibility at the appropriate time. Universities and institutes of technology are not generally familiar with such arrangements, and these would have to be worked out. In principle, organizations such as TNO and ECN (Energieonderzoek Centrum Nederland) (Netherlands Energy Research Center) are much better equipped for the purpose. Even so, close contact with actual or potential customers is vital for these organizations too. These problems are discussed in more detail in section 3.2. It should also be borne in mind that many companies may profit more from flexible business management than they do from innovation in the above sense. Their main concerns are often to procure new equipment in good time, to stay up to date with developments and to keep their organizations healthy. They benefit from technical innovation indirectly.

If the innovative power of applied research is examined, together with the resultant far-reaching and often rapid changes in industry and society, the question arises as to whether a similar degree of freedom may exist as in the case of pure research. At the least, the assessment of the utility of research findings (or anticipated findings) within a company represents a restriciton of

freedom for industrial R & D, in that companies can decide to hold back on managerial grounds. In addition the government can establish a general context that imposes certain constraints on manufacturing, which will in turn influence the type of R & D undertaken. This question assumes even greater significance if (as in the case of the modern welfare state) the government is given responsibility for the maintenance of a healthy framework of economic activity and for assessing living and working conditions. The formation of political opinion and balance of political power can exert a stimulatory or restraining effect.[83] Otherwise responsibility criteria apply in much the same way as those discussed in relation to research of an intrinsic nature, except that in this case individual researchers also bear a certain personal responsibility through their involvement in the ultimate purpose of the research.

Finally a word is in order concerning the role of education (both academic and vocational) in spreading the growing stock of knowledge. The importance of this function will be evident, not only in terms of its enlightening function and as an autonomous cultural factor, but also for its impact on the economy. In some cases it will be desirable to strengthen institutionalized education or to provide special channels for spreading new knowledge. In the 1950s, for example, Dutch industry benefitted greatly from the fact that there was an active dissemination of knowledge about polymers. At the present time a similar situation has arisen in relation to micro-electronics. Some rapid catching up would seem called for in this instance, and it is even questionable whether the existing educational bodies are able to fulfil their tasks in this respect. A requirement could well arise for a large number of specialist courses designed to train large numbers of technicians, especially for small businesses, in a short space of time.

Driving forces in technology and industry

Mankind possesses the ability to accumulate knowledge. This faculty is of decisive importance for the characteristic human activity of constructing objects of utility, in the broadest sense of the word, ranging from simple articles to large systems such as transport and energy systems.

Technological progress, that is, the understanding and application of techniques and prosesses that make use of our understanding of natural laws and material properties and that have enabled technological production to become increasingly sophisticated, goes hand in hand with the accumulation of capital goods and a network of developments, communication structures and organizations partly handed down to us by our forebears.

The driving forces behind technological developments are generally regarded as the economic logic of efficient or large-scale manufacturing and production, and the impetus to construct an interesting new 'thing' that originated in the imagination of the designers as a response to a perceived need. Such ingenuity, together with the availability of reliable, transferrable knowledge with which it operates, goes back to prehistoric times.

These factors are among the foundations of society. The human labour involved is also of importance in the historical process. A rapid growth in population meant that more labour became available, which in turn gradually strengthened manufacturing. The input of ingenuity, manpower and energy such as has occurred in modern industry, has overshadowed the results obtained under the former craft system. Industrial revolution and democraphic revolution fitted in with one another so well in Europe because entrepreneurship was particularly able to flourish in the political conditions of the time, and soon combined with great inventors and the post-Renaissance growth in the natural sciences: the world of steel and steam, and later electricity and chemistry. In addition, the governments in industrialized European

[83] A useful summary of attitudes in the Netherlands is contained in an address by the former chairman of the Advisory Council for Science Policy, Prof. A.A.Th.M. van Trier, entitled 'Kritische Bezinning op doelmatigheid' (Some Critical Observations on Efficiency), contained in an article 'Het waarom en vooral het hoe van wetenschapsbeleid' (The What and especially the How of Science Policy), *Maatschappijbelangen*, 143, no. 4; p. 269 (1979).

countries generally helped this process along.[84] The production of capital goods of course played a decisive role in the development process. Technological development thus became an intrinsic part of the process of industrial development in industrialized countries.

Inventiveness and entrepreneurship are supported by governments because the latter perceive their importance for the economy – i.e. the maintenance of living standards – and for military power. The role of government in furthering technological growth has been the subject of historical study.[85] In most industrialized countries, most entrepreneurs have by now had to fit into a framework of economic and social legislation designed to maintain living standards and to protect employees and society. Industry now plays only a limited role in the overall context of the welfare state: industry is likely in the future to absorb no more than some 20-25% of the working population.

If one were to ask what it is that actuates, or should actuate, industry in present-day society, various answers would be possible, some mutually contradictory. This point deserves consideration because the economic resession has focussed attention on and raised expectations of industry.[86] The question of the potential for growth and of innovation in industry if often approached in the context of unemployment, with industry being regarded as a means of increasing the number of jobs. Paradoxically, however, industry and technology are by nature geared towards producing more with less effort: i.e. increased output plus greater labour productivity. This has led to a decline in the size of the working population in the industrial sector in many highly-industrialized countries. The rationalization and computerization of production were well under way before the pace quickened with the advent of micro-electronics.

The demand for employment is the demand for earned income giving individuals an undisputed claim on the products of the welfare state, for a place in the social system, for selfdevelopment and activity, but not for unnecessarily heavy, difficult, unhealthy or unpleasant work. It is the task of technology to alleviate arduous activities of this kind through the discovery and introduction of improved equipment, or to replace them altogether by automatic machines. In these terms there are particularly interesting and far-reaching prospects for industrial progress, centring to a large extent on the development of micro-electronics and robotics. At the same time, however, there are a number of cross-currents in the present-day debate[87]:

- There is considered to be a large difference between what technology could do for society and what it in fact does.
- By attaching the importance it does to experts, society runs the risk of by-passing the skills, ingenuity, energy, creativity and enthusiasm of 'ordinary people'.
- The automation of production and the spread of robotics are viewed with suspicion because it is feared they will not release workers from unpleasant, monotonous or heavy work, but could produce a rise in unemployment.
- The effects of science and technology are regarded as prime causes of dehumanization.

The general nature of the industrial system has become the subject of discussion. On the one hand, it is expected of industry that it will produce a wide range of good products, while on the other hand there are doubts whether the improvement in living standards in fact measures up to the requirements and to the practical possibilities in qualitative terms and as regards its distribution. The high level of energy consumption, industrial working conditions and pollution have come in for much criticism. Industry has no choice but to take up the gauntlet. A policy towards limiting factors is essential if further developments are to be channelled in the right direction.

[84] See for example W.O. Henderson, *De industrialisatie van Europa 1780-1914* (The Industrialization of Europe 1780-1914), Baarn 1971.

[85] For a concise but extremely good survey see: Sir Alexander King, The Role of Government, in Trevor I. Williams (ed.), *A History of Technology,* volume VI, p. 113, Oxford 1978.

[86] J.M. den Uyl in a newspaper interview: 'We Must Do Something about the Current Mood of Anti-industrialism', *NRC-Handelsblad,* 14 December 1979.

[87] See for example a caustic article by Mike Cooley, 'Why work is wasteful of energy and skill', *New Scientist* 89, no. 1130, (23 November 1978), p. 598.

Some people would consciously opt for a less ambitious life-style.[88] In general, however, it is reasonable to assume that there will be a desire to maintain or even increase living standards. New products and more comfort make life easier, particularly if certain negative side-effects can be reduced.[89] For this reason industrial production is likely to continue growing.

If, however, labour productivity should continue to rise more rapidly than total output, the share of industry in total employment will remain limited. A substantial increase in industrial employment may in fact only be anticipated if there is a substantial increase in output. Apart from the possibility of economic recovery, this would be dependent on the identification of new needs. This is perfectly conceivable, with room for expansion and improvement of hardware in the services sector. This brings us back to the question of how society will continue to develop and in particular to the future of the welfare state.[90] Inventiveness in the services sector will be of great significance for the level of employment.

The scope for and desirability of new industrial activities are discussed elsewhere in this report. The following points also arise in the context of the general considerations discussed above:

- the need for production for export in order to pay for imports and other expenditure abroad;
- the demands imposed by the global energy situation, especially new and expensive technological facilities in the field of power generation, conversion and conservation; these will require a great deal of ingenuity and industrial effort;
- the universally accepted necessity of modifying the productive apparatus so as to reduce environmental pollution to acceptable levels, which will require new techniques and new industrial activities;
- our responsibility towards developing countries, which have a claim on assistance in the form of food, medical facilities and education, and which will also be seeking to broaden their range of consumer goods by means of trade and industrialization. This could generate a new market for all sorts of products, including capital goods.
- It would be impossible to say when the economic point of 'enough' might be reached,[91] but at the present time the above objectives are widely supported and it is appreciated that an effort is required to bring them about; by the same token, a solution to these questions is seen as essential for the maintenance of living standards and the Netherlands' position on the international scene, which in turn provides a justification for industry.

Controllability, control, imposition of acceptable limits

The question of controllability covers a number of problems, especially the ever-growing impact on the biosphere of the planet. Is it possible for all the human activities that there have been for thousands of years to keep going? The agricultural revolution goes back a long way, but the question may be asked as to which methods of cultivation and control will prove tenable in the long term given the constraints of largescale production and ecological conservation. Industry, too, has inherent disadvantages. These include poisoning and pollution, the depletion of resources and energy reserves,and inconvience. All these are the result of in what has been considered as desirable or normal forms of acitivity or of deliberate steps that had favourable rather than unfavourable consequences in view.

People's attitudes towards these considerations depend heavily on their particular beliefs or outlook. One school of thought sees scientific rationalism as the foundation of industrial production and hence as the major danger for the

[88] The question of life-style is examined sensitively and creatively by Theodore Roszak, *Person/Planet,* Littlehampt on 1979.

[89] Also of importance is protection from misleading commercial advertising, which forms the subject of draft bill 13 6111 tabled in Parliament by Minister of Justice.

[90] P.J. van Strien, 'De verzorgingsstaat en de psychologische grenzen van de groei' (The Welfare State and the Psychological Limits to Growth), *Civis Mundi,* 18, 192 (1979), p. 192 ff.

[91] Hans van Gerven, 'Naar een economie van het genoeg, een interview met Herman E. Daley' (Towards an Economy of the Enough, an interview with Herman E. Daley), *Wending* 34, 637 (1979).

environment and mankind, partly because it is regarded as having blocked receptivity towards the transcendental. Those who approach politics in terms of regulation and central control consider that the future should be free from surprise, i.e. the belief in the construction of a state in which all progress is planned. Then there is the pragmatic demand that progress should be primarily geared towards averting identified drawbacks and dangers and that preference should be given to stimulating and guiding the types of R & D required. Others again would apear to favour virtually unfettered freedom for the industrial adventure.

Possibly the difficulty consists of our inadequate powers of imagination when it comes to the effects of even 'harmless' growth processes in the long term. At some stage all growth must come to an end. Who, for example, would suppose that a variable growing by only 0.2% per annum will be more than fifty times as large after two thousand years? If we accept that certain major variables vital to civilization cannot, in global terms, continue to grow sharply, we are obliged to conclude that mankind will be forced into conscious moderation in the long term (e.g. with regard to population levels) if painful corrective mechanisms are to be avoided. Apart from these limitations there is the desirability of bringing about more equitable patterns of distribution (i.e. compensation effects) and to create room for spontaneous changes if these are socially acceptable.

As long as the taste of knowledge generates a demand for 'more', it is obviously impossible to aim at restraint and conservation alone in a highly developed society. In the final analysis the process of change in society cannot be checked. The word 'develop-ment' may even be somewhat misleading, since it suggests the future revelation of a definite but as yet unknown final structure. A more modest word is 'progress', that is a movement or change which, measured in human terms and taken as a whole, means an improvement. We are thus concerned with a number of inter-related or causally linked sub-processes. In such a complex there will always be both positive and negative aspects, to which people will attach different weight, for which reason progress as such will always be a matter for debate. The belief in progress has fallen into disrepute because of its association with the concept of growth and the threatening side-effects of the current technological and industrial structure, which may have rapidly increased the level of prosperity but which has failed to correct the side-effects sufficiently swiftly. Nevertheless the question of controllability may be formulated in the following terms: is it possible, while recognizing the adventurous nature or in other words the spontaneity of the social development process, to achieve or optimalize progress?

There are many impulses behind the process of renewal, including technological impulses (e.g. discoveries) and social impulses (e.g. emancipation movements). In terms of a conscious brake or restraint on social development, control must proceed from a political judgement about the present day, as well as about the likely prospects for the future if those impulses are taken seriously as the basis of potential new developments. This report does not make any detailed judgements about post-industrial society and about the question of the extent to which the services sector might assume as much importance as anticipated.[92] The report does, however, proceed on the basis of setting limits to progress in those cases where it is evident that there would be unfavourable side-effects. This is the traditional function of legislation, which is concerned effectively to protect the personal sphere of life, the environment and the economic system etc. By the same token there may be a need to initiate or accelerate certain developments; in this case the government must encourage, plan, or develop policies on specific limiting factors. This variant – which one could conceive of as positive control – would not mean that the government had the final say in the decision-making process. The problem of the devolution of power or weighing up the respective importance of interest groups, particularly when welfare preferences are not clearly articulated in a democratic system such as ours, is always particularly difficult for the government. Apart from restrictive policies, a stimulatory, differentiated and selective policy designed to establish certain preconditions would appear desirable if scientific, technological and industrial progress is welcomed in the terms outlined above.

[92] Jonathan Gershuny, After Industrial Society, *The Emerging Self-service Economy*, London, 1978.

Government policies aimed at negative control (or suppression) can take various forms:

- Production may involve the emission of objectionable or poisonous substances. A growing body of environmental legislation has arisen in this field. These controls should be intensified and made more clear and coherent. See chapter 4 and section 5.4.2 of this report.
- Industrial working conditions are often far from perfect. While companies make certain safety and similar provisions, the legislation in this area should gradually be tightened in order to accelerate the desired humanization of labour work. Disadvantages must of course be sufficiently identifiable to be incorporated into legislation (e.g. noise nuisance, toxicity, etc.).
- Some manufactured products, such as alcohol and tobacco, may enjoy consumer popularity but be objectionable on health grounds. Legislation often (and appropriately) holds back from banning the production and consumption of such commodities since society does not favour outlawing preferences that are widely regarded as a purely personal matter (e.g. the consumption of alcohol or tobacco). Heavy duties or levies are, however, acceptable.
- Raw materials and energy are essential for manufacturing. With a view to the difficulties that would appear to lie ahead one possibility would be the legislative imposition of stiff duties on the importation and consumption of scarce raw materials and energy, even whereprices were already at a high level. It would be desirable for there to be international coordination of such legislation.
- The government could also, in the general public interest, favour the allocation of public goods and hence slow down the production or importation of certain consumer goods. Such policies could either be selective or general in nature, by means of levies or prohibitions. The starting point would have to be the objective of a healthy structure of production.

The shape taken by government policies with regard to the positive control of technology will depend on society's preferences. If these preferences are not clearly articulated politically other than in the market, any far-reaching social foundation for industrial planning is impossible. Thinking on this subject, which has long been dominated by political interest in the emancipation of the participants in the process of production in liberal-capitalist and socialist models respectively, requires but has not produced any unified or persuasive approach. Other issues include the familiar questions of the desirable balance between centralized and decentralized planning and that between representative and participatory control.[93] The analysis of the social potential of new technologies, and the associated structural modelling in this field, are not well-developed.[94] At the same time, certain means of government stimulation are being applied in addition to means of effecting negative control. Technological development has certain implications both for production processes and the products themselves; this provides the government with scope for indicating particular preferences, for example labour-saving techniques or the production of certain desirable goods that are not able to hold their own in the market.

The government may also wish to help ensure the survival of particular industries or sensitive sectors. The available policy instruments include support to well-organized R & D laboratories and the encouragement of education that produces well-trained manpower. The government is also responsible for maintaining an appropriate climate in which industry can flourish. This entails leaving enough room for the spirit of entrepreneurship in private industry and for the creativity of technicians and scientists. Bureaucratization should be avoided.

The government could thus administer policies designed to establish the right general conditions, where necessary adjusted to the specific needs of a particular industry. The starting point must be a balance of forces, which the government can assist by supporting weak parties. At the present time, for example, there would be a sound case for stressing consumer interests and for encouraging consumer organizations, which can help express the true needs of

[93] See for example David Elliott and Ruth Elliott, *The Control of Technology*, London 1976.
[94] *Arthur L. Norberg and G. Patrick Johnson, 'Structure and Understanding: Some Observations on Current Activities in the Field of Structural Modeling' Technological Forecasting and Social Changes* 14, 277 (1979).

consumers. The Dutch business sector is short of risk-bearing capital, while the banks are reluctant to invest, so that there would be room for the government to provide assistance in certain instances in the form of investment provisions. In comparative terms, costs are extremely high in the Netherlands; inflation must be brought down and excessive wage settlements kept in check. Finally the government can stimulate private industry through its procurement policy. These aspects have already been considered elsewhere in this report.

5.4.2 *Environmental policies*

Place and importance

This report is centred on the option of structural economic policies. The starting points (see chapter 1) consist of the desirability of economic growth, boosting the level of employment, the maintenance of international competitiveness, and protection of the human environment. With reference to the latter, the targets and standards of the system of official regulation have been adopted as the yardstick. The above starting points are all of equal importance. The fact that they can sometimes be mutually contradictory has become the subject of public debate. This report has not set out to accentuate inherent conflicts between these objectives (see chapter 4); instead this report follows the line of the Economic Structure White Paper[95] that the protection of the environment sets certain boundary conditions for economic activity and establishes certain limits that may not be transgressed.

The structure of production thus forms a central part of this report as a policy parameter; also central to this report is the scope for structural polices as a complement to macro-economic policies. The questions that this raises for energy and environmental considerations are as follows:

a. do the non-economic objectives (environment and energy) give rise to criteria or areas for attention of relevance to structural policies? This question implies that continuity and selectivity of economic growth should be placed on an equal footing, i.e. that economic and non-economic objectives should be weighed against each other;

b. to what extent do environmental and energy considerations affect the structure of production under present government policies, in which they form no more than a side-effect of the government's general policies towards the surrounding conditions for economic activity.

The former question was taken up in chapter 4, where an attempt was made to link environmental pollution and energy consumption to individual economic sectors of the economy (i.e. industry characteristics) and to weigh economic against non-economic objectives by means of optimalization. The conclusions are considered in chapter 6.

This does not, however, dispose of the environmental and energy question. Even in a situation in which the selectivity of economic growth is stressed a good deal more than at present, there remains a requirement for physical regulation by means of official standards; for financial assistance; and for a system of permits. The second question concerns an evaluation of the government's present policies towards intermediate objectives: to what extent have the premises set out in the Economic Structure White Paper been adhered to; to what extent has progress been made in delineating boundary conditions; and do the various available policy instruments permit such policies to be implemented effectively and systematically?

This section examines the extent to which the policies spelled out in the Economic Structure White Paper have been amended or confirmed in recent official reports (e.g. the Energy Policy White Paper (part 1), the Environmental Levies Report, the Innovation White Paper and the Sectoral Report). We shall also examine the formal expression given to these underlying principles, i.e. financial regulation, the introduction of standards and the permits system. Consideration will also be given to the way in which the administrative organization assists in the substantive translation of the underlying policy principles.

[95] *Nota inzake de Selectieve Groei (Economische Structuurnota)* (White Paper on Selective Growth (Economic Structure Report)), Second Chamber, 1975-1976 session, 13 955, nos. 1-3.

The reader will hardly find any recommendations in this section. As in the case of chapter 4, an assessment of all the aspects concerned has been left till chapter 6. At this stage we are only concerned with establishing the general framework.

Intermediate economic objectives: environment and energy[96]

It is a well-established fact that the type of goods a country produces has a major bearing on the degree of environmental pollution and energy consumption; it is even possible for these to fall while there is a growth in industrial production. Pollution and energy consumption vary greatly from industry to industry (see chapter 4).

Now there are two basic ways in which such intermediate objectives can be realized. On the one hand, by influencing technological developments and by the introduction of cleaner techniques, it is possible to combine industrial growth and limitation of pollution and energy consumption. On the other hand, the government's strategy can be directed towards altering the structure of production as such. This option was explored in the White Paper on Selective Growth, only to be rejected; there were felt to be insufficient grounds for either a 'blueprint approach' or a system of subsidies and levies based on a classification of industries into good, medium and bad. The term 'intermediate objectives policy' was first introduced in this report. Such policies are concerned with effecting essential corrections to economic developments. In part, these intermediate objectives would lead to the definition of limiting conditions for economic activity, which would have to be observed. The instruments of such policies (e.g. energy prices and environmental regulations) would not be aimed at influencing quantitative developments in individual industries; this is not the intention but a side-effects.[97] The recently published Sectoral Report speaks in terms of continuing along these lines.[98] With regard to energy, however, it acknowledges the necessity of adjusting the structure of production towards less energy-intensive industries. The government wishes to encourage this, without however compelling energy-intensive production to come to a stop.[99]

In the above policy reports continuity is taken as the prime aim, with selectivity at best a side-effect, and one to be kept to a minimum at that. In the Sectoral Report, environmental objectives tend to be subsumed under the policy instrument known as 'selective structural improvement'. If there should be specific and severe problems in a particular industry, e.g. in relation to environmental impact, temporary sectoral provisions can be considered. This policy is directed towards the best possible anticipation of essential adjustment processes.[100]

The term 'planned recontruction' is reserved for problems of over-capacity.

The policy of 'selective structural improvement' is directed towards individual industries; the aim of industry surveys is to obtain insight into possible environmental measures and the resultant socio-economic consequences for those industries, on the basis of which it can be determined how undesired effects on employment and profitability can be prevented. Government policy is also concerned with individual enterprises, the point of departure being that these enterprises should in general be in position to absorb the burden resulting from the introduction of reasonable environmental regulations; supplementary means of assistance enable the government to prevent enterprises from getting into serious difficulties as a direct result of the introduction of official environmental measures.[101] Anticipatory policies can help ensure that both

[96] The White Paper on Selective Growth covers intermediate objectives as well. Apart from environmental protection and energy/raw materials it deals with physical planning and the international division of labour; sometimes the quality of work is also taken into consideration. The reasons for the choice of the four aspects discussed here were discussed in the introduction to chapter 4.

[97] *Nota inzake de Selectieve Groei (Economische Structuurnota)* (White Paper on Selective Growth (Economic Structure Report)).

[98] *Voortgangsnota Economisch Structuurbeleid (Sectornota)* (Progress Report on Structural Policy (Sectoral Report)), Second Chamber, 1979-1980 session, 15 818, nos. 1-2, p. 12.

[99] Ibid, p. 15.

[100] Ibid, p. 15

[101] Ministry of Health and Environmental Protection, Budget Estimates, Second Chamber, 1978-1979 session, chapter XVII, no. 2, p. 96.

environmental objectives and the continuity of the enterprises affected are promoted.[102]

Existing financial instruments are often of a specific nature and are regarded as inadequate for handling the above policies. A need is seen for financial instruments of a more general kind. An increase in the alocation of funds is foreshadowed in both the Sectoral Report and in the Environmental Levies White Paper (these include supplementary budgetary appropriations for the 1981 budget, WIR environmental subsidies and an increase in funds for selective structural improvements) as well as more active industrial aid policies (see section 5.4.3).

Government policy is thus one-sidedly concerned with the development and introduction of cleaner techniques by means of financial regulations (some of which are in the process of being drafted) rather than by influencing the structure of production. This is evident from the following quotation: 'Environmental legislation is primarily concerned with the prevention and limitation of harmful side-effects, rather than regulating polluting activities as such.'[103]

In addition, compensation along the above lines is not provided if the company in question would be unable satisfactorily to remain in business in the long term, even after such compensation had been extended.[104] In those cases where there are reasons from an environmental viewpoint to make the party concerned pay for the cost of certain environmental provisions, and where that company is financially unable to bear that burden (e.g. because the company is already a marginal one and in a weak competitive position internationally), the provision of assistance may be considered in the framework of the government's general socio-economic policies, in accordance with the relevant general EC regulations.[105]

The environmental industry (i.e. companies seeking to benefit from the growing market for environmental equipment) occupies a special place in the relationship between the government's policies towards intermediate objectives and its overall economic policies.[106] For this sector to be encouraged it is necessary for the size and nature of this market to be reasonably clear. The market will to a large extent be determined by the policies adopted by the government. The prospects for innovation in the environment goods industry can be promoted by environment policies tailored to that end in conjuction with the selective stimulation of technological developments and their application.[107]

The Innovation White Paper suggested that the environmental industry in the Netherlands was lagging behind in relation to other countries and that it should be strengthened; a survey was foreshadowed into the strengths and weaknesses of private industry in the Netherlands in reacting to national and international developments in the field of environmental protection and into the potential of R & D in the Netherlands in the field of environment and innovation.

This is of importance if the macro-economic effects of environmental policy are to influenced in a positive sense. A number of OECD studies[108] have indicated that environmental measures can exert a positive effect on the economy if the required equipment is ordered in the domestic market.

A sum of N.Fl. 100 m.[109] has been set aside by the Ministry of Health and

[102] Ibid, p. 107.

[103] Ministry of Health and Environmental Protection, Budget Estimates, Second Chamber, 1979-1980 session, 15 800, Chapter XVII, no. 2 o, 124.

[104] *Nota Milieuheffingen* (White Paper on Environmental Levies and Charges), Second Chamber, 1978-1979 session, 15 658, nos. 1-2, p. 70.

[105] Ibid, p. 85.

[106] The term 'environmental industry' is misleading, in that it arouses the impression of a separate industry distinct from other industries. In practice the industry tends to consist of firms that sell to other, similar firms environmental technology which they had developed for their own purposes; see for example C.T. Hill and J.M. Utterback (eds.), *Technological Innovation for a Dynamic Economy,* New York 1979.

[107] *Technologische Innovatie* (White Paper on Technological Innovation), Second Chamber, 1978-1979 session, 15 855, nos. 1-2, p. 263 ff.

[108] See for example OECD, *Employment and Environment,* Paris 1978.

[109] Of this N.Fl. 100 m., N.Fl. 50 m. is contributed by the Ministry of Economic Affairs from funds allocated for 'spearhead' policies and the remainder by the Ministry of Health and Environmental Protection from funds accumulated from air pollution levies.

Environmental Protection for technological development projects of an environmental nature over the next few years. This is in addition to existing sources of financing (e.g. development credits, funds generated by Chemical Wastes Act levies, Investment (WIR) environment subsidies, TNO financing, advance financing of environmental legislation, government contributions towards water purification technology and government policy-oriented research). With a view to stimulating the environmental industry, the Innovation White Paper expresses a preference for the placement of direct contracts with industry.

From the above it will be unmistakeably clear that it is the government's aim to minimize the side-effects of its policies towards intermediate objectives by means of extensive support measures. The criteria for assistance are so general in nature that there is no longer any question of selective economic growth. By way of justification for exceptions to 'the polluter pays' principle, it may be noted that much greater investment facilities are available to private industry in neighbouring countries[110]; these include both support measures in the context of the transitional arrangements towards 'the polluter-pays' principle[111] and competition-distorting government support, which this principle adopted by the EEC was in fact designed to prevent.

Financial provisions

Government assistance

As far as private industry as a whole is concerned, the cost of strict environmental policies is at most marginal. This has been confirmed by a growing number of publications[112] and has been endorsed by the present government: 'It may be assumed that current economic problems are in no way attributable to the environmental control measures that have been and are being introduced. Nor do I expect that these problems will be significantly affected in the short term by either a more or a less flexible attitude towards the prescribed environmental standards.'[113] In these terms there would be no reason to introduce general government financial assistance measures to compensate for these expenses. From the viewpoint of environment policy, preference should be given to specific, selective measures for individual industries and companies. These would form an effective aid towards achieving environmental control objectives.

Arrangements have been made for individual assistance measures under the various environmental acts (e.g. those relating to water, air and noise). A section on financial provisions is being drafted, which will form part of the Act concerning general determinations on environmental control.

The statutory compensation provisions are intended to prevent licensing bodies from being placed in a dilemma.
These provisions will apply to firms[114]:

a. which are confronted with relatively burdensome environmental stipulations;

b. in whose case the introduction of essential measures would lead to significantly higher costs than in comparable firms;

c. in whose case the implementation of environmental policies would, partly as a result of the circumstances noted in a. and b., lead to economic difficulties.

This formulation (relatively... higher costs than in comparable firms...

[110] See G.F.A. de Jong, 'Enige implicaties van de kosten van het milieubeleid in Nederland' (Some Implications of the Costs of Environmental Policy in the Netherlands), *Milieu en Economie*, Rotterdam 1975, p. 73 ff.

[111] These transitional arrangements run until 21.12.1980; sudsidies during the years 1979 and 1980 may not exceed 15%, compared with a maximum of 45% in 1975/1976 and 30% in 1977/1978; other EEC countries have made extensive use of this provision, whereas the Netherlands has made only marginal use of it. EEC policy towards government assistance after the expiry of the transitional arrangements is still unclear.

[112] OECD, *Employment and Environment*, Paris 1978. See also: De kosten en macro-economische gevolgen van het milieubeleid in de toekomst. (Costs and Macro-economic consequences of future Environmental Policy), Second Chamber 1980/1981 session, 16 495, nrs. 1-2.

[113] Ministry of Health and Environmental Protection, Budget Estimates, Second Chamber, 1979-1980 session, 15 800, chapter XVII, no. 2, p. 116.

[114] *Nota Mileuheffingen* (White Paper on Environmental Levies and Charges), op. cit. blz. 7.

economic difficulties) leaves a good deal of room for interpretation. What are regarded as 'normal' or 'acceptable' environmental burdens is not clear.

Under the individual environmental acts, permitissuing bodies are required to examine the environmental control stipulations laid down under the permit in terms of their general environmental importance and the available technical means of combatting pollution at a socially-acceptable cost (i.e. the best practicable means concept). This concept can however take many forms in practice, and the application of this principle demands on the part of the permit-issuing body a high level of expertise with regard to technological developments, which is by no means always available. Then there is the question of how the economic possibilities should be assessed: does one look at the individual firm, the industry, the economic position of that industry in the Netherlands, or the international economic context?

Under the present arrangements these fundamental questions are evaded. There are not clear regulations such as the Technische Anleitungen (Technical Specifications) in West Germany or the Performance Standards in the USA. A handbook containing specimen regulations is only in the process of being published, and will moreover be only advisory in nature, and have no binding force. In brief, the stipulations to be imposed on firms are determined from firm to firm.

The relaxation of environmental regulations on account of the financial and economic difficulties of an individual firm is implicitly rejected as an instrument of policy in the government's regional economic strategy. In this regard the Innovation White Paper claims that if the introduction of environmental standards is avoided in certain firms or certain industries, the technology to deal with environmental problems within those firms will not get off the ground properly. Furthermore the central government has very little influence over the regulations on which permits are based.

On the one hand, therefore, the criteria for introducing company environmental controls tend to be loose, while on the other hand there are very wide criteria for the provision of financial assistance. The funds currently available for such purposes are inadequate. The government has accordingly announced that it will be introducing a supplementary budget for the year 1981 to finance contributions to companies, over and above the payments made from the revenues derived from environmental levies. An active policy of financial assistance has been foreshadowed. It is questionable whether these more active policies will lead to a tightening of standards with regard to existing, practicable techniques (i.e. the measures regarded as reasonable for a normally operating company). At the very least this must be regarded as doubtful. It is suggested that[115] 'the scope for clean growth will depend heavily on the willingness of the business sector seriously to tackle the development and introduction of advanced production and purification techniques.' It would appear therefore that no particular pressure is to be exerted now that government assistance has been increased. This is, it may be noted, consistent with the policy of dropping levies as a regulative instrument (along with physical regulations).

The responsible Minister attaches considerable importance to the introduction of a permanent WIR environment supplement designed to stimulate the application of advanced production and purification techniques.

In somewhat simplified terms the development of environmental control and purification techniques might be described as follows. To start with there was the concept of 'the solution to pollution is dilution', i.e. taller chimneys, sewers, etc. Then came 'the end of the pipe' solution, consisting of supplementary techniques such as sewage treatment plants, flue-gas purification, filters etc. The latest direction consists of modifications to production processes. Legislation has not yet caught up with this development, in that the government's subsidy and incentive provisions still stress hardware. In this respect the WIR environmental supplements exert a restraining effect. It is perfectly feasible to distinguish normal from environmental provisions in a unit of production, let alone in the form of capital costs.

[115] Ministry of Health and Environmental Protection, Budget Estimates, 1980, op. cit., p. 117.

The VCRMH[116] has suggested that the positive effects of the environmental subsidies on the environment will tend to be limited. In itself a subsidy is only a limited incentive to undertake environmental investment, which generally only entails further costs. Moreover, much environmental investment will have to take place anyway on the basis of permit regulations. In this case, however, there exists the possibility of official compensation out of levy revenues. The environment subsidy can, however, induce companies to undertake investment before it becomes compulsory. According to the VCRMH the subsidy can also lead to an adjustment of permit regulations from the best practicable means towards the best available technology.

Confronted with this view, the Ministry of Health and Environmental Protection has suggested that this subsidy is intended to apply particularly to special, more advanced environmental control techniques. In this sense it anticipates that there will be a quite definite incentive for environmental investment. It anticipates moreover that in specific cases the provision of subsidies will lead to a tightening of environmental standards.

To sum up, it may be said that the present Cabinet attaches a good deal of importance to easing the burden imposed on companies by its environmental measures. The means of doing so include more extensive compensation provisions and the aim of instituting a permanent environment subsidy in the context of the Investment Acts (WIR). In this respect it is worth noting the suggestion made by the F.N.V. (i.e. a minority view of the VCRMH in relation to environmental subsidies) that the allocation of subsidies should be made dependent on the extent to which a number of limiting conditions of an environmental nature were fulfilled.

The Cabinet would continue to recognize 'the polluter-pays principle' but would administer it less strictly: compensation payments would be financed to a larger extent out of general revenues, in the interests of employment and company continuity. Where marginal firms in a weak international competitive situation were concerned, financial assistance would only be provided in the context of socio-economic policies, in conformity with the relevant EEC regulations.

Levies

As noted above one of the underlying principles of environmental policy is that 'the polluter pays'. This principle, which has been internationally adopted (e.g. in the EEC and the OECD), means that parties must bear the financial burdens associated with:

1) the prevention of agents or substances that could cause environmental pollution being produced as a result of activities undertaken by them;

2) the introduction of measures within the company to ensure that agents do not reach the environment in an undesirable condition, form or composition;

3) any levies imposed on the discharge of agents produced and discharged despite 1. and 2. above; levies that may be imposed for collective (i.e. governmental) measures to protect the environment.

The application of this principle is not only intended to achieve an equitable distribution of environmental costs among the various categories of polluters, i.e. a distribution in line with the nature and scale of the pollution cause, but is also designed to bring about a redistribution of the means of production by means of the price mechanism. In the open market of the EEC, it also avoids governments coming under pressure to subsidize what should be normal costs of production in order to maintain competitiveness. The levies are instituted, in inverse relation to the degree of accountability, to defray both direct and indirect administrative and regulative measures.

Levies have three separate functions:

- the financing (or redistribution) function. The primary object is to finance the direct costs of official measures for reducing pollution and the indirect costs of administering environmental legislation. In this respect the size of the levy should be as closely related as possible to the scale and nature of the

[116] Provisional Central Council for Environmental Protection, 'Milieu facet in de twee fasen van de WIR' (Environmental Aspects in the Two Phases of the WIR), V.A.R. series 1979, no. 8.

discharges; as an instrument to make 'the polluter pay', it should also be applied to any residual;

- the allocation effect consists of the change in production and consumption patterns brought about by the modified price structure. Levies help bring about a 'true' cost price. If the levy corresponds to the degree of pollution in question, this will mean that heavily polluting articles become more expensive than clean alternatives. In this way there will be a shift in production and consumption towards cleaner alternatives;
- the regulatory function. Levies are applied on residual pollution, i.e. on the discharges remaining after the application of physical regulations. The aim is to reduce discharges by encouraging manufacturers and distributors of capital goods actively to seek for the cheapest and hence the least polluting alternative.

The Report on Instruments of Environmental Policy[117] attached considerable importance to the regulatory effect of levies. Apart from physical regulation (i.e. emission regulations, standards, directives and prohibitions), which should be based on the 'best practicable means', levies were regarded as the main instrument for guiding and stimulating technological development. Levies had the further advantage in relation to physical regulation of avoiding the risk of the incorrect assessment of technological possibilities. The latter could occur in the case of phased, progressively more stringent physical regulation by means of permit regulations. The basic premise of tackling pollution at source would not be affected.

This policy comes in for reconsideration on various points in the recent White Paper on Environmental Levies and Charges. The government, it is true, continues to endorse 'the polluter-pays' principle, but wishes to administer it less strictly. The financing function is now regarded as the most important function of levies, with a view to financing the direct costs of administering environmental legislation: i.e. the planning, installation, operation and maintenance of treatment facilities and the like, the payment of compensation to companies, funds for research and development, and grants to the municipalities and provincial governments for the appointment and operation of services in relation to the planning, administration and supervision of official policies.

Over an appropriate transitional period, there will be a switch to financing indirect expenses out of general taxation revenues. To this end supplementary estimates will be submitted by the relevant Ministries. The government also intends to step up the level of compensation paid to firms. Apart from using the revenues derived from levies, the government is considering a permanent environment subsidy (Investment Act phase II). The Government has now abandoned, or no longer entertains high expectations of, the regulatory effect of levies.

The Innovation White Paper, on the other hand, argues in favour of a reassessment of the regulative effect of levies: 'Instruments of a more general nature such as levies may be applied to deal with less harmful forms of pollution. By reflecting the negative effects of environmental pollution in the price mechanism, environmental levies can help reduce the number of environmentally-harmful processes and products. This instrument is of particular use if there are available substitutes (both in the production and the consumption sphere) or if there is scope for improving existing production processes.'[118] Whether use will be made of these possibilities is still unclear.

The allocation and regulatory effects only become discernible if levies form more than just an insignificant part of the cost price. At present this is only so in the case of levies instituted under the Pollution of Surface Waters Act on industrial discharges. In other instances, such as charges on fossil fuels levied under the Air Pollution Act, and the fuel charges shortly to be introduced under the Noise Abatement Act, this is not so. In the case of the latter two levies, there is no provision for anticipation, other than by cutting back energy consumption. Levies on chemical processes are unlikely in the short term. A major problem consists of selecting the object to be taxed and determining the weights to be applied in such a way as to do justice to the diversity of polluting substances.

[117] Ministry of Health and Environmental Protection, Budget Estimates, Second Chamber, 1974-1975 session, 13 100, Chapter XVII, No. 30.

[118] *Technologische Innovatie* (White Paper on Technological Innovation), op. cit., p. 272.

The Institute for Environmental Studies contends that process emissions form a category the importance of which should not be overlooked. In view of the different types of pollution, and 'weighted' in terms of their harmfulness, the Institute considers this category to be more important than fuel and transport emissions (see section 4.2.2).

In our view the conclusion is justified that precisely because the levy instituted under the Pollution of Surface Waters Act had significant effect on costs, it had a regulatory and allocative effect and led to the successful control of discharges of biodegradable wastes into surface waters. The Minister has, however, warned against excessive expectations based on theoretical considerations that levies can encourage the adoption of less polluting techniques.[119]

In anticipation of the policy report on the Costs of Environment Policies, the Ministry of Health and Environmental Protection recently suggested that the running costs of the environmental policies adopted since 1970 could be put at N.Fl. 3 bn. for 1979, or over 1% of GDP.[120]

The actual growth in the costs of environmental control has lagged well behind the Central Planning Office's estimates (of approx. 2% in 1985).[121] According to the Minister, this is in large measure attributable to the reduction in costs resulting from improvements in anti-pollution techniques and a lower rate of growth in production and energy consumption. In addition there were a number of omissions in the range of environmental measures considered by the Central Planning Office. On the other hand they also included measures in the field of sulphur-dioxide control and atmospheric pollution by cars, the scale of which, in the Minister's view, far exceeded what was required in terms of the government's objectives.

At the present time, however, the SO_2 emission ceiling (500,000 tonnes p.a.) is being exceeded, as are the advisory environmental quality standards laid down by the Health Council (which still have not been taken up in legislation); the share of cars in NO_x pollution has risen sharply, as have total emissions of these nitrogen dioxides, so that they now even exceed the Health Council's advisory values. The government's efforts to deal with SO_2 have benefitted from the rapid increase in consumption of natural gas but are now being frustrated by the rapid conversion to oil and coal. Insufficient measures have been introduced during the intervening period to limit the SO_2 discharge, but also with respect of nitrogen oxide levels and photochemical air pollution.[122]

Physical regulation

Standards form important instruments of environmental control policy. There is still a growing need for environmental standards, in the government's case as a means of supporting its policies, and in the case of private industry and environmental organizations for reasons of legal security and equality before the law.[123]

To a certain extent the various types of standards form a hierarchy. Under no circumstances may environmental quality standards be exceeded, i.e. the standards that must be satisfied by the various compartments of the environment (soil, air and water). Subordinate to these are the emission, product and process standards, which must be brought into line with the environmental quality standards. In the absence of sufficient knowledge to establish quality standards, government policy has tended to be based on emission, product and process standards. Quality standards often take the form of marginal values, that is, standards specifying the maximum permissible levels of pollution at a given time and locality, and which should in principle be periodically tightened

[119] *Nota Milieuheffingen* (White Paper on Environmental Levies and Charges), op. cit., p. 6.

[120] Ministry of Health and Environmental Protection, Budget Estimates, 1980, op. cit., p. 119.

[121] Central Planning Office, *Economische gevolgen van bestrijding van milieuverontreiniging* (The economic consequences of Environmental Control), monograph no. 20, The Hague 1975.

[122] Thus the car manufacturer Honda produces two types of car: the clean CVCC for Japan and the US, and the old, 'dirty' engine for Europe.

[123] *Nota Milieuhygiënische normen* (White Paper on Environmental Standards), Second Chamber, 1978-1979 session, 14 318 nos. 7-8, p. 2.

until the target values have been achieved.[124] Target values consist of quality standards based on the 'no-effect level'.

Emmission, product and process standards are of a totally different type. Emission standards specify the maximum permissible discharge, emission or radiation of polluting substances, organisms or not chemically-bound energy from a source or group of sources, expressed in such forms as quantities per time unit. An emission standard is a particular form of a process standard. Emission standards are of special significance for the issuing of licences, in that they enable discharge or noise emissions to be tackled at source.

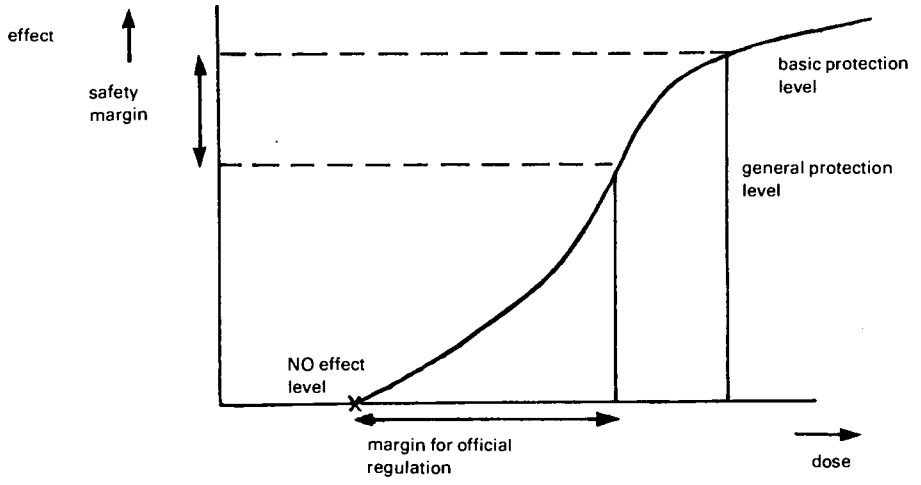
The hierarchical relationship between the various standards is not a completely straightforward one. All are concerned with the prevention of pollution, and are based on the basic premise of 'standstill' and the use of the 'best practicable means' and all are concerned with preventing quality standards from being fully 'used up'.

Environmental quality standards do not play a large part in the current system. With the exception of the Noise Abatement Act there are at present no statutory quality standards. Advisory values have, however, been submitted by the Health Council for sulphur dioxide (SO_2), nitrogen oxides (NO and NO_2), carbon monoxide (CO) and soot, while advisory values have been sought for ozone (O_3) and photochemical oxidants, lead (Pb), fluoride (F) and polycyclic hydrocarbons. In addition the EC's guidelines for drinking, swimming and fishing water will soon be converted into legislation.

The water and air pollution legislation provides little scope for the imposition of compulsory quality standards. Section 54 of the Air Pollution Act, for example, only provides for the imposition of marginal values which, if exceeded, would constitute serious pollution and be harmful to public health. This does not adequately reflect the principles on which government policy is based on preventing and reducing pollution. The prevention of serious atmospheric pollution alone cannot constitute a proper objective for the government's efforts to deal with air pollution.

An amendment to this Act is being drafted.[125] As noted above, the present range of legal instruments provide little scope for laying down binding quality standards. In order to prevent the environment form unnecessarily deteriorating towards the 'general protection level' efforts will be made to lay down standards below that level.[126] The concept 'general protection level' refers to the limit

Figure 5.



[124] The Economic Structure Report employs different terminology from that used in the White Paper on Environmental Standards. This report uses the same terminology as that in the latter policy report. Furthermore there is a marked difference in the two reports concerning the place of the various types of standards in environmental policy. The White Paper on Environmental Standards does not refer to the possibility of regular adjustment of environmental quality standards.

[125] *Nota Milieuhygiënische normen* (White Paper on Environmental Standards), op. cit., p. 5.

[126] Ibid, p. 4.

above which one or more functions of the environment can no longer be properly fulfilled. This term is generally used in conjunction with the term 'basic protection level', defined as the level at which man or objects are not exposed to unacceptable danger (see figure 5).

The marginal values laid down in the Pollution of Surface Waters Act are generally taken as a guideline; they do not constitute binding standards. Other than by laying down conditions when licences are issued, it has not so far been possible to enforce such standards, since there exists no legislative basis. Standards can, however, be enforced through the licensing system.

Enforcement would become possible if the quality standards proposed in the Indicative Multi-year Programme on Water Pollution 1975-1979 were to be formalized by means of an administrative order based on the Pollution of Surface Waters Act. The water control bodies are obliged to incorporate statutory norms of this kind in their water control plans (section 10 d. of draft amendment of the Pollution of Surface Waters Act).[127]

For a limited number of substances it is possible to determine emission standards on the basis of the Order issued under the Pollution of Surface Waters Act (section 1, art. 3). This covers the list of the so-called black or grey substances, which has the aim of reducing discharges of particular substances or in particular industries to nil.[128]

In the absence of rigorous guidelines for quality standards, the main thrust of policy consists of the produce and process standards laid down in the licences issued under the various environmental laws. In most cases the licence-issuing body is the province (i.e. the provincial executive councils), the municipalities (Mayor and aldermen) or the water control boards or similar bodies. The criterion used is that of the best practicable means, which is defined as the technique with which the greatest reduction in pollution can be obtained while taking account of economic aspects, i.e. the cost of which is acceptable for a well-run business. This criterion leaves the licensor with a great deal of latitude in drawing up the regulations.

The publication of the Environmental Protection Handbook aims at standardizing the regulations in the form of standard or specimen regulations. The handbook will not, however, be formally binding. It concerns environmental regulations but as such does not specify standards. Licence-issuing bodies can, moreover, depart from these regulations when actually issuing licences.[129] Apart from its lack of influence over licensing regulations (since these are imposed individually on companies there can by definition be no question of environment standards), the central government also attaches little importance to the phased introduction of progressively tighter standards. 'Technology forcing' is rejected on the grounds that it is impossible reliably to anticipate technological progress and that, to the extent that this might be possible in the long term, such knowledge is possessed not by the government but by producers and consumers.[130] In our view this constitutes an inadequate basis for failing to adopt US practice (e.g. the Federal Water Pollution Control Act and the Clean Air Act), which lays down emission standards in such a way that they can only be met by the introduction of the best available technology.

By contrast the Innovation White Paper strikes a different note. This report notes that the regulations are generally based on existing techniques. Applied in this manner, the physical regulations cannot be expected to provide a major stimulus for the development of new and effective techniques. Japanese experience indicates that physical regulations which are not based on existing technology but which are stricter can actively promote innovation. 'Innovation can also be stimulated by the clear indication of future plans, e.g. in indicative multi-year plans and by announcing new regulations and their impact at micro level in good time (...). Up to the present date innovation has been of less importance in the environmental sphere than it might ideally have been, both from an environmental control viewpoint and with a view to stimulating new economic activities.'[131] The report refers several time to the importance of prior

[127] *Nota Milieuhygiënische normen* (White Paper on Environmental Standards), op. cit., p. 9.
[128] Ibid, p. 7.
[129] *Technologische Innovatie* (White Paper on Technological Innovation), op. cit., p. 365 ff.
[130] *Nota Milieuheffingen* (White Paper on Environmental Levies and Charges), op. cit., p. 11.
[131] *Technologische Innovatie* (White Paper on Technological Innovation), op. cit., p. 365 ff.

notification, including the specific effect that these regulations will have at company level.

Admittedly this report also refers to 'the risk that it is not possible adequately to anticipate future technological progress' in general regulations setting down standards for the future, but nevertheless it bridges the gap between Dutch and Japanese /US practice.

The Standstill principle adopted by the EC Council of Ministers in 1973 is even further away from implementation. This document is still under consideration by the Inter-departmental Committee on Environmental Protection. The study[132] carried out on behalf of the EEC into the ways in which the principle might be applied in practice has as yet had no impact on government policies. It has, therefore, not as yet been determined whether this principle should apply to geographical areas or to particular aspects of the environment, or to combinations thereof, let alone to which regions or aspects, and at what level. Here too the Netherlands could benefit from the experience of US environmental legislation (the 'no significant deterioration' principle). Under this legislation the states are required to divide their territory into three classes, ranging from class 1, where not pollution is permitted, to class 3, where large-scale industrialization and growth are planned. The Environmental Protection Agency then lays down increments per class, i.e. permissible transgressions of or increase in quality standards.

The concept of differentiated standards also exists in the Netherlands, as may be seen from the differences in the standards (or target values) set for surface waters used for different purposes (i.e. drinking, swimming and fishing waters), as well as from the different target values for air quality in relatively clean areas and in industrialized urban areas (the so-called transitional standards).

The picture that emerges from the above is clear. 'The most important instruments so far to have been developed in environmental legislation are the licences issued to certain conditions.'[133] The criteria for these conditions are not completely straightforward. However, a body of legal practice has been built up as a result of the large number of legal appeals. In this way Parliament's intentions have gradually been amplified, and the regulations are becoming standardized. Environmental policy is however still a long way of the situation of 'preparing regional and local plans for the future on the basis of national environmental standards.'[134] We would accordingly urge that environmental quality standards be legislatively laid down as a matter of priority. Required are:

- the phased introduction of standards, to be announced in advance in the multi-year indicative plans so as to enable private industry to take the necessary steps in good time;
- a more detailed elaboration of the concepts 'best practicable means' and 'standstill'.

Licences

Until the late 1970s responsibility for environmental control resided almost exclusively with the municipalities. These responsibilities were based on the Public Nuisance Act, which dated from 1875 and was substantially amended in 1952.

This Act was primarily geared to facilities of a straightforward nature that were largely a source of nuisance in their immediate vicinity. This explains why the municipalities were the licensing bodies and why the stress lay on regulations governing means of environmental control. The Public Nuisance Act only permits a company to be examined in isolation, i.e. it does not allow for any pollution or other nuisance that might be caused by any future expansion of the company or by ancillarly industries that set up in the area. Nor can a licence once issued be revoked. This Act[135] ceased to suffice with the growing

[132] *The Standstill Principle*, Environment Study Centre, Groningen 1977.

[133] Ministry of Health and Environmental Protection, Budget Estimates 1979, op. cit., p. 90.

[134] Ibid, p. 90.

[135] Amendment of the Public Nuisance Act, Second Chamber, 1977-1978 session, 15 627. A further amendment to the Act is being drafted, which would place it on an equal footing with the specialized environmental acts.

concentration of industry and the advent of environmentally harmful technologies.

A solution was sought in the form of separate legislation for each of the compartments of the environment. The first of these came into force in the early 1970s (the Air Pollution Act in September 1972 and the Pollution of Surface Waters Act in December 1970). This at once supplemented and derogated from the Public Nuisance Act. The Nuclear Energy Act came into force at an earlier date (1963).

The municipalities had a lot of leeway to make up, besides which a practice had arisen of largely leaving companies alone. The Public Nuisance Act remains an impediment in terms of environmental legislation: only 38% of companies falling under the Public Nuisance Act in fact have licences; and approximately 14% of bodies falling under the Act have an inadequate licence in present-day terms.[136]

Under the new specialized legislation the major powers have been given to the provinces. The provinces have tended to apply stricter conditions with respect to the separate elements of the environment than did the municipalities in considering the overall consequences for the environment of the establishment of a new business. This is the reason why the provinces are often regarded as strict and inflexible (although there are also considerable policy variations between the various provinces). These variations are inherent in the system of decentralized administration (see Administrative Organization). Once again, the new specialized legislation provided the lower levels of government with wide discretionary powers.

The new legislation creates more room for making the extension of a business licence dependent not only on regulations governing the required means of environmental control but also on regulations governing emission standards. In extending a licence, account is also meant to be taken of anticipated future developments, e.g. expansion and the possible establishment of ancillary industries.

Apart from the licences required under the specialized environmental legislation referred to above, licences are required for the establishment, extension or amendment of a business on the grounds of laws or regulations concerning physical planning, public works and industrial safety, as well as by-laws laid down by the provincial and municipal governments and statutory authorities.

For the most part the laws and regulations in the various fields evolved independently. The result has been that a variety of bodies at various levels of government are involved in the extension of licences, while the individual licensing procedures tend to vary a good deal.

The various licensing procedures are consequently something of a muddle and have meant that the procedure for obtaining the various licences required for establishing a business is by no means a smooth or efficient one; this in turn affects the length of time it takes to obtain the required licences. Moreover, the processing of licence applications often takes considerably longer than it might because of the lack of coordination between the various licensing procedures. An additional delaying factor consists of the lengthy appeals procedure.

The major problems are:

- the frequent failure to meet (legal) deadlines;
- the large range of bodies involved in issuing licences;
- the lack of coordination and the lack of clarity concerning the division of responsibilities between the bodies concerned;
- problems of an organizational and staffing nature, among both the licence-issuing and advisory bodies;
- the lack of adequate public information;
- the lack of standardization between applications and licensing regulations;
- ambiguity as to when information should be submitted.

A number of these obstacles have been eliminated with the recent coming into force of the early parts of the Environmental Protection (General

[136] VAR 1979 nos. 1-3, Uitvoering Hinderwet (Implementation of the Public Nuisance Act), Twijnstra and Gudde Bureau.

Determinations) Act (WABM).[137] This Act lays down rules for coordination, consultation procedures and appeal with regard to the regulations that may be imposed under ten laws in the field of environmental protection. Thus the suspensive force of appeals has been abolished and rules have been laid down for the maximum permitted lenght of licensing procedures. A number of obstacles continue, however, to exist. Thus the scope of the WABM remains limited, although an increase in the area covered by the Act is being drafted (including the Excavation Act, the Groundwater Act and the Noise Abatement Act). The Act itself is also being broadened; thus it is the intention during the life of this government to table a new part of the Act dealing with Licensing Provisions: this would supplement the existing regulations on consultation procedures, appeals and coordination. This part of the Act would lay down the licensing procedures under each of the separate acts as uniformly as possible and would increase their effectiveness. A survey will be conducted into the possibility of drawing up a standard information classification. This classification would be designed to help split the information requirements of the various governmental bodies into logical components, thereby enabling the successive compilation, provision, assessment and processing of information. This would in turn facilitate the development of standardized regulations and enable the preliminary consultations to be more effective and streamlined.[138]

Reference should also be made in this context to Environmental Impact Statement (E.I.S.). The White Paper setting out the government's standpoint towards environmental impact reporting[139] states that E.I.R. is regarded as an instrument by means of which proposed activities can be assessed in terms of their likely environmental impact. It was also indicated that E.I.S. would receive a legislative basis in the form of a supplementary part to the WABM.

The E.I.S. is an aid in the decision-making process, and is designed to ensure that environmental considerations are taken fully into account in assessing an application. As an important side-effect, it is hoped that the systemization and harmonization of information on environmental impact, and the utilization of that information, will enable licensing procedures to be streamlined.

The starting point is that E.I.S. should form an integral part of the decision-making process. What form this integration should take is not indicated in the White Paper; a number of concepts are however explored, such as the integration and extension of existing licensing procedures into a single environmental permit, for which E.I.S. would provide information. Further research is currently being conducted on this point, namely the so-called 'research, sphere of operation E.I.S.'. At the present stage it is not clear to which licences E.I.S. should or should not be attached; this applies equally to the interim regulation which the government wishes to introduce while waiting for E.I.S. to be legislated.

A difficult aspect consists of fitting in the licensing procedures used in other areas. A number of initiatives have been taken on this score, including the appointment by the Ministry of Economic Affairs of an inter-departmental committee on licensing systems. This committee has now published its findings.[140] On the basis of this report, the Minister for Home Affairs was requested to appoint an inter-departmental working group to examine the question of administrative coordination.[141] This working group will also be looking into the proposal made in the Socio-Economic Council's advisory report[142] concerning the establishment of provincial coordinating bureaus. Since then the Rhine Delta Corporation has submitted a request for the subsidization of a licensing bureau. The working group in question has not however so far been appointed, for which reason the Rhine Delta Corporation's initiative has been indefinitely shelved. The problem is however universally recognized as an urgent one.

[137] Bulletin of Acts, Orders and Decrees 1979, pp. 442-443.
[138] Ministry of Health and Environmental Protection, Budget Estimates 1979, op. cit., p. 122.
[139] Environmental Impact Statement, Second Chamber, 1978-1979 session, 15 715, nos. 1-2.
[140] Improvement of government licensing procedures, Second Chamber, 1977-1978 session, 15 010, nos. 102.
[141] Ministry of Health and Environmental Planning, Budget Estimates, 1979, op.cit., p. 133.
[142] Socio-Economic Council advisory report 'Concerning the improvement of official licensing procedures, no. 14, 1977.

To a significant extent, the decision-making responsibilities arising under environmental legislation reside with lower-level statutory bodies. The application of this concept remains an important principle: sound environmental policies are only possible if all levels of government administration bear co-responsibility; and there can be no co-responsibility without the allocation of real powers. In allocating powers on the basis of the new legislation or in reviewing the existing distribution of powers, a major consideration consists of the fact that policy should in principle be formulated as close to the community as possible.[143] The central government's responsibilities lie primarily in the field of coordination and harmonization, i.e. the development of a legislative set of instruments for assessment procedures and of standards to provide a frame of reference for that assessment.

The central government has tended to avoid laying down nationwide standards. The government argues that local factors must also be taken into account in assessing ecological acceptability. This must be primarily a matter for specialized government agencies and the licensing bodies.

Licensing policy brings together economic and environmental policies at regional, provincial and municipal level, particularly in view of the responsibility of lower levels of government for administering environmental legislation. Environmental targets are translated at regional level by means of the Standstill principle, which seeks to reduce pollution by lowering pollution levels in badly affected areas and/or individual elements of the environment, and by maintaining the quality of the environment as far as possible in relatively clean areas and/or elements of the environment.[144]

The Standstill principle, the 'best practicable means' concept and environmental quality standards form the three main underlying principles for licensing policy, which has to date been regarded as the major instrument in environmental legislation.[145] These basic premises give wide discretionary powers to the government bodies responsible for the implementation of environmental legislation. These powers can only be curtailed by means of the rulings handed down in the case of legal appeals. The requirements that companies must satisfy are scarcely laid down in law and are determined from case to case. This technique of legislation is regarded as appropriate for the nature of the subject in question, namely the unpredictability of future developments, the complexity of the problems and the possible need for sudden action. These vague standards or discretionary powers of the administering bodies are however seen as the beginnings of a codified legal system. This logical way of building up a codified system needs, however, to be followed up. The entire body of environmental legislation had, after all, to be built up, and as such necessarily had a processual character.

That such a sequel is coming may be seen from recent policy documents, the new generation of environmental laws is characterized by the imposition of standards by the central government and by a more systematic, planned approach.[146]

The central government evidently sees the need for the harmonization and standardization of existing practice. The Environmental Protection (General Determinations) Act will consist of the following parts (the sequence suggested below is not yet definite):

- coordination, consultation procedures and appeal;
- appointment of Central Council for Environmental Protection;
- licensing;
- environmental impact statement;
- determination of standards;
- provincial environmental plans;
- financial determinations.

[143] Ministry of Health and Environmental Protection, Budget Estimates, 1979, op. cit., p. 91.
[144] Ibid, pp. 107-108.
[145] Ministry of Health and Environmental Protection, Budget Estimates, 1980, op. cit., p. 90.
[146] Ibid, p. 163.

As noted, lower levels of government continue to bear much of the decision-making and executive responsibility. The wide degree of latitude given to the provinces has meant that substantial differences in provincial policy have arisen in practice. This may be seen from the licensing regulations, the fees charged, arrangements for enabling provisions to take immediate effect, length of licensing procedures, etc.

These variations in policy can lead to the distortion of competition. On the other hand, there are certain advantages to a decentralized approach, i.e. a large measure of flexibility to respond to new insights and to specific regional circumstances. Where environmental regulations may not produce any particular problems at national level, adjustment problems can arise at regional level for certain industries. This does not mean that national standards should be made more flexible but that the best way of dealing with evironmental problems and objectives lies in differentiated policies that might for example allow differing time-scales for the introduction of standards and adjustment measures. To a large extent, however, these advantages are purely theoretical. In practice a government administering environmental policies based on the concepts of 'control at source' and the 'best practicable means' must possess a large measure of technological expertise and insight.

For this reason the existing allocation of responsibility would appear to be less than optimal. If lower levels of government wish to carry out their responsibilities properly they will have to cooperate closely with governmental bodies possessing the requisite expertise. It would be conceivable for these expert bodies or the government to lay down guidelines for the way in which emissions should be controlled at source. As the Minister has stated: 'The technical scope for reducing emissions at source and for improving the techniques employed will have to be incorporated into the regulations to a much greater extent than in the 1970s.'[147] Elsewhere the Minister has postulated 'not the government but producers and consumers possess the available information (on reliable expectations) concerning technological progress', and that 'there can be no assurance that sufficient effort will be made to find methods for meeting stricter requirements.'[148]

The Public Nuisance Act Handbook is to be combined with the Air Pollution Specimen Regulations Handbook, which is currently being drafted, into a single Handbook on Environmental Protection. This Handbook is intended as an aid to regional governments in their licensing policies, although they will be free to depart from the guidelines. The Air Pollution Act does not provide for the harmonization of licensing regulations.[149]

A major focus of interest at present consists of the provincial environmental policy plan. This plan will have to include the underlying principles on which the policies to be adopted will be based, especially in relation to the extension of licenses. This plan envisages further harmonization and coordination of specialized aspects of provincial environmental policy and the coordination of that policy with central government policy.

The coordination of the provincial policy plan and the central government's indicative multi-year planning has not yet crystallized sufficiently. This is not the appropriate place for a general examination of planning and the administrative coordination of environmental policy as such or of the question of the shape this should take. We would, however, stress the importance of improving the coordination of central and regional policies. This applies to the relationship between innovation and regulative policy and to the discretionary powers of lower level statutory bodies.

The central government will seek to strengthen its own position while maintaining decentralization. The following possibilities would exist to that end:

- marginal examination of provincial policy plans;
- power of approval over provincial policy plans;
- additional powers of Ministerial powers of appointment;
- right of appeal by inspectors.

[147] Ministry of Health and Environmental Protection, Budget Estimates, 1980, op. cit., pp. 162-163.
[148] *Nota Milieuheffingen* (White Paper on Environmental Levies and Charges), op. cit., p. 11.
[149] *Nota Milieuhygiënische normen* (White Paper on Environmental Standards), nos. 7-8, op. cit., p. 7.

Substantive coordination will remain difficult as long as the normative premises for environmental policy – i.e. the Standstill principle and the concept of the 'best practicable means' – are not spelled out in greater detail and as long as virtually no environmental quality standards are laid down under law.

5.4.3 *Energy policy*

Introduction

The aim of energy policy, as formulated in the Energy Report,[150] is as follows: 'An assured supply of energy to meet the demand arising from the most efficient possible use of energy at the lowest possible social cost; demand and supply should be fitted into a more equitable international division of labour and distribution of income and should be weighed against the demands of ecological acceptability, safety and the employment situation.'

The Economic Structure Report[151] added that a policy geared towards energy conservation was required, although this does not necessarily mean that the growth of energy-intensive industries should be curtailed. This would only be something to be decided in an international context. If the growth of a particular industry is checked by measures relating to the government's intermediate objectives, then this is a side-effect rather than a deliberate aim. The instruments employed to achieve intermediate objectives do not aim to influence quantitative developments in individual industries as such. During the current parliamentary year, both the Energy Policy Report[152] and the Structural Policy Progress Report[153] have been submitted to Parliament.

The principal elements of national energy policy are now cited as:

- limiting the demand for energy by improving efficiency and by selective investment;
- diversifying the sources of supply.

With respect to the relationship between the structure of the economy and energy considerations, the Sectoral Report notes that in the context of selective growth policies, the necessary and likely structural adjustments in industry should be stimulated in a less energy-intensive direction, without however forcing energy-intensive production to be dismantled.

The international increase in energy prices will have considerable consequences for the industries and sectors involved. Partly with a view to developments abroad, there should be a certain degree of gradualness about adjustment in these industries. This is not to deny that structural change in favour of less energy-intensive industries is required.

The above review indicates that the government now supports selectivity in economic growth. This is not so much because of any change in approach by the government towards the role it should play in a guided market-economy, but is a response to the pressure of circumstances. The situation today differs from that of the 1973 crisis (which inspired the first Energy Report and the White Paper on Selective Growth). At that time there was talk of a relatively short-lived shortage concentrated in countries hit by a selective embargo. Now, according to the report,[154] it is more a matter of a general scarcity.

The structure of production and consumption of energy

In a number of respects the Dutch energy situation differs from that in other industrialized Western countries. These differences are due to a number of factors specific to the Netherlands, especially its natural gas reserves and geographical location. After the discovery of the large gas fields at Slochteren in

[150] *Energienota* (Energy Report), Second Chamber, 1974-1975 session, 13 122, nos. 1-2, p. 62.
[151] *Nota inzake de Selectieve Groei (Economische Structuurnota)* (White Paper on Selective Growth (Economic Structure Report)), Second Chamber, 1975-1976 session, 13 995, nos. 1-3, p. 10.
[152] *Nota Energiebeleid* (Energy Policy Report), part 1 (general), Second Chamber, 1979-1980 session, 15 802, nos. 1-2.
[153] *Voortgangsnota Economisch Structuurbeleid (Sectornota)* (Progres Report on Economic Structural Policy (Sectoral Report)), Second Chamber, 1979-1980 session, 15 818, nos. 2-1.
[154] Ministry of Economic Affairs, Budget Estimates, Second Chamber, 1979-1980 session, 15 800, chapter XIII, no. 2, p. 104.

early 1960, a policy was decided upon of encouraging the use of natural gas on such a scale that the country's natural gas reserves would be exhausted in roughly a single generation. This reflected the high expectations held at that time of nuclear energy. The related policy of actively promoting the use of gas had a major effect on the present energy consumption patterns.

Also of decisive importance was the part played by Rotterdam in oil refining. Taken together these two factors led to an energy-intensive production and investment structure (e.g. high rate of growth of the chemical industry and of refineries, metallurgy, paper industry and glass-house horticulture, and the spread of central heating).

Until quite recently, extensive new industrial areas were opened up with a view to attracting energy-intensive production not only in the Rhine Delta region but also in Zealand (Sloe and Terneuzen), South Limburg, Brabant, the Ems Estuary region and along the North Sea Canal. Hundreds of millions of guilders were invested in the form of direct subsidies or in the form of heavily subsidized cheap land or were spent on pipelines (for example the Rotterdam-Amsterdam pipeline) in order to attract energy-intensive industry. Since 1963 a proportion of Groningen natural gas production has been used to stimulate a number of activities. Thus for example specially low tariffs enabled the aluminium factory in Delfzijl to be established, the Billiton Zinc Factory to be built at Budel by Hoechst, the phosphorous factory to be built near Vlissingen and glass-house horticulture to be stimulated. The energy-intensive industries export 63% of their production, or 43% of total Dutch exports. 60% of the growth in industrial energy consumption between 1961 and 1976 was attributable to the increase in production of 11 basic products.[155]

[155] M. Molag et al. 'Energie en industriële produktie' (Energy and Industrial Production), *Economisch-Statistische Berichten,* 10 January 1979, pp. 39-47.

Table 72. 1977 Energy Balance Sheet (in mln. tonnes oil equivalent)

Consumption	Coal	Crude Oil	Natural Gas	Electricity	Nuclear Energy	Other Heat	Total
Households and government							
1. Heating, lighting etc.	0.1	1.9	10.0	1.5			13.5
2. Transport		2.2					2.2
3. Sub-total households and government (1 + 2)	0.1	4.1	10.0	1.5			15.7
Enterprises							
4. Industry (excl. E-sector)[2]	1.5	8.5	8.6	2.2			20.8
5. Services		1.6	2.7	0.6			4.9
6. Agriculture & fishery		0.4	2.1	0.1			2.6
7. Construction industry		0.8		0.1			0.9
8. Transport (incl. own transport)		5.7		0.1			5.8
9. All enterprises (excl. E-sector) (4-8)	1.5	17.0	13.4	3.1			35.0
10. Total final domestic consumption (3 + 9)	1.6	21.1	23.4	4.6			50.7
11. Consumption by E-sector[1]	1.6	4.4	9.9	4.5	1.0	0.2	12.6
12. Total domestic consumption (10 + 11)	3.2	25.5	33.3	0.1	1.0	0.2	63.3
[1] E-sector specification							
conversion losses of coke trade, oil refining, mining	0.6	3.4					4.0
Operation of conventional power stations (and company generators)	1.0	1.0	9.9	—4.2	0.2	7.9	
Operation of nuclear power stations				—0.3	1.0		0.7
[2] Breakdown by industry							
Foodstuffs, beverages & tobacco		0.214	1.258	0.240			
Textiles		0.043	0.200	0.047			
Paper		0.044	0.426	0.134			
Chemicals	0.176	7.140	4.509	0.777			
of which non-energy	0.115	5.664	1.834	0.134			
Construction materials	0.043	0.146	0.787	0.092			
Basic metals	1.230	0.312	0.496	0.545			
Other metals	0.021	0.195	0.647	0.238			
Other industry	0.028	0.377	0.276	0.147			
Total	1.5	8.5	8.6	2.2			
of which non-energy	0.142	5.942	1.834	0.134			

Source: WRR, own calculations from Central Bureau of Statistics data (Netherlands Energy Budgets) and of Central Planning Office data (Energiebalans (Energy balance sheet), The Hague 1977).

Table 59 provides a more detailed picture of industrial energy consumption. At this stage it will suffice to note that even excluding the use of sources of energy as feedstock, industrial energy consumption is highly concentrated: 70% of energy consumption occurs in three industries, namely foodstuffs, beverages and tobacco, chemicals, and the base metals industry.

In the circumstances noted previously, the Netherlands finds itself in an unfavourable position in relation to neighbouring countries. The Netherlands is particularly dependent on export-led economic growth, while the range of its exports is comparatively energy-intensive. The growth of energy-intensive industries may be expected to lag behind because of the substitution processes on the demand side resulting from higher energy prices.

In addition, if only over the long term, the country will be exposed to intensified competition from certain oilproducing countries, which will lead to a different international division of labour.

The impact on economic growth is likely to be fairly severe. In anticipation of this threat, the government sees a need for a structural change in favour of less-energy-intensive production. At the same time, the government has noted that cutbacks in these industries on a larger scale than that warranted by the higher price of energy and the changed pattern of international specialization would only serve to undermine continuity and employment, without appreciably reducing import dependence.[156] The government's strategy is aimed at helping this transition to take place as smoothly as possible.

Policy instruments

The government does not see a case for cutting back economic growth itself, or for imposing a detailed blueprint for structural adjustment based on its intermediate objectives. Instead the government has opted for promoting selectivity by means of the price mechanism (including levies and subsidies) and regulations. Responsibility for production and continuity resides primarily with the company sector; the government is responsible for fashioning a general context within which companies will take decisions along the lines desired by the government from the standpoint of its intermediate objectives (energy saving, environmental protection, international division of labour and physical planning). Within the confines of the guided market economy there exists scope for amending the existing industrial structure, especially by modifying the price of the various sources of energy.[157]

Pricing policy

In order to help the anticipated transition to take place as smoothly as possible, the government has proposed a phased adjustment in costs, i.e. gradually bringing energy prices in the various sub-markets into line with market prices and maintaining them at that level. At the same time initiatives will be taken in the EEC context to work towards the coordination of pricing policy.[158] These pricing policies are of considerable importance, in that the prices of natural gas and electricity are largely determined by the government. Use of this instrument should, however, be qualified. Given the openness of the Dutch economy, it is essential for prices to be coordinated with developments abroad. An example consists of the bulk-consumer tariff for natural gas, which is directly linked to the price of fuel oil. The sharp rise in the price of fuel oil (1979: N.Fl. 200 per tonne; 3rd quarter of 1979: N.Fl. 265 per tonne) meant that gas prices would have risen over that period by some 6 cents/m^3 if as a temporary measure bulk consumers (1 m. m^3 p.a.) had not been granted a discount and if as a special measure introduced on 1 January 1979 the highest rate had not been temporarily reduced by 1.7 cents/m^3.

This measure was introduced in connection with the disadvantageous competitive position in which very large bulk consumers in the Netherlands could find themselves in certain circumstances in relation to similar consumers in other countries, where tariff concessions tend to be much higher.

A second example consists of electricity prices. A number of factors work towards relatively high electricity prices in the Netherlands. In the first place there is the difference in the tariff structure: to a greater extent than in other countries tariffs in the Netherlands tend to be proportional. Secondly, the pattern of fuel consumption depends more heavily on the level of oil prices. In addition there is a surplus of generating capacity, environmental regulations are generally stricter and the share of heat power/coupling is relatively modest (i.e. lower efficiency).

If our energy-intensive industry is to remain competitive in international markets, any price increases should remain as limited as possible. Despite the

[156] *Nota Energiebeleid* (Energy Policy Report), part 1, op. cit., p. 68.
[157] Ibid, p. 67.
[158] Ibid, p. 68.

increase in electricity generation costs, bulk-consumer tariffs have generally risen in recent years. A rise would appear unavoidable in the future (because of the greater use of oil, the rise in oil prices and a decline in average generating efficiency as a result of the mobilization of less efficient generating plants). Both these examples reveal that although the government is to a large extent responsible for determining the price of energy, its freedom of manouevre is heavily influenced by developments in other countries. For this reason pricing policy can only be used as an instrument of national energy policy to a very limited extent.

Subsidization

Subsidies and loans may be legitimized on the basis of the existing difference between social considerations and private economic interests, in that not all the benefits of energy-saving investment accrue to individual investors. In the long term the price mechanism does tend to bring about an adjustment in demand and hence of supply. In the short term, however, there are imperfections and delays that can be compensated for by means of subsidies. Thus, for example, much higher profitability requirements are laid down in the case of energy-saving investment than in the case of productivity improvements (25% as against 15%). Energy-conserving investment is regarded as purely defensive investment.[159]

Investment decisions in the private sector depend heavily on the price of energy. In managerial terms, it is often unprofitable to anticipate a likely rise in energy prices; this too forms a reason for government subsidization. It should, however, be noted that price and subsidy policies can form something of a paradox. A noted earlier the government wishes to achieve a certain gradualism in energy price increases by means of its pricing policies; it wishes as far as possible to limit the rise in bulk-consumer tariffs for gas and electricity. But in doing so, it at once removes a major incentive for companies to undertake energy-saving investment. In order nevertheless to achieve significant savings at national level,[160] the subsidies must be designed to provide an incentive, while taking care to avoid any distortion of competition.

It is the government's intention to convert the temporary subsidy provisions for energy-savings projects that applied during 1977 and 1978[161] into a permanent regulation, namely the energy subsidy provided for under the Investment Regulation Act (WIR).

In addition there are the 'pilot project regulation'[162] and the subsidy provisions for industrial energy budget analysis.[163] In the multi-year estimates a sum of N.Fl. 100 m. has been set aside for WIR energy subsidies; for the total package contained in the Energy Policy Report an annual sum of N.Fl. 600 m. has been set aside on a programme basis.

Physical regulation

The major difference between environmental policy and energy policy consists of the extent to which physical regulation is possible and has been institutionalized.

[159] E.J. Tuininga, 'Energieverbruik en economische groei' (Energy Consumption and Economic Growth), *Intermediair*, , Vol. 16, no. 9.

[160] The target values for industrial energy conservation in manufacturing suggested on p. 96 of the Energy Policy Report are: 1985: 10-11%; 1990: 15-17%; 2000: 27-31%, expressed as a percentage of the energy consumption that would have been required assuming that 1977 levels of efficiency were maintained.

[161] This measure had the following result:
1977: N.Fl. 90 m. subsidy on a total investment of N.Fl. 540 m.: savings 30 p.a.
1978: N.Fl. 55-60 m. subsidy on a total investment of N. Fl. 565 m.: savings 15-20 p.a.
These subsidy provisions indicated in precise detail the savings that were required to result from the investment undertaken.

[162] This regulation provides for a subsidy of 25% in addition to a compensatory loan of 25%. In all, over N.Fl. 3.5 m. has been disbursed in the form of subsidies and special loans.

[163] A subsidy of 50% of up to a maximum of N.Fl. 1000 per project; by mid-June 1979 a total of some N.Fl. 0.5 m. had been provided for such subsidies.

In the case of environmental policy, the main instrument consists of licensing subject to regulations. Energy policy relies more on public information and subsidies/loans/premiums (which also exist under environmental legislation). No system of levies exists under energy legislation. Finally lower levels of government have much less say in determining energy policies.

The government is conscious of these omissions: it intends in the short term to introduce energy-information labelling and to lay down efficiency standards for new heating appliances. In addition the government proposes introducing a type of framework act in the longer term setting out its policies towards the various energy consumption sectors.

Consideration is also being given to energy reporting in regional, structural and investment planning, in which the implications of government policies in these fields would be made evident, and whereby lower levels of government would obtain independent responsibilities.

Within the EEC it is the intention to restrict oil imports to 1978 levels, i.e. 472 mtoe for the period 1980-1990. This would amount to maximum annual oil imports by the Netherlands of some 50-52 mtoe, a value that is not exceeded in either of the two energy scenarios set out in the Energy Policy Report.[164] This ceiling has not however been worked out or even mentioned in the Report, which simply notes that the availability of energy will become increasingly decisive (instead of the demand for energy; see the Energy Report, September 1974).

Energy as an aspect of economic policy

It will be seen from the above analysis that the government has placed the emphasis on the last of the following three options:

- modifying consumption habits;
- adjusting the structure of production;
- more efficient use of fuel.

This option has not however been worked out in detail. In contrast to the estimated investment of N.Fl. 60 bn. required to achieve energy conservation targets, the government has made an annual budgetary provision of N.Fl. 600 m. over the next 20 years, i.e. the government intends taking only 20% of the financing of its own account. This places a heavy burden on consumers and industry. Nor has much been done about the first option: energy-rating labelling and efficiency standards remain to be introduced.

[164]

Total consumption	Oil		(mtoe)
	low	high	
1985	36.4	41.5	
1990	38.7	45.3	
2000	42.6	57.5	

In accordance with its sub-title, this report concentrates below on moving towards a less energy-intensive structure of production. The very strong case for doing so is not worked out in sufficient detail in the Energy Policy Report. The Report does not set out the instruments for such a policy: in view of the competitive position, pricing policy is necessarily subject to narrow margins, while the subsidies and premiums provided for in the budget estimates are totally inadequate, even in terms of the third option of energy conservation.

In addition, industrialization during the past 15 years has been concentrated on energy-intensive production, resulting in a high export share of these industries and a relative and in some cases absolute decline in certain other industries (i.e. investment and consumer goods: see chapter 2.1 and 2.2). This, combined with the indifferent prospects for the energy-intensive industries (see chapter 2), means that more vigorous policies are required than those proposed in the Energy Policy Report and the Sectoral Report. A further argument consists of the parallel considerations to do with the environment and energy. Environmental pollution, especially air pollution, is closely related to energy consumption. One of the most effective means of cutting back emissions of

sulpuhr and nitrogen oxides, hydrocarbons, aerosols and photochemical air pollution consists of restricting the consumption of fossil fuels. The government is well aware of this: the sulphur dioxide policy framework plan[165] is predicated on a disappointing rate of economic growth and thus a limited rise in energy consumption, thereby enabling the emission ceiling for SO_2 to be maintained.

This is not the place for a general examination of structural policy. For this the reader is referred to chapters 2.1 and 6. We should however like to examine several further aspects.

The General Energy Council has developed a number of interesting ideas in its commentary on the Energy Policy Report,[166] especially that of an (Indicative) Energy Plan (cf. the Indicative Multi-Year Programmes for the various elements of the environment). This plan would cover all major forms of energy supply and consumption, and would ultimately assume a substantive instead of an indicative character, with monitoring and correction mechanisms. This concept also corresponds closely with the 'target-setting' nature of energy conservation figures reffered to several times in the Energy Policy Report. The oil import ceilings agreed within the EEC could be incorporated in this energy plan, thereby reducing the extent to which oil is regarded as a balancing item in the national supply of energy (and thus also reducing the vulnerability of energy supply arrangements).

[165] *SO_2 beleidskaderplan* (SO_2 Policy Framework Plan), Second Chamber, 1979-1980 session 2, 15 834, nos. 1-2.

[166] General Energy Council, *Advies inzake nota Energiebeleid* (Comments on the Energy Policy Report), part 1, The Hague 1980.

Annex

Technological innovation policy within TNO[1] with regard to small and medium-sized firms

1. Organizational arrangements

The importance of Interface Management was discussed in chapter 3.2. Providing the conditions within TNO whereby such management can be handled represents an exacting task for those in charge of TNO, and one with implications at lower levels of organization as well. This is a matter of such importance that it can only be handled properly if control over Interface Management is explicitly acknowledged as one of the Board of Directors' executive responsibilities. The appointment of a new Board of Directors for TNO as a whole should provide promising possibilities to that end.

The closely related aspect of project management/planning/budgeting must also be counted among the Board's responsibilities.

In view of the wide field of activity that TNO is required to cover on behalf of small and medium-sized firms, it is unrealistic to expect TNO's central management to cover all the scientific disciplines in question (in the sense of personal expertise in these fields). In our view, the central management should – drawing on the experience of industrial R & D – concentrate on policy aspects, including coordination and the allocation of responsibilities, assisted as necessary by central secretariats.

The guidelines contained in the government's report entitled 'Outline of the new TNO organization' of September 1977 (Second Chamber, 1977-1978 session, 14 810, no. 1) provide for five members of the 'new style' Board of Directors, with one seat being reserved for the Ministry of Defence (i.e. National Defence Organization, RVO). The members of the Board other than the Director would be entrusted with the supervision of the seven to eight 'main groups' of which the new-style TNO would consist upon the abolition of the present Specialized Organizations (i.e. the TNO Industrial Research Organization, the Health Organization, Foodstuffs Organization and RVO).

This organization would be consistent with the policies of the previous government, which decided in favour of the administrative and organizational concentration of TNO into a single entity.

The following observations may be made on the basis of an examination of the official documents on which this decision was based:

1. The introduction of a central administrative structure embracing all the organization's divisions and of equal legal status for all TNO employees played a dominant part (i.e. abolition of the Specialised Organizations).
2. In this respect a central consideration consisted of achieving greater efficiency, including the use of TNO's non-scientific divisions.
3. The passages concerning the role of TNO in relation to private industry (in a technical sense) betray a lack of insight into the organizational requirements associated with conducting R & D on behalf of industry.

During the subsequent implementation phase, the primary responsibility for TNO was allocated by the present government to the Directorate General for Science Policy.

We would regard the fundamental executive functions of the Board of Directors as being:

1. General management (general affairs information, contact with the government).
2. Personnel/social matters.
3. Interface Management.
4. Project management/budgeting/planning.
5. Strategy with regard to and coordination of internal background research.

[1] And within certain comparable (semi) government bodies.

The third and fourth functions will play a key role in boosting TNO's effectiveness in relation to small and medium-sized firms.

Now that government policy has become primarily concerned with increasing TNO's effectiveness, it is essential for the principal operational characteristics of industrial R & D to be recognized. In this respect it must be realized that Interface Management represents a much more challenging problem for TNO than it does for ordinary industrial R & D organizations because the end-users of TNO's R & D are extremely heterogeneous numerous and disparate in nature.

Interface Management will have to rely heavily on TNO's own resourcefulness. In handling this function, large industrial concerns are able to draw on their own 'product-group organizations' and their central divisions for the necessary expertise, and operate within the guidelines of the company's overall strategy.

The strategy-determination role (function 5) is more inward looking in TNO's case; as far as the outside industrial world is concerned it can do no more than to concentrate on certain industries. In technological terms there is no question of a single, unified strategy for the Netherlands.

This has implications for the selection and direction of internal (TNO) theoretically-oriented research programming, in which respect two separate aspects may be distinguished.

1. the provision and maintenance of properly selected basic disciplines at sufficient strength for support research, in interaction with contract research.
2. anticipation of new technological and scientific developments with a view to the future.

As in the case of large enterprises, these activities will on average take up some 25% of the budget and will have to rely on direct government subsidization in order to ensure the necessary continuity (i.e. the equivalent to the 'corporate research budget' in large enterprises).

As far as we can estimate government-financed contract research amounts to some 25% of TNO's budget. Contract research on behalf of industry accounts for something under 20% of the overall budget. This means that general, unspecified research financed by the government currently accounts for over 50%.

With regard to government contract-research, it is questionable to what extent the government is able to control the effectiveness of that research. Does such research, for example, form a 'refuge' which it is difficult to control, the existence of which can readily tempt TNO to make less effort to obtain industrial contracts? Also of relevance is the question as to how much background research is concealed under this budget item, that is, what proportion consists of genuine government contract-research and what proportion is in fact more by way of theoretically-oriented research that should really be covered by the basic subsidies received by TNO. The true percentage of basic subsidies may therefore be put at a good deal more than 50% (i.e. equivalent to over 2,400 employees and over N.Fl. 220 m.).

No industrial research and development laboratory could justify itself in practice on the basis of such limited involvement in applied research and such a correspondingly high percentage of exploratory or fundamental research. Given the substantial budgetary provisions for scientific research at higher education institutions and various government bodies, it is not possible to maintain that there is room for government-financed research of a general nature on this scale at TNO.

In terms of a budget of some N.Fl. 433 m.[2], basic research should account for approximately 25%. Ideally, therefore, some N.Fl. 120 m. would be annually set aside for the maintenance of expertise and for basic research in various scientific fields.

For TNO to lay claim to effectiveness it would have to expand the volume of industry contract-research from approximately N.Fl. 80 m. (20%) to between N.Fl. 160 and 250 m. This would mean a doubling to a trebling of the present volume of industrial contract-research. As discussed earlier, incisive measures would be required to eliminate a number of obstacles outlined above if this

[2] For 1978. See the Final Report of the Working Group on the Future Financing of TNO dated 16/7/79.

objective were to be achieved. It would most certainly not be just a matter of a change of emphasis in the current pattern.

The government can play an active part in helping TNO to achieve this turn-around to improve its industrial effectiveness.

The government's possible role is analysed below, together with relevant policy recommendations.

The fact that TNO currently receives some N.Fl. 320 m. a year in public funds provides the government with a powerful argument for insisting on policy adjustments within TNO, provided that a reasonable time-scale is laid down so that, with a view to planning, the research facilities carefully built up at TNO over the years are not subjected to abrupt, disruptive discontinuities.

2. Government stimulation

It is not to be expected that the present lack of interest on the part of small and medium-sized firms in contracting out research to TNO would be automatically reversed if TNO were to be internally reorganized. To achieve this a stimulus would be required in order to persuade small and medium-sized firms to consider contract-research on attractive terms in what is essentially a negative situation. It is a matter of lowering the threshold by taking measures that would enable TNO in the coming years to demonstrate its effectiveness.

We would argue for a modification of TNO financing by the government along the following lines:

(money stream 1) 1. Direct government contributions to TNO (at its present strength) to be limited to approximately N.Fl. 120 m.[3] for essential long-term basic research and the maintenance of the basic disciplines and expertise required to that end.

(money stream 2a) 2. A sum of some 50% of the present budget (i.e. approximately N.Fl. 220 m.) to be set aside in principle for small and medium-sized firms for the financing of contract-research at TNO, subject to strict conditions.

(money stream 2b) 3. A sum of some N.Fl. 100 m. to be set aside from the present allocation for government contract-research.

4. A reasonable time-frame to be laid down within which this financial reorganization would be required to be completed (perhaps 5-8 years). This would entail reducing direct, unspecified government subsidies (i.e. the basic subsidies) to the same extent as small and medium-sized firms drew on government subsidies for TNO contract-research.

Taken as a whole these arrangements contain a number of advantages. It would not cost the government anything more but would provide it with the instruments to overcome the present impasse with regard to TNO's involvement on behalf of industry and industry's reluctance to consult TNO. It would compel TNO to take careful stock of the organizational and operational aspects of the research and development it conducts on behalf of industry.

At the same time these arrangements would enable the government to obtain some perspective on individual industries. The government would be able to exert influence by laying down priorities for the allocation of second-stream money flows to TNO through the private sector. Considerations to do with the government's intermediate objectives could also find expression in this way.

There will be a strong incentive for industry to make use of this second money stream of government subsidies, which do not involve any direct burden on own financing. In the first place this should help overcome the inhibitions felt by small and medium-sized firms towards TNO.

The sums accruing to TNO in this way would therefore have to be matched by a corresponding reduction in basic subsidies. In this way research of an unspecified nature would be gradually converted into applied (i.e. contract) research.

Whereas now there are grounds for questioning TNO's effectiveness in relation to small and medium-sized firms, which could in turn lead to a process of

[3] All amounts are in 1978 guilders (as the base year); we would refer to the Final Report of the Working Group on the Future Financing of TNO dated 16 July 1979; the budget in the base year of 1978 was N.Fl. 433 m.

steady and demoralizing contraction, a successful reorganization of TNO and evidence of its effectiveness would be a source of consolidation.

In the 'Final Report of the Working Group on the Future Financing of TNO' of 16 July 1979 the necessity of augmenting industrial contract research is acknowledged in as many words. According to this report industrial contract-research should increase over a number of years from the present level of 19% by some 4% (or 1% of the total budget) a year, eventually stabilizing at around one third of the budget. A point of criticism from our side is that this would not gain a great deal. Nor is there any indication as to how this should be actually realized.

The report appears to be based on the assumption that placing TNO under financial pressure would induce it to seek industrial contracts more actively. It totally ignores the possible operational causes of the present unsatisfactory situation. The danger therefore exists that the desired aims would not be achieved and that as a result the financing of TNO would dwindle from year to year. This would only lead to an increasing loss of morale and sense of purpose in TNO, which would scarcely be to the benefit of small and medium-sized firms.

Reorganizing the financing of TNO would provide the government with the opportunity of stipulating certain conditions, both for TNO and for industry (i.e. small and medium-sized firms) with regard to the use of the funds provided.

To provide a more detailed example. Without an element of company risk (i.e. company financing), the system of government-subsidized contract-research by small and medium-sized firms and TNO would be bound to fail in view of the lack of commitment on the part of private industry.

A company drawing on the second TNO money-stream would therefore have to add a contribution of its own (the two together covering the total cost of the contract project). Laying down a fixed percentage (for example 30%) for the size of this own contribution has the attraction of simplicity, but in our view serious consideration should also be given to a system with a built-in element of negotiation. The size of a company's contribution could for example be made dependent on the degree of uncertainty involved in a given project. Own contributions could thus be set at a high level for projects that amounted to an elaboration of existing know-how, and at a low level in cases where the development of new technological concepts was concerned. Such a system would gain even more point if the element of royalties was tied to the acceptance of contract research. This would mean that the industrial contracting party would undertake to return monies to the government if the project proved industrially successful, up to a maximum of the amount of government funds initially invested.

Negotiations of this kind would bring a number of considerations into play, thereby inducing the contracting parties to undertake a thorough analysis of the costs and benefits of the project in question, as is done by any large enterprise undertaking an applied-research project.

Channelling any royalties to the research institute in question will have the effect of making TNO or other government bodies more self-supporting in the long term.

This would create room within direct government financing for new initiatives, for example for the development of new expertise. Equally it should be accepted in principle that the high-grade technical potential of private consultancy bureaus should be drawn on where appropriate.

Particularly with a view to the possible lack of expertise of this kind among small and medium-sized firms (and to a certain extent in TNO as well, with regard to lay-out and installation expertise in relation to technological processes), there would be much to be gained from drawing private consultancy bureaus into a tripartite contractual arrangement with small and medium-sized firms and TNO.

Financing the costs of private consultancy bureau services could take the place of the own risk-financing that would otherwise be borne by a small or medium-sized firm.

In this way the system of Interface Management could evolve into a tripartite relationship. It would lend itself to further integration along the lines of the 'chain of innovation' discussed in chapter 3.2, for example by engaging the services of marketing bureaus. In brief, the introduction of these new financing arrangements would lead to a far-reaching refinement of research-contracts in

that the allocation of public funds would be made subject to certain conditions with regard to project design. Great care would have to be taken during the introductory transitional period to avoid any discontinuities or unequal treatment.

Consideration would have to be given to whether the proposed arrangements would apply to all types of contract research and also to the arrangements that would apply in the case of existing TNO contracts.

With regard to the latter it would seem reasonable to provide the same facilities (in addition to short-term organizational adjustments). This could lead to a temporary increase in government financing of a maximum of N.Fl. 40 m. p.a. during the initial or 'gestation' period. Furthermore it would seem logical to confine these arrangements to contracts of a certain minimum value and research duration, for example a TNO input of at least one scientist team[4] for one year, which would cost an estimated N.Fl. 350,000 a year.

In the case of smaller contracts, which are generally of an ad hoc service nature and which do not require any rigid project surveillance, it would seem appropriate for the costs to be fully passed on.

Finally we would note that if the government should in due course decide to introduce a more refined form of the system outlined above, this should be done on the basis of clear guidelines and prior information to industry. This means that the planning of contract-research commissioned by industry should stress project design and structure, with provision for cost/benefit analysis and an estimate of the likely duration of the project. The results of such planning would yield the criteria for starting a project and for the form of a contract, and for the special conditions to which government financing would be subject. The latter would depend to a large extent on the degree of physical participation by the various parties (i.e. the input of manpower and outside experts and expectations concerning the profits from a successful project).

Once a project got under way planning would give way to project reviewing in which it could be determined whether the company or R & D body in question was honouring its initial commitments or whether these needed to be adjusted or intensified.

In order to use the available expertise efficiently TNO should appoint project teams on as broad a base as possible, rather than drawing on a single division or institute alone. Large-scale industrial research is increasingly conducted under a project-matrix system. Under this system a project leader is responsible for day-to-day management and for project review.

The introduction of such an approach would require a good deal of tact and guidance since persons in positions of authority in the existing vertical hierarchy would have to give up a part of their autonomy in favour of the project leaders operating on a horizontal basis. This difficulty is accentuated if teams are drawn from various institutes. It is essential to introduce a matrix-project system of management within TNO.

In practice the geographical separation of research bodies has proved to be a considerable handicap (this has been the experience for example at Shell, Unilever and ICI). This consequently imposes a particularly heavy burden on TNO in an organizational sense, and provides a further reason for placing responsibility for Interface Management and project management, budgeting and planning in expert hands at the highest administrative level. Otherwise there will be no question of flexibility in the formation of project teams or of adjustments in the allocation of basic subsidies and contract financing respectively in the case of teams drawn from various institutes.

As noted earlier it is essential for there to be about 25% long-term or basic scientific research as a basis for applied industrial research. This should also apply to TNO. On the other hand, conducting basic-oriented research in geographical isolation would be sterile from the viewpoint of applied research, and would tend to lead to such research becoming purely theoretical in nature.

The exclusive concentration of basic research in the south-western region of the Netherlands, for example, would be to the disadvantage of the Utrecht/Wageningen/Apeldoorn region of TNO.

[4] Cost of one scientist and 2½ research assistants, including indirect costs.

It would therefore be worth considering whether in the long run it might not be better to work with two centres of basic-oriented research, even at the cost of a certain amount of duplication. In this way applied research would be in sufficiently close contact with basic research work in two regions, while at the same time helping basic research to be properly oriented in the long term. In our view it would be advisable not to promote any further geographical concentration of TNO research work for the present and to rely instead on the present system of widely spread-out research, although this should be more intensively coordinated from top levels within TNO than at present. In this respect too the separate TNO institutes would have to give up some of their autonomy. In principle, centres of expertise built up with some difficulty should be maintained.

The stimulus that the amended TNO financing arrangements should provide small and medium-sized firms will only gradually assume tangible form. For a certain period, it would therefore be appropriate for the government to provide TNO with the assurance that the same (index-linked) volume of funds will be made available by way of basic subsidy, but on the condition that during this time a structural shift in funding be effected by means of the necessary organizational and operational arrangements.

In this way the success or failure of this operation would become a criterion for determining the effectiveness of the TNO institutes with respect to contract research for small and medium-sized firms – one of the two main purposes for which TNO was established.

In our view, the above arrangements would create a management tool for increasing the effectiveness of TNO's operations. The new arrangements would also have implications for the internal adjustment of TNO and shifting its centre of gravity; this would provide greater certainty concerning its future scale and orientation.

This could produce greater security for many TNO employees, while the government would be better placed in the future to determine its policies towards TNO in relation to the promotion of technological innovation among small and medium-sized firms.

3. Recommendations

These considerations bring us to the following specific proposals. The radical changes we have suggested will demand a great deal of effort and careful direction; in these terms the appointment of the new Board of Directors for TNO as a whole affords a useful starting point. We would recommend that:

- priority be given to introducing the legislation providing for the abolition of the specialized orgnizations and their amalgamation into a 'single TNO', as decided by the previous government.
- TNO be internally reorganized with a view to developing a professional system of Interface Management and Project Matrix working methods on which contract-research concerned with technological innovation would be based. Executive responsibility for these aspects should be borne at the highest level, i.e. the Board of Directors.
- the staff required for these purposes be appointed at a central level, as far as possible by attracting experts from private industry and by strengthening this component in advisory bodies.
- a sum of up to around N.Fl. 200 m. in government funds be set aside for small and medium-sized firms out of TNO's ordinary budget with which such firms could finance the placement of contract research with TNO.

The government's ordinary basic subsidy to TNO would be reduced in line with the use made of this facility (subject to certain strict conditions) by small and medium-sized firms. This would mean that TNO would have to redirect its energies towards contract-research projects and that previously untied allocations to TNO would now be used for applied research. This process will take some time. A transitional period of at least five years would be required, and it might be necessary to be selective and to limit drawings on this facility by small and medium-sized firms fairly strictly in the early years in order to ensure that the transition would be a gradual one.

- With regard to this selectiveness clear conditions would have to be laid down which any contract-research project would be required to satisfy. Such projects would have to be based on the industrial R & D model, that is to say that the composition of the project team would also have to contain a reasonable proportion of non-technical expertise drawn from the various links of the innovation chain (i.e. market research, cost-benefit analysis, patent research etc.; see chapter 3.2).
- To the extent that small and medium-sized firms and TNO themselves were unable to carry out these functions, the services of outside experts should be engaged (e.g. private consultancy bureaus and patent agencies), which would be paid at the going commercial rates.
- This would have implications for the financing arrangements of TNO contract-projects placed by small and medium-sized firms. An important condition of such projects concerns the own involvement of the firm in question. This might take the form of agreeing to supply participants in the project team, the costs of which would therefore be borne by the firm itself, or undertaking to meet the expense of hiring outside experts. Such arrangements are designed to ensure that the commissioning company has a certain stake in the project.
- What these requirements would amount to is that before a decision is taken to proceed with a contract, both the scientific merits and the organizational structure of the project should be submitted to critical evaluation. The necessary machinery for these purposes will have to be set up within TNO, as well as within the Ministry responsible for TNO. This would enable the most promising applications by small and medium-sized firms to be evaluated and selected, thereby preventing government subsidies from being frittered away over an excessive number of small contracts. It would appear advisable to rule out use of the proposed system for applications for technical assistance of an ad hoc service nature; the actual costs of such projects could instead be passed on directly to the firm concerned. A lower limit in terms of TNO involvement could for example be laid down of some N.Fl. 400,000 per project on an annual basis; during the initial phase this might be put at N.Fl. 1 million, so as to ensure that the adjustment process in TNO was not too abrupt.
- It would seem reasonable for a provision to be included in contractual agreements concerning any royalties accruing to small and medium-sized firms from a successful project. This would introduce an additional bargaining point in the negotiation of a research and development project, thereby providing an inducement to approach matters more critically. Arranging for such royalties to flow back to the R & D institute would over time enable it to undertake new surveys and to penetrate into new research areas on its own account. Within TNO this function should be based on a basic grant guaranteed by the government (the 1st money stream) amounting to around ¼ of the present overall budget (i.e. N.Fl. 120 m.).
- The same system (with certain local adjustments) could be applied to other, non-TNO 'mission-oriented' government and semi-government laboratories. Here too a proportion of existing government grants could be gradually converted into research of a more applied nature on behalf of small and medium-sized firms, without imposing any additional burden on public funds.
- If the proposals for stimulating technological innovation among small and medium-sized firms made in the Innovation White Paper are considered in the above terms, this leads to the conclusion that some of the additional cost-support funds will have to be set aside for hiring outside experts, e.g. private consultancy bureaus, patent agencies and marketing bureaus.
- This report makes provisions to this end (in the form of project venture capital) for large enterprises which occupy a highly important economic position in the Netherlands in terms of both the scale of their own R & D activity and their export contribution (70% of manufactured goods).

But particularly in view of relative international costs, there is a danger of R & D activity in the Netherlands being eroded. If this process is to be kept within bounds - and there is every reason for doing so, in terms of the highly-skilled employment R & D provides and significant flow-on effects it has for fundamental research and training at tertiary level - then there is equally a case for the government to give special consideration to cost-support measures for large enterprises (see also chapter 5.3).

Government subsidization of contract-research by small and medium-sized firms should logically lead to a reduction in costs of internal mission-oriented research among large enterprises to the extent that Dutch manufacturing benefits from such contract-research. In this respect government procurement policy can assist technological development projects in getting off the ground.

In view of the large-scale nature of such projects – e.g. the development of alternative energy generation systems – it must be doubted whether the sums set aside in the form of 'venture capital' (some N.Fl. 150 m.) are in fact adequate, even if, as suggested earlier, the Netherlands as a small country was to carry out such projects in collaboration with other countries. In the case of West Germany, an estimated DM 2 bn. is provided annually for this purpose in the form of government grants by the Ministry for Research and Technology (i.e. approximately 50% of total technical project subsidies to private industry).

Intensive liaison between the government (i.e. the Ministry of Economic Affairs) and the major industries in the Netherlands is an essential precondition for planning sound initiatives. In this regard priority should be given to strengthening the level of technological expertise within the government set-up. The working methods of the German Ministry of Research and Technology could prove instructive here.

6. CONCLUSIONS AND RECOMMENDATIONS

1. Aims and design of the survey

The aim of the Netherlands Scientific Council for Government Policy in carrying out this study was to obtain insight into the current economic situation and the medium-term outlook, on the basis of which it could then determine the extent to which the objectives of full employment, external equilibrium and economic growth might be regarded as realizable, while at the same time taking certain non-economic considerations into account.

These are not objectives selected independently by the Council, but form part of the present system of offical economic policy, as laid down for example in the annual reports issued by the Central Economic Committee (CEC) and in Government white papers and similar policy documents.

On the basis of this survey, a judgement may be formed as to the need for more actively interventionist government policies. In doing so the extent to which the economy might adjust of its own accord without greater government intervention has to be taken into consideration.

Another of the Council's aims is to determine the extent to which the economic problems and requirements associated with the intermediate objectives of selective economic growth are linked to a particular economic structure; this will help determine the extent to which policies should be structural in nature. Thirdly, the Council has sought to examine the shape structural policies should take. This entails weighing up the respective merits of generic and sector-specific policies. The latter are the less well analysed of the two and the limits to and scope for such policies will first of all have to be worked out in detail. This will entail:

- formulation of preliminary considerations;
- examination of the proposition that forward-looking structural policies are inherently practicable, taking into account present-day knowledge of future structures; the predictability of those structures and the possibility of quantifying government intervention in the future are at issue here;
- implementation of structural policies.

In addition the various policy options should be weighed against each other. The appropriate criteria include: effectiveness in relation to both economic and non-economic ends, and the practicability and (costs) of using these instruments, taking unintended side-effects into account. This would include – and indeed might concentrate on – the option of various types of policy in combination.

This line will be pursued in this recapitulation, but to begin with the preliminary considerations deserve to be examined which prompted the Council to conduct a survey of the economic structure, in particular the structure of production. This is done in section 2. Secondly there is merit in outlining the process of adjustment in a national economic system in order to obtain insight into the political and social dimensions of the problem. This is covered in section 3.

2. The importance of the economic structure as a policy parameter: preliminary considerations

2.1. The structure of an economy may be taken to consist of a countinuous process of adjustment to international competitive relationships to the extent required – and as determined by the relevant independent variables – for economic as well as non-economic objectives to be optimally satisfied.

Two separate dimensions may be distinguished with regard to a country's international competitive position, namely a. the vertical position, that is the place on the ladder in terms of general economic development, and b. the horizontal dimension, signifying the position in relation to other countries at a comparable stage of economic development.

In relation to comparable countries, a country may possess the following 'assets' or comparative advantages:

- location, natural resources;
- factors of scale;
- stage reached in the development cycle;
- specific technological skills/organization;
- cost level.

A country's position in this matrix reflects both production and supply aspects (technical and economic) and consumer and demand aspects (market and absorptive capacity). There is a mutual interaction between these factors.

2.2. The determination of a country's position occurs through the coordination of the productive capacity and the costs of production with the opportunities for sales and the absorbing power. This occurs by means of a mechanism comprising three technical economic choices:

a. The factor mix (factor intensities).[1]
b. The product mix (structure of production).
c. Propensity to invest (investment ratio).

This economic coordinating mechanism determines the way in which the productive capacity of a country evolves. Factors taken into account will include relative prices, the availability of factors of production, and so on.

2.3. What role may then be ascribed to the structure of production within this complex?

a. At a given point and over a given period, factor intensities are largely determined by the product range. Empirical evidence indicates that at a given point in time, factor intensities vary considerably between sectors but are invariable between countries. Over time there tends to be little change in these inter-sectoral variations.

b. The investment ratio is also determined to a large extent by the product mix. This results partly from the link between the product mix and capital intensity (a), and partly from the substantial differences between sectors in terms of market dynamics and growth potential. Thus it has been empirically shown that the structure of production and growth are linked.

The structure of production may thus be characterized as the framework by means of which the productive capacity of an economy achieves market congruence. The structure is therefore of basic importance in assessing the extent to which an economy has adapted to the pattern of international competition with a view to satisfying economic objectives.

2.4. The structure of production is also highly relevant with regard to non-economic goals. This is obviously so in relation to environmental control. Economic sectors are not only characterized by variations in factor intensities, market dynamics and growth potential, but also by variations in their environmental impact (pollution).

The variations in environmental impact between sectors at any given point are particularly large, and even though pollution levels may be reduced over time (by technical improvements), inter-sectoral variations will continue to overshadow changes over time.

The industrial structure is therefore highly relevant for the achievement of environmental goals. The question of the international division of labour, together with the quality of work and physical planning, are dealt with in section 9 of this chapter.

2.5. The significance of the structure of production as a structural element of relevance for government policy may be shown in terms of preliminary considerations. Apart from this element – which may be called the specific element –

[1] Production factors at issue here include: capital in relation to labour, skills ('human capital') 'research and development', energy, etc.

there is the generic element. Aspects of the latter include relative cost levels and manipulation of the market/control of sales outlets or marketing.

A persistently higher cost level and less dynamic marketing than on the part of competitors will lead to a deterioration in a country's position in the international constellation of forces (2.2), in relation to both developing countries (the vertical dimension) and industrialized countries (the horizontal dimension). Adjustment in the form of changing factor proportions over time (i.e. rationalization) is limited in scope (by technology and cost), and also leads to redundancies, so that adjustment of this kind can come into conflict with the objective of full employment.

2.6. The study of the sectoral breakdown of an economy or its breakdown into branches of industry is conditioned by the available statistical data. The industrial statistics on which one must rely are, however, classified along conventional lines, and it is sometimes argued that in terms of the problems we are dealing with, this breakdown is not always the most relevant or effective.

Particular attention has been paid to the new information sector (e.g. electronic data processing), which cuts right across the existing standard industrial classification. As a result potentially significant trends may be lost to sight, which in turn could lead to rigidity. In relation to effectiveness, the question arises as to whether the sectors as currently defined are sufficiently homogeneous to permit unequivocal judgements to be made.

These considerations should of course also be examined in terms of the desired level of abstraction and the compatibility of divergent classification critera. The latter point is not without relevance, for efforts that have been made to incorporate the information aspect into the standard industrial classification have indicated that this can only be done at the expense of seriously weakening the homogeneity with regard to production and market characteristics of the sectors obtained in this way. The existing classification, which is in any case regularly adjusted, is necessarily a compromise involving a certain loss in specificity.

On the basis of the above considerations, that is to say the capacity of the standard industrial classification to draw distinctions in terms of such elements as factor intensities, market dynamics and growth potential, and pollution characteristics, this classification would appear in empirical terms to provide important information as far as analysis and policy formulation are concerned. The results of this study tend to confirm this. At the same time certain qualifications are in order, since it is conceivable that interesting angles will have been left unexplored. A certain amount of doubt must also surround the universality of the findings, since it is not always possible to lump together businesses in the one industrial sector or branch of industry. No allowance for these aspects has been made in the analysis of policy.

3. The pattern of adjustment: the market system and environmental framework

3.1. The process of economic coordination within the system of production is conducted through the markets: the market for the sale of goods and services, and the market for the factors of production. This process is primarily the function of business enterprises. This cannot, however, be viewed in isolation from the general political and social conditions. That environment determines the social preconditions and also vitally affects the economy in terms of the social climate, the mobility of the factors of production and the activation of potential comparative advantages. The social and political conditions should also enhance internal unity and cohesion by establishing the priorities and surrounding conditions within which market processes take place. External impulses reach us via the market, and are translated and absorbed within the general political and social environment. But, equally, the environment itself may emit impulses which are converted through the market into alterations in a country's competitive position. The first path may be described as that of internal adjustment, the second as that of selective intervention.

In broad terms, the position occupied by a national economy in the world scene is determined by these two processes. What is therefore required is for a link to be established between:

- a particular country's room for manoeuvre within the framework of international conditions, and
- the activation of that country's potential comparative advantages.

This link thus covers the way in which a country makes use of its potential to react to changes in international conditions. This dynamic element therefore means that the policies chosen should be anticipatory in nature.

3.2. The above process of adjustment does not always occur immediately, nor is it always complete. This applies both to the market system and to the environmental framework.

a. Dynamism and flexibility form only one side of the coin as far as the market is concerned. Stability and rigidity are also inherent to the market; adjustment to altered conditions requires substantial levels of investment in physical and human capital, both at company level and in infrastructure. Immediate adjustment would make it impossible for such investment to occur.

The market system within which such adjustments take place is therefore characterized by counteracting forces, namely those of change as against stability. At market level there is both:

Change – new products, techniques and forms of organization; the emergence of new competition; shifts in price patterns and the availability of factors of production.

Stability – vested interests; control over market outlets (marketing); advantages of scale, 'learning-effects', and the protection of technological know-how by charters and patents.

In conceptual economic terms, therefore, it may be contended that the free play of market forces results in members of the market being exposed to changes, thereby leading to pressures for adjustment. But at the same time imperfections in the market mean that members of the market are to a certain extent able to screen themselves off from change. This then produces scope for large-scale investments in physical and human capital with prospective yields that would be impossible in a perfect market with immediate adjustment. In this sense we may refer to structures, i.e. constellations and relationships only susceptible to change in the somewhat longer term.

b. The same considerations of change and stability apply to the political and social framework. Structures at this level are generally referred to as institutional relationships. Institutinalization also has two sides: the capacity to anticipate change in a more or less organized and coordinated manner, and thus to absorb it, or alternatively the capacity to offer resistance to change.

As noted before, this framework covers more than just the economic sphere; it also relates to the non-economic sphere and associated goals and endeavours. It could even be said that the institutionalization which forms part of the general environment affords a certain protection against the pressures for change and adjustment originating in the economic sphere. This is reflected in the ordering of priorities, where national economies can vary from one another, and which give expression to the individuality or internal development of a particular society.

What might for example be taken as imperfections in the labour market in an economic sense could in general social terms be interpreted as the concrete expression of non-economic objectives, which set limits to labour mobility.

3.3. The conclusion that forces towards change and stability are simultaneously at work in the market system implies that the system is in a continual state of flux. Fluctuations take place in the market, but at the same time there periodically occur structural shifts, or in other words spurts in the process of change. The extent to which an economy is ably adequately to respond to irreversible changes depends on the stage of internal development. This too is

characterized by unevenness: the balance between the forces tending to change and to stability can become disrupted, which can result in resistance to change. This in turn leads to institutional rigidity.

Concepts have been developed in various disciplines in which institutional rigidity plays a central role. The Dutch historian Jan Romein has based his law of the 'inhibiting lead' on this concept: progress achieved in the past restrains further progress; vested interests obtain the upper hand and resist the replacement of existing institutions or any change in existing conditions.

These manifestations of stagnation were recently investigated by Mancur Olson, who came to the conclusion on the basis of empirical research that economies which have not been forced to undergo radical change over the long term begin to suffer from institutional arteriosclerosis. This finds expression in resistance to exogenous change and obstruction of the decision-making process by the primacy accorded to autonomous group interests. These interests are articulated by the formation of interest and pressure groups.

This obstruction of the decision-making process results in the fact that measures and developments set in train at the national level can no longer be controlled. This interpretation finds further support if one takes the psychological climate of an economy into account. As the research by Katona and others has amply demonstrated, an optimistic climate exercises a favourable influence on individual willingness to accept change and to evaluate it positively. In an optimistic climate changes are perceived as improvements, but in a pessimistic climate they are perceived as deteriorations.

Not all resistance to change should of course be regarded as (institutional) rigidity. Resistance to change can, for example, be based on the deliberate and legitimate protection of the attainments of the welfare state. Genuine rigidity only occurs if developments are obstructed, being frustrated by such an accumulation of ineffective measures or procedures or individual evasive action that undesired consequences ensue.

There are various indications that institutional rigidity is occurring in the Netherlands at the present time.

Examples include:

- The functioning of the labour market. On the one hand this concerns the adjustment mechanisms whereby redundant labour no longer ends up in but outside the labour market. According to recent estimates, of the 609,000 persons drawing disablement benefits in 1979, some 150,000 consisted of disguised unemployment. Secondly, some 25,000 vacancies in the labour market are unfilled because of the lack of occupational and geographical mobility.[2]
- Provision of assistance to individual companies. The Parliamentary Sub-Committee on the Provision of Assistance to Individual Companies has stated that the practical application of this 'adjustment mechanism for private industry' must be regarded as uncontrolled. Private industry is too eager to accept assistance and the government is unable to bring the provision of such assistance under effective control.
- The entrepreneurial spirit of Dutch private industry. It is, of course, very difficult to pin this down in factual terms, but even within private industry itself it is accepted that there is staleness, a lack of adjustment to social change and a lack of vision concerning the functional position of the Dutch private sector in the field of international competition (NRC-Handelsblad Management Supplement of 1 April 1980).
- The payment of collection of taxes and social insurance. A report recently issued by the Audit Office notes that there is a substantial shortfall in the payment and collection of VAT. This is something which the Taxation Office has itself determined on the basis of sample checks of VAT returns, but which it is unable to follow up on account of the elapse of time. The payment of social insurance appears to be evaded on a fairly large scale by means of legal devices (e.g. bogus private companies), over which the authorities have insufficient control.

[2] H. Naber, 'Passende arbeid, een remedie tegen werkloosheid?' (Suitable Work: a Remedy against Unemployment?) *Sociaal Maandblad Arbeid*, Vol. 35, no. 3, March 1980.

– Decision making in urban and physical planning. The pressure on the limited space available and the increasing appreciation of the importance of the quality of that space have led to a multiplicity of plans and procedures. No matter how skilfully devised the network of coordinating mechanisms and consultative provisions, it will gradually become entangled in itself. Urban renewal and regional planning proceed slowly as a result.

While the external pressures for change in the Dutch competitive position are particularly great, internal developments often indicate that the capacity for adjustment and anticipation is on the decline. Such a situation is not tenable for long, since it places continuity on the line. This is the reason why the Council decided to re-examine the question of the structural adjustment of the Dutch economy. In doing so the Council has focussed attention on the basic objectives of the economy, proceeding from there consider the way in which future developments might be anticipated. The working method adopted has therefore been first of all to establish the economic outlook and potential and to determine what has to be done in order to satisfy the basic objectives. Finally we have sought to assess the institutional implications of these findings.

4. Medium-term economic prospects

4.1. In order to obtain insight into medium-term economic prospects, four external advisers were invited to develop structural models for the purposes of this study bringing out the interaction between economic growth and the industrial structure.

The design and results of these models are examined in detail in chapter 2-3 of this report. The models have been deliberately designed to describe the position of the industrial sector within the Dutch economy in such a way as to provide insight into economic growth, employment, the balance of trade and the structure of production in 1985, as well as into the relationship between these key variables and the industrial structure; and they are also designed to demonstrate how, in the event of disequilibrium, the structure of the economy might be modified by governmental means with a view to fulfilling basic policy objectives.

The Council has attempted to form a general impression of the quality of these multi-sector models and of their value as policy instruments. The Council also held extensive discussions with the designers of the models on the latter point. Its conclusions on these two points are as follows.

1. There has been a steady process of improvement and refinement in economic model-building since it was first begun in the mid-1930s. In terms of the present state of knowledge and their specific nature (i.e. multi-sector models concentrating on the Dutch structure of production in 1985), these models represent an analytical advance.

2. The models do not automatically lead to policy prescriptions. The same in fact applies to most models, including the macro-economic models devised by the Central Planning Office,[3] although in the Dutch context the latter are able to draw on lengthier history and experience. The models do, however, enable the likely direction and magnitude to be determined of the consequences of particular policy options, these options being based on a combination of generic and specific considerations. The potential for doing so derives from the fact that these models incorporate basic relationships forming part of the economic process. The models thus increase insight into the potentialities for economic control.

4.2. The deliberate decision largely to restrict model-based analysis of the economy to the sector of production does not in any way imply that we would view its operation in isolation from remaining sectors, especially the government sector. A specialized study has been made of future public expenditure, the results of which have been incorporated into the models in an exogenous manner. Feedback by means of the taxation and social insurance

[3] For an interesting discussion of this point see: C. J. van Eijk, 'Ontwikkelingen in de voorbereiding van de Nederlandse economische politiek' (Developments in Dutch Economic Policy Formulation), *Maandschrift Economie,* vol. 43, p. 505ff.

burden, monetary effects and so on have been left out of consideration in the models; they need still to be introduced and taken into account in assessing the results of the models. From the viewpoint of manageability and clarity there are also limits to the degree of endogenization of mutually inter-acting determinants in the private sector. In the case of certain determinants exogenous estimates have been on the basis of specialized studies. The results have then been incorporated in the models, so that feedback is taken account of in an interative manner. Apart from the analysis of public expenditure referred to, separate studies have also been conducted on:

- exports (volume and prices);
- import price trends;
- consumption patterns (volume and prices), depending on the size of private consumption expenditure.

In accordance with the required specifications, these specialized studies are, like the models, all multi-sectoral in nature. Sub-classifications have been made enabling these studies to be linked up with the industrial structure:

In specifying the relationships to be brought out in the models, a certain preference was displayed for purely economic phenomena. This was consistent with the Council's basic approach of beginning by obtaining insight into purely economic variables over the medium term and to assess the institutional implications by means of instrumental inference, that is, determining a particular instrumental mix from the objectives and the surrounding economic conditions.

This is for example of direct relevance for wage determination. By working on the basis of a given increase in money wages of approximately 7% a year (a level consistent with the current emphasis on wage restraint; it also accords closely with actual pay awards in recent years), it is possible to obtain insight into the extent to which basic objectives will be attained. The growth in wages can then be varied to show the effect this would have on getting closer to those objectives.

We share the view that there is not direct relationship between the model-results and the policies required. An appropriate approach in our view is to separate economic from institutional variables. It may be expected that subjective assessment factors will be of greater importance for institutionally determined variables than for economic variables in model relationships and parameters. By separating the two one becomes forced to systematize and define the assessment factors.

4.3. Although we felt it preferable for a distinction to be drawn between economic and behavioural relationships, the external advisers were given complete freedom to construct their models as they saw it. This resulted in totally different models being drawn up. They also differ from one another in the way in which behavioural relationships have been specified. In particular this concerns the following two interrelated variables;

- The growth of the active labour force and the extent to which unemployment affects wages settlements.
- The extent to which the volume of exports can be increased by cost and price adjustments.

In essence, therefore, we are concerned with the operation of the price mechanism in the labour and commodity markets, and with the question as to whether a rapidly growing active labour force does not provide a significant impulse to economic growth. If this should be so, the principal issue of the moment, unemployment, would be automatically solved by means of the regenerative capacity of the economy.

From one of the models drawn up by the external advisers (that of Kuipers) this would appear not inconceivable. The model drawn up by Kuipers and his group specifies a wages and prices mechanism, for which empirical estimates have been made. In combination with the sector dynamics assumed in the model, this mechanism displays a regenerative capacity of this kind. The operation of the mechanism in the next few years is however dependent on a number of conditions and assumptions. As suggested earlier, these need to be

assesed in the light of supplementary information. In this regard the following factors are of significance:

- The extent to which the potential supply of labour, which is generally assumed to be increasing rapidly, in fact finds its way into the labour market. Kuipers himself expresses doubts on this score, based on the fact that the potential supply of labour does not fully end up in the labour market ('adjustment mechanisms') and that entry into the labour market falls below expectations (e.g. married women).
- The effect of unemployment on money wages (the Phillips Curve). Considerable significance is attached to this relationship in Kuipers' research, but other investigations have concluded: 'unemployment has had an impact on money wages in recent years, but it has not been dominant.'[4] On purely statistical grounds it is not possible to choose between these two positions.
- The price mechanism in commodity markets, especially export markets. On the basis of past experience, Kuipers' model concludes that if export prices remain in line with foreign competitors, the volume of Dutch exports will manage to keep pace with the growth in the volume of international trade.

This aspect is examined in detail in chapters 2.3 and 5.2 of this report. In the first place it may be noted that in recent years Dutch commodity exports have lagged badly behind world trade even though export price levels cannot be held principally to blame. The evidence suggests that market pressures have forced Dutch exporters to adjust to international price trends. The fact that the volume of Dutch exports should still be lagging behind despite these enforced price adjustments must be explained in structural terms. This proposition now commands more general support:

'From this it emerges that excess capacity is likely to be relatively high for some years to come. This forms a reflection of the problems – of restructuring and structural over-capacity – facing a number of branches of industry, especially manufacturing industry. This is a new situation in comparison with the past, when there only arose short-lived fluctuations in capacity utilization. *In these circumstances, relationships that held good in the past can undergo change in response to the changed impact of capacity utilization* (our italics). We are dealing here not just with the chronic nature of excess capacity, but also with its sector-specific nature. For the time being the question remains unresolved as to the extent to which chronic under-utilization will lead to an accelerated reduction in capacity. Excess capacity exerts various effects. Price rises are moderated and the propensity to invest is weakened.'[5]

The above trends are particularly evident in branches of manufacturing industry that occupy a significant place in the Dutch package of exports and the Dutch pattern of industrial specialization. These typical characteristics of the starting position have been taken into account in the separate export study conducted as part of this survey, and are reflected in the exogenous export estimates. To the extent that these estimates have been used by the external advisers they also influence the results of their models. This is deliberately not the case in Kuipers' model.

As noted previously Kuipers' model contains a number of crucial behavioural relationships, the influence of which has been incorporated in the other models by means of the exogenous estimates derived from the special studies.

These differences in assumptions and model specifications tend to be of a fundamental character, in that they affect the future outlook for the economy, as well as policy options. It is for this reason – slightly to anticipate the argument – that consideration has been given to them at this stage. At this point we would confine ourselves to the proposition that there are structural characteristics inherent in the starting position leading on the one hand to imperfections in the market mechanism and on the other to modifications in relationships that applied in the past. The subject of the structural background is considered in greater detail in section 5 of this chapter, while the regenerative capacity of the

[4] Central Economic Committee, *Macro Economische Verkenning op middellange termijn 1978-1982* (Medium-term Macroeconomic Surveys, 1978-1982), The Hague, 19 June 1978, p. 5.
[5] Central Economic Committee, op. cit., p. 26.

economy is considered further in sections 6.1 and 6.2. In terms of surveying medium-term economic prospects, the various models should be reduced to a comparable starting point. As far as the impact of a rapidly growing active labour force is concerned, this can be readily done with Kuipers' model. Apart from the variant assuming a rapidly increasing active labour force there is also a variant for a constant labour force. As a result of this adjustment the operation of the Phillips Curve naturally becomes less significant. The starting point in relation to the Dutch export situation can only be grafted onto the results of the Kuipers' model by approximation.

Our survey of medium-term economic prospects is based on the following major assumptions:

- an annual increase in money wages of approximately 7%;
- an annual increase in the volume of exports of approximately 3%;
- an annual increase in import prices of 6.5% and an annual increase in export prices of initially 3.5%. The latter figure has been adjusted for the link between import and export prices.

4.4 The following were the main results to emerge from the basic projections conducted on the basis of the structural models for the period 1976-1985:

- economic growth (value added by private sector)	2.5—3%
- private sector employment	slightly negative trend
- balance of trade	unstable; could easily deteriorate considerably

In simplified terms the background to these projections is as follows:

- technical progress has been analysed in the model studies on a sectoral basis. In empirical terms this turns out to be largely labour-saving in nature and also to be virtually autonomous, that is, the pace of technical progress is independent of the growth in added value.

These long-term trend values appear to be extremely stable. Especially in agriculture and manufacturing, the resultant growth in labour productivity is higher than the anticipated growth in value added, leading to a significant net displacement of labour from these sectors. Admittedly much of this is compensated for by the absorption of labour in the services sector and the construction industry, where the growth in value added is expected to exceed labour productivity gains, but taking all sectors together there is a slight tendency towards a decline in employment;

- in the light of current international trade levels, the export expectations on which the basic projections are based now appear somewhat optimistic; this means that the growth and employment scenarios in the models can on no account be held to be pessimistic;
- nevertheless the balance of trade can only be characterized as unstable. This may primarily be attributed to the unmistakeable deterioration in net energy and tourism receipts in the coming years. From the export projections used in the model studies, it is apparent that this deterioration could be partly compensated for by increased exports of agricultural products and of food, drink and tobacco. But this is uncertain. At our request, the Landbouw-Economisch Instituut (Institute of Agricultural Economics, LEI) made special forecasts for these products. Unfortunately it was too late for these to be worked into the model studies. The LEI's forecasts are substantially lower than the estimates we have used, which are mainly based on current trends. If the projections were to be adjusted in line with the forecasts made by the LEI – which does not consider that current trends may be used as the basis for the coming years – this would have quite far-reaching consequences for the balance of trade, and especially for sales and employment in the sectors concerned.

Furthermore, price pressure in export markets due to increased international competition has led to a general worsening in the terms of trade. As might be expected, the estimated strength of this trend proves to be decisive in

determining whether these projections for the balance of trade show a net surplus or a net deficit. The strength of the trend is, however, uncertain, as indeed is the current Dutch competitive position as a whole. For these reasons we have characterized the balance of trade position as unstable.

In assessing model projections one must not only consider the projections made for specific dates in the future but one must also take into account the margins of uncertainty, and must bring continuity requirements into play. This uncertainty in the Dutch competitive position, and the resultant instability in the balance of trade, can have repercussions on the projected levels of growth and employment, in two different ways:

- if Dutch companies are forced in the face of international competition into making price concessions not based on any cost advantages, this will lead to the risk, of firms being forced to withdraw from export markets because production is no longer profitable. Companies will be confronted with a relatively sharp rise in import prices, which it may be expected can be passed on in export prices since all international competitors will be faced with the same price rises. The same does not apply, however, to wage compensation for increased import prices. An indicator of the risk of withdrawal is formed by the size of gross profits. Proceeding on the basis of the continuity requirement as formulated by Kessler,[6] namely that the gross profits will have to grow at least in parallel with added value over the period in question (a requirement which, it may be noted, the model results suggest will also have to be satisfied if the projected investments are to be financed adequately), the relatively small size of remaining income and its uneven distribution among the various sectors mean that there will be still a risk of withdrawal. Price concessions will only increase that risk, with repercussions on the level of output and employment.
- if the trend towards worsening terms of trade persists and a structural trade deficit develops, policy makers will be forced to bring about the required coordination of public revenue and expenditure by means of government savings and wage moderation, or alternatively by tight monetary policies. In both instances this would depress the level of economic activity in the private sector.[7]

The economic prospects that emerge from the basic projections may be examined in yet another way in terms of whether the continuity of the Dutch economy is safeguarded. According to the analysis made by Kessel[8], the relationship between the total number of wage and salary earners in the Netherlands and the size of the population (15-65 years) tends to be stable over the longer term. A number of factors are responsible for this, including increasing entry into the labour market. In view of the growth in population an annual increase in the total number of wage and salary earners in the order of 1.25% must be anticipated in the coming years. The basic variant suggests that there will be a slightly downward trend in employment in the private sector, but even if one could assume that employment in this sector were to remain at the same level, this would still necessitate an annual increase in the number of employees in the public sector of 2.4%. The higher social insurance contributions which the private sector would have to bear as a result would

[6] G.A. Kessler, 'De publieke sector in de jaren tachtig' (The Public Sector in the 1980s), *Economische Statistische Berichten,* 64, no. 3226, October 1979, pp. 1065-1072.

[7] See on this point a recent analysis by A. Knoester and J. van Sinderen 'Over de monetaire gevolgen van de betalingsbalans' (On the Monetary Consequences of the Balance of Payments), *EZ-discussie-nota 8002,* The Hague 1980.

[8] G.A. Kessler, op. cit.

have a negative impact, for which due allowance would have to be made in the basic projection.[9]

If, on the other hand, private employment were to rise by 1% a year – which given other economic considerations could only be achieved if the growth in value added were also 1% higher – the number of wage and salary earners who would need to be absorbed by the public sector would rise by only 1.5%. Furthermore, the growth in National Income that would occur in these circumstances would make this easier to manage. Seen from this angle one is again forced to conclude that the medium-term economic prospects that emerge from the basic projection are not such as to assure the long-term continuity of the Dutch economy.

There are substantial differences between the projection for 1985 and what is required from the viewpoint of continuity. This is so despite the fact that the export forecasts which form an important part of the projections assume a certain degree of recovery in the international economy and in the Dutch private sector. It seems improbable that the regenerative capacity of the private sector could, without more interventionist official policies, be sufficient to bridge the discrepancy between growth trends and continuity requirements.

5. Structural background to the economic situation and prospects

5.1. Changes over time in employment in the private sector provide a good insight into the structural background of the economic situation and prospects outlined in the previous section. To begin with we have taken the historical growth for the period 1953-1978, subclassifying this into four sectors for purposes of comparison with the projected values and so as to throw greater light on some of the background factors. The question with which we shall be particularly occupied is why it will not be possible for the displacement of labour from agriculture and manufacturing to be absorbed by the expansion of the services sector. This is a view that still enjoys widespread currency in this country.

Table 73. Growth of employment in the private sector 1953-1978 (man-years and percentage changes)

	1953 (x 1000 m.y.)	% change on 1953	1963 (x 1000 m.y.)	% change on 1963	1973 (x 1000 m.y.)	% change on 1973	1978 (x 1000 m.y.)
Agriculture	550	—2.7	420	—3.0	310	—1.7	285
Manufacturing[1]	1,202	1.5	1,395	—1.6	1,185	—2.7	1,033
Construction	339	2.3	425	1.0	470	—0.1	446
Services	1,318	2.2	1,639	2.6	2,120	1.0	2,229
	3,409	1.3	3,879	0.5	4,085	—0.2	3,992

Source: Central Planning Office.

[1] Excludes construction industry.

This table shows the familiar picture of growth in employment in all sectors with the exception of agriculture between 1953 and 1963, the gradual displacement of labour in manufacturing industry between 1963 and 1973, which was however readily absorbed in the services sector, and between 1973 and 1978 an accelerated displacement of labour from manufacturing industry, which could no longer be fully absorbed in the services sector.

[9] In the study by Kessler (op. cit.) a distinction is drawn between the 'market sector' and the 'collective sector'. The former comprises the private sector less the quarternary sector (for example health care) because the latter is financed through the collective sector and services are not always provided so as to cover costs. We have basically been concerned with the private sector in its entirety. The basic model-projections indicate that the absorption of labour in the services sector will have to be concentrated in local services; more internationally-oriented services such as shipping and aviation, trade and communications will see the displacement of labour, in the same way as manufacturing industry. This means that the employment projections assume an expension in the quarternary sector; this is indeed entirely consistent with the economic laws governing this phenomenon. At the same time it should be noted that the increased company taxation/social insurance burden that could result might have feedback effects.

What is the relationship between the projected growth in employment to 1985 and the historical trend?

Table 74. Projected[1] employment trends 1978-1985 (man-years and percentage change)

	1978 (x 1000 m.y.)	% change on 1978	1985 (x 1000 m.y.)
Agriculture	285	—1.8	250
Manufacturing	1,033	—2.4	873
Construction	446	1.9	509
Services	2,229	0.5	2,303
	3,992	—0.2	3,935

Source: Institute for Economic Research, Erasmus University, Rotterdam.

[1] This table draws on the study carried out by the Institute for Economic Research. This study is subclassified into 23 sectors, which provides a degree of differentiation that we have found indispensable for the rest of our analysis. The total level of employment projected in this study lies in the middle range of the other studies, and may therefore be treated as representative in this respect as well. Special mention should be made of the fact that these projections are based on detailed forecasts of the structure of demand. This is of particular significance for the service sectors, the dynamic nature of which has been fully taken into account in the structure of demand.

According to the projection, the historical trend is continued forward up to 1985: continued displacement of labour from manufacturing, compensated for to a drecreasing extent by the services sector; only the construction sector is seen as offering any solace. In this respect it is worth noting that the construction industry emerges less favourable (in terms of employment) in the other model-studies. It is worth examining the services sector in more detail in order to determine the reasons behind the steadily declining labour-absorption capacity of this sector.

Table 75. Employment in the service sectors 1973-1978 and projected trends 1978-1985 (percentage changes)

	Change 1973-1978		Projected trend 1978-1985	
- Trade	—0.4		—0.6	
- Shipping and aviation	—1.15		—2.7	
- Other transport and communication	0.7		—1.2	
International services		—0.1		—0.8
- Banking and insurance	2.1		—0.5	
- Other local services	2.0		1.75	
Local services		2.0		1.5
Total service sectors		1.0		0.5

Source: Institute for Economic Research, Erasmus University, Rotterdam.

As in the case of other characteristics of these individual sectors, this survey confirms the marked similarity between the 'international services' sector and manufacturing industry. These sectors are relatively capital intensive and, like manufacturing industry, are subject to labour displacement. Both display similar turnover patterns, which need to be related to the goods-nature of their production. Labour productivity trends in these sectors are also comparable with those in many branches of manufacturing, while the projected growth in value added is insufficient to bring about a net creation of employment. The picture is different for 'local services', except that banking and insurance do not display any increase in employment in the projections. This at first glance surprising result is moreover confirmed by the annual pattern of change in the most recent period (1973-1978). Growth in employment in this sector has come to a halt. According to the projections, the 'other local services' sector, comprising 'business services', 'medical and veterinary services' and 'other services' (including sport, recreation the hotel and restaurant industry, etc.), where demand tends to be more autonomous in nature, will continue to generate net employment. With regard to this sector, which comprises part of the so-called quarternary sector, we have already added the cautionary note that it is

dependent on the government for its financing and also that it receives government subsidies.

The development of demand and turnover in these sectors have thus been statistically estimated on the basis of data that take these circumstances into account. The projections therefore implicity assume that this trend will persist into the future. Equally, however, the factors outlined above make it possible that this sector will run up against other considerations in the next few years which will impede its projected development. The subsidy factor will be of decisive importance in this regard; the continued expansion of the quarternary sector would face the government with increasing operating costs. In other words, the likely pattern of developments makes it unlikely that the net creation of jobs in this sector will in fact take place.

In overall terms, we are forced to the conclusion that the proposition that the services sector can in significant measure compensate for the displacement of labour from the manufacturing sector does not hold good for the Dutch economy in the present circumstances. The evidence of the 1960s and first half of the 1970s clearly demonstrates the existence of counter forces to this process. This is not to deny that a revival of activity in manufacturing – in which the exposed sector, i.e. the more export-oriented sector, would play a critical role – and thereby of the economy as a whole, might be expected to lead to the restoration of the services sectors' capacity for expansion. This is essentially so because the commercial services sectors generally expand in response to growth in the goods sectors, and because the government's financial position would then again provide room for an expansion of the quarternary sector.

5.2. If we are to retain the continuity requirement of growth in the order of 1% in private employment in the coming years, it is clear that the private sector as a whole should be taken into consideration and that manufacturing industry should not be singled out for exclusion. It is simply not conceivable that current employment problems can be solved if industry continues to evolve in accordance with the projections.

What then is the structural situation in which industry finds itself, and are there any indications of means by which the trend towards declining employment levels in manufacturing industry could be arrested?

That there has been such a decline is clear from the survey above. The answer to the question as to whether this decline went further than necessary, and whether this trend can be reversed, may be split into various aspects as follows:

- inter-European comparisons in order to determine whether the trends in the Netherlands are comparable with those in other industrialized countries;
- characterization of the post-war pattern of industrial specialization in the Netherlands;
- survey of the likely outlook for that pattern of specialization;
- tentative assessment of what would constitute a feasible and desirable trend in sectoral evolution in Dutch industry.

5.3. Employment trends in Dutch industry differ from those in other industrialized European countries. In all these countries there has been a tendency for the share of industrial employment in total employment to fall since the early 1970s, but this decline has been far greater in the Netherlands: a development that this country shares with the United Kingdom. Two factors are basically responsible for this development:

- favourable growth in industrial productivity, with the Netherlands at the top of the league in the EEC along with Germany, Belgium and Denmark;
- a decline in the industrial share in total value added at constant prices, in which respect the Netherlands stands alone in the EEC with the United Kingdom.

On balance one may also refer in a relative sense to de-industrialization in the Netherlands. This has been largely concentrated in the following three sectors:

1. The sensitive sectors (textiles, clothing, leather, timber and furniture); these have fared far worse than in any other EEC country. In large measure this is attributable to the singularly rapid loss of the share in the domestic market,

which could not be compensated for by export growth. In this regard it is highly significant that the bulk of import penetration in the Dutch market has come from other industrialized countries.

2. The intermediate sectors such as chemicals and base metals; these acted as a spearhead in post-war industrial development in the Netherlands, but switched from expansion into a stabilization phase in the 1970s.

3. The sector of capital goods and equipment, which is growing strongly industry world trade. It did not prove possible to adjust sufficiently in the Netherlands to these changes in the world market, partly because this sector has traditionally played a relatively minor part and because of the severe structural problems facing the transport equipment industry, for example motor vehicles and shipbuilding.

5.4. There are a number of special features about the post-war pattern of industrial specialization in the Netherlands.

Sectoral specialization has been particularly marked, which has enabled Dutch industry to respond exceptionally well to opportunities for growth in the world market. In this respect Japan has led the field but, among the industrialized countries, the Netherlands has – at a respectable distance from Japan – taken in second place as far as the growth potential of the industrial structure was concerned during the 1960s.

This phenomenon should be related to the recent nature of Dutch industrialization. This initially placed the Netherlands in an advantageous position in relation to more established industrialized countries, which one might well relate to Jan Romein's 'law of the inhibiting lead'.

Newcomers are able to assume an advantageous position in relation to established suppliers in such ways as:

- intensive specialization;
- concentration on emerging branches of industry with good marketing prospects;
- modern equipment.

Intermediate goods, and especially base products (chemicals, metals and petrochemicals), light electronics and food, beverages and tobacco, have come to assume a significant position in the Dutch package of exports. This development must be seen in the light of the selected factor mix, the organizational structure of Dutch industry and our location and infrastructure. The latter factors are of importance in relation to the processing nature of the branches of industry in which the Netherlands has specialized. The resultant structure of production has, however, been achieved at the cost of a disproportionate burden on the environment in relation to our trading partners. The Netherlands has a large deficit on the international pollution balance sheet. This may be attributed almost entirely to four branches of industry, namely base chemicals, the oil industry, paper industry and base metals. To a lesser extent, and only in relation to water, the food, beverage and tobacco industry is also a net polluter.

5.5. The indications are that the comfortable position the Netherlands has occupied as a young industrialized country will be challenged in the next few decades by the newcomers in the industrialized world of 1980: the Newly Industrialized Countries (NICs). With their emphasis on 'middle' industries,[10] the pattern of specialization as it has developed in the Netherlands and the formula of industrialization appear particularly suited to these countries; and this is indeed proving to be the case.

In prospective terms – that is, in the light of the changing pattern of international competition –it is now possible to place a contra-indication against many of the 'assets' from which post-war industrialization in the Netherlands has benefitted. In other words, the Dutch industrial position is and will continue to be under severe pressure.

[10] H. B. Chenery and L. Taylor, 'Development patterns: Among countries and over time', *The Review of Economics and Statistics*, Vol. L., Nov. 1968, no. 4, p. 391 ff.

Even if allowance is made for the fact that the situation in the post 1973 period has been aggravated by cyclical factors, the proportion of industrial activities in the Netherlands still in the innovation and growth stages of the product life-cycle can only be regarded as limited.[11] The de-industrialization that has already set in must be viewed in this light.

At the same time these trends cannot be viewed in isolation from external and internal circumstances.

5.6. The expansion in world trade to which the Dutch industrial structure is so closely geared has given way to stabilization. This is, moreover, something which – given the Dutch structure of production – affects us more than other countries since our spearhead industries are affected relatively heavily. Since there are signs that we will have to continue to live with this fact in the next few years we are faced with the necessity of adapting the structure of the Dutch economy. The problem of adjustment is further complicated by the fact that the pattern of international competition may be expected to confront smaller industrialized countries with three particular sets of problems:

- severe competition from the great industrial powers (United States, Japan, West Germany) in relation to the category of advanced products (1 and 2);[12]
- with regard to the intermediate or middle categories (3 and 4)[12] increasing competition from the Newly Industrialized Countries (Korea, Taiwan, India, Brazil and Argentina in general terms; OPEC countries in relation to petro-chemical products);
- severe pressure from developing countries in relation to the labourintensive sector (5)[12].

This competitive pressure will manifest itself not only in foreign markets but in the domestic market. In each of the categories distinguished above, small industrialized countries may find themselves having one or more comparative disadvantages in relation to the groups of countries best able to compete against them.

This means that gearing the industrial structure to future circumstances will be a complex matter, in which three requirements will have to be taken into consideration:

- in view of the anticipated development of international trade the industrial structure will have to be more varied for industry to be on sufficient scale;
- because of intensified competition from below the package of products will have to be upgraded, i.e. Dutch industry will have to make the jump from 'middle' to 'late' industries.[13]
- in order to prevent the Netherlands from being forced along the path of unilateral price-competition in relation to established industrialized countries, which might leave too little margin for investment in R & D (research and development) and possibly lead to a deterioration in the terms of trade, we must place greater stress on product differentiation and non-price factors.

This is a matter of selective technical innovation and marketing. These factors form the components of a general programme, the emphasis of which will vary according to the particular sector on which it is focussed.

5.7. With a view to the fact that the main difficulties being faced in the industrial structure are concentrated on the three sub-sectors, a number of branch surveys have been conducted as part of this study. In each case a single branch of industry has been selected on the grounds of its representative significance: chemicals to represent the intermediary sector, the timber and furniture industry to represent the sensitive sectors, and electrical engineering to represent the equipment sector.

[11] J. J. van Duijn, 'Economisch beleid en industriële ontwikkelingsfase' (Economic policy and the stage of industrial development), WRR, Serie Voorstudies en achtergronden ('Preliminary and Background Studies') The Hague 1980.

[12] 1 = research and skills intensive
2 = research, skills and capital intensive
3 = capital and skills intensive
4 = other capital intensive
5 = labour intensive.

[13] See Chenery and Taylor, op. cit.

By way of background orientation there follows a projection for value added and employment to 1985 for these sectors and branches of industry. This is succeeded by some tentative judgements concerning possible and more desirable ways in which the structure of Dutch industry might develop.

Table 76. Projected value added and employment in various branches of industry 1976-1985

	Value added (N.Fl. m. 1970)			Employment (x 1000 man-years)		
	1976	1985	% change	1976	1985	% change
5. Textiles	1,253	1,159	—0.9	49	28.6	—5.8
6. Clothing	704	518	—3.4	41	22.6	—6.4
8. Timber and furniture	2,687	3,144	1.8	96	73.3	—3.0
	4,644	4,821	0.4	186	124.5	—4.4
9. Chemicals	6,774	8,944	3.1	117	85.8	—3.4
10. Base metals	2,196	2,635	2.0	37	27.8	—3.1
14. Crude oil	2,354	2,783	1.9	10	6.3	—5.0
	11,324	14,362	2.7	164	119.9	—3.4
11. Metal products	6,246	7,285	1.7	215	175.8	—2.2
12. Electrical engineering	4,962	7,131	4.1	110	94.1	—1.7
13. Transport facilities	2,396	2,258	—0.7	80	56.6	—3.8
	13,604	16,674	2.3	405	326.5	—2.4

Source: Institute for Economic Research, Erasmus University, Rotterdam.
The results of this study have been used because of their disaggregated nature.

Chemicals

The survey confirms that the Dutch chemicals industry, with its marked emphasis on bulk products, has reached a stabilization stage. This change has not only had an effect on turnover and employment but also on profitability (via margins and capacity utilization) and the resultant availability of funds for research and development. This sector does offer adequate scope for expansion, but this is concentrated in the field of chemical end-products. Research intensity in this sub-sector is high, while it also sets high standards in terms of industrial know-how and experience. Because of their declining profit margins, the large chemical concerns in this country, faced with the necessity of diversifying for the reasons outlined above, will have difficulty in releasing the required funds derived from production in the Netherlands, while their international nature means that they may well be inclined to make use of the frequently more favourable locations in the United States and Germany than in the Netherlands. This trend is already evident. This is an unfavourable factor for the Dutch industrial position. Policies will have to be geared towards creating the appropriate circumstances of production to encourage diversification within this country.

Furniture industry

The sensitive sectors in the Netherlands are exposed to severe competition from other industrialized countries. The degree of import penetration is much greater than in any other EEC country, and exports have been unable to compensate for this. According to the survey, the main problems in these branches of industry lie in the field of management and marketing (including design), where the Netherlands is incapable of offering resistance to competitive pressures. For these branches a policy of revitalization would appear to hold out scope for preventing further ground from being lost.

At least two marginal notes are in order here. The first is that this revitalization will have to be primarily directed towards products and markets where we are losing markets to other industrialized countries - which are in any case

the major competitors – and not towards products in which developing countries are beginning to specialize.

Secondly, a revitalization of this kind will have to be handled with care, since recent experience in this country has shown how such efforts can miss the mark completely. With regard to the much stressed factors of scale – such as the size of the market – official policies cannot simply be aimed at import substitution in which the domestic market is used as a foundation for strengthening the export position and vice versa.

Electrical engineering

According to the projection this branch of industry enjoys favourable marketing prospects. In the light of the technical breakthroughs that may be anticipated in this field, it may be asked whether the Netherlands is properly equipped in a technical and industrial sense to take effective advantages of these developments. In general terms the survey of this point suggests that the Dutch potential is not unfavourable. A major effort in this field might be able to help offset the almost certain decline in the transport facilities sector and to boost metal products in relation to the basic projection. The metal products sector may be expected to benefit from breakthroughs in electrical engineering, since machine construction and electronics will become increasingly interlinked.

5.8. Apart from external developments in world trade and the pattern of competition, internal developments, especially in relation to production costs, during the 1970s affected the position of Dutch industry. The structural factors, related to the size and composition of world trade, may be designated as sector-specific factors because they directly affect the structure of production and exports. Costs may be regarded as a generic structural factor, since their impact is of a general kind, although sector-specific variations may also occur to a limited extent.

Labour cost trends

Hourly money wages in industry increased in the Netherlands during the period 1972-1977 by 95%; of the other EEC countries only West Germany (64%) recorded a lower increase.

If exchange rate varations are taken into account, the rise in labour costs in West Germany remains lower than that in the Netherlands. The other EEC countries, however, such as Italy, France and the United Kingdom, where there was the highest increase in money wages, ultimately emerged favourably in relation to the Netherlands because their currencies had consistently depreciated against the guilder.

Overall it is fair to say that relative labour costs in Dutch industry have risen sharply. Even if allowance is made for the reasonable rate of growth in productivity, the rise in unit labour costs still exceeded that in other EEC countries.

The Central Planning Office has reached the same conclusion and has estimated that the cumulative increase in unit wage costs in the Netherlands during the period 1972-1977 was some 7.5% higher than that in other EEC countries.

Appreciation of the guilder

An important cause of the deterioration in Dutch competitiveness has been the steady appreciation of the guilder since 1971. Although this means a certain initial reduction in costs on the import side, these benefits were outweighed by the disadvantages on the export front. This may be seen from the fact that during the period 1970-1978 the guilder rose by 24.5% (cumulative) in relation to suppliers but by 33.5% in relation to competitors in foreign markets.

An examination of the effective appreciation of the guilder for various categories of goods reveals that it varied from 0 to 23%.

Competitiveness

The various studies conducted on the subject are not in full agreement on the impact of the relatively high cost levels that prevailed in the Netherlands during the 1970s. The question that arises is whether the high costs were passed on in export prices, thereby leading to a decline in the volume of exports through price elasticities, or whether Dutch exporters were obliged to adjust to international price patterns, with the price cuts they were forced to make decreasing their profitability levels to the point of having to leave the market. There are indications that the latter path has been the more important, this leaving open the possibility that the range of goods offered by the Netherlands, the geographical distribution of Dutch exports and non-price factors (such as delivery times, services etc.) have played a significant part in this decline.

Competitive position in foreign markets

During the 1970s a striking deterioration occurred in the Dutch international competitive position. Between 1963 and 1973 the Netherlands registered a significant increase in its share of world trade, while from 1973-1978 a significant decline was recorded.

Table 77. Volume of world trade and of Dutch exports of goods 1963-1978 (average annual percentage change)

	1963-1973	1973-1978
Volume of world trade	9.5	5
Volume of Dutch exports of goods	12.0	2.5

Source: WRR, see chapter 5.2 of this report.

The percentage by which the volume of Dutch exports of goods exceeded the growth in world trade between 1963 and 1973 was the same as the shortfall in 1973-1978, namely 2.5%. Both sector-specific and generic structural factors were at work in this dramatic turnaround. The quantitative impact of the two sets of factors appears to have been roughly equal in the recent past.

6. Structural policy: urgency and policy options

6.1. A number of basic policy premises have been touched on in the course of the discussion above, which it may be as well to recapitulate at this point:

- given the present structure of the Dutch economy, the medium-term prospects for the economy suggest that the likely growth of the private sector will not be consistent with the requirements for continuity in the economy.

In terms of continuity, employment in the private sector would have to increase by 1% a year over the projection period 1976-1985. This amounts to a net creation of employment of an average 40,000 man-years a year and a level of 4,370,000 man-years in 1985, which would entail a corresponding growth in value added of around 4%. The anticipated levels of employment and economic growth fall well short of these continuity requirements, while the Dutch international competitive position appears so inherently unstable that the actual outcome may well fall short of expectations as a result of possible production losses and restrictive monetary policies;

- the popular notion that labour displaced from industry can be absorbed by the services sector is not borne out by our research. A solution to the continuity question will therefore have to be sought over a broad front in the private sector;
- both sector-specific and generic structural factors have had an impact on the Dutch international competitive position; the period 1973-1978 saw a dramatic deterioration in the process of adjustment to the pattern of international competition. An improvement in the ability to adjust will therefore have to take place in a structural sense, in both sector-specific and generic terms. Even if considerable importance is attached to the price mechanism in the labour market and the market for goods, one is forced to make allowance for practical factors that have either impeded the operation of the market

mechanism or have led to that process having different results from in the past.

On the basis of the conceptual model devised by Kuipers, consideration was given in section 4.3 of this chapter to the regenerative capacity of the economy, when it was seen that the latter must in broad terms be regarded as depending on the growth of the active labour force, the impact this will have (through unemployment) on wage settlements, and the operation of the price mechanism in export markets. Imperfections of a structural nature occur both in the labour market and in the market for goods. As was noted in section 2.3 of this chapter market imperfections – at least in the labour market – also have the effect of providing a certain degree of isolation from the pressure for change and adjustment coming from the economic sphere. In principle, a reassessment of the priorities at issue here would of course be possible.

But fairly far-reaching measures would be required to bring about a realignment of priorities. These measures would have to bring the unused labour potential out into the open so that it would appear in the market effectively and exert a moderating influence on wage determination. Leaving aside the desirability of such measures, to which we shall be returning later, it is apparent that they are dependent on government intervention. On balance the regenerative capacity of the economy – that is, the ability of the economy to adjust effectively without supporting official regulation of the general environmental background – would not appear assured in the current circumstances and a solution to the problems may only be anticipated by means of greater government intervention. The actual content of such policies is another matter.

6.2. The Netherlands is at present confronted with an economic situation which, at the macro-economic level, is characterized by a singular combination of factors:

- for some time now output has lagged behind consumption expenditure, thereby indicating a fundamental imbalance in the economy;
- this high level of domestic demand might lead one to see it as the cause of the declining growth in exports (the 'Zijlstra-effect'), but this would be inconsistent with the fact that there is also a substantial degree of excess capacity;
- in addition the Netherlands has been confronted with relatively high levels of unemployment and, at the same time, regional and occupational shortages in the labour market.

This configuration of circumstances indicates that the causes must be identified at the structural level. The main elements of such an interpretation were discussed in the previous section, with emphasis being placed on latent structural problems.

These problems manifest themselves only too clearly in the existence of excess capacity in specific sectors, where the level is much higher than the macro-figures might suggest. Given our level of costs, the structure of production is not properly geared to domestic and foreign demand. It is partly for this reason that the time-honoured formula of stimulating demand in order to eliminate excess capacity would appear less desirable in undifferentiated form in the present circumstances. This is supported by certain ancillary consideration as well. A policy of generating extra expenditure, for example by increasing the budget deficit, takes no account of latent imbalances and could therefore easily lead to the crowding-out of private investment from the market. As was said, this applies to demand stimulation in undifferentiated form; matters might be different if the additional government expenditure were directed towards private investment; expenditure designed to 'recycle' capital to investors will generally have different effects.[14]

Equally, a policy of demand stimulation ignores bottlenecks in the labour market. Without complementary measures in the employment sphere, it is quite conceivable that demand stimulation would run up against local and occupational shortages in the labour market.

[14] A. Knoester and J. van Sinderen, 'Over monetaire gevolgen van de betalingsbalans' (On the Monetary Consequences of the Balance of Payments), *EZ-discussienota 8002*, The Hague 1980, p. 33.

The main issue currently confronting us in the field of economic policy may be characterized as the re-allocation problem. This covers all the factors of production, i.e. including labour.

6.3. The fact that sector-specific and generic structural factors may be regarded as joint causes of the structural situation as it has developed means that both may be taken as major policy parameters in the future, but it does not necessarily mean that they should be regarded as action parameters for government policy.

Before such a conclusion could be reached one must develop a conceptual approach towards the adjustment process, taking account of the mutual interaction between the market system and the general political and social environment. Such an approach was discussed in section 3 of this chapter and in the remainder of this discussion we shall be building on the underlying principles that emerged.

6.4. A distinction was drawn in section 3 between a policy of internal adjustment and policies of selective intervention. In terms of this analytical distinction, the former may more readily be linked to the generic and the latter to the sector-specific, focussed approach to structural policy.

Generic structural policies would therefore attempt to overcome the rigidities that have developed in the production-factor markets, especially the labour market. Obvious starting points would consist of the comparative cost disadvantages that the Netherlands now suffers in relation to its closest competitors as well as the unsatisfactory operation of the labour market; the case for action in these fields is strengthened by the fact that relatively rapid adjustments are currently required in response to external pressures. An integral part of such a generic or global approach would consist of policies designed to set the general conditions with regard to such aspects as the adaptation and improvement of the infrastructure, modernization of the technological base and more active marketing. All this would be done on a generic basis and would be geared towards breaking through internal rigidities and overcoming resistance to innovation by means of the improved operation of the market system and greater allocative efficiency, in the expectation that this would bring about the required adjustment in the structure of production. Considerable attention has been devoted in this study to the improvement of generic policies, especially making better use of our innovative potential.

Sector-specific policies would focus on the structure of production, in line with the view outlined before that the structure of production may be regarded as the framework by means of which the productive capacity of an economy may be oriented towards the future. If it were possible to define the broad outlines of the structure of production needed in the future it would be possible logically to determine the direction in which the productive capacity of the economy should develop, and the demands this would impose, including in relation to the general political and social environment. Both the adaptation of the infrastructure and the mobilization of the technological base could be given effective shape in terms of specific priorities; this would in itself be a considerable advantage, if only in terms of the scarcity of available resources. Furthermore, the government could undertake investment which it believed would be insufficiently generated by the market mechanism but which might be regarded as indispensable in terms of the future structure of the economy and the attainment of national objectives. The fact that the market mechanism might not operate to the advantage of the Netherlands is particularly evident from the fact that private investors obviously consider the future conditions of production in the Netherlands to be less favourable than those in other countries. There is no doubt that the considerations taken into account by the private sector in assessing new activities and production many differ from those that apply at the national level. Finally it should also be borne in mind that institutional rigidity can occur at the enterprise level, and in the view of many peope already is.

6.5. While it is possible to juxtapose generic and sector-specific policies, as has been done above, there are also points of contact or overlap.

a. In the first place there is the complementary aspect. Part of sectorspecific policies, too, must consist of examining the general environmental framework for its congruence in terms of the desired economic objectives. Equally important are the flexibility and mobility of the production-factor markets and the impact of institutional limitations. This is particularly so if the centrifugal or wider effects of sector-specific policies are taken into account, which can only be realized if there is an improvement in the overall climate, while the complementarity factor is also of relevance for the length of time it takes for policy options to take effect. And if it is correct to say that the present situation is characterized by institutional rigidity (on a broader front than just the labóur market), a lack of coherency in objectives and the transfer of burdens, it follows that a thorough re-assessment of priorities and a reorientation of our position in the international economic field will be required. In the interests of social acceptability, a far-reaching process of adjustment of this kind would have to be balanced in nature. The creation of an optimistic psychological climate is highly dependent upon the possibilities for the future opened up by the government. In principle there exists greater scope for sector-specific policies in this field. Although a sector-specific approach may be focussed elsewhere, it can – indirectly – help create the sort of conditions required for increasing mobility in the factor markets. In terms of social change, therefore, complementarity is a relevant policy option.

b. Secondly, there is the way in which structural policies are implemented; this may either be interventionist, or in conformity with market principles. If the latter option is chosen, sector-specific policies still differ from generic policies in that they proceed from the assumption that the operation of the market system may need to be supplemented and strengthened from outside, and this does not apply to the labour market alone.

In this sense structural policies would provide the framework for the activation and mobilization of our national potential by indicating the possible and desirable directions in which the economy might develop. Taking activation and motivation as the prime functions does not necessarily imply that structural policies should be based on taking over private industry but on the regeneration of the economy by strengthening existing activities – in so far as they have sound future prospects – and stimulating initiatives, as well as undertaking certain initiatives on government account. In other words, we would thus stress the government's 'pro-active' rather than dirigistic potential.

6.6. We are well aware that the policy alternatives outlined above have their 'roots' in society. The various approaches are bound up with the differing schools of economic thought and traditions of research; both approaches also suffer from having an identifiable political or ideological stamp. These traditions and orientations each have their adherents within a body such as the Council.

The Council has attempted:

– to elaborate and provide a basis for the sector-specific approach, as the less researched and practised of the two alternatives;

– to arrive at a critical evaluation of the two alternatives and a pragmatic approach in which a major element would be specific emphasis on the complementarity aspect as a policy option.

7. Sector-specific policies: scope, conditions and limitations

7.1. We are faced with a fundamental reorientation of our economy, namely the restoration of 'pre-stabilized harmony', which must provide an answer to the question of the appropriate focus of future production. In an open economy, the allocative system must bring about an appropriate balance between static and dynamic efficiency. The former relates to the performance of well-defined tasks or to events predictable in the short term, while the latter relates to the capacity to react to less predictable long-term developments by means of technological and organizational change, and places greater stress on actively shaping the future.

A serious disturbance such as that currently affecting Western economies has the effect of disrupting the coordination of economic activities, which in turn

expresses itself in the avoidance and passing on of risks, thereby leading to a loss in initiative. The altered expectations at the micro level lead to a shortening of time horizons coupled with immobility and a defensive posture.

A primary condition for the reform of the economy consists of lengthening planning horizons, as a result of which we:

- incorporate the new data with which we are confronted (technology, scarcity trends, the international division of labour) into government policy;
- are required to specify the long-term tasks needed for the attainment of economic and non-economic objectives;
- can give institutional shape to the system of production with a view to the interaction between the market and the background environment.

The particular functions that sector-specific policies could fulfill in this context are as follows:

1. Providing insight into the future shape of the structure of production. This is of relevance because (a) it governs the attainability of macro-economic goals and (b) it provides both the private sector and the government with a future frame of reference to which they can orient themselves. By this means it also becomes possible to determine (a) the comparative advantages that the Netherlands will have to create with a view to products and techniques that may be regarded as indispensable for the structure of production, (b) how greater certainty can be created with regard to the basic conditions of investment, and (c) which risks should be borne by the government in view of the fact that its financial capacity exceeds that of individual enterprises. The government has such varied access to the capital market that it is in a position to transfer capital to the risk-bearing sphere.
2. Increasing the effectiveness of government activities by improving the coordination of economic policy, intermediate objectives, science and technology policies and labour market policy, and to set priorities for such policies in line with the limited resources available.

In this sense sector-specific policies could provide the framework for the activation and mobilization of our national potential by indicating the posible and desirable directions in which the economy might develop. Although such policies would be planned in nature, they would not imply acceptance of centralized economic planning, assuming that were possible in the first place. We are not therefore proposing to do away with the market in favour of dirigistic controls. On the contrary: we see sector-specific policies as a means of creating the right social conditions and of establishing coordination and consistency within the system of production.

In assessing the potential effects of sector-specific policies, one cannot escape the question as to why these functions could not be carried out by the market system.

There are of course circumstances in which the market can fulfill these functions without the need for intervention but, as discussed in general terms in section 3 and specifically in relation to the Dutch situation in section 5 of this chapter, it is possible for the system of production to lose resilience, thus creating a possible need for intervention.

The de-industrialization that has occurred in the Netherlands forms an excellent example. With the future in mind it is worth reiterating that the operation of the market mechanism could well lead the private sector to downgrade the Netherlands as a potential location for new industrial production. Such a trend cannot be allowed to run its course. We must not shut ourselves off from international competition but, instead, safeguard our position in it.

This situation is by no means new. The post-war industrialization policy of the Dutch government was aimed at:

- specifically drawing attention to and providing documentation on actual opportunities and possibilities, both for the individual entrepreneur and for the economy as a whole;
- to emphasize the seriousness of the government's resolve to create a favourable climate for new investment;
- by means of 'selective stimulation' to help establish companies of key

importance for the process of industrial adjustment (e.g. restructuring Dutch State Mines into a chemical concern).

From this pragmatic framework it should be evident that we would regard sector-specific policies as being tied to specific circumstances; such policies amount to a reserve function of the government which is only activated as and when circumstances demand.

7.2. The implementation of selective sector-specific policies would not be without precedent as a form of intervention in Dutch industrial development, but a number of safeguards would be needed if unintended side-effects were to be avoided.

The system of intervention will depend for its success on the existence of an appropriate social and political foundation and the creation of social and political acceptance. On the one hand, this will require willingness to adopt a pragmatic approach, in the sense that policies make explicit allowance for the operation of economic laws and leave the market mechanism intact as far as possible, especially in the interests of the effectiveness and efficiency of economic activity. On the other hand primacy must be accorded to the principles of objectification and democratic controls, in which respect the community takes far-reaching responsibilities upon itself through the intermediary of the government.

A second important proviso concerns the competence of the government in relation to structural problems. Expertise, initiative and proficiency will all be required in formulating an operational programme and in devising effective cooperation arrangements.

Special administrative arrangements will have to be made where the government lacks specialized knowledge. The broad outlines of government policy must be decided at the political level, but the implementation of those policies must be professionalized.

Thirdly there should be a requirement for the periodic review of structural policies in terms of specific objectives and the existence of any undesired side-effects, so that the policies can if necessary be adjusted. To this end an action-oriented review mechanism should be established to enable a running check to be conducted.

7.3. Sector-specific policies are primarily concerned with the relationship between sectors, and should be developed and considered in the light of the desired structure of production. Desired in this context denotes congruence in terms of economic and non-economic objectives; such policies assume the structure of production to be of consequence for the attainability of those objectives. While we are dealing with operational and interventionist policies, account will of course also have to be taken of the limits to what is possible at the national level. We are concerned not so much with a blueprint as with a loose structure, that is a sketch indicating the main or pivotal points. Policies may be directed towards accentuating those pivotal points against the background of the structural framework, i.e. the 'two-step-flow' approach. Such policies can only take actual shape in the form of sectoral policies concerned with intra-sectoral relationships.

Structural analysis – the consideration of what is desirable and possible – leads in principle to the identification of those sectors where government intervention is required; sectoral policies form the next logical step.

On the basis of the results of the model-studies and of other studies, we shall attempt to reach a preliminary judgment in section 7.5 concerning the extent to which the conceptual approach outlined above might be justified in terms of the model-results.

We would stress that understanding of inter- and intra-sectoral processes and the extent to which those processes can be controlled are strictly limited. No policy can hope to cover the entire range of business-sector activity, no matter

how desirable that might be deemed. Nor would such policies be consistent with the underlying assumption concerning the formative or shaping role of government. This limitation applies both to the selection of the sectors lending themselves to intervention, and to the actual nature of intervention decided upon for those sectors.

With regard to the latter, we would attach the following conditions:

- the sectoral policies implemented by the government in this context should in principle be kept separate from any sectoral consultations conducted in certain branches at industry's own initiative. The problems, responsibilities and respective areas of competence are so divergent that they are best kept apart;
- preference be given to selective governmental stimulation (i.e. the establishment of key enterprises) and selective governmental intervention (restructuring), with the government having a free hand in the choice of partners and enterprises themselves remaining free to decide whether or not to participate in collaborative arrangements;
- sectoral policies should take account of the prevailing market structures under which sectors of industry operate. These have far-reaching consequences for the content of the policies selected. With a view to policy effectiveness, considerable importance should in our view be attached to the differentiation of market structures.

7.4. The question arises as to whether selective government stimulation coupled with intervention may not be at variance with prevailing EEC law. Extensive consideration has been given to this point in the report.

In general we have reached the conclusion that, taking into account the conditions we would impose, the policy framework as outlined above need not result in any conflict with the Treaty of Rome.

The policy framework has been examined in terms of individual treaty provisions of relevance to the problems under discussion. These provisions impose certain limitations at the level of policy implementation, but these are not of sufficient moment to deny the introduction of such policies altogether.

7.5. The final point at issue is whether there exists sufficient policy justification in terms of the following preliminary questions:

- is the structure of production of relevance for the extent to which economic and non-economic objectives are attainable?
- are there sufficient quantitative indications of the need for at least a general programme designed to reshape the structure of production along more desirable lines?
- what indications are there for deciding wheter what is desirable belongs to the realm of the possible?

Generally speaking the structure of production is of relevance for the fulfilment both of economic and non-economic objectives. This emerges from the results of the model-studies. With regard to economic objectives, the following key variables were noted earlier: employment, external equilibrium and economic growth. We have determined the effect on these target variables of an autonomous increase in productive capacity (investment) in the various sectors, with capacity utilization remaining at the normal level.[15] These effects have been related to the amount of investment required, thereby permitting inter-sectoral comparisons. A distinction has been drawn between direct effects, i.e. those in the sector itself, and cumulative effects, which take account of the impact on other sectors. These effects have to be related to the selective stimulation and intervention by the government discussed earlier in the context of targetted, sector-specific policies.

[15] Two further aspects should be taken into account in interpreting the computed effects. In the first place these effects are provisional in nature, in that they will only take full effect if demand grows as anticipated. Secondly, account would have to be taken in practice of the fact that, given the gestation period and the inevitable teething troubles, the investment push would precede any actual increase in sales. In the short term this may have some effect on the balance of payments and the macro investment ratio.

It turns out that these effects vary significantly from sector to sector, as shown by the survey in the following table.

Table 78. Changes in employment, value added and the balance of payments resulting from selective sectoral stimulation according to the Muller and Driehuis models (absolute values)

Sector		Employment (1000 man-years)		Value added (N.Fl. b., 1970)		Investment (N.Fl. m., 1970)		Balance of payments (N.Fl. m., current)
		initial	total	initial	total	initial	total	total
2. Food, beverages and tobacco	M	8	54	0.7	2.2	195	643	450
	D	8	31	0.5	2.4	238	399	—
3. Sensitive sectors	M	21	51	0.7	1.7	161	446	375
	D	28	62	1.4	3.8	171	357	—
4. Intermediate sector	M	13	48	1.0	2.1	279	609	590
	D	3	14	0.4	1.0	253	306	—
5. Capital goods	M	20	87	0.9	3.1	164	722	345
	D	46	96	2.3	4.9	605	858	—
8. International services	M	34	81	1.4	2.9	439	871	865
	D	—	—	—	—	—	—	—
9. Local services	M	46	87	0.7	2.1	281	675	149
	D[1]	169	180	8.0	8.5	753	913	—

[1] Covers the services sector as a whole, i.e. sectors 8 and 9 together.
Key: initial = in the stimulated sector; M = Muller; D = Driehuis.

In order to determine the relationship between the structure of production and the attainment of non-economic objectives, a model-analysis was carried out in which environmental impact played a central part. This covered water pollution, air pollution, solid waste and energy consumption. Environmental impact and energy consumption were then distinguished in terms of 17 separate sectors of production and weighed up against the contribution that these sectors made to employment, economic growth and the balance of payments. Reference has been made several times to the fact that the Dutch structure of production is such that a weighing-up process of this kind can lead to only one result, namely the contraction of the intermediate sector. A large proportion of Dutch production is centred in this sector, while it also accounts for a significant part of the environmental pollution and energy consumption with which we are concerned. In order to give the optimalization aspect more weight a number of additional constraints were introduced amounting to the fact that not abrupt changes could be made to the structure of production and expenditure. By means of five 'environmental production sectors' scope was also introduced into the model for reducing pollution at a given level of production. This of course gives rise to costs of environmental control which have to be met but which also help generate economic activity.

By thus incorporating the optimalization aspect into the model we believe that all the principal aspects have been properly taken into account. The results suggest two possible solutions. The first is characterized by a strong growth in industrial production coupled with a high level of investment in environmental control designed to eliminate the resultant pollution. In the second the growth of production is low, with a correspondingly lower level of environmental investment. Both types of solution may be distinguished at the sectoral level.

The first entails above-average growth in sectors making a large contribution to growth and employment and which are relatively big polluters, i.e. the intermediate sectors. In the second the share of these sectors slips back. The same pattern emerges in the variant where energy restrictions are incorporated. This result corresponds closely with the results of the study 'Economic Structure and Environment' conducted by the Institute for Environmental Questions (see chapter 4).

It is worth noting that as a side-effect of the stagnation in economic growth, the current state of affairs approximates the second solution. But as soon as

economic activity picks up again – for example in response to the policies being proposed – the danger will arise that environmental investment will lag behind the minimum required for effective environmental control.

Problems have already arisen and are bound to increase in the years ahead in relation to various forms of pollution. These include sulphur dioxide (SO_2), nitrogen oxides (NO_x) and photochemical air pollution (including O_3). According to many experts, present incidents in the field of chemical waste (e.g. illegal dumping, groundwater pollution) and environmentally harmful substances (e.g. carcinogens, teratogenic and mutagenic compounds) concern merely the tip of the iceberg. Most of these forms of pollution would increase sharply if there were a conversion from gas to oil, coal and/or uranium. At any event, there will be a sharp increase in the future in the cost of environmental and energy policies. Structural policies can take environmental and energy considerations into account. By anticipating the likely development of environmental and energy costs, a pattern of specialization can be worked out designed to keep these costs to the minimum and to minimize the risk of disinvestment, a lessening of environmental standards and the need for government assistance.

With reference to a general programme to improve the structure of production, we believe that the above considerations provide a further confirmation of the insights tentatively formulated in section 5 of this chapter.

1. *Restructuring of the intermediate sector (crude oil, chemicals, steel)*

A restructuring of this kind is not only indicated in terms of the limited growth potential of basic products and the resultant pressure on profit margins and capacity utilization, but also in terms of environmental constraints, since basic products are energy intensive and heavy polluters. A restructuring of this sector would also lead to a significant improvement in the balance of trade, both in volume terms and as regards the terms of trade, since non-price factors form an important weapon against rising prices in the markets for chemical end-products, differentiated steel products and so on. These factors include product development, delivery times, after-sales service and the like.

2. *Revitalization of sensitive sectors (clothing, footwear, furniture, etc.)*

These sectors are sufficiently attractive in all respects (employment, growth, balance of trade and environment) to justify resistance to any further contraction except as strictly necessary in terms of sales and cost factors.

3. *Strengthening of the equipment sector (mechanical engineering, electrical engineering, transport facilities and instruments)*

This sector turns out to be particularly important in terms of employment, while its environmental impact is also moderate.

With a view to the future composition of world trade, expansion of this sector would also help it to adjust to the pattern of international competition.

7.6. The desirability of this overall stimulation and restructuring programme seems to us beyond doubt, but the practical prospects for such a programme are harder to assess. Our judgement is primarily based on the surveys referred to earlier of a number of respresentative branches of industry as well as on a survey of likely technological developments and the extent to which the Netherlands is in a postion to react adequately to those developments. This survey consists of a detailed summary of international technological developments, from which has been derived a list of new technological options in the form of production processes and/or products. On the basis of qualitative considerations and criteria, a selection has been made from this collection of options of possible openings for the Netherlands.

The following key points may be noted in relation to the technological openings for the Netherlands.

- The advent of micro-electronics has made 'distributed intelligence' possible. Computerization will no longer be essentially confined to large systems with large central computers. A form of 'distributed computerization' will become possible, enabling mechanization to penetrate into new areas, for example assembly, and permitting further computerization at the component level.

Particular opportunities exist for the Netherlands in these small-scale developments in the field of instruments, process control units, numerically-controlled systems, adaptive robots, 'intelligent' sensors and software.

The micro-electronics revolution means that the equipment sector offers scope for the Netherlands, provided that a number of basic conditions are fulfilled.

Large systems, such as coal gasification, will of course also remain important. Many of these systems are still too small for industrial application and must be increased in scale. This gives rise to a number of problems, expecially in the field of materials. Work is being conducted in the Netherlands on these increases in scale. Advances in high-grade, heat-resistant and corrosion-proof materials hold out long-term prospects for the Netherlands in relation to certain large systems and could provide an important stimulus to the metal sector in special markets.

- The above also applies to energy-saving techniques and environmental technology. Here too there exists scope for micro-electronics, thereby upgrading the value of the goods. The prospects remain promising, expecially for small systems, particularly if the rigidities in the energy market can be overcome. The will and know-how for production certainly exist.

- Chemicals: the upgrading of this sector holds out distinct possibilities, both in relation to the processes used for basic chemicals and in relation to new activities. Potential new activities include biotechnology, enzyme technology (biological catalysts) and special materials (engineering plastics, super-strong fibres). New processes might include environmental measures, energy conservation (embodied or disembodied in the main processing apparatus) and conversion to new raw materials.

- Sensitive sectors: as noted previously, the real sticking points in this sector lie in the fields of management and marketing. Developments are also taking place at the technical level in this area making it possible for countries with relatively high costs to produce profitably, although the market will have to be approached in a highly selective way.

7.7. In terms of the government's capacity to redirect economic activity, regional variations in know-how can be a factor of some importance for the new activities mentioned above. The special importance of the knowledge factor has been analysed in general terms in chapter 3.1.

The implementation of a selective stimulation programme demands specialized knowledge: technological and organizational knowledge, and understanding of the demands of the market, allied to an adequate level of creativity. Existing or newly acquired knowledge should therefore be put to optimal use in the Netherlands.

The smaller a country, the less marked regional variations tend to be. This applies to a number of but not to all the relevant factors of production. In particular, the availability of know-how as a factor of production may vary widely between regions on account of the regional distribution of educational and research establishments; the distribution of knowledge in relation to existing industrial activities; the lack of human mobility; and the limited geographical range of an effective, creative exchange of information. This means that certain new activities particularly dependent on industrial know-how will get off the ground more quickly and cheaply in certain areas than in others, or will in short stand more chance of success. In mobilizing the relevant sources of industrial know-how and creating an appropriate regional climate for selected industrial activities, the government can play an important part.

The role that sources of know-how can play in innovation has often been pointed out. The Innovation White Paper, published by the Dutch Government in 1979, proposed a structure of 'transfer points' at Institutes of Technology (and other institutions). Provided certain conditions are fulfilled, great advantages may be obtained by supplementing such structures with clusters of selected industrial activities. Such activities should be sufficiently closely related to enable cross-fertilization, while at the same time being sufficiently different to avoid the development of industrial monocultures. The influx of recent graduates provides a direct means of transferring know-how, especially if they retain their links with their Institute. These clusters of new enterprises can form a type of vanguard establishing a link with sources of know-how and preparing the way for industrial redevelopment. The innovation-oriented climate produced in this way can stimulate other industrial activities in the same area or elsewhere.

In this respect the government's role can concentrate on:

- the provision of special assistance to selected activities, i.e. explicit cluster formation;
- adapting the educational system as necessary;
- the creation of a favourable entrepreneurial climate at the regional level for the selected activities; the government can also play an active part, by attracting entrepreneurs.

The regionally differentiated approach outlined above will result in selective government intervention in the regional industrial structure. There are risks as well as benefits associated with selective interference, and it should be conducted in such a way that expansion in other areas is not checked.

The approach suggested above of a selective stimulation programme can be made considerably more effective by basing industrial development on regional clusters. It should be stressed that we are concerned here with derivative regional development policies, that is regional specialization in relation to industrial redevelopment. Regional concentration based on existing centres plays an important part in achieving redevelopment as quickly and successfully as possible. The proposed concentration would not impair general regional development policies.

The diagram sets out the substantive detail of such a regional clustering.

Figure 6. Regional clustering of selected new industrial activities

TWENTE

Micro-electronics
- numerical control systems
- robotics
- dedicated chips
- interface system/chips
- (intelligent) sensors
- software

GRONINGEN
- medical aids and apparatus
- recombinant-DNA (esp. pharmaceutical)
- special materials (esp. polymers and their application)

WAGENINGEN
- bio-organic technology
- fermentation technology
- enzyme technology
- recombinant-DNA

GENERAL
- energy (conservation) technology
- hydraulic engineering/offshore
- special materials
- raw materials processing technology
- carbon chemistry
- process equipment (relatively small-scale)

DELFT
- instruments
- process control equipment
- sensors
- transport regulation systems
- telecommunications

EINDHOVEN
- energy techniques (solid state, control units, et.)
- special materials
- telecommunications

The figure shows a number of industrial activities which could be given special stimulation in the regions concerned, making use of existing concentrations of industry and the presence of technical colleges and universities. 'General' includes activities that can either best be grafted onto existing industrial activities and the geographical concentration of such activities, or which tend to be so widely distributed as to make it unworthwhile for the government to promote their regionalization.

8. Activating our technical innovation capacity

8.1. The main subject of this study concerns the adjustment of the structure of production in the Netherlands to the international pattern of competition. In section 5.6 of this chapter three requirements were laid down for the future industrial structure, namely:
- greater versatility;
- adaptation of the range of products produced;
- greater emphasis on product differentiation and non-price factors.

The contribution that a selective programme of stimulation could make to the achievement of these objectives was considered in section 7. A major factor in assessing the impact of such a stimulation programme on the level of economic activity in general consists of the multiplier effects on other sectors. A number of conditions must, however, be fulfilled if these multiplier effects – which may be demonstrated in the multisector models – are to be realized. In this respect technological innovation plays a major part. Technological innovation will be essential on a broad front if the Dutch corporate sector is to assume a satisfactory position in the pattern of international competition, especially with a view to product differentiation and the required reshaping of the product mix.

To this should be added the fact that small and medium-sized in this country are relatively vulnerable, in that the pace of technological change in large industrialized countries is accelerating, based on the one hand on a large

domestic market and on the other on significant government assistance towards research and development (R & D). In the United Kingdom and the United States, for example, some 40-45% of total government funds for research are directed to industry, as against a mere 5% in the Netherlands. The government's Innovation White Paper 1979 proposed that in the case of a number of additional stimulatory measures this should be increased to 15%.

According to this report, government subsidies of N.Fl. 150-160 m. in 1980 should be primarily used to subsidize research contracted out to small and medium-sized firms, thereby mobilizing the country's available technical potential. The practical details of the way in which this should be done remain to be worked out.

8.2. Small and medium-sized firms lacking R & D facilities of their own are required to rely on technical assistance from 'mission oriented' research institutes, of which TNO (the Netherlands Central Organization for Applied Scientific Research) is by far and away the largest. Less than 20% of the budget of this government organization, which has a staff of around 4,800, goes on contract research for industry – although ironically this is the purpose for which it was established (apart from conducting research in behalf of the government). It enjoys a substantial basic government subsidy of over 50% for unspecified research purposes, while around 25% of its work consists of government contract work.

The low percentage of research specifically for industry is a lack that seriously calls into question the effectiveness of TNO.

As far as the Innovation White Paper is concerned, it would have been more logical to have stressed the fact that N.Fl. 200-250 m. is allocated to TNO alone for unspecified research purposes. Priority should therefore be given to specifying the purpose to which these funds should be put, without the need for any increase in the level of public funding. The Innovation White Paper, it is true, does note the desirability of expanding contract research at TNO. It is suggested that such research might rise from 20% to around 30%, with an annual increase of 4%. The White Paper does not, however, indicate how this might be achieved. This point has been examined in detail in the rapport of the Council especially in relation to the operational requirements of effective R & D for technical innovation projects.

8.3. Based on the experience of large enterprises with their own R & D facilities, the process of technological innovation was decribed as a chain of operations, in which non-technical expertise also played a vital part and needed to be operationally integrated in a team context.

A range of expertise should also be brought to bear before a project gets under way in order to reduce the risk of mistakes being made in project selection and definition. Important aspects include market surveys, cost-benefit analysis, the financing of the proposed stages of the project and planning.

In general successful projects are characterized by the fact that as they progress they focus increasingly on production aspects. The process of innovation is a dynamic one requiring professional 'interface management' and intensive 'project management' within the R & D organization. In these respects it may be necessary to change the composition of the team as the project progresses. A project matrix system is frequently employed in industrial R & D laboratories concerned with applied research. Such a system cuts 'horizontally' across the 'vertical' administrative hierarchy under the supervision of the project leader. In general, non-specific or pure research of an exploratory and future-oriented kind accounts for only some 10-30% of the R & D work done in industrial laboratories, while the remaining 70-90% consists of applied research.

Leaving aside some N.Fl. 100 m. in the form of government contract-research, this relationship is reversed for the remainder of TNO's budget of approximately N.Fl. 330 m. (1979); instead of being 1:3, as in the case of industry, the ratio at TNO is 3:1.

This large difference is undoubtedly explained by the special nature of the work carried out at TNO. If external questions, including unexpected questions, are to be answered promptly, knowledge is required over a broad front. Never-

theless it may be asked whether the knowledge accumulated within TNO has not become over-theoretical and is insufficiently geared to the practical requirements of small and medium-sized firms. If industrial R & D is taken as a yardstick for the way in which TNO should operate, this would mean that the present level of industrial contract-research should be increased by a factor of around 2.5.

8.4. There is no lack of scientific knowledge within TNO. This knowledge covers a wide range of natural sciences. In the light of TNO's great potential, the report examines in detail possible means of improving the situation. This has covered the inter-relationship between the financial structure of TNO and operational aspects. The recent appointment of a Board of Management for TNO as a whole holds out the prospect of improvement.

The principal policy implications of our analysis may be recapitulated as follows:

- basic scientific work at tertiary education establishments in the Netherlands is generally at a high to very high level. It is, however, highly fragmented so that, while diverse, it also tends to be small-scale.

These institutions are of major importance for the assimilation, processing and transmission of knowledge, and therefore play a key role in applied science. The industrial application of this stock of knowledge is, however, confined to specialist organizations for this purpose, the so-called 'mission oriented' research institutes. The industrial application of knowledge must therefore rely heavily on information on developments in other countries, supported by Dutch experts at universities, technical colleges, (semi)government bodies and where possible also industrial R & D laboratories.

- Data on knowledge only lend themselves to formal organization with regard to the location of such knowledge, especially where computerization is concerned. This opens up scope for government assistance.
- Most small and medium-sized firms in the Netherlands suffer from the disadvantages of having narrow horizons, being comparatively small-scale and lacking adequate research and development facilities. These factors particularly limit their ability to introduce new technical concepts and systems promptly. The great diversity of product types and production processes mean moreover that one cannot speak of a single R & D (innovation) strategy for all small and medium-sized firms.

The pace of scientific and technology change is accelerating in a number of areas, with a marked degree of mutual interaction between the two. The ability to respond adequately and in good time to such changes requires a multidisciplinary research capacity generally far beyond the ability of the individual small or medium-sized firm. Such firms must therefore rely on outside research establishments for technological innovation, as well as on private advisory and technical design offices that are sufficiently broadly-based and capable in organizational terms of conducting applied-research projects right up to the manufacturing and marketing stage where the firm itself can take over.

- Organizationally, TNO fulfills the requiments for R & D conducted on behalf of small and medium-sized firms. In practice, however, TNO has generally not measured up to expectations. Apart from government contract-research, a disproportionate amount of government funds are allocated towards pure research. Measured in terms of the nature of the activities carried out under the various expenditure headings, TNO's industrial efficiency in relation to large industrial R & D laboratories is no higher than 30%.

This imbalance between pure and applied research is due to a complex of causes. The principal of these lie in the operational sphere, where TNO deviates sharply from the industrial model of applied R & D. The fact that TNO has grown in both size and range in recent years should in principle make it a major potential source of stimulus for innovation for small and medium-sized firms without a requirement for additional public funds. This would however require radical changes in TNO policies. A major element would consist of increasing the industrial contract-research by a factor of 2.5. In practical terms, such changes would be highly demanding and would require careful administration. The current reorganization affords a good opportunity.

9. Generic versus sector-specific policies: advantages and disadvantages.

9.1. The conclusion was reached above that the continuity of the Dutch economy could not be assured. In order to alter this, company employment would have to increase by 1% p.a., which would only be feasible given a 4% p.a. real increase in company value added (see section 4.4 of this chapter). This represents a major shift in the basic projections for 1985, since employment would have to grow by over 1% on those projections and value added by an extra 1%. Government policies must geared towards such a shift. In view in the instability of the balance of trade, strengthening external equilibrium would form an additional policy goal.

These changes can however only be achieved if the economic structure is improved. The question then arises as to whether the structural policies required should be of a general or a selective, sector-specific kind, or whether these two policy options may be regarded as complementary in that the one compensates for weak points in the other. The following criteria have been taken into account in this weighing-up process:

- effectiveness in relation to economic and non-economic policy aims;
- practical feasibility;
- 'costs' of these respective policy options (i.e. unintentional side-effects);
- degree of complementarity.

9.2. Before proceeding to this weighing-up process it is worth considering several aspects of the current economic situation which pose particular problems for the government or where other considerations must be taken into account.

In relation to production, consumption expenditure is at present at a high level. This situation is, however, coupled with a significant degree of excess capacity. Cutting back consumption would create the risk of a slump in demand, which would only aggravate the problem of excess capacity and possibly lead to a downward economic spiral.

What is required in macro-economic terms, therefore, is for demand to be reallocated in such a way that any vacuum created by a reduction in consumption demand is immediately filled by a rise in investment demand. This therefore comes down to a matter of judgement, that is, which set of policies will best enable consumption demand to be cut back at much the same time as investment rises.

On the assumption that the adjustment of the economy will have to be linked to an increase in the gross investment ratio of enterprises, and given the limited self-financing capacity of the corporate sector, the question arises as to how this investment is to be financed. In this regard the financial position of the government plays a key role. A further increase in the budget deficit creates the risk of crowding out referred to earlier, although this risk might be qualified if the budget deficit were increased in order to recycle private capital back to the private sector for investment. In addition it must be borne in mind that a substantial investment push can in the short term adversely affect the balance of payments. The decision taken will depend on the way in which consumption expenditure is to be curtailed after taking into account marginal import propensities. At any event these considerations form a cause for restraint with regard to any increase in the public borrowing requirement.

This issue must of course be seen in relation to the fact that there has been a shortage of private savings in recent years, while compensation for this by means of government savings has declined. To bring about the changes outlined above, therefore, the savings ratio would have to rise.

Finally there is the situation in the labour market, where the existing bottlenecks could form an obstacle towards the implementation of large-scale investment programmes.

9.3. On the basis of the model-variants tested, which examined the economic effects of both wage restraint and a sector-specific approach, certain conclusions may be drawn about the respective effectiveness of the two approaches. The results should, however, be interpreted with caution, since models are only

an approximation of reality, and the link between the models and policy is therefore not a direct one.

The wage-restraint variant takes several forms. One of these is aimed at improving the position in foreign markets by reducing export prices through a lower rise in money wages than that anticipated in the basic projection. Where the elasticity of exports exceeds unity, the resultant growth in the volume of exports will boost the level of company activity and thus employment. This will also enable the continuity condition to be fulfilled that company profits should grow at least in proportion to value added. The rise in investment could then be financed out of undistributed income.

According to the model-results, restraint in money wages can in these circumstances readily be coupled with a certain rise in the real primary labour costs of companies, but this rise would have to be lower than that associated with an unchanged trend in money wages. Each percentage point reduction in money wages leads to a reduction in real primary labour costs of approximately 0.2%.

A significant factor in these model-calculations of the wage-restraint variant consists of the size of export price elasticities. In this respect use has been made of the estimates made on an industry branch basis by the Central Planning Office during the 1960s.

More recent estimates for individual branches of industry are not available. On average the above estimates correspond closely with a macro-estimate based on up-to-date data; this placed export elasticity at —1.15. Assuming export elasticities of between —1 and —2, the model suggests that limiting the growth in money wages to 3-4% p.a. over the entire projection period would be consistent with the objectives set for employment and growth. Real primary labour costs would rise by only a little over 1% p.a. There could, however, be a deterioration in the balance of trade because of the worsened terms of trade resulting from lower export prices.

In view of the instability of the balance of trade, an effect of this kind would have to be viewed as a limiting condition, especially if the impact of balance of payment deficits on economic activity is taken into account.

As noted earlier, these calculations are dependent on the estimated magnitude of the elasticity of exports. If this elasticity should turn out to be much higher, as has been suggested in recent literature on the subject, the desired effects could be achieved with much smaller price adjustments. At the same time the limiting conditions noted above would carry much less weight. On balance, however, we consider that one cannot rely on export elasticities being higher, for two reasons:

- if the demand for our exports were so elastic exporters would long since have exploited the fact by improving their position through price cuts: small cuts in profit margins would have led to substantial improvements in capacity utilization. This reasoning does not of course apply to branches of industry where profit margins have been squeezed excessively;
- given relative stability in world demand, an increase in the volume of Dutch exports would have to be at the expense of competing suppliers.

In these circumstances account has to be taken of the fact that competitors would respond to any price cuts, and that this could lead to a dangerous price-cutting spiral, so that in the final analysis the volume of exports could only be increased if substantial price cuts were made. The objection that the Netherlands has only a small share of world trade and would therefore have little to fear from such a spiral process does not hold good in so far as there are certain categories of goods and foreign markets of importance to us in which the Netherlands holds a significant share. In other words, in assessing export elasticities in an ex ante sense, one cannot necessarily base one's estimates on ex post elasticity values.

Given the structural problems of Dutch exports to which reference has been made several times, excessive expectations should not in general be entertained of our ability to improve our competitive position by means of the price

mechanism. At the same time this is not in any way to deny the importance and urgency of possible price cuts.

All things considered it would appear that there are certain limiting conditions inherent in the wage-moderation approach which become more exigent the higher the required level of wage restraint. If the objectives in question are to be achieved through wage restraint alone, these limitations begin to carry considerable weight.

Another variant of the wage-restraint approach – which could for that matter operate in conjunction with the above variant – would go some way towards overcoming these limitations. In this variant export prices are not reduced so that wage restraint basically benefits undistributed income, thereby increasing company profitability. This would of course amount to real primary labour costs remaining constant or falling, which would in turn affect the volume of private expenditure.

Under this variant it is envisaged that this drop in private expenditure would be largely compensated for by lower taxation; and given the limits reached by the public borrowing requirement, this would in turn lead to cuts in government expenditure, which would according to model-computations have a substantial impact on employment.

The regenerative effect of wage restraint under this approach would consist entirely of the spontaneous recovery of company investment. There would be no immediate effect on employment as under the former variant, while the net prospects of a reduction in demand would tend to be high. The ultimate goals could therefore be nullified by the immediate consequences.

The problems associated with the second variant recently formed the subject of discussion between the OECD's economic advisers and policy makers in The Hague concerning the appropriate economic policies for the Netherlands. In their draft report the OECD advisers tended to stress the potential fall in expenditure, which would come at a particularly bad time for Dutch industry and enterprise.

9.4. Sector-specific policies would be designed to operate through company investment. As part of the shift in policy geared towards the fulfillment of employment objectives, such policies would be designed to bring about the required expansion of capacity together with the associated volume of investment.

In relation to the basic projection up to and including 1985, this would mean that the volume of gross company investment would have to increase by some N.Fl. 4 billion (1970 prices) a year. At 1980 prices this amounts to over N.Fl. 8 billion extra a year.

This sum includes depreciation and, since we are concerned here with new projects in which the replacement element will initially be low, net investment may for the next five years be put at around N.Fl. 7 billion a year.

Sector-specific policies do not envisage this full amount being borne by the government. Nor would this be necessary, since new projects would have multiplier effects on investment in other sectors. Taken over all sectors of industry as a whole, the value of this multiplier (i.e. the total volume of investment generated in all sectors in relation to the initial volume of investment in the sector selected for stimulation) may be put at around 2.75. At the same time there are certain sectors, especially the equipment sector and the 'sensitive' sectors, where the multiplier is rather higher, and others, such as the intermediate sector, where it is lower. In the equipment sector the value of the multiplier is nearly twice as high as the average. The selective element in this approach therefore consists of making use of the multiplier effect, while the specific aspect consists of concentrating on those sectors with especially favourable prospects. Certain other conditions must of course also be taken into account, in that the expansion of capacity must be feasible and realistic.

9.5. On the basis of the general stimulation programme discussed earlier it should in principle be possible to achieve a multiplier-effect in the order of 3.25. This would mean that the volume of investment under such a programme would have to be a little over N.Fl. 2 billion a year (at 1980 prices).

Selective stimulation and the multiplier-effect discussed above can clearly only be achieved if:

- the projects undertaken increase the effective penetration of the Dutch economy in international markets and do not simply replace activities that would have been undertaken in any case;
- the projects initiated are successful, i.e. that sufficient demand exists for the capacity created and that this capacity can be operated at a normal level of utilization (apart from initial setting-up losses).
- selective stimulation is linked to a general programme aimed at improving the investment climate.

The great potential advantage of a combined approach of this kind is that it would avoid the risk of a slump in demand: recovery would not bank on spontaneous regeneration, about which there must be doubts, but would be based on the interaction between active stimulation and generic improvement.

9.6. The generic approach can also help non-economic objectives to be fulfilled. This applies to environmental protection, the quality of work, and physical planning and regional development.

As far as the environment is concerned, a system of levies, physical regulation, subsidies and permits has been developed, although no environmental quality standards have been laid down legislatively.

The Council takes the view that priority should be given to the legislative establishment of environmental quality standards. To enable industry to react in time the best course would be for the phased introduction of environmental standards. In the interests of legal security and the physical coordination of policies at the various levels of government, normative standards (sometimes referred to as 'qualitative norms') should be spelled out at the same time.

In recent years the required selectivity in environmental control has not managed to get off the ground. The need for such selectivity also became less pressing with the decline in economic growth, which was particularly marked in the more pollutant sectors. In view of their lack of international competitiveness there was an understandable reluctance to hit these sectors with environmental control measures. As it happens, the branches of industry most suited for selective stimulation in terms of economic objectives also fit in with environmental objectives. This is a decided plus in favour of selective, sector-specific policies.

The selective stimulation proposed in this report would also help the Netherlands make a contribution towards the international division of labour, in that the modernization of the Dutch economy would mean that the Netherlands would be less obliged to cling tenaciously to products with little or no future in the medium term.

The revitalization of the sensitive sectors could, however, come into conflict with this consideration. In this regard it should once again be stressed that the ground lost by the Netherlands has been largely filled by imports from industrialized countries. The revitalization would therefore need to be concentrated on those segments of the market.

The quality of work would be another relevant factor in terms of the proposed policies. The quality of work may be divided into three main constituent parts:

- working conditions, i.e. the overall circumstances in which productive activities are carried out: noise, light, temperature, subservience to machines are the main determinants, while safety can also play a part;
- intrinsic labour factors, meaning the existence of autonomy, variety, the pace of production, the required skills and training, and the scope for self-improvement;
- extrinsic labour factors, such as pay, training facilities and promotion prospects, job security, psychological benefits.

The branches of industry singled out above for selective stimulation largely on purely economic grounds are not characterized by relatively poor working conditions; indeed, innovative activities are much more likely to be associated with pleasant working conditions.

As far as intrinsic labour factors are concerned, a selective programme of stimulation will not automatically lead to an improvement. Given the wide range of skill levels and scope for self-improvement in potential new employment and the trend towards higher qualifications, there would be a case for using selective stimulation to help coordinate the demand and supply of labour in the future. Specific allowance would then have to be made for this aspect in government policy.

Finally extrinsic labour factors, especially job security, which have an important bearing on willingness to accept jobs in industry, would be greatly promoted by the redevelopment and strengthening of the Dutch industrial structure.

In view of the importance of each of these constituent parts for the quality of work, the Council believes that selective stimulation should have these objectives in mind. This would also be of value in relation to labour motivation and the industrial climate.

There is also a case for selective stimulation in terms of physical planning and regional development. By means of greater environmental control, the upgrading of the bulk chemicals and base metals industries, heavily concentrated as they are in Rijnmond, Moerdijk, the North Sea-Canal area and South Limburg, can lead to an improvement in the human environment in the most densely populated parts of the country. The stimulation of the textile, footwear, timber and furniture industries in North Brabant, Overijssel and Gelderland can help further the official objective of urban development outside the conurbation in the Western part of the country known as the Randstad. The same applies to strengthening the capital goods industry and to the proposed strengthening of regional innovation in conjunction with the University of Groningen, the Institutes of Technology of Twente, Delft and Eindhoven, and the School of Agriculture at Wageningen. Finally there is the very general consideration that, as experience since the Second World War has shown, prosperity differentials between the Randstad and the problem areas tend to grow disproportionately at times of economic stagnation; conversely a general strengthening of the economic structure has a specially beneficial effect on weaker regions.[16]

Taking non-economic objectives as a whole, we believe that it may fairly be argued that a programme of selective stimulation as we have proposed would have a beneficial effect, not least because of the improvement in the industrial climate it would produce.

9.7. Wage moderation has remained an instrument of official economic policy, even after the tripartite wages and income policy came to an end. Wage restraint is encouraged in the belief that the level of economic activity is related in general terms to the level of wages.

This affects competitiveness, as well as the distribution of value added between wages and other income (profits and profit expectations) and the room for the public sector.

Nevertheless the link between wages and the level of economic activity is not a straightforward one. Recent increases in the price of imports as well as the composition of the Dutch package of imports and exports impose certain constraints on the actual effects of wage restraint; and the recent stability in international markets of importance to the Netherlands has meant that it is less easy to predict those effects. Apart from wage trends there are other structural factors – of a more specific nature – that determine the international competitiveness of Dutch industry. This is something that could be taken account of by means of the selective stimulation of investment. Partly for this reason, wage restraint does not necessarily deserve support as the sole remedy for recovery.

[16] C.P.A. Bartels, 'Regio's aan het werk: ontwikkelingen in de ruimtelijke spreiding van economische activiteiten in Nederland' (Putting Regions to Work: Trends in the Regional Distribution of Economic Activity in the Netherlands), WRR serie Voorstudies en achtergronden (Preliminary and Background Studies), The Hague 1980.

At the present time the government has no direct control over either wage formation or company investment. It could, however, introduce the necessary controls if this were dictated by circumstances. The required legislative framework already exists in the case of wage determination, and could be introduced for the selective stimulation of investment. In both cases, however, they will only be effective instruments of policy if they rest on widespread acceptance.

In the case of selective stimulation of investment there is at least one additional factor of importance, namely the creation of competence and expertise for the successful administration of such policies. In view of recent experience with government intervention in the private sector, this is not something to be dismissed lightly.

The Council attaches great importance to the fact that such policies should be administered on a fully professional basis. On the one hand this necessitates a high degree of expertise and reasonable room for manoeuvre to enable such policies to be efficiently formulated, implemented and supervised within the set limits. On the other hand there will have to be a clear demarcation, in the sense that the basic political decisions about the appropriate structural policies are left to the government and Parliament.

Assuming that these policies rested on widespread acceptance, we believe that there are sufficient precedents in Dutch industrial development to ensure that they would not fail on account of their inherent difficulty of implementation.

9.8. The strengthened grip of the government on economic activity would be widely regarded as the major undesired side-effect of such policies. In particular there would be two mutually-reinforcing effects: first, escalation on the part of the government itself with even further intervention if such policies were to fail. Secondly, the acceptance of greater responsibilities by the government could lead to the displacement of responsibility onto the government by the private sector. This study could be seen in terms of the escalation theory according to which the failure of public assistance to industry almost invariably leads to a quest for ways to strengthen such assistance rather than to abolish it.

This side-effect also applies in the case of government wage controls. Such controls begin with a wage freeze which must then be converted into more sustained wage measures. The desire to avoid compensatory wage rises once the freeze is lifted can result in statutory wage controls, thereby leading to rigidity rather than greater mobility in the labour market.

We consider that the risk of greater government intervention should be taken seriously. But at the same time it should be borne in mind that this is a matter of assessment: there are not only risks associated with government intervention, but the lack of intervention can also lead to an uncertain situation in which the economy slips steadily out of grasp and the capacity for recovery is weakened. These considerations have prompted us to conduct a detailed examination of the merits of such a policy and not to fall back on the view that the government provides support to industry in any case and that this could be improved.

With a view to limiting these risks, selective, sector-specific policies have deliberately been made subject to certain limitations in the report:

- by essentially linking such policies to specific circumstances: i.e. they have a 'reserve function' that only becomes activated when circumstances demand;
- by not interfering with business freedom and deciding that intervention should be conducted in conformity with market principles;
- by limiting such policies at the operational level: market structure and urgency;
- by making it conditional upon professionalization and objectification.

Now it could be maintained that these limitations belong to the realm of good intentions and that the actual implementation of such policies and the establishment of governmental machinery would set in motion forces that would tend to transgress those limits.

We believe that this issue can also be approached in another way. By the end of the 1950s, when circumstances had totally changed, the post-war system of government intervention or 'guided economy' that arose in response to the shortages and bottlenecks of the time, had been completely dismantled. In our

view, the belief that there is a relentless drift towards ever greater government interference fails to do justice to the strength of counter-movements.

Nevertheless, there is a need for caution in this regard, and in drawing up the institutional framework for sector-specific policies we have decided to include the additional safeguard of a set time-limit in order to prevent the risk of policies remaining in force irrespective of the need for them or their actual effectiveness. Such a time-limit – which might be in the order of five years – would create scope for policy review in the light of changed circumstances and understanding.

As far as the operation of the labour market is concerned, serious consideration should be given to tapping the latent supply of labour effectively. This means that the scope should be reconsidered of the disablement regulations, and that greater emphasis should be placed on labour market coordination problems, from both the supply and the demand side. There are indications that both sides of industry are prepared to cooperate in this – a willingness that might be increased now that the intensification of labour market policies is seen as a real alternative to a statutory wages policy.

9.9. The Dutch economy faces the need for far-ranging adjustments to the structure of production. The current situation is often likened to that in which the Dutch economy found itself after the Second World War. There are however certain important differences between then and now:

- international trade was then growing strongly: now growth is much more moderate;
- at that time no industrial sectors had reached the stagnation or decline stage; now some have;
- at that time costs were at a relatively low level: now labour costs have weakened our competitiveness.

If the growth in international trade continues to be moderate, the competitiveness of Dutch industry assumes all the more importance.

These circumstances justify a greater degree of government intervention in order to bring about the required adjustments in Dutch industry. The scope for structural and selective, sector-specific policies should be used in conjunction with one another. If the basic problem is seen in terms of rigidities in the structure of production, this means that there is not just room but a requirement for complementary, mutually reinforcing policy measures. This applies not only at the psychological level – however important that may be – but also in purely economic terms. The timing of the effects is also important: sector-specific policies do not have an impact in the short term, while lags are generally shorter in the case of generic structural policies. In this respect the level of costs is of particular importance.

At the same time, generic structural policies cannot be expected to be geared towards structural factors of a more specific nature which significantly affect Dutch international competitiveness; nor can a selective stimulation programme generate a sufficient multiplier effect without an improvement in the overall climate. The task must be to lay the foundations for a system of production which is sufficiently adapted over the coming decades to meet the requirements for continuity and selectively. Sector-specific policies form an indispensable part of this process.

9.10. There are certain institutional requirements if sector-specific policies are to act as a complement to generic policies.

It would not be appropriate for the Council to go into detail on this point, and the report deals with it only in outline. Foremost in the Council's thinking is that the political responsibility for deciding the fundamental nature and scope of structural policies must reside with the government and Parliament. With regard to determining the way in which such policies might actually be implemented, we believe (as set out in more detail in chapter 5.1) that there would be a lot to be said for the legislative appointment of a Government Commission on Structural Policy with a high measure of expertise and independence and its own budget under the Appropriation Act.

With regard to the practical implementation of such policies, we would envisage the establishment of a National Economic Development Corporation. On the basis of the guidelines laid down by the Government Commission, this body would extend financial assistance to appropriate companies and new projects. In addition there would be separate sectoral committees for each branch or sector of industry covered by structural policy. These committees, which would come under the Government Commission, would be responsible for the specific preparation and implementation of policies in particular sectors. This would at the same time enable appropriate use to be made of specialist expertise in individual branches of industry.

10. Recommendations

In the Council's considered judgement, the continuity of the economy, as measured by the attainability of economic goals, cannot be assured under present circumstances. If the principal objectives as laid down in the Central Economic Committee's report – i.e. employment, growth and external equilibrium – are to be realized, a strengthening of the private sector will be required, starting with manufacturing industry.

This calls for government policies consisting of a combination of sector-specific and generic structural policies. The judgement that such policies are needed is based on an assessment of the discrepancy between the current structure of the economy and (a) the sort of structure required for the attainment of economic objectives and (b) the self-regenerative capacity of the economy, as well as on an assessment of the political and social implications of government intervention. An attempt has been made in this study to break through the doctrinaire nature of much of the discussion about the appropriate policies and to base the choice of policy on a professional and as far as possible objective balancing of costs, benefits and risks.

In the Council's judgement such policies would be inherently capable of implementation because:

- our understanding of the economic consequences of structural measures does not differ intrinsically from that related to macro-economic regulation, although in the case of the latter policies there is a longer history and more experience in the Netherlands;
- the instruments required for sector-specific policies (i.e. the administrative organization) are perfectly conceivable and well within the bounds of practical possibility.

Nor does the Council believe that these policies should be avoided because they would give rise to significant undesired side-effects.

The policies proposed could also help further a number of non-economic objectives, which may be regarded as a further point in their favour.

More specifically, the Council considers that industrial adjustment could be focussed on:

- upgrading the intermediate goods sector;
- revitalizing the 'sensitive' sectors;
- expanding the capital goods and equipment sector.

There are persuasive indications in favour of the need and scope for selective policies of this kind. Further consideration needs, however, to be given to the operational aspects before such policies could be responsibly undertaken. This goes beyond the Council's scope; instead the Council has attempted to devise a new approach towards government policy and to draw the attention of policy-makers to specific options. Following the publication of certain policy reports by the government, the need was commonly expressed in the subsequent consultations between Parliament and the government for an comprehensive approach into which policies in specialized areas could be slotted, thus giving them more substance and facilitating their coordination.

An attempt has been made in this survey to devise such an approach and to tackle individual areas of policy in an integrated manner.

With regard to the administrative organization required for sector-specific policies, the appointment is envisaged of a Government Commission and a number of sectoral committees coming under it, together with the establishment of a National Economic Development Corporation. The Council is well aware that such an elaborate institutional structure might contain the seeds of subsequent rigidity. This applies, however, to any policies of comparable size and range, and forms a reason for caution and the avoidance of precipitate action. The Government Commission would play a central role in the overall framework. It would be premature to advise the government at this stage to set up these elaborate administrative arrangements all at once.

In view of the fact that the operational aspects of such policies must still be examined, the Council believes that at this stage the appointment of the proposed Government Commission would suffice. Its terms of reference should at first be limited to the short-term drawing up of an operational policy programme on behalf of the government and Parliament. These policies and the required administrative machinery could be subsequently expanded in the light of the Commission's findings.

Specific and generic policies should be regarded as complementary. If sector-specific policies are not to run up against bottlenecks, they will have to be accompanied by appropriate general policies of a more general nature. These would include improving the operation of the labour market, in relation to both wage formation and the coordination of supply and demand.

For sector-specific policies to have the intended multiplier effect presupposes a general improvement in the industrial climate. The various policy aspects at issue here are examined in detail in chapter 5 of this report, which recommended:

- more active trade policies, aimed at consolidating the position of the Netherlands as best as possible in the short term and at actively promoting specialization and product differentiation in the medium term;
- strengthening innovation and management, especially on behalf of small and medium-sized firms;
- environmental policy, especially with a view to increasing policy predictability, both with regard to the protection of citizens and with regard to the legal security of companies.

A number of specific proposals and suggestions with regard to these aspects of generic policies have been made in chapter 5.

Prof. Kolnaar does not share the principal conclusions and recommendations set out in chapter 6; he also attaches different significance to the analysis and observations on which those conclusions are based. In this regard he submits the following.

1. General effectiveness of structural policies in theoretical terms

Broadly speaking two theories may be distinguished in economic theory, demand theory and supply theory. In theories of the former kind the multiplier concept occupies a central analytical position. By means of the multiplier, any boost in demand (for example by budgetary means) has a more than proportionate effect on economic activity and the level of employment. It is of less consequence whether such a boost in demand occurs in consumption, exports or investment. What is important is that the chain process of increased demand leading to increased output and thus to increased income and increased demand should be able to run its course unimpeded. This will be the case as long as there are no obstacles with regard to the available input factors, the actual disposal of sales or monetary factors.

In contrast the second theory stresses the available input factors. Apart from demand, the supply side occupies a central place in these theories, the two being linked by price formation and markets: markets for finished products (in relation to the problem of sales in the light of demand and the productive capacity) as well as for the means of production (labour and capital) and financial resources.

These two theories lead to quite different conclusions, for example in relation to the selective sectoral investment policy put forward in this report. According to demand theory, sectoral investment impulses will for example have a beneficial effect on employment, especially in labour-intensive sectors. This would apply in both the short and the long term.

According to supply theory, by contrast, and for that matter integrated supply and demand theory, a reallocation of investment will exert scarcely any long-term influence on overall economic development (assuming the reasonably efficient operation of the markets). According to supply theory the structure of production in a country is determined in the long term by:

- technological possibilities and developments, both national and international;
- the pattern of and shifts in domestic and foreign consumers' preference;
- the specific characteristics of a country in relation to climate, location and natural resources and the qualitative and quantitative aspects of labour as such and in relation to other factors of production.

The above factors have a structural impact on costs and prices and thus on the structure of production. The question arises as to the extent to which these factors can be controlled and regulated by means of various long-term policies such as science policy, innovation policy, education policy, competition policy in all markets and possibly consumer policy, rather than by sectoral investment policies dealing with symptoms. If this sort of control outside the markets does not exist, this necessarily means that the structure of production is also ungovernable over the long term (quite apart from the desirability on other grounds of such policies and control). In the opinion of this member of the Council, the above report tends to place exclusive emphasis on those observations and model studies which are based on demand theory.

2. Expectations with regard to structural policies

The report is at least moderately optimistic about the potential effect of structural policy on the realization of the objectives of economic growth, employment and balance of payments equilibrium. But this optimism stands or falls according to the way in which sectoral demand develops in response to sectoral invest-

ment stimulation within the context of demand theory. If no additional demand is forthcoming for the finished products of a particular sector, the expansion of the productive capacity by means of government investment will only lead to difficulties.

Apart from current account deficits, difficulties may arise in the form of price under-cutting and excess capacity on account of surplus supply, thereby leading to lower profit margins, reduced investment and possibly even to the elimination of all companies in the sector. In these circumstances the policy would obviously backfire. The report tends to skate lightly over these risks. As noted previously, in economic terms the proposed sectoral policies hinge on the scale of and internal differences between the estimated employment multiplier effects of sectoral investment stimulation.

The model studies drawn on in the report were based on exogenous domestic and foreign sectoral sales impulses. They then examined how much additional productive capacity would be needed to cope with the rise in sales, and hence the amount of additional investment. But in the report matters are reversed: it takes sectoral investment stimulation as the starting point, and banks on the generation of extra sales through the multiplier process. In theoretical terms this is a curious approach. Why should our exports and/or domestic consumption rise if the productive capacity is increased? Will that not depend among other things on price-fixing, the implications of which the report fails to examine? Moreover, on the assumption that companies themselves were unaware of any such potential demand and therefore conducted cautious investment policies, on what grounds would the government arrive at a different view of matters and undertake additional investment, when it does not itself possess the relevant information but must obtain it from the private sector?

The budget provides the government with a means to redress incipient shortfalls in macro-demand. But imbalances in sectoral demand are another matter. The government will only preside over the necessary set of instruments required for structural policies (as indeed forms part of demand theory), if in addition to controlling investment it is also able to control domestic and foreign demand at the sectoral level. Had this been posited, it would have been consistent. Instead, the report proceeds on the basis of consumer freedom and operating in accordance with market principles. In this case the government would not have such a set of instruments at its disposal (leaving aside whether they might be desirable on other grounds).

An optimistic approach of this kind does not just raise the question of whether consumption will in fact rise. Sections 9.2 and 9.3 of chapter 6, for example, reject any further increase in the government deficit. Direct investment stimulation would therefore have to be coupled with cuts in consumption (either private or public). (The economic/political question as to how this should be brought about and its possible repercussions remains an open one.)

The analysis of sectoral income and employment multipliers assumes a pure investment push. This does not square with the need as related to the government deficit of simultaneously reducing consumption, or in other words increasing the savings ratio. For the sake of internal consistency, the model-builders should have been asked to incorporate a downward consumption impulse together with the positive investment push. This would then have taken account of the macro-economic problems outlined above. But at the same time, it would mean that there would be no net expenditure push, since the increased investment would be counter-balanced by a drop in consumption. In these circumstances there would be no clear rise in national income or any appreciable improvement in the level of employment. This then undermines still further the calculations made concerning the appropriate levels of investment as based on (sector) multipliers. The increased investment will result in greater productive capacity but not in more and perhaps even in lower consumption with all the profitability, sales and capacity utilization implications noted previously.

Finally, the calculations based on sector multipliers appear to assume that all types of labour and other means of production required for the additional investment and the presumed rise in sales will be abundantly and instantly available. This hypothesis, which is rejected by supply theory, is a very bold one. The lack of labour in general or of specific occupational categories could nullify the assumed multiplier process and possibly even increase inflation and have other unfortunate consequences.

The same of course applies to other means of production and raw materials.

The validity of the sectoral multipliers on which this report is partly based may be challenged on at least three grounds (the automatic increase in sectoral sales, the macro-economic financing problems, and constraints on the supply side). This is not to say that these considerations are totally ignored in the report, but they tend to be touched on lightly and less than rigorously. For this member of the Council, the reservations outlined above provide sufficient grounds for not sharing the meaured optimism expressed in the report concerning sectoral policies based on government investment.

3. Limitations with regard to the generic policy of wage restraint

The report refers to limitations with regard to wage restraint policies. According to two of the model-studies, balance of payments problems could arise, reflecting the inherent instability of the balance of payments. This member of the Council would not deny that wage restraint could conceivably have an adverse effect on the balance of payments on current account in the short term. But given an elasticity of demand for exports of greater than unity – as suggested in the report itself – and certainly if the sum of import and export elasticities exceeds unity, this effect must be the result of a high marginal propensity to import. A substantial worsening in the terms of trade is not only unrealistic in the Dutch situation but is also largely irrelevant in current circumstances.

The Council member in question cannot share the limitations expressed in the report on this point, least of all over the long term, which is what the report is really concerned with. In his view, the observations in section 9.3 of ch. 6 concerning exports, price determination and export elasticities should, in view of the point made in that section and in ch. 2.2.4 about low unit profit margins, be the very cause for a renewed call in favour of wage restraint instead of the need for caution. A rising or high marginal propensity to import can equally as well be the consequence of our relatively high costs and resultant import penetration. Furthermore, the analysis in section 9.3 of ch. 6 should at several points be concerned with the sum of import and export price elasticities, which according to the report itself must be considerably higher than unity (since the elasticity of demand for exports alone is said to be at least unity).

Feasibility

The problem of the information available to the government has already been touched on. It is implicitly assumed in the report that the government would be better informed than the private sector on the basis of information it obtained from that sector. This is a dubious premise. The whole issue has even more ramifications if, in addition to sales and sales trends, the factor of manufacturing know-how is to be taken into account in making investment decisions. There is also the difficulty of sector demarcation. Sectors do not display homogeneity with regard to particular characteristics such as labour intensity and market structure but are heterogeneous and moreover cut across one another. At the same time more and more enterprises are tending to operate in more than one sector at once. In terms of economic policy these are highly complex matters, not least because these characteristics are continually changing over time.

This member of the Council would concede that sectoral committees might play a useful part with respect to competition aspects (although he would also foresee problems associated with the heterogeneity and complexity). But their autonomous role in relation to investment goes further than he would like. It would, moreover, be easier to set these bodies up than to dismantly them after they had fulfilled their temporary functions as envisaged in the report.

Conclusions

This member of the Council considers that the main emphasis should be placed on generic policies. He strongly doubts the room for complementary sectoral (structural) policies; given the lack of assured effectiveness and a proper set of instruments, and the substantial chance of failure, such policies would be best avoided.

The Council has published the following Preliminary and Background Studies

First term of office

V1. W.A.W. van Walstijn, *Kansen op onderwijs, een literatuurstudie over ongelijkheid in het Nederlands onderwijs* (Educational Opportunities: a Literature Study on Inequality in the Netherlands Educational System), 1975.

V2. I.J. Schoonenboom en H.M. In 't Veld-Langeveld, *De Emancipatie van de vrouw* (Women's Emancipation), 1976.

V3. G.R. Mustert, *Van dubbeltjes en kwartjes, een literatuurstudie over ongelijkheid in de Nederlandse inkomensverdeling* (Dimes and Quarters: a Literature Study on Inequality in the Distribution of Income in the Netherlands), 1976.

V4. J.A.M van Weezel a.o., *De verdeling en de waardering van arbeid* (The Distribution and Appreciation of Work), 1976.

V5. A.Ch.M. Rijnen a.o., *Adviseren aan de Overheid* (Advising the Government), 1977.

V6. *Verslag Eerste Raadsperiode 1972-1977* (Report on the First Term of Office 1972-1977).

Second term of office

V7. J.J.C. Voorhoeve, *Internationale Macht en Interne Autonomie* (International Power and Internal Autonomy), 1978.

V8. W.M. de Jong, *Techniek en wetenschap als basis voor industriële innovatie – Verslag van een reeks van interviews* (Technology and Science as a Base for Industrial Innovation), 1978.

V9. R. Gerritse, *Instituut voor Onderzoek van Overheidsuitgaven: De publieke sector: ontwikkeling en waardevorming – Een vooronderzoek* (The Public Sector: Development and Valuation), 1979.

V10. Vakgroep Planning en Beleid/Sociologisch Instituut Rijksuniversiteit Utrecht: *Konsumptieverandering in maatschappelijk perspectief* (Shifts in Consumption in a Societal Perspective), 1979.

V11. R. Penninx, *Naar een algemeen etnisch minderhedenbeleid? Opgenomen in rapport nr. 17* (Towards an Overall Ethnic Minorities Policy? Attached to Report nr. 17), 1979.

V12. *De quartaire sector – Maatschappelijke behoeften en werkgelegenheid – Verslag van een werkconferentie* (The Quarternary Sector: Societal Requirements and Employment Opportunities), 1979.

V13. W. Driehuis en P.J. van den Noord, *Produktie, werkgelegenheid en sectorstructuur in Nederland 1960-1985* (Output, Employment and the Structure of Production in the Netherlands, 1960-1985). Modelstudie bij het Rapport Plaats en toekomst van de Nederlandse industrie (1980).

V14. S.K. Kuipers, J. Muysken, D.J. van den Berg en A.H. van Zon, *Sectorstructuur en economische groei: een eenvoudig groeimodel met zes sectoren van de Nederlandse economie in de periode na de tweede wereldoorlog* (The Structure of Production and Economic Growth: a Simple Six-Sector Growth Model of the Dutch Economy in the Post-War Period). Modelstudie bij het Rapport Plaats en toekomst van de Nederlandse industrie (1980).

V15. F. Muller, P.J.J. Lesuis en M.M. Boxhoorn, *Een multisectormodel voor de Nederlandse economie in 23 bedrijfstakken* (A Multi-Sector Model of the Dutch Economy Divided into 23 Branches of Industry).

F. Muller, *Veranderingen in de sectorstructuur van de Nederlandse economie 1950-1990* (Schifts in the Structure of Production in the Dutch Economy 1950-1990). Modelstudie bij het Rapport Plaats en toekomst van de Nederlandse industrie (1980).

V16. A.B.T.M. van Schaik, *Arbeidsplaatsen, bezettingsgraad en werkgelegenheid in dertien bedrijfstakken* (Jobs, Capacity, Utilization and Employment Opportunities in Thirteen Branches of Industry). Modelstudie bij het Rapport Plaats en toekomst van de Nederlandse industrie (1980).

V17. A.J. Basoski, A. Budd, A. Kalff, L.B.M. Mennes, F. Racké en J.C. Ramaer, *Exportbeleid en sectorstructuurbeleid* (Export Policy and Structural Policies). Preadviezen bij het Rapport Plaats en toekomst van de Nederlandse industrie (1980).

V18. J.J. van Duijn, M.J. Ellman, C.A. de Feyter, C. Inja, H.W. de Jong, M.L. Mogendorff en P. VerLoren van Themaat, *Sectorstructuurbeleid: mogelijkheden en beperkingen* (Structural Policies: Prospects and Limitations). Preadviezen bij het Rapport Plaats en toekomst van de Nederlandse industrie (1980).

V19. C.P.A. Bartels, *Regio's aan het werk: ontwikkelingen in de ruimtelijke spreiding van economische activiteiten in Nederland* (Putting Regions to Work: Trends in the Regional Distribution of Economic Activity in the Netherlands). Studie bij het Rapport Plaats en toekomst van de Nederlandse industrie (1980).

V20. M.Th. Brouwer, W. Driehuis, K.A. Koekoek, J. Kol, L.B.M. Mennes, P.J. van den Noord, D. Sinke, K. Vijlbrief en J. van Ours, *Raming van de finale bestedingen en enkele andere grootheden in Nederland in 1985* (Extimate of the Final Expenditure and some other Data in the Netherlands in 1985). Technische nota's bij het Rapport Plaats en toekomst van de Nederlandse industrie (1980).

V21. J.A.H. Bron, *Arbeidsaanbod-projecties 1980-2000 (Projections of the Labour Supply 1980-2000)*, 1980.

V22. A. Faludi, R.J. In 't Veld, I.Th.M. Snellen en P. Thoenes, *Benaderingen van planning; vier preadviezen over beleidsvorming in het openbaar bestuur (Approaches to Planning)*, 1981.

The Report on the First Term of Office 1972-1977 has been translated into English.

The Council has published the following Reports to the Government

First term of office

1. *Europese Unie* (European Union), 1974.
2. *Structuur van de Nederlandse economie* (Structure of the Netherlands Economy), 1974.
3. *Energiebeleid op langere termijn* (Long-term Energy Policy), 1974. Reports 1 to 3 are published in one volume.
4. *Milieubeleid* (Environment Policy), 1974.
5. *Bevolkingsprognoses* (Population Forecasts), 1974.
6. *De organisatie van het openbaar bestuur* (The Organization of Public Administration), 1975.
7. *Buitenlandse invloeden op Nederland: Internationale migratie* (Foreign Influence on the Netherlands: International Migration), 1976.
8. *Buitenlandse invloeden op Nederland: Beschikbaarheid van wetenschappelijke en technische kennis* (Foreign Influence on the Netherlands: Availability of Scientific and Technical Knowledge), 1976.
9. *Commentaar op de Discussienota Sectorraden Wetenschapsbeleid* (Comments on the Discussion Paper on Sectoral Councils of Science Policy), 1976.
10. *Commentaar op de nota Contouren van een toekomstig onderwijsbestel* (Comments on the White Paper on the Contours of the Future Educational System), 1976.
11. *Overzicht externe adviesorganen van de centrale overheid* (Survey of External Advisory Bodies of the Central Government), 1976.
12. *Externe adviesorganen van de centrale overheid, beschrijving, ontwikkelingen, aanbevelingen* (External Advisory Bodies of the Central Government: Description, Developments, Recommendations), 1977.
13. *'Maken wij er werk van?' Verkenningen omtrent de verhouding tussen actieven en niet-actieven* ('Do we make Work our Business?' An Exploratory Study of the Relations between Economically Active and Inactive Persons), 1977.
14. *Overzicht interne adviesorganen van de centrale overheid* (Survey of Internal Advisory Bodies of the Central Government), 1977.
15. *De komende vijfentwintig jaar, een toekomstverkenning voor Nederland* (The Next Twenty-Five Years: a Survey of Future Developments in the Netherlands), 1977.
16. *Over sociale ongelijkheid, een beleidsgerichte probleemverkenning* (On Social Inequality: a Policy-oriented Study), 1977.

Second term of office

17. *Etnische minderheden – A. Rapport aan de Regering; B. Naar een algemeen etnisch minderhedenbeleid?* (Ethnic minorities – A. Report to the Government; B. Towards an Overall Ethnic Minorities Policy?), 1979.
18. *Plaats en toekomst van de Nederlandse industrie* (Industry in the Netherlands: its Place and Future), 1980.
19. *Beleidsgerichte toekomstverkenning; deel 1: Een poging tot uitlokking* (A Policy-oriented Survey of the Future; Part 1: An Attempt to Challenge), 1980.
20. *Democratie en geweld – Probleemanalyse naar aanleiding van de gebeurtenissen in Amsterdam op 30 april 1980* (Democracy and Violence – an Analysis of Problems in Connection with the Events in Amsterdam on April 30, 1980), 1980.
21. *Vernieuwingen in het arbeidsbestel* (Prospects for Reforming the Labour System), 1981.

The Reports nrs. 13, 15 and 17 have been translated into English; an English summary is available of Reports nrs. 16, 18, 19 and 21.