

‘Input-Output and the Analysis of Sector Policy Scenarios’

By Jan van der Linden

**(with special thanks to Chris Peeters, Antoon Soete,
Lars Couvreur and Peter Vandendriessche)**

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By Jan van der Linden¹

This paper introduces a method to analyse sector-oriented government policy. The method builds on the Structure-Conduct-Performance concept, and applies an input-output model for the numerical analysis. It has the following features:

- detailed field research to determine cost structures;
- estimation of intercountry spillovers;
- estimation of macroeconomic expenditure effects;
- a behavioural approach to analyse responses to policy changes.

These features secure flexibility, completeness and accurateness of the outcomes.

The method is applied to the German maritime shipping policy.

Abstract

Input-output analysis basically provides an estimation of a sector's economic impact by taking into account the indirect effects on all other sectors. For purposes of policy making, however, this may produce rather rigid and inaccurate results. This paper therefore introduces some extensions to the basic impact analysis. These extensions secure flexibility, completeness and accurateness of the outcomes. First, an accurate cost structure is determined in a bottom-up approach, *i.e.* by using data from a sample of representative companies. This allows for reliable outcomes and a flexible definition of sub-sectors. Second, the analysis is made in an intercountry context. Third, the expenditure effects of generated income are determined by a macroeconomic module. Fourth, company-level responses to alternative policy scenarios are investigated and translated into changing model parameters. These four basic elements are applied in a case study concerning the shipping sector of Germany.² The scenarios are a *continuation* of the present policy, a *laissez-faire* policy, and two *framework* policies in which the government creates a favourable environment for shipping companies. For each scenario, the effects on value added, employment, tax revenues and expenditures are analysed and evaluated. This paper thus shows the relevance of accordingly amplified Input-output analysis for policy purposes.

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1. INTRODUCTION

In achieving the economic aim of welfare, sectors are often insufficiently well-performing. Generally, public policy may play a role in improving the performance.

One of the most outstanding economic aims for a country (or region) is the optimisation of its citizens' welfare. This may be attained by the provision of a sufficient number of high-quality products at a sufficiently low price. To achieve this, the economy is dependent on a range of well-performing sectors. Often, however, sectors are less performing than possible. This has a domestic and an international dimension. Domestically, high market concentration may induce output to be lower and prices to be higher than necessary. Furthermore, certain government attitudes may remove any incentive to improve product quality. Internationally, the price/quality ratio of the country's products may be such that they are not competitive in the world market. Although it is up to the attitudes of entrepreneurship to improve the performance, public policy may also play an important role. This role may be in removing the constraints that impede companies to be competitive, and/or in shaping the conditions that better accommodate competitiveness.

This paper develops a method to analyse the relationship between public policy and sector performance.

The method is labelled 'Policy Research - Economic Impact Study' (EIS).

This paper develops a method to analyse the performance of a sector in relation to public policy. This method consists of a broad causal framework to describe the relationship, and a quantification of the most important elements to estimate performance under alternative policy scenarios. The framework builds on the Structure-Conduct-Performance model known from the literature on industrial organisation. The method is carried out in three stages: detailed field research, scenario building and input-output analysis. This constellation is labeled the *Policy Research - Economic Impact Study* (EIS).³

³ In this paper, the author outlines the method as initially introduced by Professor Chris Peeters, and further developed and applied by *Policy Research Corporation N.V.*. The author greatly thanks Chris Peeters, Antoon Soete, Lars Couvreur and Peter Vandendriessche for the many work done in building and applying the method as given in this paper. In this respect, and besides modelling part of the economic relationships, the role of the author has only been to bring the concepts and results together in one piece of text. The method is formally denoted by EIS[®]. For applications see *e.g.* Peeters (1992), Peeters *et al.* (1994), PRC (1996, 1998) and PRC & ISL (1998).

In the EIS, elements of

- *the Structure-Conduct-Performance model;*
- *Porter's 'diamond';*
- *the Agency approach; and*
- *Input-output analysis are incorporated.*

The EIS gives a sound analysis of the above mentioned relationship, with the following merits:

- *synergetic effects of the incorporated concepts;*
- *explicit modelling of behavioural relationships;*
- *close cooperation with the analysed sector.*

This paper discusses the following:

- *the conceptual framework of the EIS;*
- *the working-method;*
- *a case study on the German maritime shipping policy.*

As regards the basic framework, it is shown that 'Structure' can very adequately be analysed by the Porter (1990) model of competitive advantage. 'Conduct' is treated in the context of an Agency problem. Strategies are discussed for both the government (principal) and the sector (agents). Attempts are also made to quantify the sector's reaction to the policy alternatives. Finally, 'Performance' is evaluated in terms of economic activity. This is estimated from an extended Input-output analysis, where the extensions are threefold. First, it involves detailed field research to augment the input-output data. Second, a macroeconomic module to estimate the effect on expenditures is adopted. Third, the effects in other relevant countries are estimated by an intercountry approach.

The major merit of the EIS is that it gives a thorough analysis of the effects of public policy on sector performance in terms of economic activity. This analysis is based on a combination of sound and established theoretical concepts. In this combination, there are synergetic effects. The Agency approach, for example, gives a deeper insight into the government-sector relationships that are often loosely described by Porter (1990). The Input-output approach explicitly includes the indirect effects in other sectors (and countries) for the performance measurement. Furthermore, there is an explicit modeling of behavioural relationships. Finally (as also indicated in *Section 3*), an EIS is executed in close cooperation with the players of the analysed sector. They provide the necessary information to model the behavioural relationships and refine the input-output table. They also signal the most important bottle-necks, and how government might tackle them. Moreover, the sector involvement creates the goodwill to support the implementation of the recommended policy measures.

To summarise, the EIS analyses the relationship from policy, via the business environment and business behaviour, to the economic activity generated by a sector. The business environment is conceptualised in terms of Porter's 'diamond', behaviour in terms of an Agency problem, and the activity by Input-output analysis. *Section 2* of this paper works out the conceptual framework of the SCP model. *Section 3* introduces the three-stage working-method of the EIS. *Section 4*,

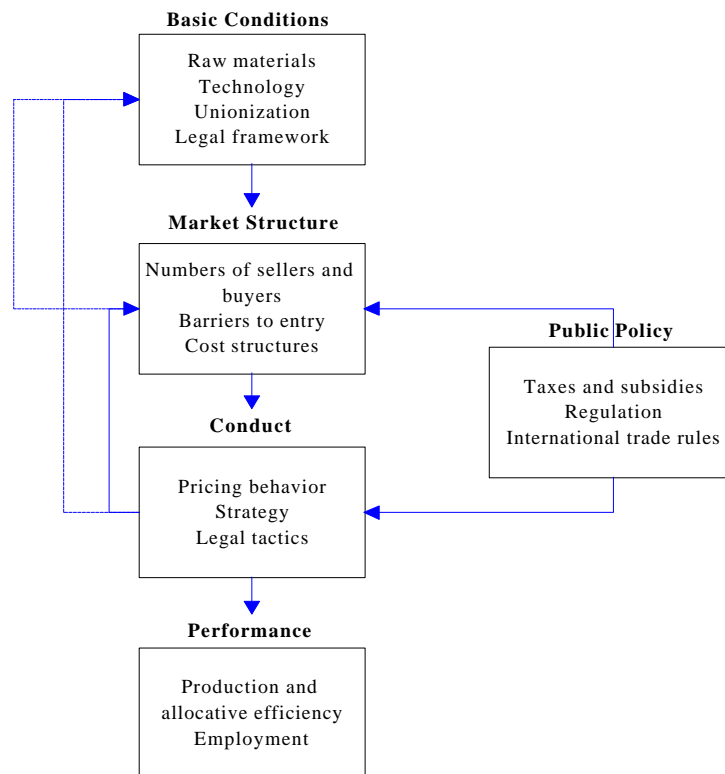
finally, gives a detailed case study, which involves the development of a new maritime shipping policy for Germany (PRC & ISL, 1998).

2. CONCEPTUAL FRAMEWORK

The EIS is based on the Structure-Conduct-Performance model. In this model, public policy serves as an instrumental factor.

As mentioned above, the EIS basically builds on the well-known Structure-Conduct-Performance model (SCP), developed by Edward Mason in the 1930s. The model is adopted in numerous textbooks on Economics (see *e.g.* Scherer & Ross, 1990). A basic objective for a sector is to have a good economic performance. This is subject to the economic conduct of the producers, the structure of the sector, the prevailing conditions of demand and supply, and the government policy. As government has the power to influence the other factors by policy measures, it serves as an instrumental factor. The model is illustrated schematically in *Figure 1*. Its application to the EIS is elaborated in the remainder of this section.

Figure 1: The Structure - Conduct - Performance model



Source : Scherer & Ross (1990).

2.1. STRUCTURE: PORTER'S 'DIAMOND'

Together with public policy and the basic conditions of demand and supply, the market structure forms the business environment in which companies operate. This business environment is adequately analysed by Porter's 'diamond'.

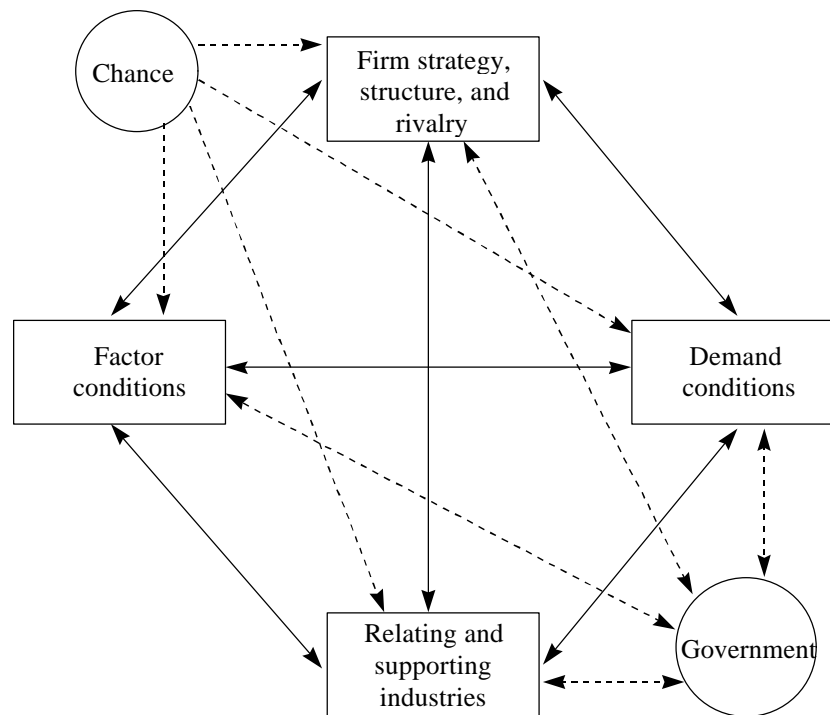
In the SCP model, the market structure is determined by the basic conditions of demand and supply, and by public policy. Together, these three factors form the *business environment*, in which a sector operates. The Porter (1990) 'diamond' indicates how the elements of the business environment are interrelated, and together form the basis of a sector's international competitiveness. This 'diamond' thus serves as a framework for analysing the business environment, and especially the role of government. It consists of four interrelated and mutually enforcing angles, which are all related to the business environment factors of the SCP model (see *Figure 2*).

In the description of Porter (1990), the *factor conditions* angle is generally related to the supply-side basic conditions of the SCP model. The *demand conditions* angle is related to the demand-side basic conditions, but also holds elements of the market structure factor. The *related and supporting industries* angle holds elements of all three, as it refers to both the demand- and supply-side of the sector. The *firm strategy, structure and rivalry* angle, finally, is related to the market structure, but already holds elements of the conduct factor too. For a sector to have a competitive advantage in the international economy, all four angles need to shape a favourable environment to operate in. Porter (1990) gives two further factors that have an impact on the angles. The one is *chance*. This relates to unpredictable and often uncontrollable events that influence a sector's competitiveness. The other is *government*. Via policy measures, government is able to enhance or frustrate the factors of competitiveness. In earlier expressions of Porter's approach (see Porter, 1985), the role of government is rather underexposed, as was rightly mentioned by Peeters (1992). Its role is of course not decisive, because it is only one of the factors determining competitiveness. It is, however, important in the sense that it is controllable. In other words, government policy serves as an instrumental variable in determining a sector's competitiveness.

The role of public policy is instrumental. By its policy measures, government has a significant influence on the playing field of competition.

Through differences in legislation and policies, government can distort the playing field of competition. The business environment is directly and strongly influenced by government action. It is the result of policy in the past and present. The more distorted the level playing field, the harder it is for companies to compete on the basis of market factors.

Figure 2: The determinants of competitive advantage



Source : Porter (1990).

2.2. CONDUCT: AN AGENCY APPROACH

The market conduct in relation to public policy is analysed in terms of an Agency problem.

In the SCP model, the business environment as introduced above determines the behaviour of the market participants. As regards the interaction between a sector and the government, this may very adequately be analysed in terms of an Agency problem. This refers to the analysis of a relationship between two or more parties in which one party, designated as the 'agent', acts for, on behalf of, or as representative for the other party, designated the 'principal', in a particular domain of decision problems (Ross, 1973). Both the principal and the agent have their own interest and aims which they

seek to achieve. When these interests coincide, there evidently is no problem. When they do not, the problem for the principal is how to make the agent serve his interest, while at the same time serving his own interest. An Agency problem focuses on the utilisation of compensation rules with which the principal seeks to motivate the agent to choose his activities in way advantageous to the principal (MacDonald, 1984). For seminal contributions, the reader is referred to Alchian & Demsetz (1972), Ross (1973) and MacDonald (1984). A 'popular' introduction is given by McMillan (1992).

The Agency problem is usually applied to intrafirm management issues. It then focuses, for example, on the relation between shareholders and management, or the relation between management and employees. As indicated by *e.g.* Jensen & Meckling (1976), MacDonald (1984) and Miller & Fische (1995), it is applicable to a far wider domain of motivation problems. One of these is the relationship between government and the players in a sector.

Under this approach,

- *the government serves as the 'principal', and wishes to preserve sustainable economic activity;*
- *the companies in the sector serve as the 'agents', whose main interest is generating a profit.*

In that case the government is in the role of the principal. Its objective for a sector is that it serves the national economy. Ideally, a sector should generate sustainable economic activity (measured in *e.g.* value added and employment). It is sustainable when the competitiveness of the sector is assured for the longer run, and the activity can be maintained without invoking excessive costs to society. Evidently, the activity must be realised by the players in the sector, who are in the role of the agents and have their own objective to serve. This is making a profit and seeking continuity. Although activity is a means for the agents to achieve their objective, it is not implied that the government's and the sector's objectives coincide by definition.

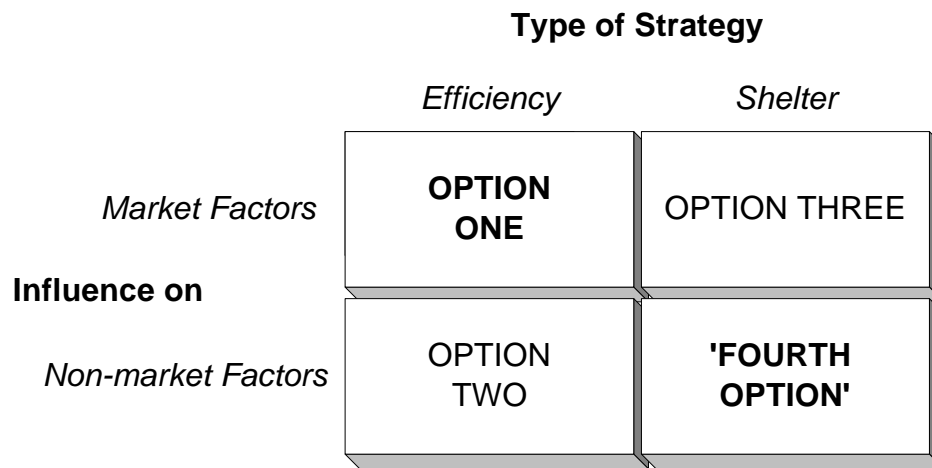
These two goals do not necessarily coincide. The challenge for government is to develop a policy that enables the achievement of both aims at the same time. This is the central issue of the EIS.

The challenge for government is thus to develop and implement the right measures to reach the aim of sustainable activity. It should provide business with incentives and possibilities to achieve their own objectives within the national context. The central issue of the EIS is to analyse what incentives government may give to a sector, to make it simultaneously achieve the business objective and the national objective.

In reaction to the prevailing policy, companies may seek for economic efficiency or for shelter from competitive forces.

In going along with the business environment, the companies in the sector will set out a certain strategy. The goal of this strategy is to establish a position where it can best defend itself against the competitive forces or can influence them in their own benefit. The company strategies may aim for economic efficiency or shelter, and have a market-internal or- external scope (Peeters *et al.*, 1994). This double dichotomy is given *Figure 3*, and labeled as the four options of strategy. Options one and two refer to efficiency, option three and the 'fourth option' to shelter. In general, the most desirable strategies are those aiming at efficiency. Especially the 'fourth option' strategies are considered undesirable by Peeters (1992) and Peeters *et al.* (1994). Such strategies should be avoided, which is indicated in by means of the arrow.

Figure 3: Combinations of strategy and influenced environment



Source : Policy Research Corporation N.V..

When striving for efficiency, companies are generally

- innovative;*
- competitive;*
- profitable;*
- independent from government.*

They possess a sustainable market position.

Options one and two are based on one of Porter's (1985) generic strategies, *viz.* cost leadership, differentiation and the creation of market niches. The potential success of the company then lies in creating and maintaining its competitive advantages. By being innovative, companies build a strong competitive position. This secures the maintenance of a sound market share, profitability and knowledge base, and the independence of direct government support. In other words, it brings the companies a sustainable market position (see also Porter, 1990). The external scope may hold when government or

government-controlled companies are important customers. Then, the strategic activities aimed at efficiency are coupled with an appropriate relationship with the government. Under option three and the 'fourth option', companies seek shelter from the competitive forces from inside and outside the nation. Internal to the market, they may call on trusts or monopolistic behavior. Externally, the companies may establish a strong relationship with the government.

When seeking shelter, companies are generally

- *not innovative;*
- *dependent on government or monopolistic behaviour;*
- *vulnerable to outside competition.*

They possess a non-sustainable market position.

When the strategy of a company, or an entire sector, is pointed towards shelter, there is a danger that only the preservation of this protected position will be pursued. This is a sub-optimal situation for at least three reasons. First, when a monopolistic position has arisen, the sales prices may be relatively high. Second, there is no need for innovation, because of which it is likely that the prices will also be relatively high and the quality low. Third, the profitability may nevertheless be such that the sector is dependent on direct subsidisation. Therefore, government should be aware of the potential danger of this strategy, as it will endanger its long term objective of sustainability.

Besides being sub-optimal, the situation of shelter is non-sustainable as well. The sheltered sector is in a vulnerable position, because there is still a competitive pressure from outside. As long as innovation proceeds elsewhere, the technological gap with potential competitors widens, and becomes ever more expensive for the sector to close. Furthermore, in spite of the prevailing protection, the sector is still dependent on political decisions to continue or stop the protection.

The competitiveness of a sector, and hence the sustainability of the generated economic activity, is thus best served by a business environment that supports the pursuit of efficiency. By adopting the right measures, the government is in the position either to strengthen or weaken the 'diamond' in which business operates.

2.3.

PERFORMANCE: INPUT-OUTPUT ANALYSIS

In the EIS, the performance is measured by means of Input-output analysis.

In the SCP model, the conduct in the end determines the sector's performance. To measure performance, the EIS employs Input-output

analysis. This enables not only to measure the performance of the analysed sector itself, but also in the sectors that directly and indirectly supply the analysed sector. For the purpose of the EIS, the basic Input-output analysis (see *e.g.* Miller & Blair, 1985) is extended in several respects.

The Input-output analysis is extended in three respects:

- 1. existing input-output tables are augmented by data received from field research;*
- 2. a macroeconomic module translates the outcomes into terms of employment, back-flow and final expenditures;*
- 3. an intercountry approach includes the effects in other relevant countries.*

First of all, the given input-output tables are augmented by cost structure information obtained from extensive field research. This significantly increases the flexibility of the Input-output analysis. When relevant, given sectors can be split into two or more sub-sectors. Furthermore, when a policy change gives occasion to changes in a sector's cost structure, that cost structure can be adapted accordingly. Finally, in the case of outdated or less reliable input-output data, the field research may enable the estimation of a correct cost structure. This may especially be the case for services sectors (Peeters, 1992). Second, a simple macroeconomic module is added. This enables to translate the outcomes into employment, net government revenue (labeled 'backflow', see Peeters *et al.*, 1994) and final expenditures. Third, by adopting intercountry input-output tables (Van der Linden & Oosterhaven, 1995), the analysis may be extended with the spillovers to other countries. This is especially relevant in the light of the proceeding international economic integration, such as the extension of the European and American common markets.

A fourth extension would be the closure of the input-output model with respect to households, government and capital. However, this is likely to result in an overestimation of the outcomes.

The macroeconomic module also allows for the adoption of a semi-closed input-output model (see *e.g.* Miller & Blair, 1985). By disaggregating the expenditures into the goods and services involved, a new final demand column is created that could serve as a starting point of a new 'round' of indirect effects. In that case, the economic effects of the consumption and investments are included in the performance measurement, which gives a more complete perspective on the economic impact. Because of the rather simple linearity assumptions in (open and) semi-closed input-output models, however, the outcomes are inclined to be an overestimation. In short, it is assumed that supply is perfectly elastic and demand perfectly inelastic. This implies that any increase in demand can be satisfied, and productive capacity can be extended immediately. In practice, the given capacity limits the demand growth, which will be dampened by price increases. Applying

a semi-closed model without taking care for capacity limits would thus give an overestimation of the actual economic impact.

As explained, the performance is dependent on the business strategy. In its turn, this is partly dependent on the government strategy towards the sector. Business may seek efficiency or shelter. Evidently, under shelter, the performance is expected to be worse than under efficiency. One may expect that the generated activity and product quality are lower, and prices higher than necessary. Furthermore, the net backflow may be lower. This is caused by the relatively low tax revenues and the probably high subsidisation. Finally, and most important, the generated activity is increasingly vulnerable to external pressures, and deemed unsustainable.

3. THE THREE STAGES OF THE EIS

The EIS analyses the relationship between policy and performance in three stages:

1. *field research;*
2. *scenario building;*
3. *impact analysis.*

To analyse the relationship between policy measures and economic activity, the EIS adopts a three-stage approach. First, the required information on the business environment and company behaviour is gathered by extensive *field research*. Second, a number of relevant *policy scenarios* is built from the gathered information. Third, the *economic impact* of each of the scenarios is estimated and compared. The first and second stage thus refer to both Structure and Conduct, the third stage refers to Performance. In this section the three stages are briefly introduced.

3.1. STAGE I: FIELD RESEARCH

*By means of strategic interviews and questionnaires, the **field research** gathers information on strategic behaviour and policy effects at the company-level.*

In this first stage of the EIS, an analysis is made of company-level effects of the relevant policy measures. By discussing the changes in the business environment with the companies involved, relevant information about strategy and decision-making behaviour is obtained. This is done by conducting strategic interviews with the sector's decision makers. On the basis of these interviews the specific benefits of policy measures are determined qualitatively. Furthermore, the sensitivity of the companies' behaviour to policy measures is investigated by asking the companies their opinion on which problems should be solved first, and how strongly they would react to certain

policy changes. In addition, the field research includes interviews with other relevant parties, such as the government, interest groups, and training and research institutes.

Using the information collected by interviews and questionnaires, the effects of policy measures on the sector's cost structure can be quantified and built into the input-output table.

An important question for the impact analysis is to which extent certain measures lead to changes in output and cost structures. Therefore, a second element of the field research is to investigate the cost structures by means of an extensive questionnaire. The outcome of this questionnaire is built into a given input-output table. This way of determining the cost structure has three major advantages above directly applying the input-output table. First, it enables the determination of relevant sub-sectors by a bottom-up approach. This generally gives a more reliable outcome than disaggregating existing sector-level data with predetermined dividing ratios. Second, it enables to modify the cost structure whenever a policy scenario gives rise to that. These two advantages thus significantly increase the flexibility of the Input-output analysis. Third, the field research gives a cost structure that builds on data that is only one or two years old, whereas input-output tables are usually issued with a time-lag of about five years. This also avoids the use of updating techniques such as RAS (Stone, 1963; Bacharach, 1970; Miller & Blair, 1985) and EURO (Beutel, 1992).

This first stage thus determines the effects of alternative policy decisions on the operating conditions for the companies. Furthermore, the relation between the conditions and subsequent behaviour are mapped.

As market rigidities and institutional disequilibria prevail in everyday life, the effectiveness of policy measures has to be confronted with a number of limiting conditions. Factors which possibly limit the effectiveness of policy measures are to be considered, *e.g.* labour-market inflexibility, international conflicts of interest, congestion, *etc.* Principally the EIS does not investigate these limiting conditions in-depth unless compelling reasons exist. In some cases, a qualitative inventory of the limitations may be adopted, or a tentative quantification may be used to analyse their actual impact.

3.2. STAGE 2: SCENARIO BUILDING

Based on the collected information, a number of **policy scenarios** are built. These are basically classified according to four archetypes:

1. *laissez-faire policy*;
2. *unconditional sector policy*;
3. *conditional sector policy*;
4. *framework policy*.

The archetypes are characterised on the basis of two dimensions:

1. *guidance, ranging from pure to non-interventionism*;
2. *specificity, ranging from the single sector orientation via the cluster to the economy as a whole*.

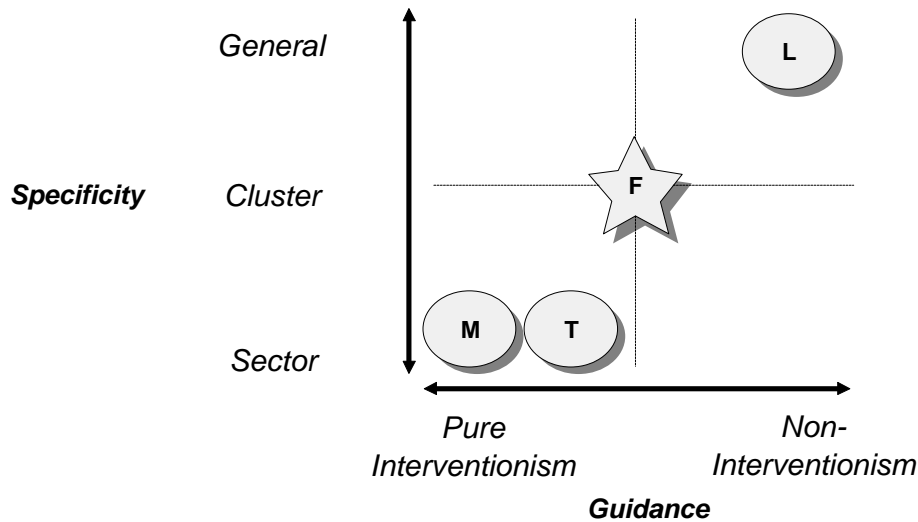
Under a laissez-faire policy, all existing measures aimed at or related to the sector at hand are discontinued. It is assumed that the sector should be able to compete and survive on the basis of economic efficiency.

In the second stage of the EIS, the results of the field research are used to make a prognosis of the future activity and cost structure of the sector at hand. For the analysis, these prognoses are laid down in policy scenarios, which are built up of sets of relevant measures. Basically, four policy archetypes are considered. The actual policies will of course rarely correspond to these pure forms. Therefore each actual policy is classified according to the archetype it most resembles. The archetypes are ‘laissez-faire policy’, ‘unconditional sector policy’, ‘conditional sector policy’ and ‘framework policy’. They are depicted in *Figure 4* on the basis of two dimensions, *viz.* guidance and specificity.

The *guidance* refers to the extent to which the government tries to influence the economy or industries. It runs from pure to non-interventionism. A policy is interventionist when the government decides what is good for the companies, and tries to steer them accordingly. The *specificity* refers to the sector(s) at which the policy is aimed. At one end of the scale is a pure sector policy, which is aimed at one single industry. At the other end is a generic policy, which is aimed at the economy as a whole. In between there is the ‘cluster policy’, which aimed at a number of related industries, and thereby follows the ideas of Porter (1990). The four archetypes, labeled by *L*, *T*, *M* and *F*, are briefly introduced below.

A *laissez-faire policy* is based on a government attitude characterised by non-intervention. Under laissez-faire, no measures are implemented which support or stimulate the activity at hand. This attitude usually springs from the principle that the best economic results are achieved by means of free-functioning markets. This scenario implies that all existing measures aimed at or related to a specific sector are discontinued and that no new measures are introduced. The government feels that the sector should be able to compete and survive on the basis of economic efficiency. The government’s aim, preservation of the sector, should be realized by the companies by means of being competitive. In terms of *Figure 4*, this policy is characterised as non-interventionist and general.

Figure 4: Policy Archetypes



Source : Policy Research Corporation N.V..

Laissez-faire is adequate when there is a level playing field for competition. In reality, however, this is not the case. Without sector-specific support, the companies then have two options:

1. *seek shelter and ask for government support;*
2. *seek competitiveness abroad.*

Hence, laissez-faire does not serve the aim of sustainable economic activity.

In an ideal neoclassical world, all governments would act like this, and competition would not be distorted by intervention. However, in the real world, competition is distorted. The company cannot achieve its goal just by striving for competitiveness, because other companies, or companies in other countries, enjoy special facilities. The companies then have the two strategy types distinguished by Peeters *et al.* (1994). On the one hand, they may seek shelter and ask for support or facilities. Evidently, if the government agrees, the ‘fourth option’ danger becomes real. This even deems the laissez-faire attitude itself to be non-sustainable. On the other hand, they may find support or efficiency by relocating to another country. This way, the companies can achieve their goal, but the government can not. As will be discussed in the next section, this option is especially relevant for an international activity as shipping. So, in the absence of a level playing field of competition, a laissez-faire policy does not seem to serve the political aim of sustainable economic activity. Furthermore, it also seems to serve the business’ aim of profitability and continuity in a sub-optimal way.

The unconditional sector policy consists of specifically sector-oriented measures. Mostly, this concerns non-selective and open-ended subsidy schemes.

Unconditional subsidisation becomes less affordable because of the ever increasing budget constraints. Moreover, it is not efficient because it does not lead to innovation and competitiveness. So, also unconditional subsidisation may not serve the aim of sustainable economic activity.

The conditional sector policy differs from the unconditional one in attaching strict criteria and procedures to the granting of a subsidy. It requires considerable knowledge from the government.

An *unconditional sector policy* is characterized by non-selective and open-ended measures oriented towards a specific sector, which are often subsidy schemes. Because of its emphasis on subsidies it is also referred to as a ‘traditional subsidisation’ policy. The subsidies are general and by no means discriminate, *e.g.* between different types of companies in the sector. The government unconditionally grants the subsidies to both efficient and inefficient companies. The rationale behind the imposition may be the realisation that the concerned sector is not able to survive just on the basis of pursuing competitiveness, because there is no level playing field in the international market. In order to preserve the sector, the government decides to support, and protect the sector. In *Figure 4*, this kind of policy is denoted by ‘T’, and characterised as interventionist and purely sectoral.

The most important downside is that the open-ended, non-discriminative policies are neither affordable nor efficient. The increasingly solid budget constraints governments are presently faced with put further pressure on governments to avoid this kind of policy. It is inefficient because the amounts of money spent by government is not likely to lead to the creation of an innovative and competitive sector. It may rather lead to the maintenance of an inefficient, subsidy-dependent sector. In other words, this kind of policy is susceptible to ‘fourth option’ strategies. The subsidies may even be instituted after extensive lobbying by the shelter-seeking agent. As there is no discrimination, inefficient companies that benefit from the scheme can easily become dependent on it. According to Porter (1990), this type of policy may even be counter-productive for creating and maintaining national competitive advantage. So, unconditional sector policy seems to serve neither the aim of the government nor the sector in the long run.

A *conditional sector policy* is a modern version of the unconditional sector policy, and also labeled as a ‘modern subsidisation’ policy. Nevertheless, there is an important difference. It applies strict criteria and procedures to the granting of subsidies. Generally, government feels that the sector needs to be supported, but at the same time it tries to direct the support towards certain key sub-sectors. This is done by means of criteria the companies have to meet in order to receive a

subsidy, which implies that the government must precisely know what is good and what is bad for the sector. In other words, the government steps into the shoes of the entrepreneur. The subsidy schemes require considerable knowledge, both at the policy making level and at the level of officials responsible for the approval and refusal of proposed projects. It assumes that the government is better informed than the companies, or at least as good. Moreover, this knowledge has to be maintained and updated. Like the unconditional subsidisation, this kind of policy is interventionist and sectoral, but in a stronger form, because it even aims at *sub*-sectors. In *Figure 4*, it is denoted by 'M'.

The principal weaknesses of this kind of policy are the need for information and the vulnerability to shelter-strategies.

The principal weaknesses of this kind of policy are the need for information and the high vulnerability to 'fourth option' strategies. Its implementation is attended by high bureaucratic and monitoring costs. Furthermore, high transaction costs may result from lobbying activities by the subsidy applicants, even though the criteria and procedures were introduced in order to avoid this kind of company strategies. Hence, both from the government's and the sector's point of view, this kind of policy is not satisfactory in the long term. First, it will preserve only part of the sector. Second, the other parts will either have to resort to 'fourth option' strategies or be forced to relocate to other countries. Third, because of the attached criteria and procedures, the administration and awarding of this kind of subsidies will be very costly and susceptible to either 'fourth option' strategies.

A framework policy is a synthesis between interventionism and laissez-faire. It creates an environment in which the sector can attain efficiency, while still being driven by market forces.

A *framework policy*, finally, is a modern version of the *laissez-faire* type. It is characterised by creating an environment in which the sector can attain the efficiency needed to be profitable and assuring long term survival, within the government's sphere of influence. Following Porter (1990), a framework policy basically recognises that a number of indirect policy measures may contribute to the national advantage, and thus the long-term preservation and development of the sector. The primary objective is the development of sustainable economic activities in a country. Important elements of a framework policy are the attention to education and research, the removal of price/quality disadvantages for the international market, the recognition of the importance of an infrastructure, and the preservation of the environment. It directly influences the companies' operating costs, and

enhances the business environment. In terms of *Figure 4*, a framework policy is a *cluster policy*, recognising the strong linkages within the cluster.

A framework policy thus forms an adequate symbiosis between neoclassical economics and interventionism. As its name indicates, it provides the sector with a framework in which it has a better chance of achieving his and the government's goals at the same time. It differs from the subsidization policies in that it is not likely to provoke shelter-strategies, and it does not cause inefficiencies by supporting non-viable companies. In terms of the Agency approach, the principal leaves the decision making to the agent and at the same time tries to stimulate and attract both national and foreign agents by creating a beneficial environment.

The framework policy's major advantages are:

- *incentive-driven;*
- *transparent;*
- *cluster-oriented;*
- *stability-enforcing.*

A framework policy has four basic advantages. It is incentive-driven, transparent, cluster-oriented and stability-enforcing. It is incentive-driven, because it creates incentives for business to serve the government's aim. The government does not need to step into the shoes of the entrepreneur. It is transparent because it consists of clear and straightforward measures. As a result there is no room for strategies of individual companies aimed at obtaining special government support. It is cluster-oriented because it aims at a cluster of activities instead of an individual sector. It is stability-enforcing because it represents a long term vision and commitment, providing the sector with a competitive and stable business environment.

3.3.

STAGE 3: ECONOMIC IMPACT ANALYSIS

In the final stage, the estimation of the total economic impact for the present situation and the policy scenarios is performed by Input-Output analysis.

The prognoses for the various policy scenarios are the input for the final stage of the EIS, the Input-output analysis. First, the present economic significance of a sector is estimated. The outcomes of this estimation are used as benchmarks in the evaluation of the future scenarios. Then, the effects the policy measures have on the economic significance are estimated. The calculations are basically made in terms of value added, employment, backflow and expenditures. In some cases, also the impact on the balance of payments is analysed. When applying Intercountry input-output analysis, the estimations are

made on both national and bilateral levels.

4. APPLICATION: A NEW MARITIME POLICY FOR GERMANY

The EIS has been applied to the German maritime shipping sector

The EIS has recently been applied to the German maritime shipping sector. As part of a broad study to analyse shipping policy issues on the EU level (see EEIS-EEIG, 1997), a detailed analysis for Germany has been made (PRC & ISL, 1998). The major findings are outlined in this section.⁴

4.1. BUSINESS ENVIRONMENT

The prevailing conditions in the international shipping market require low costs in order to be competitive. In the EU, however, the government and institutional framework have become a constraint for shipping companies trying to comply with these market conditions.

For maritime shipping, the international business environment is presently characterised by excess capacity. This implies that there is intense competition on the supply-side, and a strong bargaining power on the demand-side. Evidently, the result is a downward pressure on the price level of the services. The cost structure of the shipping companies is therefore crucial in remaining competitive. In the EU, however, this cost structure is strongly influenced by factors that are beyond the control of the shipping companies, *viz.* the government and the institutional framework.

European countries are characterised by a high standard of living and extensive social security systems. Both the high net wages and social security payments contribute to a strong disadvantage in labour costs for European seafarers, compared to seafarers from non-European (usually third world) countries. For the *officers* from the EU, these higher costs are partially offset by their better education and higher productivity. This does, however, not apply for the *ratings*. Furthermore, traditional seafaring nations often attach very strict manning requirements to the registration of ships. The entire crew, or nearly all of it, has to consist of EU member states' nationals. So, instead of providing the sector with incentives, the government and the institutional framework have become a constraint for the European

⁴ Another notable application in this field has been the development of a new shipping policy for The Netherlands (Peeters *et al.*, 1994; MV&W, 1995). The developed package of measures has fully been implemented by January 1, 1996.

shipping companies.

4.2.

CONDUCT

This has led companies to 'flag out' most of their fleets and, to a lesser extent, relocate their management activities. This is their solution to the problem of not being competitive under the prevailing conditions, but does not serve the governments' aims of preserving maritime activities.

For this and other reasons (not further discussed in this paper), the European business environment for shipping is not favourable. This has led companies to seek for strategies to remain profitable. One of the most convenient of these has been to bring the fleet under the flags of countries with a lower wage level and less strict regulations than the European. This 'flagging out' allows for cutting crew costs and regaining competitiveness. Furthermore, it provides opportunities to avoid corporate taxation in the home country, which also gives an incentive to relocate part of the shore-based activities as well. Otherwise, the tax authorities of the home country may still consider taxing the profits generated on the flagged-out ships.

In the double dichotomy of Peeters *et al.* (1994), the shipping companies seek efficiency, but not in a way that serves the economic activity in the home country. In other words, the objectives of the principal and the agents do not coincide. Generally, the government wishes to preserve the existence of the shipping sector. It thus wishes to stop and counter the flagging out of ships and shore-based activities, and secure sustainable value added and employment. The European shipping companies' main interest is generating a profit and securing the future of their business, regardless of their location.

4.3.

THE POLICY ISSUE

In some EU countries, the government has taken action to support their shipping sector and counter the trend of flagging out. Germany is about to do so as well.

The trend of flagging out and the threat of management relocation have already stimulated European governments to reconsider their shipping policies. Especially the Dutch and Norwegian initiatives have proven successful in turning the trend.⁵ Also for Germany, there is a need for a policy change to counter the trend of flagging out.

⁵ See also Note 4.

In Germany, the objectives of shipping policy are twofold:

- to maintain a modern and competitive fleet flying the German flag;*
- to secure (and generate) employment for German seafarers.*

The emphasis has long been on the first objective. The measures were strongly related to the unconditional sector policy archetype. It was supposed that realising the second objective would depend on realising the first.

However, the causality may well be opposite. In order to maintain shipping management activities within Germany, the sector must be able to rely on highly-skilled and trained personnel. This has recently been recognised by the German government.

Historically, the objectives of the German shipping policy have been twofold. The first is to maintain a modern and competitive fleet flying the German flag. The second is to secure employment for German seafarers. Up to a few years ago, the emphasis has generally been on the first objective. It was pursued by tax rebates on profits and capital gains, allowances for accelerated depreciation, and lucrative fiscal schemes for private persons to invest in ships.⁶ Furthermore, and following some other countries, an ‘International Shipping Register’ (ISR) was implemented. Under this ISR, the manning requirements were conditionally relaxed by allowing some of the officers and most of the ratings to be non-EU nationals. These measures have indeed been successful in maintaining a modern and competitive fleet. Especially in container shipping, Germany has gained a leading position in the world market. It was supposed that the realisation of the second objective would in great part depend on the first. However, the trend of flagging out ships and shore-based activities was not reversed, which has been detrimental for safeguarding employment.

The causality between fleet and employment may very well work in the opposite direction. A shipping policy that guarantees a competitive employment for a significant number of German seafarers may then secure the position of Germany as a maritime centre. In spite of the threat of management relocation, German shipping companies are still strongly rooted in the German economy. However, in order to maintain these activities in Germany, the sector must be able to rely on highly-skilled personnel. In this respect, it is essential to recognise the importance of securing a certain amount of German seafarers. After their career at sea, the knowledge embodied in these seafarers is crucial for shore-based activities and shipping-related sectors. In case of flagging out, this may no longer be the case, since relatively expensive German officers are substituted by less expensive foreigners. Due to differences in *e.g.* language and culture, very few of these foreign officers may find employment in the German shore-based maritime cluster. From the Input-output analysis done for this study it follows that the larger part of value added is generated in the shore-based

⁶ These schemes actually hold for all capital investments, but are especially of interest for shipping investments.

activities of the shipping sector. Further growth of these shore-based activities is only guaranteed when they can build on a certain number of experienced German seafarers.

In the EIS for the German shipping sector, four policy scenarios are considered.

Recently, the German government has recognised these problems, and launched a package of intentions to adapt the maritime shipping policy. In short, this package reflects the ideas behind the framework policy archetype of the previous section, but not to the extent possible. Together with a few other alternatives, the proposed package is evaluated by the EIS. They are (i) *continuation* of the present shipping policy, (ii) the introduction of a *laissez-faire* policy; (iii) the above mentioned *proposed framework* policy, and (iv) the introduction of an *extended framework* policy.

The first scenario is the continuation of the prevailing measures.

The *continuation* scenario is based on the continuation of the prevailing measures. As stated above, it consists of the granting of corporate tax rebates, lucrative fiscal schemes, and conditional relaxation of manning requirements.⁷ Although the present policy is not characterised as a direct subsidisation policy (only 40 million DM is granted for training schemes) it is most related to the unconditional sector policy archetype of *Figure 4*. In terms of that figure, it is classified as sector oriented, and half-way interventionism and non-interventionism.

The second scenario is a laissez-faire approach.

As introduced in the previous section, the *laissez-faire* scenario implies that all existing measures aimed at or related to the shipping sector are discontinued, and that no new measures are introduced. So, no special facilities for companies, entrepreneurs or employees in the shipping sector exist under this scenario.

⁷ The accelerated depreciation scheme has been abolished by January 1, 1998.

*The third scenario is the **framework policy as recently proposed** by the German government. This basically consists of corporate and income tax breaks that do not only decrease operating costs, but also create incentives for becoming more innovative. It is cluster-oriented and creates a more favourable business environment.*

The proposed measures, however, are too 'weak' to be sufficiently effective.

*The fourth scenario is an **extended framework** policy. Compared to the proposed package,*

- the tax breaks are more pronounced;*
- there is more emphasis on the long term aspects of human resources;*
- there are more funds for promotion and R&D foreseen.*

As mentioned, the *proposed framework* policy reflects the change in attitude towards the shipping sector. This policy makes it more attractive for shipping companies to employ German officers, whereas the opportunities to employ foreign ratings are improved. This is done by granting an income tax reduction to German seafarers, granting a partial exemption of social security payments for foreign seafarers, and giving a further relaxation of the nationality requirements under the ISR. Evidently, this seizes upon the problem of the high and non-controllable operating costs. In the sphere of corporate taxation, shipping companies may opt for a tonnage tax for ships flying the German flag, and are exempted from capital gains tax provided the gains are reinvested within ten years. A tonnage tax is a taxation scheme based on the company's fleet capacity. Compared to profit taxation, it gives the companies an incentive to become more efficient, because the marginal tax rate on profits has become zero.

In terms of the policy archetypes, the intended policy is classified as a framework policy. It is cluster-oriented because it emphasises the importance of a skilled seafaring labour force for the shore-based activities, both in the shipping and shipping-related sectors. It is half-way interventionism and non-interventionism because it creates conditions under which German companies become better able to compete in the international playing field of shipping. The proposed measures, however, are relatively weak in the sense that they can still be taken a step further. This would make the package even more effective. Therefore, an extended framework scenario has also been considered in this study.

Compared to the proposed policy, the *extended framework* scenario further stimulates the employment of German seafarers by means of a 'fiscal facility'. This implies an exemption from paying income tax and social security contributions to a maximum of 40% of the gross wage on German flagged ships. For foreign seafarers the scenario foresees a complete exemption from social security payments. In the sphere of corporate taxation, the tonnage is tax linked to the seat of the shipping company instead of the flag of the ships, and there is an unconditional exemption from capital gains tax. Furthermore, more emphasis is put on the long term aspect of human resources management. Finally,

funds are foreseen to promote maritime activities, infrastructure and services in Germany, and to pursue more R&D with respect to maritime activities. This should ensure a modern, competitive fleet and thriving shore-based activities in the long term.

4.4. QUANTIFICATION

The shipping sector's conduct with respect to the scenarios has been quantified in two respects:

1. *fleet and flag development;*
2. *manning composition and cost.*

Both estimations relate to 1997-2006.

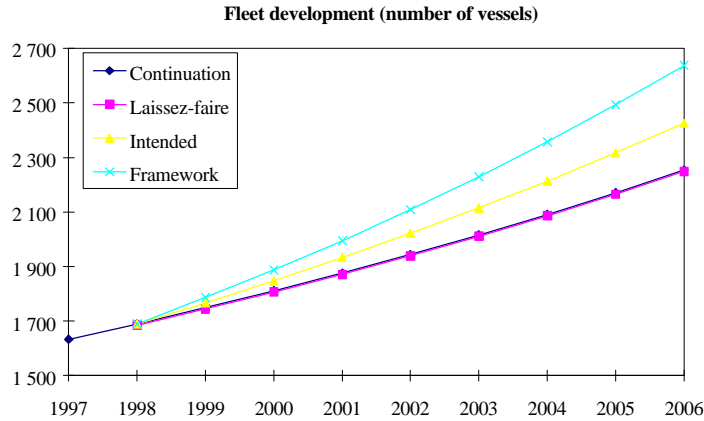
The policy alternatives introduced above all have an impact on the business environment. This may lead the shipping companies to a change in flagging, manning and management strategy, such that that it becomes more (or less) in line with the government's fleet and employment objectives. As part of the scenario building stage of the EIS, the changes have been quantified in two respects. First, estimations of the fleet and flag development up to 2006 are made. Second, estimations of the development of the manning composition and cost per type of ship and flag have been made. The fleet development thereby serves as an indicator of the total shipping activity in Germany. The flag and manning development affect the cost structure, and hence the shipping column of the input-output table. Both serve as an input for the Input-output analysis that quantifies the performance of the policy alternatives.

The German-owned fleet is anticipated to grow under all scenarios. This is caused by the growing world trade and favourable investment conditions. Under the extended framework scenario, the growth will be the strongest.

The expected development of the German *fleet and flag* in relation to the policy alternatives is summarised in *Figures 5 and 6*. The fleet is expected to grow under any scenario. This is not only the consequence of the still growing world trade. It also is the consequence of the fiscal schemes for shipping investments, which is part of all four scenarios. Nevertheless, there are differences between the scenarios. These differences can be explained by the extent to which the competitiveness and profitability of the shipping sector are improved. The *continuation* of the present policy or the *laissez-faire* scenario will not improve the business environment for shipping. Therefore, the growth of the fleet is anticipated to be mainly driven by two factors given above. The introduction of the *proposed framework* policy will cause a moderate improvement of the business environment, and thus of profitability. This will result in higher investment volumes. Under the *extended framework* scenario, the business environment is further improved, which is expected to further boost profitability and investments. This is

mainly induced by the nationality and fiscal incentives introduced above.

Figure 5 : Estimated development of the German fleet, 1997-2006

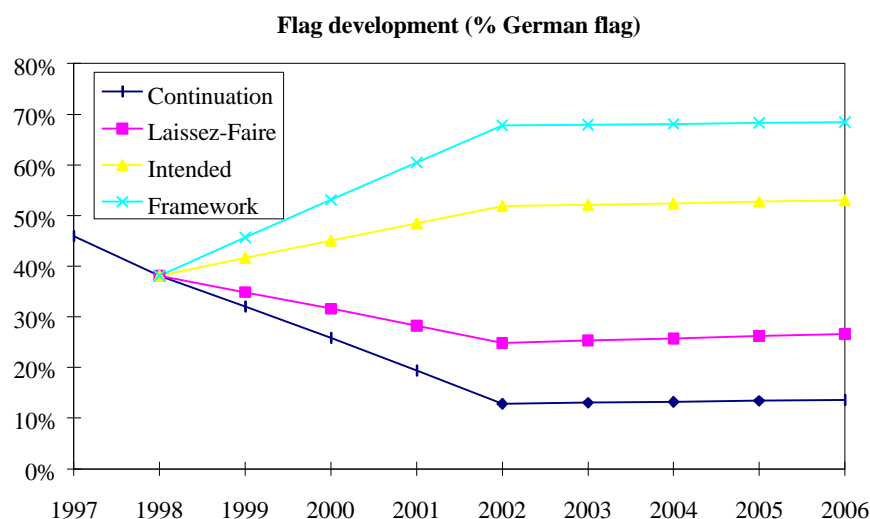


Note: The fleet development is equal for the continuation and laissez-faire scenarios.

Source : Policy Research Corporation N.V..

The trend of flagging out is expected to be countered within four years after the implementation of a framework policy. Under the proposed package, the significance of the German flag will stabilise at the present level. Under the extended package, the significance will even increase.

The changes in flag strategy are expected to take place in four years after the implementation of the new measures. It has turned out from the field research that the companies' flagging strategy builds on a one-off decision following the policy change. The decision will then be carried through within a few years. Therefore, the larger part of the shifts between German and foreign flags are situated between 1999 and 2003. Under *continuation* and *laissez-faire* it is expected that the decline of the German flag will continue. Under the *proposed framework* scenario, it is expected that the share of the German flag will remain more or less at the present level. The relaxation of the nationality requirements, and the fiscal measures to cut operating costs and increase incentives for efficiency, make the German flag significantly more competitive than it would under the other two scenarios be. As a result of the still lower crew costs and stronger facilities in corporate taxation, the *extended framework* scenario results in a significant flagging back of German-owned vessels.

Figure 6 : Estimated development of the German flag share, 1997-2006

Source : Policy Research Corporation N.V.

The analysis of the manning development focuses on the German officers. The rationale for this is that the maritime human capital stock is essential for the long term sustainability of shipping and shipping-related activities.

Under continuation and laissez-faire, their number will dramatically fall. Under the proposed framework policy it will fall too. Under the extended framework, it will stabilise at the presently high level.

To analyse the development in the sphere of *manning*, a series of crew cost and crew composition models have been developed. The crew cost models calculate the gross labour cost per seafarer as a function of rank and nationality, and of the flag and policy scenario. The crew composition models give the level and composition of the crew as a function of ship size, flag and scenario. So, for each ship, the total crew cost are determined given the flag and prevailing scenario. By applying the expected flag shares to the crew composition models, the total crew cost share per scenario has been estimated and built into the intercountry input-output table.

Furthermore, the development of total employment for German seafarers has been estimated. The focus has thereby been on the officers, for reasons that the quality of the employment is also of importance. This refers to the level of education, training, experience and skills. In this respect officers are considered to generate the highest value. Their knowledge is an asset for shore-based functions, both in the shipping sector and in related maritime and port activities. For the ratings, there is no such requirement. To remain competitive, the shipping companies should rather have the opportunity to employ sufficiently qualified ratings from all over the world, instead of the relatively expensive German ratings. Moreover, as also argued by

Porter (1990), the German would-be ratings could then develop their human capital for more productive use in the German economy. The 1997-2006 development is given in the next section on performance, where it is tentatively confronted with the supply developments.

4.5. PERFORMANCE

Using Input-output analysis, the effects of the scenarios have been estimated. For shipping, the effect on domestic expenditures is thereby highly relevant.

Using the Inter-country input-output analysis and a simple macroeconomic framework, the policy scenarios are compared in terms of the output, value added, employment, net backflow and expenditures they generate. Especially for an international sector as shipping, the expenditure effect plays an important role in the analysis. Basically, value added and expenditures give the same information, as they relate to the generation and spending of the same income, respectively. In present-day shipping, however, a relatively large part of the generated income is earned by foreign nationals, and is thus transferred to other countries. So, the domestic expenditure of the generated income may be significantly lower than the income itself.

The output of the German shipping sector is estimated at 5.8 billion Ecu in 1997. When taking into account the indirect impact, total output amounts to 9.2 billion Ecu, of which 1.5 billion is created in the other member states.

In 1997, the total output of the German shipping sector was 5.8 billion Ecu (see *Table 1*). Considering an intra-EU12 output multiplier of about 1.6, the total output generated by the German shipping sector was 9.2 billion Ecu. So, the indirect output amounted to 3.4 billion Ecu, of which 2.0 billion was generated in Germany and 1.5 billion were inter-country spillovers into the other member states. The major part of these spillovers is generated in Italy, Belgium/Luxembourg, the United Kingdom and France, respectively, followed by Spain and The Netherlands. Thereby note the remarkably high spillover into Belgium/Luxembourg and the remarkably low spillover into The Netherlands. For Belgium/Luxembourg this is caused by the strong intra-EU trade integration of this small but centrally located entity (see also Dietzenbacher *et al.*, 1993; and Van der Linden, *forthcoming*). For The Netherlands, a relatively high spillover might be expected for the same reason. The given spillover, however, seems relatively low, but may be considered an underestimation because of some statistical differences that need to be resolved in the framework of EEIS-EEIG (1997). In the remaining four countries, only a 120 million ECU is generated.

Table 1 : The economic impact of the German shipping sector, 1997 (mio Ecu)

	Output	Value added	Employ.(no.)	Backflow	Consumption	Investments
Shipping (dir. & indir.)	5 763	2 814	45 278	344	276	727
Other sectors	1 987	862	19 616	262	208	416
Total Germany	7 750	3 676	64 893	606	484	1 143
Italy	343	133	4 171	39	25	86
Belgium / Luxembourg	275	200	2 085	54	38	98
United Kingdom	226	131	4 805	34	35	80
France	218	93	2 263	28	23	64
Spain	142	68	1 446	6	19	68
The Netherlands	132	55	743	14	8	61
Ireland	46	9	297	3	7	32
Denmark	42	16	343	6	3	44
Portugal	29	10	606	3	3	38
Greece	3	1	114	0	0	38
Total rest EU12	1 457	716	16 872	187	161	609
Total EU12	9 207	4 392	81 765	792	645	1 751

Source : Policy Research Corporation N.V.

In 1997, 4.4 billion Ecu value added was generated in the EU12, 82,000 jobs, and a backflow of 800 million Ecu. The expenditures amounted to 2.8 billion Ecu, which is lower than the value added for two reasons:

1. investments outside the EU;
2. employment of non-EU citizens.

To give a comprehensive analysis of the economic significance, the impact on output is translated into value added, employment, backflow and expenditures. The outcomes are also given in *Table 1*. In total, the German shipping sector generated 4.4 billion Ecu value added and 82,000 jobs in the EU12, and the respective governments received almost 800 million Ecu. The intercountry patterns are basically the same as for output, although there are also some deviations that may be induced by differences in capital- and labour-intensity.

The expenditures are the sum of private consumption, investments and public consumption, where the latter is assumed to be equal to the backflow. In other words, it is assumed that the government receipts are budgetary-neutral spent. The total expenditure effect amounted to 2.8 billion Ecu, which is considerably lower than the generated value added. This is caused by two major reasons. First, a large part of the shipbuilding investments is made outside the EU, for example in Japan or South-Korea. Second, on the flagged-out ships, the many non-EU seafarers working for the German shipping companies spend the major part of their income in the home country.

The value added equivalent of output on the EU level is 4.4 billion Ecu, 81% of which is generated by the shore-based activities. This illustrates the importance of the shore-based activities for the economic impact of the shipping sector.

In terms of economic activity, the present and laissez-faire policies are outperformed by the framework policies.

With the exception of the net backflow, the extended framework policy is expected to perform better than the proposed framework policy. So, the lower backflow is the 'price' paid for a better performance.

A distinction has been made between ship-related and shore-related effects. This gives an indication of the relative importance of the actual operation of ships and the management of the company. With respect to value added, the ship/shore-ratio on the EU level is 19/81. On the domestic level, this is 23/77. For the expenditures on the domestic level, this ratio is 26/74. These ratios show the importance of the shore-based activities for the economic impact of the shipping sector. It underlines the need for emphasising the safeguarding of management activities when considering policy measures for the shipping sector.⁸

Table 2 gives the major outcomes of the scenario analysis. Evidently, *continuation* is not the best alternative in terms of value added and employment generation, and the impact on expenditures. In terms of backflow to the government, the present policy is in the long run outperformed by the laissez-faire and proposed framework policies. A *laissez-faire* policy results in a slightly higher value added creation than continuation of the present policy. Both scenario's, however, are outperformed by the two framework scenarios when their impact on expenditures is taken into account. Finally, employment is worse off in case a laissez-faire policy is introduced. As indicated below, this especially holds for the German officers, who represent the human capital stock for the country's cluster of maritime activities. A laissez-faire policy should therefore not be considered as a sustainable shipping policy.

The introduction of the *proposed framework* policy is an adequate alternative on account of all factors considered in the EIS. In terms of value added and expenditures, it outperforms the present policy right from the start, while employment and backflow is higher after only a few years. The *extended framework* policy, finally, performs best in absolute terms of generated value added and employment. Moreover, the generates the largest impact in terms of expenditures. In terms of the backflow to the government, however, the extended framework policy is an underachiever in the short term. However, in the medium term, it has about the same effect as the continuation scenario. This underachievement can therefore be interpreted as the trade-off between

⁸ For the Netherlands, Peeters *et al.* (1994) found ratios of the same order.

the government's (financial) effort and its effectiveness regarding the economic activity.

Table 2 : The performance of shipping policy scenarios, 1999-2005 (mio Ecu)

	1999				2002				2005			
	Continuat.	Laiss.-Faire	Proposed	Framework	Continuat.	Laiss.-Faire	Proposed	Framework	Continuat.	Laiss.-Faire	Proposed	Framework
Value added												
Shipping	2 978	2 988	3 046	3 078	3 118	3 225	3 484	3 633	3 481	3 601	3 993	4 296
Other sectors	924	924	933	943	1 027	1 027	1 068	1 113	1 146	1 146	1 223	1 316
Germany	3 902	3 912	3 979	4 021	4 144	4 252	4 551	4 747	4 627	4 747	5 216	5 613
Intra-EU12 spillover	767	767	774	783	852	852	886	924	951	951	1 015	1 092
Backflow												
Shipping	308	361	307	209	223	359	345	208	249	400	396	246
Other sectors	282	284	240	243	321	316	276	289	359	353	316	342
Germany	590	646	547	452	545	675	621	497	608	754	712	587
Intra-EU12 spillover	200	200	202	204	222	222	231	241	248	248	265	285
Employment (no.)												
Shipping	49 112	48 972	48 548	48 218	54 700	54 088	54 211	54 921	61 070	60 304	61 799	64 368
Other sectors	21 012	21 012	21 228	21 453	23 351	23 351	24 283	25 325	26 067	26 067	27 829	29 946
Germany	70 125	69 984	69 776	69 671	78 051	77 438	78 495	80 245	87 137	86 370	89 628	94 314
Intra-EU12 spillover	18 074	18 074	18 260	18 454	20 086	20 086	20 888	21 784	22 422	22 422	23 938	25 759
Expenditures												
Germany	1 483	1 523	1 459	1 436	1 270	1 385	1 474	1 449	1 418	1 546	1 689	1 713
Intra-EU12 spillover	642	642	649	656	714	714	742	774	797	797	851	916

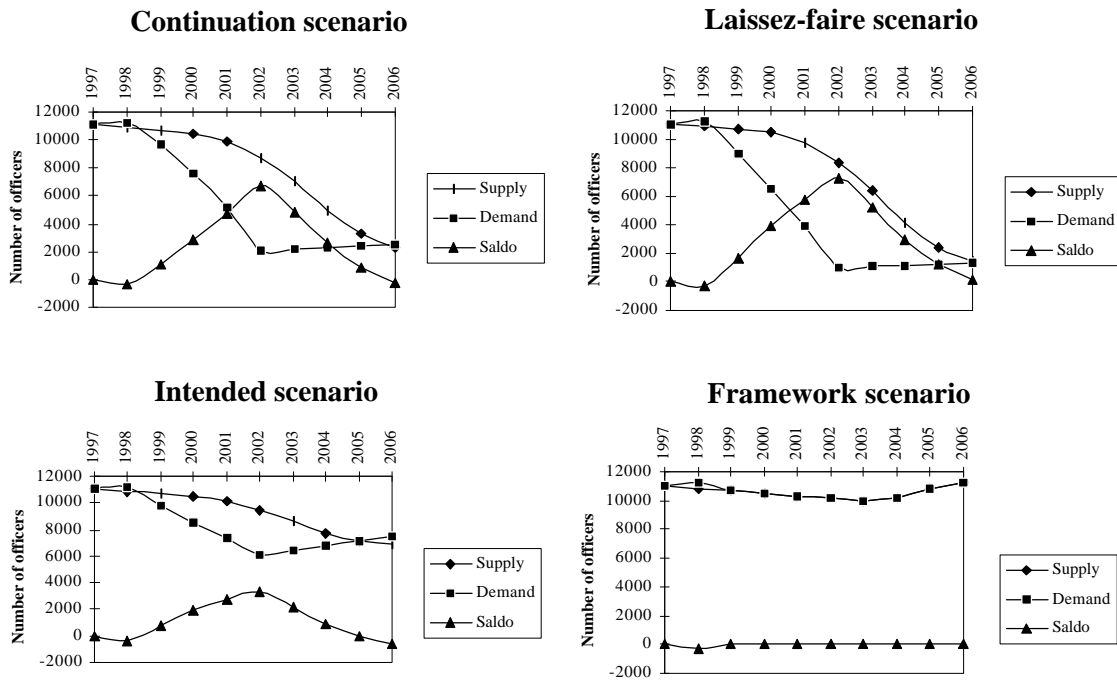
Source : Policy Research Corporation N.V.

Besides the Input-output analysis, and because of the above mentioned importance of qualified labour, some special attention has been drawn to the expected labour market developments for German officers. The 1997-2006 development of their supply of and demand under the four policy scenarios are summarised in *Figure 7*.

Both the continuation and laissez-faire scenarios result in a strong decrease of employed German officers. Therefore, these scenarios cannot lead to a sustainable development of the shipping and shipping-related sectors in the long term.

The *continuation* and *laissez-faire* scenarios would both result in a severe reduction of the employment level for German officers. In both these scenarios the German crew members are replaced by foreigners as a result of the continued flagging out. More important, the number of people interested in a maritime career is expected to decrease strongly. So, the supply of German officers would also be decimated. This implies a large and irreversible loss of maritime knowledge in the long run. The decline in the maritime human capital stock would not only affect the shore-based operations of shipping companies. Especially the rest of the maritime cluster, which consists of all activities related to shipping and ports, would encounter insurmountable difficulties in finding qualified people further in the future. Consequently, the knowledge basis for a future function of Germany as a maritime centre would be severely endangered.

Figure 7: Estimated labour market developments for German officers, 1997-2006



Source : Policy Research Corporation N.V.

The proposed framework scenario will also lead to a large reduction of the employment of German officers. This leads to imbalances of the maritime labour market, and poses a certain threat to the position as a maritime centre.

Although to a significantly lesser extent than in the continuation and laissez-faire scenarios, the proposed framework policy still leads to a relatively sharp decrease in the demand for German seafarers. Between 1997 and 2006 nearly 4000 officers are expected to lose employment at sea. Moreover, these ex-seafarers cannot be employed ashore immediately. When the demand for ex-seafarers picks up after 2002, the sector may not be interested in the then long-term unemployed candidates anymore. In conclusion, this scenario will still result in large labour market imbalances. Again, the loss of human capital, although less serious, could certainly threaten the position as a maritime centre.

The extended framework policy is not expected to result in short term unemployment of German officers. This will secure the sustainability of the successful development of the shipping sector, while the position of Germany as a maritime centre is safeguarded.

The extended framework policy is not expected to result in either a short or a long-term loss of employment. On the basis of the minimum manning requirements, a moderate loss of employment might be anticipated. However, the fiscal facility lowers the costs of German officers to such an extent that German shipping companies will employ more of them than legally required. This expectation is based on the

experience with a comparable framework policy introduced in the Netherlands. On further analogy to the Dutch experience, a shortage of German officers is expected in the short term. This is caused by the flexibility in the crew costs and the requirement to train German officers under the German flag (Peeters *et al.*, 1997). The continued employment of German officers will secure the sustainability of the successful development of the shipping sector and the rest of the maritime cluster. In other words, the framework policy safeguards the position of Germany as a maritime centre.

4.6.

THE MOST DESIRABLE POLICY

So, a framework policy is preferred for the German maritime shipping sector. The extended version thereby outperforms the proposed version on the basis of

- economic activity (although at a higher budgetary cost);*
- sustainability and human capital development.*

Considering the above, it may well be expected that the adoption of a framework policy is the most appropriate for the German shipping sector. Under the two other alternatives, neither of the fleet and employment objectives are fulfilled because the shipping companies seek strategies which performance does not coincide with the public objectives. The choice is thus limited to the proposed and extended framework scenarios. Roughly speaking, the long-term outcomes of the two alternatives are comparable. The budgetary costs related to the extended framework policy are of course higher, implying a higher level of support. Therefore, on the basis of the Input-output analysis, it may be concluded that there is a trade-off between government effort and economic activity, with a clear preference for the extended framework policy when the activity is considered more important.

This preference is underlined, when the effects on the sustainability of human capital is taken into account. The basic difference between the scenarios lies in the sustainability of the development of the German shipping sector and the function of Germany as a maritime centre. Under the proposed policy, the human capital element is not supported to the same extent as under the extended framework policy. This difference is mainly qualitative. It is not so much in the total number of German seafarers, but in the number of German officers. Only the extended framework policy is able to secure the level of employment for German officers, and thus the future of Germany as a maritime nation.

5.

CONCLUSION

The 'Policy Research - Economic Impact Study', as developed in this paper allows for a sound analysis of the relationship between public policy and market performance.

This paper introduced the *Policy Research - Economic Impact Study*. This EIS analyses the relationship between public policy and the economic performance of a sector, in order to draw up recommendations for continuing or changing the prevailing sector-oriented policy. It consists of a broad causal framework and a quantification of its most important elements. The framework builds on the Structure-Conduct-Performance model. The major merit of the EIS is that it gives a clear and thorough analysis of the relationship, based on a synergetic combination of established concepts. Very important in and beneficial for the EIS are the explicit modeling of behavioural relationships, and the close cooperation with the analysed sector.

However, this analysis may be further developed in several respects.

Nevertheless, there remains room for further development. First of all, the, admittedly, broad conceptual framework may be elaborated further, for example by more precisely laying the relationships between the principal's decisions and the agents' actions. Second, the scope of the data collection may be widened. It basically builds on published statistical and company-level data. A promising additional source may be the adoption of expert estimates on the cost structures of specific productive activities. A first step towards this approach was the development of the crew cost and composition models. Third, the quantification of behavioural relationships may be further elaborated and formalised, for example by adopting econometric estimation techniques. Fourth, a semi-closed input-output approach may be developed that takes account of price changes and supply constraints. Finally, as the present EIS exclusively focuses economic activity, *i.e.* performance in quantity terms, it may be extended towards price and quality measurement.

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