The Economic Significance of Maritime Clusters
Lessons Learned from European Empirical Research

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THE DANISH SHIPOWNERS’ ASSOCIATION

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Preface

The concept of clustering has been widely integrated across Europe in the political, academic, and industrial spheres of maritime clusters, and to a greater extent than in most other areas of economic activity. In fact, we do not lack sources of knowledge on the economic importance of clusters – as this working paper will show, researchers have produced studies in abundance, which have consistently indicated the large potential of maritime activities to contribute to employment and GDP in European nations. What was lacking, however, at the outset of this project was easily accessible knowledge on the results and findings from the maritime cluster studies. By producing an aggregated overview of the research field, combined with individual reviews of a large array of studies, we hope to make the research more accessible and facilitate its use as a foundation for decision making in maritime clusters going forward.

Interestingly, this working paper has itself been developed through a small-scale cluster initiative. The Danish Shipowners’ Association, namely the Department for Trade and Shipping Policy as well as the Committee for Trade and Shipping Policy, which represents the membership of DSA, appointed me to carry out this project, through two faculty members of the Copenhagen Business School. In addition, a number of persons in The Blue Denmark and at the European level have contributed to this final version.

The Danish Shipowners’ Association and I wish to acknowledge The Danish Maritime Fund, which contributed by financing the projects in full, towards publishing it in the interest of the Danish maritime sector. Furthermore, the Fund’s administration, Carsten Melchior and Erik Bastiansen have actively contributed throughout the project’s duration. Thanks should also be extended to Steen Sabinsky with the Maritime Development Center of Europe, who has on several occasions pointed to literature and material of relevance to this paper, as well as the European Community Shipowners’ Associations for their helpful comments.

A number of persons in the European Commission were kind enough to allocate time to meetings on this project in Brussels, and their comments have greatly helped to refine the contents and make it more relevant in the context of European policy. On this basis, we are grateful to Mr. Torsten Klimke, Policy Officer, and Ms. Dorthe Lomholt, National Expert (DG Transport and Mobility – Maritime transport policy: ports and inland waterways); Ms. Luisa Sanches, Policy Analyst, Mr. Patrick Bernard-Brunet, Assistant Policy Officer, and Mr. Martin Wegele, Stagiaire (DG Regional Policy – Thematic coordination and innovation); and finally, Mr. Ronald Vopel, Policy Officer (DG Maritime Affairs and Fisheries – Maritime policy).

The working paper’s findings speak of the interdependence of sea-related activities and the fundamental importance of maritime clusters in economic terms to regions and nations, particularly as the vast majority of the value created remains in the national economy. Additionally, it shows that the derived social and economic effects of the core maritime sectors far exceed their direct impacts, and that the presence and strength of certain sectors, i.e. shipping, ports, and offshore, are drivers of cluster development. It is our hope that this paper may prove useful to the reader as a reference tool and a detailed review of maritime cluster research.

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Executive Summary
This paper aspires to provide an accessible and concise overview of research into the economic significance of maritime clusters in Europe. It does so through individual reviews of a large range of maritime cluster studies, describing the purpose, methodologies, and key findings of each. These reviews are preceded by a report, which has been written to enhance the understanding and accessibility of the cluster concept and maritime cluster research. The report contains a description of the theoretical background of clusters, an assessment of their typical structure and dynamics in the maritime context, as well as a section aggregating the main findings on the economic significances of maritime clusters.

The key conclusions from the reviewed research are:

- The concept of clusters has been widely integrated into the conduct and political governance of maritime activities, both at the level of the European Union and in the respective member states. This development can be seen as evidence of the concept’s value, and in addition, it makes it even more worthwhile to familiarize oneself with the basic tenets of clusters, their structure, and their economic significance.

- Not only do clusters exist, they are highly significant to European economies, as regions with higher levels of clustering tend to have higher income and employment levels.

- The total economic impacts of maritime clusters are of great importance to most European nations, as they consistently account for multiple percentages of total GDP and employment.

- The total economics impact of maritime activities may be broken down into direct and indirect effects. Direct considers the economic activity and jobs generated directly by the cluster. Indirect effects include the jobs and demand created up and down the supply chain, as well as the consumption generated in the rest of the economy. Thus, the value and demand generated in the clusters trickles down through the overall economy to create further jobs and demand, making the combined economic importance of an even greater nature than simply direct activities.

- This has led to the realization that the full economic significance of maritime activities is not the jobs at sea, but rather the derived employment and economic activities on shore.

- The majority of studies sub-categorize economic impacts to assess the relative contribution of different sectors as some contribute larger value to GDP than others in maritime clusters. Shipping and ports are consistently shown to be the top value-generating activities in the European maritime clusters – in the clusters considered, these two accounted on several occasions for up to half of all value added created.

Main FINDINGS

- “Maritime clusters exist and are of significant economic importance to European economies.”
- “The strength of the core sectors, i.e. shipping, ports, and offshore, determines cluster prosperity and growth.”
- “Though maritime activities are international, the value they create remain to a large extent domestically to benefit their hosts.”
The relative role and importance of sectors differ within a cluster. The main core sectors in maritime clusters are shipping companies, ports, and offshore industries, though the relative weight of sectors vary between regions. The surrounding sectors depend upon the core for activity, as the core facilitates the demand and investments necessary for growth in cluster activity. Also, related economic activity is more likely to develop if businesses in the core are strong, and thus able to create demand and attract suppliers and related businesses to a location. It follows that the stronger the core, the greater is the prosperity of the cluster.

Similarly, one may also distinguish between demand and supply sectors. Supply sectors such as shipbuilding and marine equipment depend upon demand from other parts of the cluster. Demand sectors make the capital investments and spending, which drive economic growth, profitability and future competitiveness in a cluster. The main demand-generating sectors are shipping and offshore. As a result of these dynamics, the ability to attract and retain economic activities depends upon the presence and strength of the demand-generating sectors.

While international in nature and despite worries to the contrary, a large amount of intermediate purchases by shipping companies and other core maritime activities are made domestically, and only a low level of investments are outside of the EU. Thus, the value created remains to a great extent at home.

The maritime sectors are found to have linkages to nearly all other industries through intermediate deliveries and purchases. Furthermore, the effective functioning of many industries and overall economies require reliable, extensive infrastructure for transport of goods, which depends upon many levels of the cluster from shipping and ports to maritime services and equipment.

The clusters observed in the reviewed studies go beyond geographic co-location: important linkages and relationships exist within specific maritime sectors and across different sectors; markets for labour with maritime experience are shared across many levels in the clusters; Cooperation take place in a number of areas such as innovation, image building and recruitment, as well as lobbying activities. Other benefits include informal interactions, learning opportunities, and knowledge flows.

Firms locate in a cluster because a cluster environment holds advantages such as the proximity to customers and suppliers, existence of positive externalities from investments by cluster actors, which facilitates the development and sharing of specialized labour pools, knowledge, and information. These aspects of a cluster enhance dynamics such as cooperative rivalry, innovation pressures, and the establishment of trust relations between cluster actors.

The benefits from cluster dynamics are actively sought by some sectors in the cluster, such as maritime services providers and marine equipment producers, as well as related and supporting industries. In doing so, they seek to locate themselves close to the ‘core’, shipping companies, whose presence enhances local demand, interaction, and provides a basis for cluster dynamics. Thus, it is important to ensure that these core companies can operate on a level playing field with their international competitors, so that they are not driven to re-locate abroad due to cost and tax disadvantages in the cluster.

Clusters are based upon significant investments in maintaining networks and building skills. Should the cluster decline, for instance if key sectors in cluster contract or exit, a similar dynamic environment will take a long time to develop.
1. Introduction

The notion of clusters has increasingly been integrated into European economic and political thinking, and today it functions as a cornerstone in innovation and industrial planning policies. Cluster policy initiatives have been enacted on regional, national, and supra-national levels. The European Commission has recognized the importance of clusters, identifying it as a priority to strengthen clusters in Europe in its Broad-based Innovation Strategy\(^1\). Similarly, documents such as the *European Cluster Memorandum\(^2\)* and *Towards World-Class Clusters in the European Union\(^3\)* have strongly indicated the prominent position that the concept of clusters will continue to hold in European and national policy making going forward.

In the maritime context, the concept has been embraced by stakeholders at all levels. In yet another document by the European Commission, it is pointed out that the importance and interconnectedness of sea-related activities make clusters particularly relevant.\(^4\) Much has been done by maritime organizations to evaluate, further develop, and exploit the potential of maritime clusters as enablers of competitiveness, often with the support of public authorities. With these initiatives has come a growing range of literature on and research into the economic importance and structure of maritime clusters. These studies extend in focus from the regional level, such as the maritime sector’s contribution to the economy of Merseyside\(^5\) in the United Kingdom, over the national level, considering the Danish, Dutch, or Italian clusters, to the level of the European Union.

The researchers have consistently emphasized the economic significance of maritime clusters, concluding that the direct and indirect economic impacts in terms of employment and contribution to GDP make maritime clusters of vital importance to a society. The studies reviewed as part of this project show that it is not the jobs at sea, but rather the derived jobs and activities on land, which make up the full impact of maritime industries. These findings have not gone unheard: The first studies of the Dutch maritime cluster led the government to alter its maritime policy towards a predominantly cluster-based policy, in order to fully support its future growth and potential; The Danish government has launched an agenda for growth of the Danish maritime cluster, on the basis of a study of the international competitiveness of the cluster as a whole; And since it commissioned two extensive projects, which have assessed the economic importance of European maritime activities and clusters, the European Union has highlighted maritime clusters in its Action Plan as part of the recently adopted Integrated Maritime Policy.\(^6\)

This report aims at making the vast knowledge on the economic significance of maritime clusters available to all stakeholders, practitioners, and policy makers. In doing so, a large array of empirical maritime cluster studies, policy documents, and theoretical papers have been reviewed. A great part of the maritime cluster projects that were considered have been summarized individually, describing purpose, methodologies, and key findings. The studies to be summarized were chosen on the basis of relevance, thoroughness and depth of investigation. Another factor was that several different clusters should be represented, and of a certain size and importance in Europe. These reviews may be found in the back of this material.

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\(^1\) European Commission, COM(2006) 502 Final: *Putting Knowledge into Practice: Implementing the Broad-based Innovation Strategy*.

\(^2\) The European Cluster Memorandum – Promoting European Innovation through Clusters: An Agenda for Policy Action. Stockholm School of Economics for the High Level Advisory Group on Clusters, the INNOVA initiative, the European Commission.


This preceding report has been written in order to aid the understanding and accessibility of the cluster studies. First, an overview is provided in section 2.1. of the theoretical background behind the cluster concept. Then, in section 2.2., evidence is shown of observed benefits of clusters in general. Section 3. will relate the cluster concept specifically to the maritime context, by describing the ‘typical’ structure and dynamics in maritime clusters. Section 4. will consider the prior studies’ findings of the economic contribution of maritime clusters. Section 4.1. is concerned with the findings on the level of the European Union, while 4.2. describes the contents and findings of the national studies on a country by country basis. 4.3. contains an aggregated summary of the described economic significances, and functions as a part conclusion, before an overall conclusion is provided in section 5.
2. The Concept of Clusters in Theory and Practice

2.1. The Theoretical Concept of Clusters

Though the association between geographical proximity and economic performance is by no means new, the concept of clusters was not popularized until the 1990s in the writings of Harvard Professor Michael E. Porter. The earlier literature focused upon the potential for scale and scope economies, as well as lower costs of transactions in such agglomerations, which arise for instance from access to specialized labour, common technologies and infrastructures. While significant, the view was somewhat static, and cost-efficiency based. However, the recognition and awareness of the dynamic nature of clusters, which holds the potential to foster sustained competitive advantages, came with Porter’s description of industrial and regional clusters. Porter defined clusters as “geographic concentrations of interconnected companies, specialized suppliers, service providers, firms in related industries, and associated institutions in particular fields that compete but also cooperate.”

Thus, it is implied that clusters consist of related economic actors and institutions, active in multiple levels of the cluster, and that the scale is sufficient to achieve the critical mass, which leads to the development of specialized suppliers, resources, and services.

Figure 1. Source: Van den Linden, Jan (1998); Porter, Michael E. (1990)

Porter’s Diamond depicts the dimensions that define the level of dynamism in a cluster.

Clusters may improve the factor conditions, the inputs that firms need in their operations, such as specialized labour and skills, targeted capital, infrastructure, technologies, research, education, and knowledge. The greater concentration leads to more intense competition, simultaneous investments and innovation in the cluster industries, and the opportunities for cooperation, which will influence firms strategy, structure, and rivalry in the competitive environment and increase pressures to in-

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novate business processes. Companies are attracted to the cluster and new firms are established in order to serve the needs of this larger concentration of companies, which enables the growth of smaller businesses, whose costs are lowered by this proximity, and the ability to outsource non-core activities. Thus, clustering enables the presence of advanced, specialized suppliers and others in related and supporting industries. Lastly, these favourable demand conditions enable growth, and facilitate innovation, as sophisticated customers pose intense requirements and needs, which increase the competitiveness of the suppliers.

The concept of clusters goes beyond geographical proximity in that it emphasizes the relationships and social ties among the actors in the cluster population. The personal interaction, frequent communication, and a sense of a common identity that can arise out of a cluster’s diverse networks, from project cooperation to cluster organizations and networking arrangements, are what make up the linkages that foster the cluster dynamics. While some relationships are contractual, many are founded upon built-up trust between cluster actors over long time. Such relationships and the proximity can arguably increase both intentional and unintentional resource sharing, in terms of formal and informal knowledge spillovers. These positive externalities from the co-location tend to attract more economic actors to a cluster.  

Clusters may play a significant role in innovation. The modern approach to innovation is less linear, emphasizing the benefits of ‘open innovation’ in dynamic, networked environments, where organizations and institutions in different levels of a cluster interact to combine knowledge to new products and processes. A useful concept in this regard is the ‘triple helix’, which holds that innovation networks in clusters depends upon academic and research institutions (universities); companies, capital and entrepreneurship (private sector); as well as favourable framework conditions (public administration). Cluster organizations and forums that facilitate the networked collaborations are also frequently highlighted as instrumental in clusters. However, at the basis of clustering is the interaction that occurs among businesses and people as part of regular work life. It is the creation of linked relations, which create cluster benefits. Clusters can therefore per se exist independently of whether cluster organizations are set up, although such are often formed as the cluster benefits become apparent. The European Commission have argued that clusters may help to close the gap between business, research, and resources, thus facilitating the assimilation of knowledge. Proximity, it is said, plays a vital role in innovation, as it is at the level of the region that employees, businesses, and organizations interact with one another, particularly so, the innovative small to medium sized enterprises.

It is important for clusters to consist of a critical mass of heterogeneous activities, in order to make the value of the cluster bigger than the sum of its parts, as well as enable increased specialization of companies. By ‘heterogeneous’ is meant that cluster actors should be well distributed across vertical and horizontal dimensions, so that the different levels of the supply chain are represented, along with a number of activities horizontally within each sector.

11 Suggested by Ms. Luisa Sanches, Policy Analyst, Thematic Coordination and Innovation, Directorate-General for Regional Policy, European Commission.
The parts of a cluster differ with regard to their relative importance and potential contribution. Peter W. de Langen argues that clusters are centred around a particular economic specialization, which functions as the ‘core’. The core is less dependent upon the presence of other economic activities, but related industries are attracted to the location encouraged by, i.e. the demand and investments by the core for services and resources, the positive externalities, and availability of common inputs. Similarly, some sectors will function as demand generators, requiring significant inputs from other levels in the cluster. Other sectors are sources of supply, which are vital but largely dependent upon the economic health of the demand-sectors.

Leader firms may facilitate the growth and beneficial dynamics within a cluster. Nijdam and de Langen found in their assessment of leader firm behaviour in the Dutch maritime cluster that such companies have the size, market position, resources, and the entrepreneurial orientation that contributes positively to the competitiveness of the cluster and its population. Leader firm behaviour includes, among others, acting as lead user by posing sophisticated demands and high standards to suppliers, improving transfer of knowledge and the organizational infrastructure, encouraging internationalization of partners, and improving the internal labour market.

The emergence and life-cycle of clusters is significant, in particular as public policy at times designates the development of potential clusters as priority. However, research has shown that despite the importance of creating favourable framework conditions to encourage clusters, the actual formation and growth is essentially a bottom-up process, requiring significant time and investments by the member population of the clusters. In the report for the European Commission, *Regional Clusters in Europe*, Isaksen and Hauge provided a six-step model of cluster development.

- Historical or accidental circumstances and location factors, i.e. availability of raw materials or specific needs of a concentrated customer group, may stimulate the growth of pioneer firms and lead to firm spin-offs of related activity, followed by local competition, which stimulates entrepreneurship.
- External economies result from this agglomeration, i.e. establishment of specialized suppliers and labour market.
- Formation of dedicated organizations, such as business associations, education and knowledge establishments, which advance local collaboration, learning, and technology spillovers.
- The external economies and the new local organizations enhance the visibility, prestige, and attractiveness of the cluster, attracting more firms and skilled human resources.
- The proximity encourages the creation of non-market, trustful relationships and socialization, which foster an untraded circulation of knowledge and information, as well as collaboration.
- Lastly, clusters may either continue to renew themselves or rather reach a state of stagnation or decline.

In the book, *Attracting the Winners*, it is argued that three main upgrading mechanisms are the sources of renewal and self-reinforcing growth of clusters: innovation pressures, knowledge diffusion, and complementarity. Competition, imitation, and sophisticated demands from customers lead to pressures to innovate, which spread through the supply chain. Knowledge is diffused through the levels of a cluster through high mobility of human resources, forums for communication and inter-

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19 Isaksen, Arne. & Hauge, Elisabet (2002): *Regional Clusters in Europe. Observatory of European SMEs*
20 Jakobsen, Erik; Mortensen, Ari; Vikesland, Martin; & Cappelen, Alexander (2003): *Attracting the Winners.*
action, as well as cooperation. Finally, growth and establishments of new companies lead to a critical mass, which enhances synergies and the profitability of infrastructure projects, and makes the cluster an even more attractive location.

Others have pointed to a more extensive list of factors that may enable the growth and prosperity of clusters, such as the report *European Maritime Clusters*, namely: define cluster and establish its economic significance and visibility; define an industrial policy for the cluster; strengthen demand-generating maritime sectors; monitor and maintain a level playing field; promote exports and internationalization; Encourage R&D, innovation, and leader firms; Strengthen specialized education and labour market.21

Overall, institutional settings play a significant role in enabling competitiveness and expansion, retaining maritime activities, attracting foreign companies, as well as increasing the level of innovation. This includes government policy, interest organizations, educational institutions, and research bodies. Cluster-based policy shifts the role of government towards building appropriate legislative frameworks for cooperation and growth.

In short, successful clusters reinforce and upgrade themselves, driven by the dynamic inter-relationships of cluster actors in terms of competition, cooperation, knowledge spillovers, and innovation.22 The benefits of such concentration of activities are largely undisputed, as regions worldwide compete to provide the best framework conditions to attract and retain businesses, investments, and human resources.23

2.2. Clusters in Practice

A 2008 communication from the European Commission concluded that “Clusters play an important role in driving competitiveness, innovation, and job creation in the EU”24. The European Cluster Observatory has identified more than 2000 regional clusters in Europe. From the same analysis, it is estimated that 38% of European employees work in companies that are part of a cluster, while in some regions that share of cluster employment exceeds 50%. Thus, clusters play a larger role in economic activity than is often acknowledged. Most people are familiar with the concentration of certain activities and regional specialization – consider the City of London’s financial services, luxurious fashion consumer goods from Italy, the biopharmaceuticals in Eastern Denmark, or one of the larger concentrations of automotive production in Southwest Germany. The value of the cluster concept is that it combines the regional concentration with the value, dynamics, and benefits, which may strengthen the competitiveness of the actors within.

Clustering in regions is associated with higher levels of economic prosperity. Using data from the European Cluster Observatory it can be shown that regions, where larger shares of employment are in industries belonging to strong clusters, have higher GDP per Capita. The European Commission document, *Concept of Clusters and Cluster Policies for Competitiveness*25, cite a number of empirical studies, which show that strongly clustered regions have higher growth in employment and lar-

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22 Ibid.
ger average wages, while entrepreneurial firms in clusters create more jobs, more tax payments, higher wages, and have higher likelihood of survival than non-cluster firms.

Innovation in clusters exceeds that of firms elsewhere, which is the case in both theory and practice. The Innobarometer 2004\textsuperscript{26} survey by the European Commission considered ‘innovative companies’, while the 2006 Innobarometer\textsuperscript{27} surveyed innovative companies in clusters. 63\% of clusters firms introduced new or significantly improved production technology, vs. 56\% of non-cluster firms. Overall, cluster firms conducted more market research (53\% vs. 33\%), registered more patents (29\% vs. 12\%), and introduced more innovative products (78\% vs. 74\%). Also, firms in clusters are far more likely to cooperate with universities, other firms, or research institutes in innovative activities (41\% vs. 20\%). Thus, these figures provide an indication that clustering may foster firm-level innovation, just as European Cluster Observatory data show that regional level of patenting may be positively associated with strength of clusters. Between 66\% and 71\% of the firms in the 2006 survey responded that they saw advantages in being part of a cluster, just as 53\% of the cluster firms agreed that belonging to a cluster enabled them to extend the scope of their activities.

Findings from cluster research, as reported above, should not be viewed as exact, but rather as indicative results of the significance of clusters. An often cited limitation is that clusters do not exist as definite units in regional, national, or supranational statistics. They are instead constructed by the researchers, based upon empirical knowledge of the interrelationships among industries in a region, to be termed a cluster. Bounding and delineating a cluster from other economic areas is a significant task, which will inevitably introduce some variation across studies. More qualitative case studies are often employed to counter such limitations, although case studies often preclude generalizing to the whole population of clusters. Overall, however, the concept of clusters has been shown repeatedly to be highly valuable as unit of analysis, as firms are not free-standing or independent entities, but rather parts of a socially and economically interconnected population. The mutual dependency and the cross-pollination of economic activity among sectors and firms are taken into consideration in cluster analyses, thus recognizing that a cluster’s significance to a society may extend well beyond the sum of its parts.

\textsuperscript{26} Gallup Europe (2004): \textit{Innobarometer 2004}. European Commission, DG Enterprise
3. Maritime Clusters: Structures and Internal Dynamics

The concept of clusters has been widely drawn upon in the context of maritime-related activities in a number of European countries and at the EU level. The European Commission, national governments, as well as institutions and organizations have examined maritime clusters as a basis for guiding economic and sector policies to facilitate the growth and prosperity of maritime activities in regional concentrations. Though a large part of the research has focused upon establishing the combined economic significance of maritime clusters, the knowledge on the structure and dynamics of maritime clusters has been greatly enhanced. With the caveat that regional variations are bound to exist, this section describes the ‘typical’ maritime cluster.

The definitions of the sectors considered as part of the maritime clusters differ from study to study. While some of the differences relate mostly to labelling, a few relate to more fundamental choices, i.e. whether to include fishing or Navy in the core of the cluster. Other potential issues in delineating the cluster are that only maritime-related activities should be included. For instance, companies under Marine Equipment may well produce parts used in other types of industrial machinery. Researchers use significant resources to control for non-maritime activities in cluster firms in their data assembly processes. The table below serves to exemplify the sector contents of the clusters and the sub-categories used in the research considered.

<table>
<thead>
<tr>
<th>Dutch Maritime Cluster studies</th>
<th>European Commission 2008</th>
<th>Navigating Blue Denmark</th>
<th>Italian Maritime Cluster studies</th>
</tr>
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<tbody>
<tr>
<td>Shipping</td>
<td>Traditional Sectors</td>
<td>Core Sectors</td>
<td>Industrial Maritime Activities</td>
</tr>
<tr>
<td>Shipbuilding</td>
<td>Shipping</td>
<td>Water Transport</td>
<td>Maritime Transport</td>
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<tr>
<td>Marine Equipment</td>
<td>Marine Equipment</td>
<td>Maritime Equipment</td>
<td>Merchant Shipbuilding</td>
</tr>
<tr>
<td>Offshore</td>
<td>Offshore Supply</td>
<td>Offshore Oil &amp; Gas</td>
<td>Maritime Transport Services</td>
</tr>
<tr>
<td>Inland Navigation</td>
<td>Inland Navigation</td>
<td>Maritime Services</td>
<td>Leisure Boating</td>
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<tr>
<td>Dredging</td>
<td>Maritime Works</td>
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<td>Fishing</td>
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<tr>
<td>Ports</td>
<td>Seaports</td>
<td>Related Sectors</td>
<td>Other Maritime Activities</td>
</tr>
<tr>
<td>Maritime Services</td>
<td>Maritime Services</td>
<td>The Navy</td>
<td>The Navy</td>
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<tr>
<td>Yachting</td>
<td>Recreational Boating</td>
<td>Offshore Wind Energy</td>
<td>The Coast Guard</td>
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<tr>
<td>Fishing</td>
<td>Marine Aggregates</td>
<td>Commercial Fishing</td>
<td>Port Authorities</td>
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<tr>
<td>The Royal Navy</td>
<td>Tourism</td>
<td>Maritime Recreation</td>
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<td></td>
<td>Coastal Tourism</td>
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<td></td>
<td>Cruise Tourism</td>
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</table>

Table 1 – Cluster and sector definitions in selected studies. Source: own creation

As argued in section 2.1., the sectors differ in terms of function and relative importance to the cluster. Cluster researchers either implicitly or explicitly define a few sectors as the ‘core’, on which related and surrounding industries depend for demand and activity. While the ‘core’ may not be the sectors with the densest linkages to other sectors, they are essential to the existence of the cluster. The predominant core sectors are such as Shipping (or Maritime Transport), Ports, and Offshore. The stronger the core, the greater the potential for companies in related and surrounding industries to develop and/or be attracted to a specific location.28

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28 Viitanen, Miko; Karvonen, Tapio; Vaiste, Johanna; & Hernesniemi, Hannu (2003): *The Finnish Maritime Cluster*
Niko Wijnolst and his co-authors of *European Maritime Clusters*¹⁹ argue that certain demand-generating sectors (shipping, offshore, inland shipping, dredging, fishing, and naval) act as cluster drivers through large capital investments, thus making stronger impacts on cluster dynamics than supply sectors. As such, the cluster as a whole is heavily dependent upon the presence and prosperity of these cluster drivers. The studies into the Dutch maritime cluster find similar patterns, concluding that shipping has the largest demand-initiating character among the sectors.

It is widely acknowledged in literature that in order to achieve the optimum level of cluster benefits and long-run competitiveness, it is necessary for a cluster to hold a critical mass of actors at each level of the individual sectors, i.e. it has to consist of large variety of customers, suppliers and service providers, as well as competitors. From this it follows that the ability of the demand sectors (cluster drivers) to generate sufficient demand to sustain activity across the levels of the cluster is of utmost importance³⁰

In connection with their 2008 study for the European Commission³¹, Policy Research Corporation depicted the financial interrelationships (in € million) within the Dutch maritime, which may be seen in figure 2 below.

![Figure 2 – Financial linkages in the Dutch Maritime Cluster in 2006. Source: Policy Research Corporation (2008).](image)

While each cluster is in itself unique with regards to the relative size and contribution of the different sectors, it serves as a good example of how interdependent maritime sectors are – it is evident that the value of the linkages is very high indeed. Though some sectors are linked only to a few others directly, these others are in turn linked to additional sectors, thus allowing the demand effects to trickle down the cluster levels. While some core sectors, such as shipping, base their location decisions more on cost considerations than on cluster benefits, other sectors tend to search out the clus-

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ter benefits actively. A number of studies have indicated that sectors such as maritime services and marine equipment rely heavily on cluster dynamics for competitiveness and growth, which is supported by the large degree that these sectors are linked to the remainder of the cluster. Although some sectors, i.e. shipping, are linked to fewer sectors, they are still essential to the functioning of the cluster, upholding the cluster dynamics and demand on which other sectors depend.

The level of interdependencies within the cluster can be assessed in other terms than the capital flows among the sectors. Maritime clusters are to a large extent connected through common labour markets – much land-based employment requires personnel, who have developed maritime skills from prior employment at sea, from equipment production over port authorities to shipping services. The figure below supports the notion of a cluster linked through human labour movement, by showing the 2006 labour outflows within and between maritime sectors in the Netherlands. Overall, close to 40% of labour outflows go to the cluster. The reliance on some sectors at sea for stable flows of labour to other parts of the cluster serves to further enhance the common identity and human interactions among cluster actors.


Employees trained at sea, however, are not the only type of human resources developed in maritime companies, which are attractive and valuable to firms in other parts of an economy. Highly trained personnel, such as logistics professionals, managers, shipbuilding engineers, and engine operators, are in great demand outside the maritime professions.

The book *Attracting the Winners* included an investigation of cluster linkages in five European countries by asking managers of their perception of the strength of linkages between their company and a number of different sectors in the maritime cluster. In each country, shipowners consistently had the strongest linkages with the category ‘other shipowners, service providers, naval architects,'
and ports’. Similarly, shipowners had the strongest or second strongest linkages in each case with ‘yards and equipment producers’. Overall, shipowners, yards, and equipment producers were the sectors that operated with the greatest amount of linkages to other parts of the investigated maritime clusters. These findings are supported by the study *A Value Creating Norway*[^36], which concluded that Norwegian shipping companies displayed the strongest linkages to other sectors.

An implied significance of the strength of linkages is the consequent potential for cooperation. Cooperative initiatives obviously can take many forms, i.e. cluster-wide or bilateral, within or across sectors, and in widely different forums. Some of the observed forms of cluster cooperation are, among others, marketing, promotion, and branding of maritime careers, regulatory interest representation, and carrying out or supporting research, development and innovation activities.[^37] As suggested by the triple helix concept, discussed in section 2.1., the ideal cluster dynamics involve interaction and cooperation between companies, academia and research institutions, as well as regulatory institutions, potentially assembled in the context of a cluster organization. Investigations suggest that although industry-academic partnerships are significant, room exists to increase such cooperation.[^38]

The significance of a maritime cluster to a region or country depends upon its connections to the rest of the economy, not just the internal cluster dynamics. The report *Navigating Blue Denmark*[^39] reported that the Danish maritime cluster received intermediate inputs from 125 of the total 130 industries and made intermediate deliveries to 129 out of the 130. Thus, it is clear that the maritime cluster is deeply integrated in to a national economy. In addition, the maritime cluster’s role in facilitating more productive flows of goods and resources makes it constitute an essential part of European infrastructure and economic activity, which cannot be discounted.


[^38]: i.e. Jakobsen, Erik; Mortensen, Ari; Vikesland, Martin; & Cappelen, Alexander (2003): *Attracting the Winners*.


16
4. Economic Significance of Maritime Clusters

At the heart of maritime cluster research has been the pursuit of an enhanced awareness of the economic contribution of maritime-related sectors to a national or regional economy. Some observers have commented that the largely international, global nature of maritime transport makes the localized benefits negligible. However, the vast research base to be presented below concludes overwhelmingly that it is the derived economic impacts from the core sectors to the cluster and the economy as a whole, which should be considered to define the true economic significance of maritime clusters. When asked to comment upon the European Commission’s 2008 cluster study\(^{40}\), Policy Officer in the Directorate-General for Mobility and Transport, Mr. Torsten Klimke, argued that the most valuable gain had been ‘the realization that it is the bread-and-butter parts of the cluster that create growth and employment’. The analyses indicate that while the sea-based activities are important on their own, their greatest value is the jobs and activities that they inspire on land.\(^{41}\)

This section considers the results of the reviewed research with regard to the economic significance of maritime clusters. First, the methodologies employed by the researchers are briefly described to facilitate the discussion in the remainder of the paper. Thereupon, sections 4.1. and 4.2. will provide a more detailed treatment of the studies and findings.

In evaluating economic impacts of industries or clusters, one commonly distinguishes between direct and indirect impacts of activities. Direct impacts occur from the employment and activity, i.e. investments and other spending, in the cluster companies themselves. In general terms, the indirect impacts consist of the derived employment and activity in surrounding industries, arising from the cluster firms’ purchasing of goods and services in the supply chain, as well as the induced spending and consumption of those employed in the cluster and the supply chain. Figure 4 below depicts Policy Research Corporation’s definition in their 2008 study of direct and indirect economic impacts, while also demonstrating the breakdown of the key variables, production value and direct/indirect added value.

![Figure 4 – Definition of Direct and Indirect economic impacts of economic activity. Source: Policy Research Corporation (2008).](image)


As mentioned previously, one of the major limitations to cluster analysis is the non-existence of a maritime cluster as a statistical entity. Without a uniformly defined cluster, it requires considerable judgment on the part of the researcher to draw the cluster’s boundaries, which in turn influences the outcome from the input/output analysis of the national statistics. The demand multipliers, which measure the indirect impact of an additional unit of direct demand in the cluster, are particularly hard to estimate. Thus, the results presented in the coming sections are not exact, but the sheer sizes of the figures are highly indicative of the economic importance of maritime industries.

4.1. European-Level Research

The Economic Impact of Maritime Industries in Europe study, published by the European Commission in 2001, was a pioneering project. Though the Dutch maritime cluster had been studied to some degree in the 1990s, this was the first of its kind to be carried out at such a large-scale as the total EU-15 member states plus Norway. As it did not consider the individual regional clusters, but reported on activities in the aggregate for the EU, it served mainly to show the economic importance of maritime-related activities. The authors found that the European maritime industries directly employed 1.45 million people and had a total production value in 1997 of €159 billion. The direct value added was found to be €70 billion, or roughly 1% of total EU-15 and Norway’s GDP. Including also the indirect economic impacts, total value added was estimated at €111 billion, or 1.6% of GDP. Significantly, it was found that only 17% of the direct value added was spent outside of the EU – thus, contrary to often cited concerns, the value from maritime activities remains within the region to generate economic benefits. Also, only 10% of value is spent in other EU countries – that is, 90% of the value, which remains in the EU, is generated domestically in the country of focus. The largest sectors by far were shipping with more than €31 billion in total value added, followed by ports with €20 billion.

Standing on the shoulders of the prior study, the European Commission published the report, The Role of Maritime Clusters to Enhance the Strength and Development in European Maritime Sectors, in 2008. Here maritime clusters in the EU-27 member states and Norway were identified and evaluated down to the regional level. In addition to rating the strength of the respective clusters and discussing the role of cluster organizations institutions, the report further enhanced the awareness of the size and structure of maritime clusters in Europe. Total direct employment was estimated at 4.8 million jobs, or 2.25% of European employment, with a production value of close to €450 billion. Total direct value added was estimated at €186.8 billion, thus contributing 1.65% of average GDP in the EU-27 and Norway. As in the 2001 study, shipping and ports were found to be the largest GDP contributors among the maritime sectors. Though indirect effects are not reported, if the multiplier was gauged to be the same as in the first study, the indirect value added would amount to €110 billion, reaching a combined, rough estimate of €297 billion of value added. While the overall EU figures are monumental in size, the top-10 countries in absolute terms account for 88% of value added and 83% of employment in maritime sectors, indicating that for some countries the impact of maritime activities are even greater. These top-10 member states are Belgium, Denmark, France, Germany, Greece, Italy, the Netherlands, Norway, Poland, Spain, and United Kingdom.

The European Commission, DG Maritime Affairs and Fisheries, commissioned a study from ECOTEC Research and Consulting, Employment Trends in All Sectors Related to the Sea or Using Sea Resources, which was published in 2006. It sought to provide an exhaustive overview of the state of and trends in employment in sea-related activities on a per sector and country basis, using the same sector definitions as the European Commission study from 2001. All sea-related sectors directly supported employment of 5 million people in 2004/2005. Excluding coastal tourism and
navy, the more traditional maritime sectors accounted for 1.9 million jobs. France, United Kingdom, Italy, and Germany each account for more than 200,000 jobs in core maritime sectors – only three other EU countries are estimated at above 100,000: Poland, Denmark, and Greece. Of the older member states, the countries where both all maritime activities, as well as the core, make up the largest share of total national employment are Denmark, Greece, and Finland.

4.2. National studies
This section provides a more in-depth discussion on the economic significance of maritime clusters, by considering the findings from a number of studies on a national basis. The clusters discussed below are the ones, which have been subjected to the most thorough and rigorous research. That is not to say that other maritime clusters are not worthy of mention – Countries such as Germany, Spain, Greece, and France have considerable maritime activities, many in clustered regions, but have not been studied to the extent desired in this project. Furthermore, these eight maritime clusters are thought to be well representative and highly indicative of the importance of sea-related activities.

4.2.1. The Dutch Maritime Cluster’s Economic Significance
The Dutch maritime cluster is thought by many to be an example per excellence and is often brought forward as a model for cluster development. It was the Dutch case that pioneered maritime cluster studies. In 1994, a study was published which brought forth fundamentally new insights, namely that most of the value generated by the shipping sector was not on board ships under the national flag, but rather on shore by the shipping companies’ activities. In fact, only 30% of value added was created at sea, while 70% was created on shore. On this basis, the policy objectives then shifted away from supporting the Dutch flag towards creating a level playing field for shipowners and later, to enhance the potential for value added creation in the network surrounding the shipping industry, the maritime cluster as a whole. Since its creation in 1997, the Dutch Maritime Network has commissioned and published a large number of studies that have greatly strengthened the knowledge on clusters, their structure and importance, as well as the methods to delineate and analyse them.

The first major Dutch study of the maritime cluster’s economic significance was published in 1999. It defined the cluster and its sectors, arriving at 11 main sectors and close to 12,000 companies. Studies were later published in 2003 and 2006 to monitor the development of the Dutch maritime cluster for the years 1997-2002-2005.

In 1997, the direct production value amounted to 32.9 billion Dutch guilders (€15 billion), and if indirect effects are included, the total value was roughly 45 billion (€20.3 billion). By 2002, the direct production value had increased to €18 billion and total was close to €25 billion. The comparative figures in 2005 were €20.3 billion and €29.9 billion respectively.

Direct value added in 1997 was 17.1 billion Dutch Guilders (€7.8 billion), or 2.5% of GDP, and when including indirect effects, the total reached more than 23 billion (€10.6 billion). The equivalent figures for 2002 were €9.5 billion, 2.2% of GDP, and €12.6 billion, 2.9% of GDP, while in 2005 these were €10 billion, 2% of GDP, and €13.3 billion, 2.6% of GDP.
The Dutch maritime cluster employed 137,000 people directly, and 193,000 in total in 1997. By 2002, employment had dropped to 135,000 / 190,000 and in 2006, to 133,250 / 187,000. The 2006 report argues that while the Dutch navy experienced the most significant fall in employment, the other sectors have not increased employment domestically, partly due to greater productivity, and partly as many companies are creating employment abroad as well in a process of internationalization.

Throughout the period 1997-2005, the sectors contributing the most value added to Dutch GDP were the ports, the shipping sector, and the offshore sector. In 1997, these three sectors alone represented around half of all production in the cluster. The largest purchasing sector were found in all studies to be the shipping sector, as the companies therein make the most capital investments and therefore create the most demand in the cluster, though offshore and inland navigation, as well as dredging and ports also purchase significant amounts.

4.2.2. The Danish Maritime Cluster’s Economic Significance
Following the Dutch and EU studies, particularly the Northern parts of Europe were relatively quick to catch on, and Denmark was no exception. Copenhagen Business School professor, Henrik Sornn-Friese’s Navigating Blue Denmark: Structural Dynamics and the Evolution of the Danish Maritime Cluster covered substantial ground in describing the Danish cluster, though like all other studies it was faced with difficulties in defining the cluster boundaries. The author found the production value of the cluster in 1998 to be DKK 120 billion, or 6.4% of the Danish economy. When indirect effects are included, the total production was DKK 160 billion, or 8.5% of the economy. The direct value added of the cluster was estimated at 45 billion, thus contributing 4.5% of GDP. Directly, the cluster accounted for 3% of Danish employment with 81,000 jobs, while when including indirect effects, the job contribution was 119,000, or 4.4% of total employment. Sornn-Friese finds that the water transport sector (i.e. shipping) is by far the largest contributor to the cluster. In 1998, water transport had a total output of 63 billion out of the cluster’s 160 billion. Water transport and maritime services together generated more than 68% of total cluster output.

The Danish Maritime Authority, under the Ministry of Economics and Business Affairs, produced a large-scale report in 2006, entitled The Danish Maritime Cluster – An Agenda for Growth. It aimed at describing the state of the cluster and its framework conditions effect on growth, benchmarked to a number of other maritime nations. In 2002, the cluster accounted directly for a production value of DKK 193.3 billion (8.3% of the economy), and including indirect effects, the value was 216.1 billion (9.3% of economy). The estimated gross value added contribution was DKK 73.5 billion, or 6.3% of the Danish GDP. While direct employment was 75,712 people, the total number of jobs supported by the cluster was 106,914, or 3.9% of total Danish employment. On a sector-basis, the largest contributor in terms of production value was the shipping sector, offshore had the largest gross value added, and maritime services employed the most. In describing the interdependencies within the cluster, the report found that from a demand perspective, the shipping sector had the greatest impact on and linkages to the rest of the cluster, due to its demand-generating nature. Finally, the report highlighted the vital contribution of the Danish maritime cluster, in particularly shipping, towards the Danish balance of payments, export levels, and foreign currency earnings.

48 1 DKK is approximately equal to 0.133 EUR (June 2010 rate)
4.2.3. The Norwegian Maritime Cluster’s Economic Significance

A significant number of studies have been carried out on the Norwegian maritime sector, predominantly on a regional level. The two reports, *Et Verdiskapende Norge* (A Value Creating Norway) and *Det Regionale Maritime Norge* (The Regional Maritime Norway) arrived at different estimations due to their respective industry definitions, but both indicated the significance of maritime activities in the Norwegian economy. In the former project, the gross value creation was found to have increased from €1.3 billion to €3.7 billion between 1988 and 1999, while the total turnover grew from €5.7 billion to €16.3 billion in the same period. The Regional Maritime Norway project, on the other hand, described increases in value creation from €1.5 billion to €6 billion and growth in turnover from €6.1 billion to €24 billion. In both reports, the growth rates of the maritime clusters exceeded the average of all Norwegian industries. The Norwegian maritime sector is often referred to as a highly complete cluster, yet in 1998, 61.7% of all companies were in shipping and these accounted for more than half of all value creation in the cluster.49

The European Benchmarking Project, as presented in the book, *Attracting the Winners*, found that the Norwegian cluster employed roughly 70,000 people in the year 2000. The average value creation in the cluster in the years 1998-2001 was US$4.7 billion, approximately €4 billion. Again, shipping companies were found to contribute half of cluster value. On average, the maritime sectors accounted for 7.9% of all Norwegian value creation, in direct terms, between 1990 and 2001, making it a highly significant area of economic activity for the Norwegian economy.

Finally, the paper *A Cluster Analysis of the Maritime Sector in Norway* showed that the total maritime sector in Norway had a turnover of NOK 128.5 billion in 1998, where shipping accounted for nearly 70%.50 Gross value creation was NOK 35.3 billion, 79% of which was contributed by shipping related activities. The growth rates from 1988 to 1998 in total turnover and gross value creation were 209.4% and 227.5% respectively, far exceeding the Norwegian economy. In 1997, shipping activities had a 50.7% share of total Norwegian service exports, while the cluster’s share of total exports was 14.1%.

4.2.4. The Swedish Maritime Cluster’s Economic Significance

The Swedish shipping industry was analysed in the 2006 report *Den Svenske Sjöfartsnäringens Ekonomiska och Geografiska Kluster* (The Swedish Shipping Industry’s Economic and Geographical Cluster). Several other reports have been published in the beginning of the millennium in connection with the formulation of The Swedish Maritime Policy. However, due to some methodological shortcomings, these have not been included in this paper.51

The 2006 report shows that 18,500 people are employed in the maritime core sectors, 13,500 of whom are in the shipping industry. In surrounding industries with closer economic connections to the shipping industry another 70,000 people are employed, while a further 133,500 people work in the less close, yet surrounding industries. In this way, the authors estimate the total supported employment of the maritime cluster to be 220,000 people. Multiplying the average value added per employee in the private sector with this employment figure, they gauge the total GDP contribution at SEK 104 billion. This estimate should be taken with caution, however, as this particular method of arriving at the combined direct and indirect effects is less academically rigorous than most of the other studies considered as part of the literature review. More reliable is the data presented on the shipping industry, which is readily available in official statistics. The shipping industry contributed

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50 1 NOK is approximately equal to 0.127 EUR (June 2010 rate)

51 For an interesting critique of the earlier studies of the Swedish maritime sectors, see Viitanen, Miko; Karvonen, Tapio; Vaiste, Johanna; Hernesniemi, Hannu (2003): *The Finnish Maritime Cluster*
SEK 9.1 billion of value added to GDP, with a total value of produced goods and services of SEK 54 billion, or roughly 1% of Swedish production.

4.2.5. The Finnish Maritime Cluster’s Economic Significance

The report, *The Finnish Maritime Cluster*, aimed at describing the social and economic impact of the cluster, as well as the existing cluster dynamics. Overall, it found that all companies directly related to the maritime cluster had a combined turnover of €11.4 billion in 2001. The two largest core sectors were maritime transport with €2.1 billion and shipbuilding with €1.5 billion. The turnover of all companies directly or indirectly related was €90 billion. The 2,500 companies in the cluster employed 47,000 people, though the maritime sector companies considered in the study directly and indirectly supported up to 300,000 people. Another interesting finding was that of the €3 billion in purchases by the shipping companies, shipyards and their largest subcontractors, more than 60% of the purchases were made domestically. Also, the maritime cluster accounted for 11.5% of total Finnish exports, where shipping companies and their subcontractors contributed approximately 7.9% of total exports. The authors further tested a number of scenarios related to subsidies and flagging out of ships, and the economic impact on Finland. They showed that were the Finnish policy changed to grant the maximum allowable amount of subsidies in the EU to a shipping company, thus keeping a ship under the Finnish flag rather than flagging out to Sweden, then there would still be an economic net gain to the Finnish society.

4.2.6. The Belgian Maritime Cluster’s Economic Significance

Policy Research Corporation, who has carried out a number of the major projects on maritime clusters, also produced the report *A Durable Belgian Maritime Policy*. The Belgian cluster had a direct economic impact in terms of value added of 17.1 billion Belgian Francs (BEF) in the year 2000. Including indirect effects, the total impact rises to BEF 27.8 billion. Direct and total employment was 6,750 and 11,470 respectively. The considered sectors, listed according to descending size of value added, are hydraulic engineering, the merchant marine, and the tugboat industry. Similar to other studies, the authors find that the economic effects are localized to a great extent, as 64% of value added generated is spent within Belgium. Testing the economic impact of policy scenarios, the report shows that were the Belgian government to discontinue the then-current policy related to shipping, which was highly unfavourable, and instead ensure a level playing field, they would enable the preservation of the maritime cluster and create significant growth in employment and economic contribution. Were no changes made, net losses would occur. The authors warn that if shipowners move resources to other locations, other economic activities tend to shift abroad as well.

4.2.7. The United Kingdom Maritime Cluster’s Economic Significance

Oxford Economics completed two projects, using similar methodologies, in 2009 on the UK maritime cluster, namely *The Economic Contribution of the UK Shipping Industry* as well as *The Economic Contribution of Ports to the UK Economy*. The former report shows that the UK shipping industry directly employed 96,000 workers, or 0.3% of UK employment. Estimating that 79,000 further jobs are created through the industry’s spending on inputs, and another 37,000 jobs are supported through consumer spending, the combined total employment effects are 212,000 jobs. Similarly, the shipping industry contributed directly £4.7 billion to GDP, and when indirect effects are included, £9.8 billion. Significantly, £2.9 billion of tax receipts were accounted for by the shipping industry to the Exchequer. Using scenario analysis, Oxford Economics shows that the UK shipping industry is between three to five times larger than it would have been without the tonnage tax, and that the tonnage tax regime generates additional benefits of £5.5 billion to GDP and £1.4 billion more per year in tax receipts.

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52 The Belgian Franc is obsolete, with a fixed exchange rate of EUR 1 = 40.339 BEF
The UK ports sector was found in the second study to contribute £17.9 billion, or 1.2% of GDP, of which £7.7 billion is generated directly. The ports also support jobs for 363,000 workers, roughly 1.3% of UK employment, of whom 132,000 are directly employed. In total, the ports accounted for £7.1 billion in tax receipts to the Exchequer.

The results of these two projects were combined, data was corrected for double-counting issues, and the new report were published under the name *The Economic Impact of Ports and the Shipping Industry on the UK Economy in 2007*. Together the two sectors are estimated to have supported 490,000 jobs, 1.7% of total UK employment. Direct employment constitutes 221,000 jobs. Similarly, the direct contribution to GDP was £11.4 billion, which in conjunction with indirect effects totalled £23.4 billion, or 1.7% of GDP.

### 4.2.8. The Italian Maritime Cluster’s Economic Significance

The Italian cluster organization, Federazione del Mare, took the initiative behind the study of the state and significance of the Italian cluster, carried out by the Censis Foundation and published as *The Second Maritime Economy Report: The Economic and Employment Impact of the Italian Maritime Cluster*. The report found that in the year 2000, the maritime cluster contributed €26.3 billion to GDP, or 2.3% - If only traditional maritime sectors are considered, i.e. the core, the cluster contributes 2.1% of GDP. Similarly, overall employment impact is estimated at 356,000 average worker units, 1.5% of total Italian employment. 175,830 were employed directly, and the remainder in upstream economic sectors, 88,985, and downstream, 81,260. The maritime transport sector, shipping, contributes €12.6 billion to GDP, or roughly half of the entire cluster, or more than 1% of Italian GDP. It also accounts for 76.7% of all cluster exports. Also, this sector’s total impact is estimated via its multiplier, which shows that for every 100 Euros of demand in maritime transport, the economy as a whole generates value of 270.8 Euros, as compared to the 212.3 Euros of the maritime sectors on average.

In 2006, the report was followed by *The Third Maritime Economy Report 2006: Economic Growth, Human Resources, and Environmental Protection in the Italian Maritime Cluster*. In 2004, the GDP contribution of the cluster had increased to €36.5 billion, 2.7%. Total employment was estimated at 318,484, of which 122,386 were directly employed. Total exports from the cluster amounted to €14.1 billion, which equals 4.7% of national exports. In addition, the cluster made gross fixed investments and spending on intermediate inputs of €1.6 billion, 4.2% of registered investments in Italy in 2004. Again, the maritime transport sector made up the majority of the cluster’s GDP contribution, with 53%, or €15.7 billion.

### 4.3. Part Conclusion – Implications of Research on Clusters and Economic Effects

The above treatment of the findings from research supports the notion that maritime clusters are highly important in economic and employment terms to national economies, as well as on the level of the European Union. Even if one discounts the need for efficient maritime sectors for the effective functioning of the economy, i.e. through transports of goods and persons, then the impacts of sea-related activities are still worthy of note, as maritime clusters both directly and indirectly support significant shares of employment and GDP in most, if not all, EU member states.

Table 2 below contains figures from a selection of the studies presented in sections 4.1. and 4.2. From this overview, the economic importance of maritime clusters is quite evident. And although it is far from exhaustive, the table provides an indication of the results of comparable research.
<table>
<thead>
<tr>
<th>Study Name</th>
<th>Yr*</th>
<th>Area</th>
<th>Value Added</th>
<th>% of Area GDP</th>
<th>Employment</th>
<th>Production</th>
<th>Largest Value Added</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Role of Maritime Clusters to Enhance the Strength and Competitiveness of European Maritime Sectors</td>
<td>2006</td>
<td>EU-27+NO</td>
<td>€ 186.8 296.0</td>
<td>1.7% 2.6%</td>
<td>4,780,000 - 2.3%</td>
<td>450.0</td>
<td>Shipping Ports</td>
</tr>
<tr>
<td>Economic Impact of Maritime Industries in Europe</td>
<td>1997</td>
<td>EU-15+NO</td>
<td>€ 70.0 111.0</td>
<td>1.0% 1.6%</td>
<td>1,545,000 2,400,000</td>
<td>159.0</td>
<td>Shipping Ports</td>
</tr>
<tr>
<td>De Nederlandse Maritieme Cluster: Economische Monitor 2006</td>
<td>2005</td>
<td>The Netherlands</td>
<td>€ 10.0 13.3</td>
<td>2.0% 2.6%</td>
<td>133,250 187,000</td>
<td>-</td>
<td>Ports Shipping</td>
</tr>
<tr>
<td>The Economic Impact of Ports and the Shipping Industry on the UK Economy in 2007</td>
<td>2007</td>
<td>United Kingdom</td>
<td>£ 11.4 23.4</td>
<td>0.8% 1.7%</td>
<td>221,000 490,000</td>
<td>-</td>
<td>Ports Shipping</td>
</tr>
<tr>
<td>Navigating Blue Denmark**</td>
<td>1999</td>
<td>Denmark</td>
<td>DKK 52.2</td>
<td>4.9%</td>
<td>79,598 116,080</td>
<td>168.0</td>
<td>Ports Shipping</td>
</tr>
<tr>
<td>The Danish Maritime Cluster - An Agenda for Growth***</td>
<td>2005</td>
<td>Denmark</td>
<td>DKK 110.7 130.0</td>
<td>8.5% 9.8%</td>
<td>77,488 115,486</td>
<td>304.7</td>
<td>Ports Shipping</td>
</tr>
<tr>
<td>Den Svenska Sjöfartsnäringens</td>
<td>2004</td>
<td>Sweden</td>
<td>SEK 9.1 104.0</td>
<td>0.3% 3.9%</td>
<td>18,500 220,000</td>
<td>54.0</td>
<td>-</td>
</tr>
<tr>
<td>Ekonomiska och Geografiska Nätverk</td>
<td>2001</td>
<td>Finland</td>
<td>€ - -</td>
<td>- -</td>
<td>47,000 300,000</td>
<td>90.0</td>
<td>Shipping -</td>
</tr>
<tr>
<td>The Third Maritime Economy Report 2006: Economic Growth, Human Resources and Environmental</td>
<td>2004</td>
<td>Italy</td>
<td>€ - 36.5</td>
<td>- 2.7%</td>
<td>122,386 318,484</td>
<td>-</td>
<td>Shipping Ports</td>
</tr>
<tr>
<td>A Durable Belgian Maritime Policy</td>
<td>2000</td>
<td>Belgium</td>
<td>€ 17.1 28.8</td>
<td>6.5% 10.9%</td>
<td>6,750 11,500</td>
<td>-</td>
<td>Ports</td>
</tr>
</tbody>
</table>

Table 2 - Measures of economic significance from selected cluster studies. All Value Added figures are in billions of indicated currency.

Where no figures are reported in the study in question, a hyphen (-) is shown.

* The years are those referred to in the data and figures. For year of publication, see the list of references

**Navigating Blue Denmark reported 1998 figures, but Appendix D updated findings for 1999

***The Danish Maritime Authority has updated the report's findings online up to year 2005. Here the most recent figures are used.
Extending the discussion of maritime cluster research, it is interesting to consider a few implications of the findings. First of all, the studies have served to foster a common identity within a maritime cluster to a much greater extent. Mr. Ronald Vopel, Policy Officer in Maritime Policy, Directorate-General for Maritime Affairs and Fisheries, argued that the studies from 2001 and 2008, commissioned by the European Commission, had served mainly as an educational tool, refining the stakeholder base in the creation of maritime policy, while providing knowledge on the then-current state of maritime activities in Europe. One aspect of this emerging common identity is the enhanced degree that interests of stakeholders are jointly represented towards governments and institutions, which is facilitated by more frequent interaction and common bodies. Interestingly, the EU has shifted towards an integrated maritime policy\textsuperscript{53}, which in effect means that the development of policy at the EU-level is increasingly taken place in an almost cluster-like environment, where the officers responsible for separate sectors and policy areas are interacting more frequently amongst themselves and across Directorate-Generals.\textsuperscript{54}

How maritime clusters are governed vary considerably across the member states.\textsuperscript{55} Cluster thinking has, however, been included in maritime policy making even before the EU adopted its integrated maritime policy position. In Germany, the inter-relationships of sea-related activities have resulted in the appointment in government of a person responsible for the multi-sector coordination of maritime activities. In comparison, in the Netherlands, where the cluster is predominantly a bottom-up construct, members of different levels of the cluster meet at periodic roundtables to discuss common approaches to common issues.\textsuperscript{56}

The existence of maritime clusters is well-documented, and moreover, it is beyond doubt that they are greatly significant in economic terms. Inadequacy in the structure of national statistics means that uniform definitions in cluster research are still lacking, which then complicates targeted policy and resource allocations. Even so, the consistent indications of significant, positive employment and GDP contributions of clusters will likely cause the concept of clusters to increase in importance going forward, partly as the issue of employment is high on the agenda in the European Union in the future, as communicated by its recent adoption of the vision, Europe 2020.\textsuperscript{57}

\textsuperscript{54} Suggested by Mr. Torsten Klimke, Policy Officer, Maritime Transport Policy: Ports and Inland Waterways, Directorate-General for Transport and Mobility, the European Commission.
\textsuperscript{55} For more in-depth consideration and examples of cluster initiatives and modes of cluster governance, see the annexes to Policy Research Corporation (2008): The Role of Maritime Clusters to Enhance the Strength and Development in European Maritime Sectors.
\textsuperscript{56} Suggested by Mr. Ronald Vopel, Policy Officer, Maritime Policy, Directorate-General for Maritime Affairs and Fisheries, the European Commission.
5. Conclusion
This report has aspired to make the extensive knowledge base on the economic benefits of maritime clusters more easily accessible to stakeholders. In doing so, the initial sections have discussed the theoretical and practical features of clustering, before describing the typical structure of maritime clusters. Finally, the major findings in a number of research projects on European maritime clusters were shown, with emphasis on the economic effects of maritime clusters to their host countries and regions.

The great extent that the concept of clustering has been studied and included in policy making and economic coordination in relation to maritime industries in the European Commission, in EU member states’ institutions, and in the clusters themselves, is evidence of the concept’s value. The notion of clusters is beneficial as it recognizes the inter-dependence of sectors in core and supporting activities, the complimentary of inputs, and the ability of firms to create mutual gains across multiple sectors.

The reviewed research shows overwhelmingly that not only do maritime clusters exist, they also contribute so vast amounts of value, that they account for multiple percentages of total GDP and employment in the majority of European nations. In addition, the value and demand created in the maritime cluster trickles down through the overall economy in the form of investments in the supply chain and consumption, which creates further jobs and demand, so that the total economic importance of maritime activities in national and regional economies is even larger. This is supported by the fact, that statistical tests have shown that regions in the EU with clusters are generally more prosperous, with a higher GDP per capita.

It has also been found that the relative role and importance of sectors differ within a cluster. The core sectors in maritime clusters are such as ports, shipping companies, and offshore industries. The surrounding sectors depend upon the core for activity, as the core facilitates the demand and investments necessary for growth in cluster activity. It follows that the stronger the core, the greater is the prosperity of the cluster. Similarly, one may also distinguish between demand and supply sectors. Supply sectors such as shipbuilding and marine equipment depend upon the demand-generating sectors, for instance shipping or ports, to make capital investments and thereby enable growth. As a result of these dynamics, the ability to attract and retain economic activities depends upon the presence and strength of the core, demand-generating sectors. Furthermore, it is evident from the findings of the reviewed research, that certain sectors consistently contribute larger value to GDP than others in maritime clusters. Shipping, or maritime transport, and ports are shown to be the top value-generating activities in the European economies – in the clusters considered, these two accounted on several occasions for up to half of all value added created in the cluster in question.

Maritime activities are inherently international, and a vital link to the outside for any regional, national, or supranational economy. However, this internationality has often led observers to doubt the ability of maritime industries to contribute in economic terms locally. Two findings should allay these concerns: firstly, studies have found that the vast majority of generated value in maritime clusters does not leave the region considered – for instance, the European Commission study of 2008 found that only 17% of value left the EU, and more than 90% of the remaining value was spent domestically in the same country, it was generated in. Secondly, the widespread use of the cluster concept in maritime industries came with the realization that the largest economic contribution does not arise from the maritime activities at sea, but rather from the derived activities on land. Thus, a significant implication of the cluster studies is that a maritime cluster contains highly international activities, whose greatest economic contribution occurs at a regional level.
List of References and Additional Literature

**European Studies of Maritime Clusters**


- The Danish Maritime Cluster. Mogens Schrøder Bech.
- The Dutch Maritime Cluster. Henk Janssens.
- The United Kingdom’s Maritime Cluster. Mark Brownrigg.
- The Italian Maritime Cluster. Corrado Antonini.
- The French Maritime Cluster. Francis Vallat; Philippe Perennez

European Commission Documents on Maritime Policy and Clusters


Isaksen, Arne. & Hauge, Elisabet (2002): Regional Clusters in Europe. Observatory of European SMEs


General Literature on Clusters


**Non-European Maritime Clusters**


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The Role of Maritime Clusters to Enhance the Strength and Development of European Maritime Sectors.

Policy Research Corporation

Purpose
The study was commissioned by the European Commission from Policy Research Corporation and published in 2008. Thus, it builds upon the similar, though less extensive, study from 2001. The main objective of the study was to enhance the knowledge on the size, specialization and focus of the maritime sectors or clusters in the European member states and Norway, and mapping the clusters accordingly. This is done to investigate the question of how to maintain and strengthen the competitiveness of the European maritime clusters and utilize the findings as building blocks for evidence-based policy development in line with the Blue Paper. The commissioning of this study reflects the shift in European policy making towards a more integrated maritime policy and a greater consideration of the dynamic relationships across maritime sectors and clusters.

Methodology
The study presents an overview of the structure and main economic indicators of regional maritime clusters as well as maritime policy development, based upon secondary data collection and field research carried out in 2008.

The maritime clusters in European Union member countries and Norway are examined in terms of production value, added value and employment in total and sector-by-sector. The clusters are subsequently mapped using the Star method of the European Cluster Observatory, which considers Size, Specialization, and Focus. These three indicators reflect, according to the study, whether the cluster has reached a sufficient mass to facilitate cluster benefits such as positive spill-overs and strong internal linkages.

Size: Considers whether a cluster is in the top 10% of clusters in terms of added value and/or employment in the EU and Norway, and if so, the cluster will receive a star.

Specialization: If a region is more specialized within a specific cluster category than the overall economy across all regions, it indicates that the regional cluster has been able to attract economic activity, and spill-over benefits are likely to be larger. The overall squared sector share of European regions in a cluster is calculated - If a region is in the European top 10%, it receives a star.

Focus: This variable considers whether a regional economy’s activities focus on a specific cluster, i.e. is strongly dependent upon it, as measured by employment in the cluster as a proportion of total employment in the region. The rationale is that if a cluster accounts for a larger share of a region’s employment, it will be more likely to have stronger linkages as it is not ‘drowned’ in other economic activity. Top 10% receive a star.

The maritime clusters are broken down into three categories: Area 1 (Traditional maritime sectors, such as shipping, maritime services, maritime equipment and similar); Area 2 (coastal and marine tourism and recreation); Area 3 (Fisheries).

In addition, the report investigates the configuration, activities, and significance of maritime cluster organizations through field research, such as questionnaires and interviews, in Denmark, France, Germany, Italy, Norway, and the UK.
The report defines a cluster as a geographically proximate group of interconnected companies and associated institutions in a particular field, linked by commonalities and external economies. Examples of external economies that occur within a cluster are the economic and financial inter-sector relations, a common knowledge and technology base, and a shared labour market. Building upon this definition, it is argued that “the main benefits of (maritime) clusters are the increase in efficiency, the increased level of business formations and, the higher level of research, development and innovation. These benefits can be optimised by cluster organisations through activities and initiatives, e.g. promotion campaigns, structural cooperation between cluster organisations and knowledge institutions, specific (government) support programs and platforms to exchange best practices.”

Abstract
The maritime sectors in Europe account for a production value of roughly €450 billion and added value of €186.8 billion, which is 1.65% of average GDP of member nations and Norway. Total employment is estimated at 4.8 million people, or 2.25% of European employment.

As mentioned above, the study categorises the cluster into Areas 1, 2, and 3. Area 1 (traditional maritime industries) contribute €300 billion of production value, 67% of maritime total, and with €123.6 billion in added value, Area 1 accounts for 66% of total added value from maritime activities. This single area alone accounted for 1.09% of GDP in EU-27 and Norway. Therefore the traditional maritime sectors must be considered highly economically significant. The report concludes that the main sectors in Europe in terms of added value are shipping, seaports, and marine equipment, as shown in the figure below.

Area 1 has an average added value per employee of €64,400, far higher than the total maritime average of €39,000. In terms of employment, 40% of jobs are in Area 1 activities, 51% in Area 2, and 9% in Area 3.

Countries with the strongest traditional maritime sectors (top-4) are the United Kingdom, France, Germany and Italy. In these countries the traditional maritime sectors account for 0.5% to 2% of GDP. The value added per person employed is higher in the northwestern European countries than in the more southern countries.

The EC study did not consider indirect effects of maritime clusters. However, using an estimate from the 2001 study “Economic Impacts of the Maritime Industries in Europe” by Policy Research Corp., which found that €1 of added value would yield €0.59 in indirect value, they place the total indirect value added of European maritime sectors at around €110 billion, in addition to the €186.8 billion in direct added value. Thus, they conclude that “the role of a maritime cluster surpasses its own impact”.

The vast majority of maritime economic activities are located in a limited number of locations and countries. The top-10 countries in the study account for 88% of added value and 83% of employment in all sea-related sectors. Within Area 1, traditional maritime sectors, the top-10 countries ac-
count for 87% of added value and 80% of employment. Top-10 countries in absolute terms of employment and added value in all the sea-related sectors are Belgium, Denmark, France, Germany, Greece, Italy, the Netherlands, Norway, Poland, Spain, and United Kingdom.

The figure below presents from the study’s results the top-10 countries in terms of the percentage of maritime activities in national GDP and total national employment.

<table>
<thead>
<tr>
<th>Maritime added value in national GDP (%)</th>
<th>Maritime employment of total (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Europe 1.65%</td>
<td>Europe 2.25%</td>
</tr>
<tr>
<td>Malta 11.36%</td>
<td>Malta 13.51%</td>
</tr>
<tr>
<td>Cyprus 9.07%</td>
<td>Cyprus 12.02%</td>
</tr>
<tr>
<td>Estonia 8.83%</td>
<td>Norway 6.85%</td>
</tr>
<tr>
<td>Latvia 7.71%</td>
<td>Estonia 6.54%</td>
</tr>
<tr>
<td>Norway 6.23%</td>
<td>Greece 6.39%</td>
</tr>
<tr>
<td>Denmark 4.19%</td>
<td>Latvia 5.36%</td>
</tr>
<tr>
<td>Greece 3.24%</td>
<td>Denmark 5.26%</td>
</tr>
<tr>
<td>Lithuania 2.59%</td>
<td>Spain 4.62%</td>
</tr>
<tr>
<td>Spain 2.53%</td>
<td>Bulgaria 3.46%</td>
</tr>
<tr>
<td>Netherlands 2.25%</td>
<td>Portugal 3.34%</td>
</tr>
</tbody>
</table>

On the significance of clusters, the EC report comments: “Clustering is not a goal in itself, but may be beneficial because of its link with economic prosperity: regions with a higher rate of employment in industries that belong to strong clusters appear generally more prosperous” [higher GDP per capita]. Key aspects and benefits of clustering are related to encouraging innovation, specialisation and outsourcing.

The main cluster benefits can be achieved through cluster activities, such as promotion campaigns; Economic reports on the maritime cluster; Structural cooperation between cluster organisations and knowledge institutions; Specific (government) support programs; Platforms to exchange best practices.”

In Annex 12 of the study an overview of key benefits of clustering is provided, citing projects and documents such as the 2006 Innobarometer, the EC COM (2008) 652: “Towards world class clusters in the European Union” document and similar. Here it is argued that clusters provide a fertile environment for innovation, allowing the firms to benefit from knowledge flows and presence of related labour markets – for instance, it is found that between 30 and 40% of all labour in- and out-flows in the Dutch maritime clusters, occurs internally from one cluster actor to another. As a whole, cluster firms are arguably more innovative than non-cluster firms, they register more trademarks (29% vs. 14%) and file more patents (29% vs. 12%), according to Innobarometer 2006. Innovative activities are placed in more open environments, rather than carried out internally in single organizations, which is an increasingly utilized approach in R&D in modern corporations.

Because of the above benefits associated with clustering of economic activities, a cluster-based policy approach has increasingly been adopted by the EC.

Main maritime cluster initiatives deal with the promotion of the maritime cluster, for image and recruiting purposes (as a lack of public awareness and attractiveness of maritime careers is a concern), education and training improvements, as well as the stimulation of research, development and innovation, RDI. While the performance gains of such measures are difficult to quantitatively
evaluate, 85% of cluster firms state that a cluster initiative has improved their competitiveness, according to the Cluster Initiative Greenbook from 2003.

**Conclusion**
The study by Policy Research Corp. for the European Commission finds that the maritime clusters hold large significances to their regional and national economies. The traditional maritime sectors are especially important in terms of economic contribution and strength of regional cluster linkages, particularly so in Northern Europe, where major traditional maritime activities are primarily located. Shipping is highlighted as a top sector in terms of production value and added value with the highest per employee value added (partly due to its capital-intensive nature).

Moving beyond direct contributions, the report also emphasizes the importance of shipping and maritime services for the wellbeing of citizens and the functioning of society. The authors argue that “the maritime clusters also play a key role in facilitating the functioning of the entire economy, e.g. by means of maritime transport, facilitating international trade, and in generating effects through purchases in the supply chain”.
Economic Impact of Maritime Industries in Europe

Policy Research Corporation &
Institute of Shipping Economics and Logistics

Purpose
The European Commission commissioned this study of the European maritime clusters from Policy Research Corporation and the Institute of Shipping Economics and Logistics, completed in 2001. The purpose was to define discrete sectors within maritime activities and provide an overview of these based upon basic economic data, to gain an initial insight on the scale and scope of maritime cluster in Europe.

Methodology
The study calculated best estimates of turnover, value added, employment, and expenditure effects, both in direct and indirect terms for the EU-15 plus Norway. The intermediate purchases of goods and services by a sector were used to estimate multipliers, the indirect impact on the economy.

The researchers were faced with a significant lack of comparable data across countries, sectors, and time. Data was often out of date or unreliable, while definitions were inconsistent among member states. Similarly, information on interrelations between companies was somewhat limited. Therefore the figures summarized below should be viewed as estimates only, even though the researchers went to great lengths to improve the quality of the data.

Abstract
The total production value of the maritime cluster in 1997 was estimated at €159 billion. Of these, 44% represent direct value added, amounting to €70 billion, or about 1% of Europe’s GDP in 1997. Direct employment stood at 1,545,000 people. The researchers further showed that an estimated 33% of the direct value added, or €23 billion, flows back to national governments as taxes and social security contributions. The value added generated was further used for consumption and investments by the private sector, the former amounting to €16 billion and the latter to €19 billion. Overall, only 17% of the direct value added was spent outside the European Union, showing that the EU area reaps the vast majority of positive effects from maritime cluster activities.

Value added from maritime activities differed greatly among countries and sectors. Below is a depiction of direct value added by country, excluding Austria and Luxembourg, whose maritime activities are negligible. As can be seen, the UK, Germany and Italy were found to have the largest direct value added. The indirect economic effects were also highly significant, generating additional value added of €41 billion. Thus, the combined direct and indirect effects of the maritime cluster amounted to €111 billion in 1997. The largest maritime sector in terms of direct effects was shipping, followed by ports. The sectors with largest indirect effects were shipping, marine equipment, and shipbuilding.
The total turnover of European shipping, the largest sector by far, was €48 billion. Direct value added amounted to €15.7 billion. While significant in themselves, these figures probably underestimate the actual effects of shipping, as they only consider shipping activities under European flag. Direct backflow to government through taxes was €3.8 billion. Direct employment in shipping activities totalled 302,000 in 1997. Indirect employment was another 305,000, of which 183,000 were domestic and 122,000 inter-country.

Conclusion
The report delivered to the European Commission made contributions on a number of levels. First of all, the need for initiatives to enhance data availability and create common sector definitions on a European level was highlighted. Further research into dynamics of clusters and inter-company relationships was recommended, which would prove a better basis for policy making. The study was later followed up with an even more extensive project of the EU-25, also by the Policy Research Corporation.

Despite the shortcomings of the statistical sources, the report did indicate the immense importance of maritime activities in the European economies. Furthermore, the findings that the additional indirect economic impact amounted to almost 60% of the direct benefits led to a heightened awareness of the full extent of maritime clusters’ economic significance. As shown above, the shipping sector is the largest maritime sector and takes on an important role in driving employment, value added and intermediate purchases within and external to the cluster.
Purpose
The purpose of the paper summarized below is to investigate the determinants of dynamics of maritime clusters and their long-term viability, and on this basis assess the policy measures that may contribute to the strengthening of a cluster.

Methodology
The paper examines the structural dynamics, relative strengths, and benefits of clusters in theory and from empirical cases of Norway and the Netherlands. First, an overview of shipping and international trade developments is provided, along with a discussion of the fall of great maritime nations. Second, the 2001 study for the European Commission of the economic impact of maritime clusters is summarized. Third, a detailed discussion of theory of clusters and potential gains is provided, including an assessment of the determinants of enhanced cluster performance and cluster-enabling factors. Fourth, the above findings are analysed in conjunction with extensive analyses of the Dutch and Norwegian maritime clusters. Finally, an extensive overview of policy measures and developments at the European Union level is provided, which is related to the cluster-enabling factors highlighted in the study.

Abstract
The report discusses cluster development using a model from an EC report, Regional Clusters in Europe, which describes six stages:

- Formation of pioneer firms based upon historical circumstances
- Development of specialized suppliers and manpower
- Formation of supporting and coordinating organizations
- Attraction of outside firms and new local firms through the growing external economies
- Formation of non-market relationships between persons and organizations, which stimulates knowledge circulation
- Growth, renewal, or eventual decline of cluster

Thus, at the core of a cluster’s growth lies the need for larger firms to initiate investments and spur the development of dedicated suppliers and support industries, which then later enables the enhanced interaction and linkages among the different levels in the cluster. This is in line with Porter’s idea of anchor firms or de Langen’s concept of leader firms, who are companies with the sufficient size, market position and knowledge base who can contribute through the value chain with positive impacts upon smaller firms. Such leader firms are inevitably part of the core of a cluster, which is primarily made up of shipping companies, seaports, and maritime services firms.

Clustering is argued to be important due to the creation of positive externalities among the participant firms, which may be inspired by a number of dynamics, here summed up from the extensive treatment in the text:

- Transaction costs of cooperation and specialization are reduced due to the close proximity, which enables firms to reduce non-core in-house activities
- Good access to production factors, or complementarities in input resources can create a critical mass of demand, thus increasing scale and reducing costs
- Local rivalry can increase innovation pressures and efficiency
- Skilled, specialized and experienced labour is more available, partly as targeted education and training is developed.
- Knowledge diffusion and learning can result from networking, internal labour flows, and formal cooperation, a process which is impacted by the proximity to firms in same or adjacent industries, thus defining firms’ learning capacity.
- Geographical proximity to demanding customers, specialized suppliers and information can put pressure for and enable innovation.
- Common interests may be jointly represented, such as initiatives to promote maritime careers, images and public awareness or influence policy development.

A cluster is argued to increase both intended and unintended resource sharing among firms as both formal knowledge and informal, uncompensated knowledge flows through ties between businesses. Knowledge is considered to be informal and tacit in nature and difficult to codify, articulate and transfer. Therefore, transference of knowledge/know-how requires long-term and trustful relationships. These relationships may, for instance, be created through competition in the same market, production of complementary goods, co-operative production (alliances), development or use of the same technology/R&D, circulation of human resources (employees, consultants, board members), infrastructure (broad band etc., transportation hubs), and capital (joint ownership, credit institutions).

Government may play a significant role in stimulating clusters through establishing an innovation-supportive institutional environment, as was seen by the Dutch maritime experience in the mid-90s. The Observatory of European SMEs conducted a study of governmental policies and organisations aimed at stimulating the cluster processes. Surveying 34 regional clusters, financial support of firms’ projects, support of physical and knowledge infrastructure, support of education, training and research, and networking programmes were found to be the most important policies.

In arguing which elements are necessary to create a strong, successful cluster, the authors’ write: “An industrial environment needs to have a solid vertical and horizontal structure in order to create the stimulating dynamics, i.e. it has to include a variety of suppliers/services, customers and competing businesses. The industrial environment also needs a critical mass of related actors. It has to include both breadth and depth of organisations. A complete cluster, including all kinds of related organisations, provides the companies with important complementary resources. Successful clusters of businesses are characterised by self strengthening growth, driven by competition, co-operation, learning and innovation.”

To evaluate the competitiveness and strengths of the Norwegian and Dutch maritime clusters, nine indicators are isolated and considered:

- Structural indicators. Type and number of maritime sectors, and number and size of companies. The broader the cluster in terms of sectors, the greater its potential synergy and strength. Sectors within the cluster that order new capital equipment have a stronger impact on cluster dynamics than the supply sectors (“cluster drivers”: shipping, offshore, inland shipping, dredging, fishing, naval). The shipping companies create the demand that equipment suppliers depend heavily upon – in the absence of such in-cluster demand creation, supply companies would be dependent upon foreign demand for their products.
- Economic indicators. E.g. the value creation of the cluster, expressed in direct and indirect value added, employment, backflow to the government, (foreign direct) investment, export quote and balance of payments contribution, growth over time.

- Internationalisation. The ability to export is a clear indication of and empirical evidence that sectors and companies are able to compete in the world market, and are thus by definition competitive.

- Critical mass and leader firms. The larger the maritime sectors and maritime cluster as a whole in a country, in terms of turnover and value added, the more chances there are that companies become leader firms. Maritime leader firms are able to initiate innovation processes on a large scale, thereby integrating many smaller suppliers and stimulating them to innovate and export as well. The presence, the number and market share of maritime leader firms in a cluster, is a clear indication of the ability of a maritime cluster to export, innovate and upgrade itself.

- Level playing field. Countries that are able to create a level playing field for their maritime clusters, have a better chance to have leader firms, innovation, export, value added, critical mass and upgrading mechanisms.

- Innovation. The presence of a strong maritime services sector and marine equipment sector are good indicators for the innovative strength of the cluster and the pace of diffusion of innovation within the cluster.

- Institutional framework and business networks. The quality of the maritime trade organisations, the quality of the cluster networks, the level of interaction with policymakers and politicians, all determine the strength of the cluster. The stronger the networks, the greater the chance of cluster dynamics and upgrading.

- Labour market and education. A cluster requires a broad set of expertise and a high level of education. A large cluster offers many employment opportunities and increases the attractiveness to choose for a maritime career.

- Image and communication. A positive image and a continuous two-way communication effort between the cluster, the policymakers and the general public is of the essence if the cluster wishes to attract to best people and maintain a high-level of dynamics.

The Dutch maritime cluster
The total direct and indirect economic significance of the Dutch cluster in 1997 was a production value of €20.3 billion (direct only: ~ €15.1bn) and value added of €10.6 billion (direct only: ~ €8bn). Between 1997 and 2002 these figures increased 22% and 19% respectively. The three largest contributing sectors in 2002 of value added were ports, the offshore sector, and shipping. A highlighted fact was the near-explosive growth of the shipping sector as a result of the favourable Dutch policy initiatives taken in the mid-1990s.

Total direct employment in 2002 was 135,000 with an additional indirect employment of 55,000 people. Ports, offshore, and shipbuilding sectors are the largest job contributors, while shipping is less significant due to its capital intensive nature and frequent employment of foreign crews, who are not taken into account.
Overall, the cluster exported 63% of its production value, with shipping exporting more than 93%. Thus, the cluster’s share of Dutch national exports amounted to 5.5%. Cluster share of GNP was 3.1%, making it a significant element of the Dutch national economy.

Based upon their investigation of the linkages and economic relationships among the cluster actors the authors conclude that six sectors drive the domestic cluster through their capital investments: shipping, dredging, inland shipping, navy, offshore and fishing. The shipping sector appears as one of the largest contributor through the amount of capital flowing from this sector through the network – significantly, the maritime services and maritime equipment sectors supply and depend upon all the other sectors in the cluster.

From the studies and findings, the Dutch Maritime Network has highlighted a number of key areas for future cluster initiatives: the global market, exports and internationalisation of companies, the opportunities at home and the attractiveness of the Netherlands for investments, the availability of a well-educated workforce and flexible labour market, the innovation climate and research and development, the level playing field, the cluster synergies, and, last but not least, a strong maritime Europe, including a common European cluster policy.

The Norwegian maritime cluster
Several Norwegian reports have emphasized their cluster as one of the most complete in Europe, with significant breadth and depth. While the cluster certainly is complex with actors in a large number of sectors, the cluster is regionalized, with many sub-clusters spread across the West and Southeast coastline. Shipping companies amounted to 61.7% of all maritime companies in 1998, and contributed more than half of all value creation in the cluster, which indicates the relative dominance of shipping in importance in Norway.

A number of separate studies into the Norwegian cluster’s economic significance have been conducted utilizing different methodologies and sector definitions. Two such research projects, “Et Verdiskapende Norge” (A value creating Norway) and “Det Regionale Maritime Norge” (Regional Maritime Norway), are cited in this paper. Depending upon the study, in 1999 the turnover in the cluster totalled between €16.3 billion in the former to €24 billion in the latter, representing overall growth since 1988 of between 187% and 293%. In comparison, in the same period all Norwegian industries grew 150% only. Similarly, the estimated net value creation of the cluster ranged in 1999 between €3.7 and €6.1 billion, equalling growth 1988-99 of between 184% and 324%.

The Global Maritime Benchmarking study, as reported in the 2003 “Attracting the Winners”, although not readily comparable to the above studies, found average value creation in the cluster from 1998-2001 to be €4 billion. Also, the cluster’s importance was measured as close to 3% of GDP.

An interesting dynamic highlighted by the authors is that the regional clusters are becoming increasingly specialized in certain types of economic, maritime activities – for instance, mid-Norway’s cluster is becoming focused upon high-tech R&D and technology intensive suppliers, while the Oslo-area consists primarily of shipping firms and knowledge-intensive support services, i.e. classification and insurance, and the Northwest engages in ship design and shipbuilding. The increased specialization sub-clustering effect is combined with an observed strengthening of linkages in between the different regions.

The study “et verdiskapende Norge” measured the strength of linkages between the cluster sectors and found that shipping companies function as the central actors with the highest economic contri-
bution, as well as the strongest linkages to most industries in the cluster, particularly shipbuilding, equipment and maritime services. Linkages among same-sector firms are similarly strong. However, the findings also indicate that education, research and development have relatively weak linkages to the rest of the cluster, posing a challenge for the cluster to upgrade its innovative abilities in the future.

Another finding of “Det regionale maritime Norge” was that the highest level of growth in value creation over time was found in regions with higher competitive rivalry and more demanding customers. Also, a positive relationship is found between more intense regional competitive rivalry and cooperation in innovation, which supports some of the theoretical benefits of clustering.

Cluster-enabling factors
Based upon their theoretical and empirical discussion of clusters, the authors define seven cluster enablers, which should be the focus of national and European cluster policy making:

- Define cluster, establish its economic significance and promote visibility: By conceptualizing the cluster and making it appear statistically, attention from politicians and researchers is more likely to be obtained.

- Define an industrial policy: By understanding the internal dynamics of the cluster, and acknowledging the importance as a development tool, an industrial policy for clear growth paths of sectors and clusters may enable firms to better adapt to changing conditions.

- Strengthen demand pull sectors: The demand pull sectors, such as shipping and offshore, utilize the capital and services of the other sectors and are less vulnerable to foreign, low-cost competition than the supply push sectors, such as shipbuilding, who depend more upon the opportunities created within the cluster by demand-creating leader firms, i.e. shipping companies.

- Monitor and maintain a level playing field: Cluster growth is only enabled if companies are not faced with unfair competition, allowing free market access in the EU and equal opportunity.

- Promote exports and internationalisation: reinforcing exports of products and services can enable significant growth and dynamics in cluster. After a certain point, cluster firms should be encouraged to internationalize their activities and begin foreign production, which can mean increased in knowledge and professionalization of activities, also in the home market.

- Strengthen innovation, R&D and leader firms: Export positions of firms can only be maintained in the long run by upgrading processes and products, which calls for a R&D infrastructure where entrepreneurs innovate cooperatively. Also, leader firms may set demanding standards, trigger innovation, and organize groups of suppliers to address technical challenges.

- Strengthen maritime education and labour market: Ensuring inflow of highly skilled labour requires a sufficient maritime education system, a positive image of maritime activities, as well as appealing career prospects

Conclusion
As one of the key cluster drivers, with significant linkages to cluster actors, and with large leader firm potential, the shipping industry greatly increases demand in the cluster, creating a trickle down
effect to other sectors and levels. Also, this demand-enhancing effect encourages the growth and continuous improvements of supplier-companies and their products. The sheer size and capital-intensiveness of inputs into shipping activities can push the cluster forward towards a critical mass of firms, which can enhance cluster-benefits, while the large shipowners may even be able to mobilize several members of a cluster towards common initiatives.

In both the Dutch and Norwegian maritime cluster, shipping companies were found to be important elements with significant contribution to overall value creation. In Norway, particularly, the shipping companies accounted for the vast majority of economic activity. However, the Dutch study also emphasized the explosive growth of the shipping sector that came with the introduction of favourable policies in the late-90s, such as tonnage tax.
De Nederlandse Maritieme Cluster:
Economische Betekenis en Structuur

Policy Research Corporation

Purpose
The Dutch maritime cluster study, whose title means ‘The Dutch Maritime Cluster – Economic Significance and Structure’ consists of two major parts: First, an evaluation of the economic significance of the Dutch maritime cluster and its degree of clustering and networking. Second, an investigation into methods and policy measures that could encourage the innovativeness and value creation within the cluster. The Dutch study included a large number of reports on individual sectors with maritime activities.58

Methodology
The report aggregates the analyses of its individual-sector reports conducted over the period 1997-1999, which enables the study to present well-argued findings on the size, structure, and economic significance of the Dutch maritime cluster. It considers key variables such as total and sector level production value, value creation and contribution to GDP, employment, as well as capital investments and intermediate deliveries within the cluster. In addition, using input/output analysis, the study estimates the indirect economic effects on production value, value creation and employment. To ensure validity and proper delineation of cluster sectors and relations, hundreds of interviews were conducted with industry actors and experts. Note: All figures are reported in Dutch Guilders, which were replaced by the Euro as of 1999 – One Euro is equivalent to 2.204 Dutch Guilders.

Also please be aware that the summary below have mainly been subjected to formatting and structural changes, but as a whole, represents the originally summarized findings of the two reports by Policy Research Corporation.

Abstract
The Dutch maritime cluster comprises 11 sectors and 11,850 companies, and as such, is arguably one of the most complete maritime clusters in the world. The 11 maritime sectors are shipping, shipbuilding, marine equipment, offshore, inland navigation, dredging, ports, maritime services, fishing, yachting, and the Dutch Royal Navy.

The direct production of the Dutch maritime cluster amounts to 32.9 billion Dutch guilders. Value added represents 17.1 billion Dutch guilders of that amount, which is about 2.5% of total value added generated in the Netherlands. In addition, the Dutch maritime cluster employs about 137,000 persons.

The largest sectors within the cluster in terms of production are the seaport sector (20%), the shipping sector (15%), and the offshore sector (14%). Together they represent about half of the total production of the cluster. The largest sectors in terms of employment are again the seaport sector (19%) and the offshore sector (14%), followed by the Royal Navy (13%). The cluster firms are internationally oriented and, excluding the navy, on average 60% of their sales are realized abroad, representing 5.4% of Dutch exports.

58 See the Dutch Maritime Network’s ’Nederland Maritieme Land’ series, volumes 3-12.
However, the economic significance of the maritime cluster amounts to more than just the production, value added and employment in the cluster itself. In view of the many relations with other sectors, the maritime cluster has a far-reaching effect on the rest of the Dutch economy. Production, value added and employment generated elsewhere in the economy, must also be included in the economic significance of the cluster, in terms of *indirect effects*.

Using input/output analysis, the total economic significance of the Dutch maritime cluster appears to be 35% greater than its direct significance in terms of production and value added, and almost 40% greater in terms of employment. Total production amounts to roughly 45 billion Dutch guilders, total value added amounts to more than 23 billion Dutch guilders and total employment stands at 193,000.

A part of the total value added flows back to the government in the form of taxes and social premiums. The backflow represents a total of 8.5 billion Dutch guilders, 5.6 Dutch guilders of which are generated by the maritime cluster itself.

The analysis of expenditure patterns carried out in this project shows that the maritime cluster creates 4.6 billion Dutch guilders of investments, about 75 percent of which is spent within the maritime cluster itself, with the remainder being spent in other sectors of the Dutch economy. Capital expenditure on maritime goods – mainly in ships - is estimated to be 1.6 billion Dutch guilders. The effect of the cluster on Dutch consumption amounts 6.3 billion Dutch guilders.

There are also extensive financial relations *between* the different sectors of the maritime cluster, as shown by mutual deliveries of (intermediary) goods and services, thus the maritime sectors have a lot more in common than just their maritime character. The total deliveries between the various maritime sectors amount to over 7.2 billion Dutch guilders. The major supplying sectors are the shipbuilding sector and the marine supply activities. Each of these two supplies more than 2 billion Dutch guilders to other maritime sectors in the form of goods, services and capital goods. The major purchasing sectors are the shipping, inland navigation, dredging, offshore and sea port sectors. Together, these sectors purchase goods and services within the cluster for a total amount of 5.1 billion Dutch guilders. About 35% thereof is purchased by the shipping sector.

The study finds that the shipping and ports sectors, the inland navigation sector, the offshore sector, the Royal Dutch Navy and the fishery sector have an extensive demand generating effect on the maritime cluster. This results in important indirect effects on the Dutch economy as a whole. The total effect of the demand of the six above-mentioned sectors amounts to about 5.5 billion Dutch guilders of production, about 70% thereof within the maritime sector itself. The shipping has the most pronounced demand-initiating character and represents about 2.2 billion Dutch guilders of production, of which more than 1.5 billion Dutch guilders are within the maritime cluster.

Also in *non-financial* terms are important relations seen between the sectors within the maritime cluster. These factors determine for a large part the competitive position and the strength of the individual sectors, and as such an important policy focus point. In particular we can mention the strong (technological) relation, the overlapping employment markets, but also the relations in physical streams between sectors such as inland navigation and seaports.

The recommendations for the maritime industry on the basis of the findings emphasized: the continuation of efforts related to network- and image-building via the Dutch Maritime Network; the establishment of a maritime export forum; the establishment of a market monitor; the establishment of a maritime capital forum; the investigation of opportunities for the establishment of an innovation forum.
Together with the government the maritime industry needs to assume its responsibility with regard to: initiating innovation; optimising the use of present export instruments; initiating and shaping a renewed framework for public-private co-operation; optimising the balance between education programmes and the need for education.

In addition the Dutch government has an important role in creating a framework within which the maritime sectors can operate. Because of the strong domestic cluster relationships, providing the right framework is essential for the sustainable development of an individual sector as well as of the entire maritime cluster. The sailing sectors, i.e. Shipping, in particular are major demand-generating sectors which have a strong effect on other maritime sectors and on the rest of the economy. Thus, the report concludes that the significant changes that created a very favourable Dutch shipping policy should be maintained in order for the maritime cluster policy to succeed.

With regard to infrastructure the government should become a ‘giving’ rather than a ‘demanding’ government. This means that government interventions in the field of infrastructure and environmental planning should primarily be aimed at setting an appropriate framework. The basic task of the government thus shifts from financing and carrying out infrastructure projects to more planological co-ordination of infrastructure projects.

With regard to labour market, schooling and recruiting, two recommendations for government are made. Both adaptations are meant to stimulate entrepreneurial measures and to enable inland shipping companies to effectively manage their business. The recommendations relate to increased flexibility regarding the labour law for foreigners; and increased flexibility regarding the Dutch law on labour time.

**Conclusion**

The reports by Policy Research Corporation first of all confirm the existence of a maritime cluster, an important finding in itself – In addition, it establishes its highly significant direct and indirect contributions to the Dutch economy in terms of demand, overall public and private consumption, and backflow to the government. The study also highlights the difference between the demand-generating sectors and the supply-side of the cluster – the Shipping sector, in particular, is highlighted because it has the “most pronounced demand-initiating character” of any maritime sector, spurring demand of more than 2.2 billion Dutch Guilders. Also, the shipping sector accounts for 35% of total cluster purchases within the cluster itself. This supports the notion that large, demand-generating firms and sectors enable the growth and development of firms in other parts of the cluster, such as suppliers. On this basis, the report’s policy recommendations emphasize the need to maintain or enhance the now-favourable shipping policy in order to facilitate the success of an overall maritime cluster policy.
Purpose
This study considers the economic significance and structure of the Dutch Maritime Cluster. As such, it follows up on the extensive study by the Policy Research Corporation, which was published in 1999-2000 with 1997-data on the cluster. The publication therefore describes the changes and developments between 1997 and 2002.

Methodology
The study utilizes similar methods as the earlier cluster research, which enables comparison. In addition to measuring cluster value added, export levels and employment, input-output analysis is used to calculate the indirect effects of cluster economic activity. In conjunction with the economic analysis, expert interviews and industry surveys were used to assess the developments in the cluster.

The summary below represents the originally summarized findings of the report by Policy Research Corporation.

Abstract
The Dutch maritime cluster comprises some 11,500 companies. The total value added of the maritime cluster represents € 12.6 billion, of which € 9.5 billion is generated in the maritime cluster itself. The remaining € 3.1 billion is generated indirectly – via purchases – elsewhere in the economy. The total value added accounts for 2.9% of the Gross National Product (GNP). A part of the total value added flows back to the government in the form of taxes and social premiums. In 2002, the total backflow represented over € 4.5 billion.

Apart from the Royal Netherlands Navy, the maritime sectors realise 63% of their sales abroad, which is well above the average for the Dutch economy. Total exports amount to € 12.5 billion. In addition, total employment stands at 190,000 persons. The maritime cluster itself directly employs over 135,000 persons. The maritime cluster comprises 500 to 600 companies of Dutch origin that have foreign branch offices. Going where one’s customers go, cost-related considerations and circumventing entry barriers are considered to be the most important motives for international presence. The leader firms of Dutch origin employ about 34,000 persons abroad. In turn, foreign companies manage a similar number of firms in the Dutch maritime cluster. The presence of the main port Rotterdam and its related infrastructure, the quality of the Netherlands as a maritime centre and the country’s geographical position (time zone) are the most important incentives for selecting the Netherlands as the location for a branch office. The foreign companies employ 9,000 persons in the Dutch maritime cluster; these are included in the 135,000 persons mentioned above.

Since 1997 to 2002, the maritime cluster has evolved in a predominantly positive way. The value added has increased by 19%. Although this figure remains below the 29% growth rate of the GNP, it is higher than in similar sectors. The largest growth has been observed in the shipping, dredging, yachting and maritime services industries. The value added of the other sectors has increased by 14% to 17%, with the exception of the fishing sector, where value added posted an increase until 2001 but fell considerably in 2002 to hit the level of 1997.
In 2002, the total deliveries among the various maritime sectors amounted to approximately € 3.6 billion. The major purchasing sectors are the shipping sectors. Developments, such as the budget cuts, which postponed the purchase of new vessels by the Royal Netherlands Navy, the shipping industry’s difficulties in attracting equity capital under the national flag and (partly because of this) the weak order-book of the Dutch shipbuilding industry put the maritime cluster under pressure.

In most sectors growth was accompanied by increased exports. The export quote rose by a few percentage points in sectors such as shipping, offshore, yachting industry and marine equipment supply. In the other sectors, exports have also risen. In some sectors, such as shipbuilding and marine equipment supply, the domestic turnover came under pressure. Due to an increasing number of new-buildings abroad, these sectors were not able to fully take advantage of the positive developments within the shipping sectors.

However, the growth of turnover and value added has not resulted in increased employment in the Dutch maritime cluster. Total Dutch employment decreased by 1.8% or 3,500 persons. With 1,900 persons, the Royal Netherlands Navy has experienced the most significant reduction.

None of the other sectors have been able to substantially increase employment in the Netherlands. Partly this is due to an increased productivity. Moreover, it should be stressed that an increase in employability has been realised, albeit abroad, in particular by the shipping industry and the maritime leader firms.

In 2002 the maritime cluster accounted for 34 000 jobs abroad, as mentioned earlier. In the period 1997-2002, the export quote of the maritime cluster grew to 63% of total cluster sales. Because of this, the maritime cluster retained an equal part in the total export figure for the Dutch economy in comparison with 1997. The cluster contributed 5.4% to total export in 2002.

**Conclusion**
The study confirms the economic significance of the Dutch maritime cluster. While overall the cluster saw positive growth between 1997 and 2002, the individual sectors showed some variations — the shipping sectors were highlighted for their demand generating nature through purchases and its positive growth rates, while other more supply-oriented sectors, such as shipbuilding, had been more vulnerable to falling demand for ships under Dutch flag, while faced with low-cost competition.
Purpose
This report follows up on the two prior maritime cluster studies carried out by the Policy Research Corporation in the Netherlands from 2000 and 2003. The authors assess the economic significance of the Dutch maritime cluster in nominal terms using year 2005 data while referring to the developments since 2002 (the year 2003 study).

Methodology
Since the report should be viewed as a continuation of previous research efforts, the methods adopted are similar, combining measurement of key economic variables and input-output analysis to assess indirect significance with expert interviews and industry surveys. The time period considered is from the end of 2002 to 2005.

The summary below represents the originally summarized findings of the report by Policy Research Corporation.

Abstract
The Dutch maritime cluster comprises some 11,500 companies. The total value added of the maritime cluster represents €13.3 billion, of which €10.0 billion is generated in the maritime cluster itself. In addition nearly €3.3 billion is generated indirectly – via purchases – elsewhere in the economy. The total value added accounts for 2.6% of the Gross National Product (GNP). A part of the total value added flows back to the government in the form of taxes and social premiums. In 2005, the total flow back represented over €4.8 billion.

Apart from the navy, the maritime sectors realise 64% of their sales abroad, which is well above the average for the Dutch economy. Total exports amount to €14.2 billion. In addition, total employment stands at 187,000. The maritime cluster itself directly employs 133,250 people. The maritime cluster comprises 500 to 600 companies of Dutch origin that have foreign branch offices. Going where one’s customers go, cost-related considerations and circumventing entry barriers are considered to be the main motives for international presence. The leader firms of Dutch origin employ about 37,500 people abroad. In turn, foreign companies manage a similar number of firms in the Dutch maritime cluster. The presence of the main port Rotterdam and its related infrastructure, the quality of the Netherlands as a maritime centre and the country’s geographical position (time zone) are the key incentives for selecting the Netherlands as the location for a branch office. The foreign companies employ 9,000 people in the Dutch maritime cluster; these are included in the 133,250 people mentioned above.

The maritime cluster has increased its value added by 5.5% from 2002 to 2005. Apart from fishing and the navy, the increase amounted to 7.6%. This figure remains 1.1% below the 8.7% growth rate of the GNP. The most substantial growth was observed in dredging, shipbuilding, the water-sports industry, ports and offshore. The development of shipping lagged behind by almost 4%, mainly because of the decline in activities in the Netherlands. However, the remaining companies performed well in 2005. The maritime services industries, inland shipping and marine equipment supply showed a more modest growth. For the navy and fishing, value added was less than in 2002.
In 2005, the total financial flows among the various maritime sectors amounted to approximately €3.9 billion. The major purchasing sectors are the shipping sectors. In the period 2002-2005, the export figure of the maritime cluster grew to 64% of total cluster sales. As a result, the maritime cluster maintained a substantial share in the total export figure for the Dutch economy as compared with 2002. The cluster contributes 5.1% to total export.

However, the growth in turnover and value added has not resulted in increased employment in the Dutch maritime cluster. Total Dutch employment decreased by 1.6% or 3,000 people. With 1,920 staff (of which 1,610 employed directly), the Netherlands navy experienced the most significant reduction.

None of the other sectors have been able substantially to increase employment in the Netherlands. This is due in part to an increased productivity. Moreover, it should be stressed that employment has increased, albeit abroad, in particular thanks to maritime leader firms. The number of jobs abroad, 37,500, reflects an increase of 10% compared to 2002.

**Conclusion**

A particular strength of Dutch maritime cluster research, as compared to that of its European neighbours, is its early definition of the cluster and the consistently applied methodology that enables comparison across time. The foundation for evidence-based policy making is strengthened significantly by such consistency, enabling policy makers and interest groups to track changes and development in the structure and performance of maritime activities in the cluster.

This monitoring study has shown that despite stagnating growth rates in parts of the cluster, the economic significance to the Dutch national economy of maritime activities remain worthy of note.
Purpose
Entitled ‘Leader Firms in the Dutch Maritime Cluster: Theory and Practice’, the purpose of this research was to identify leader firms in the Dutch maritime cluster and to analyze the ways in which they contribute to the performance and innovation of the cluster as a whole.

Methodology
This study examined the role and behaviour of ‘Leader firms’ using case studies of 26 firms that are found to fit the leader firm criteria. The firms were selected based upon two methods: first, experts were asked to identify leader firm, i.e. executives of trade associations that are part of the Dutch Maritime Network, such as the dredging association and the port association. Second, to ensure consistency, a cross-check was made using firm characteristics, which indicate the ability of the firms to act as ‘leader firms’. The two methods proved highly consistent.

Five criteria for leader firm status were used in the cross-check: Size (turnover and employment); Number of foreign subsidiaries; Number of patents filed in the last 10 years; Number of association memberships in the cluster.

In the case studies emphasis was given to the analysis of four relevant networks: the production network, the innovation network, the internationalisation network and the labour market network. On the basis of an analysis of the relationships of leader firms with other firms in each of these networks, forms of leader firm behaviour were identified. In addition to the case studies, senior managers of 18 of the 26 selected firms responded to a set of survey questions.

Abstract
The authors define leader firms as “firms in a cluster that have - because of their size, market position, knowledge and entrepreneurial skills - the ability and incentive to make investments with positive externalities for other companies in the cluster.” Leader firms encourage innovation, enable internationalisation of other firms in the cluster and invest in the quality of the labour pool.

Firms locate in a cluster because the ‘cluster environment’ provides advantages, such as the proximity of customers and suppliers, a joint labour pool and the presence of knowledge and information. The report refers to Lorenzoni and Badenfuller’s argument that leader firms may contribute to this environment and their partners’ competitiveness in four ways: through strategic outsourcing, the sharing of knowledge, by forming a bridge between different networks, and by focusing on competition on a value chain or network level rather than on firm level. Thus, Leader firms may encourage innovation, enable internationalization of other firms in the cluster and invest in the quality of the labour pool. These dynamics are drivers of competitiveness of cluster actors and the cluster as a whole.

Two main types of positive externalities are relevant in this context: network externalities and cluster externalities. Investments in a network (inter-firm infrastructure and communication networks) will benefit all network partners. Cluster externalities in turn benefit all cluster actors, not just the members of the relatively closed cooperative networks. Leader firms’ investments that lead to network externalities include investments in innovation and internationalization. Investments with
positive cluster externalities include those training and education; knowledge and information infrastructure; and an infrastructure for collective action.

The survey results in the table below reflects the roles of 18 firms in innovation in the maritime cluster:

<table>
<thead>
<tr>
<th>Roles in Innovation</th>
<th>No. of firms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Act as lead user</td>
<td>17</td>
</tr>
<tr>
<td>Orchestrating networks</td>
<td>12</td>
</tr>
<tr>
<td>Providing finance for innovation projects</td>
<td>12</td>
</tr>
<tr>
<td>Management of innovation networks</td>
<td>11</td>
</tr>
<tr>
<td>Share knowledge and innovation</td>
<td>17</td>
</tr>
<tr>
<td>Demand precisely specified new products</td>
<td>11</td>
</tr>
<tr>
<td>Involve suppliers in innovation in early stage</td>
<td>14</td>
</tr>
<tr>
<td>Co-invest in foreign facilities</td>
<td>4</td>
</tr>
<tr>
<td>Offer location on-site</td>
<td>5</td>
</tr>
<tr>
<td>Act as 'matchmaker'</td>
<td>2</td>
</tr>
</tbody>
</table>

Source: own creation

From the case studies and surveys combined, nine forms of leader firm behaviour were identified:
- Coordinating production networks
- Roles as lead users, posing sophisticated demands to suppliers
- Creating high standards that make suppliers adapt early
- Creating new combinations of technologies into new products
- Improving the transfer of knowledge and its fast diffusion in the network
- Encouraging and enabling internationalization of suppliers
- Creating reputation of cluster as a whole through cutting-edge initiatives
- Improving the labour market
- Creating and maintaining organizational infrastructure.

Of these nine forms of behaviour, the most frequently observed were initiatives to improve the transfer of knowledge among firms, the role as lead users, and creating standards in the industry.

**Conclusion**

The report concludes that leaders firms can indeed have a large, positive impact on the competitiveness of their network partners, most importantly customers and suppliers, and the cluster as a whole through several different forms of behaviour. The most frequently observed forms of behaviour were encouraging innovation by investing in improving knowledge flows, as well as challenging suppliers by demanding complex, sophisticated products.

The leader firms examined all had the size and capacity to function as a driving force in their networks and the cluster, but were still locally embedded in the cluster and had not shifted too many of their value creating activities abroad. Because of this, the number of local partners in their innovation networks is relatively large and can exert a greater impact upon members in the geographical cluster.
A Durable Belgian Maritime Policy:
Economic Impact Study on Belgium’s Shipping Cluster

Policy Research Corporation

Purpose
This report is based upon research by the Policy Research Corporation, commissioned by the Flemish government and the European Commission. It sought to describe the current social and economic significance of Belgium’s shipping cluster, in order to discuss the need for changes to and the optimal form of Belgian shipping policy.

Methodology
The employed methodology is similar to that used in other studies by the Policy Research Corporation, using input/output analysis to describe the economic significance of the cluster, while conducting an Economic Impact Study, which compares the economic and social outcomes of different policy measures. The year 2000 is the base year for the data and analysis, the ‘current’ situation, unless otherwise stated.

Abstract
The Belgian maritime cluster is made up of a relatively small number of players who occupy good niche positions, or even top positions, i.e. in hydraulic engineering. The Belgian cluster, the report argues, has declined due to a lack of a level playing field, so that Belgian firms have either moved their activities abroad or simply ceased operating, which reduces the contribution to Belgium’s economy. The shipping industry has seen significant flagging out of vessels to reduce operating costs. In 1986, 102 merchant marine vessels were sailing under Belgian flag, compared to zero vessels in 2001. The report finds that as the ships are out-flagged, economic activities tend to shift abroad as well.

Similarly to other studies, the authors argue that the economic significance of the shipping cluster is twofold, the direct impact of the shipping companies as such and the indirect significance, through the purchases of such companies in the rest of the Belgian economy.

The direct economic impact of the shipping cluster in terms of added value amounted to BEF 17,100 million in the year 2000, BEF 8,800 million (52%) of which were generated by hydraulic engineering. BEF 1,900 million (11%) by the tugboat industry, BEF 6,400 million (37%) by the merchant marine.

In terms of employment, Belgium’s shipping companies supported 4,500 sea-going jobs and 2,250 jobs on shore. Approximately 43% of the mariners and almost 955 of shore personnel are Belgians and Belgian residents. The hiring of merchant marine personnel by Belgian shipowners is required by formal regulations to occur through the so-called Mariner’s Pool, which in recent years has seen declining numbers of human resources available.

Indirectly, through purchases from the rest of the economy, the Belgian shipping industry provides employment to 4,720 people and it also induces an additional added value of BEF 10,700 million. Especially hydraulic engineering generated quite a lot of indirect added value with BEF 8,300 million, more than 75% of total cluster indirect effects.
In total, including subcontractor impact, the Belgian shipping cluster employs about 11,500 people, almost 8,800 are Belgians or Belgian residents. While 60% of those directly employed are Belgian residents, those employed indirectly almost exclusively reside in Belgium. The respective contributions of the merchant marine, the tugboat industry, and hydraulic engineering to indirect employment amount to 21%, 3%, and 76%.

The total added value of the Belgian shipping cluster equals BEF 27,800 million in year 2000, BEF 10,700 million (40%) of which are indirectly generated. The contributions of the merchant marine, the tugboat industry, and hydraulic engineering to indirect employment are 19%, 3%, and 78% respectively. 64%, or BEF 17,800 million of the added value generated are spent inside Belgium. The return to government amounts to BEF 8,300 million per year, investments account for BEF 5,500 million and consumption equals BEF 4,000 million. The total expenditure by the merchant marine, the tugboat industry, and hydraulic engineering amount to BEF 3,600, 1,900, and 12,300 million respectively. These figures suggest that although the maritime industries are international in nature, their economic effects are generally localized and do not leave a home base to a great extent, contrary to the arguments of some critics.

The ratios of expenditure to added value indicate the extent that the added value remains inside Belgium and amounts to 43%, 82%, and 72% respectively for the merchant marine, the tugboat industry, and hydraulic engineering. The lower contribution of the merchant marine, the report argues, is partially explained by the larger number of non-residents employed.

The report then moves on to describe and analyse the Belgian government policy towards the shipping industry, arguing that as a large part of the cost basis for shipping companies is determined internationally, the ability to compete is determined by a limited number of components such as taxation, crew policies, and wages.

Belgian shipowners are exempted from paying employer’s contributions and withholding taxes of mariners’ wages, which places them comparable to other European maritime nations. Still, the report argues, as the policy is short-term, and temporary (until 2002), the policy regime lacks the consistency and predictability needed to make long-term strategic decisions.

The existing crew rules in 2001 severely reduced Belgian shipowners’ competitiveness, mostly due to social security requirements. The annual wage costs of a Belgian shipowner operating a gas tanker of 30,000 DWT under the Belgian flag are roughly BEF 10 million higher than those of his Dutch counterpart. Moreover, requirements to have ‘double recording’ of ship’s mortgages, as well as hefty corporate taxation of the shipping companies, contrary to the Dutch case, has effectively reduced merchant marine registrations to zero.

Then, the authors apply the Economic Impact Study methodology, as developed by the Policy Research Corp., to analyse the impacts of two policy scenarios: the continuation of the then-current maritime policy vs. a durable Belgian flag, where the Belgian government ensures a level playing field independently, but within the EU framework, while maintaining the current tax exemptions.

Continuation of the current policy, it is argued, will seriously weaken international competitiveness, making it impossible to preserve the jobs of Belgian mariners. In terms of total added value, the significance of the shipping cluster will shrink with BEF 3,200 million. Moreover, about 900 Belgian residents will lose their jobs by 2020. The return to the government will be BEF 6,000.
By 2020, the second scenario, the durable Belgian flag, will provide nearly BEF 16,000 more added value per year. Close to BEF 9,600 million of this will be direct added value. In terms of employment, this scenario generates a difference of 6,300 jobs, 3,500 of which will be created in the shipping cluster as such. Also, by 2020 this scenario will make an additional BEF 10,000 million flow annually into the Belgian economy. The return to the government will be BEF 9,000, compared to 6,000 under current policy. However, the second scenario will cost BEF 5,100 million in lost revenue. Even so, the authors maintain that the lost revenue, which arises from granting exemptions to the Belgian shipping cluster, is needed to enable preservation of the shipping industry, and therefore it still translates into higher revenue for the government.

Consistency and continuity is vital to ensure success of maritime policies. In response to the developments in policy in other European nations by the late-90s, most notably in the Netherlands, the Belgian government introduced some temporary measures, set to end in 2002. Were these in fact to be continued in that year, the report warns that decision centres would be shifted abroad, reducing added value, expenditures, and the critical mass of maritime knowledge. By 2020 the loss of added value annually will amount to BEF 8,000 million, and roughly 4,000 Belgians would become unemployed.

Conclusion

The researchers’ findings, as summarized above, show the significant impact that government policy can have in terms of enabling or reducing competitiveness. Also, the value and the need for a level playing field in maritime policy terms is highlighted, stressing the importance of such policy measures to be consistent and continuous, to enable long-term decision making and investments.

Comparing the then-current framework to one, where a level playing field was created by vessels under the Belgian flag, it is evident that the latter contributed much greater levels of employment and added value to the economy, both directly and indirectly. Despite the lost revenue to the government, the total effects of a level playing field remained positive. In fact, such change is argued to be vital for the future survival of a Belgian shipping industry.

Another implication of the findings is that a significant share of the generated value tend to stay domestically, despite the international nature of maritime activities. However, it is also implied that if shipping companies cannot be retained inside Belgium due to unfavourable, uncompetitive policy regimes, economic activity may be reduced to a great extent.
The Economic Contribution of the UK Shipping Industry

Oxford Economics

Purpose
The report seeks to quantify the economic contribution of the shipping industry to the UK economy, in terms of direct, indirect and induced impacts of shipping activities and employment, thus updating a report from 2007. Furthermore, the report evaluates the economic significance of the tonnage tax regime, introduced in 2000.

Methodology
Oxford Economics’ report considers the economic contribution of the shipping sector focusing on three channels of impact: direct, indirect, and induced. The direct impact measures the economic activity and jobs generated by ports themselves. This activity causes a ripple effect in the rest of the economy, stimulating output and employment in other industries. The indirect impact captures the effect ports have on activity and jobs in their supply chain, while the induced impact considers the effect of wages and salaries paid to staff within ports and their supply chain on the rest of the economy through consumer spending. A fourth channel, the ‘catalytic’ effects, is concerned with the broader, society-wide impacts, which further enlarges the economic contribution of the shipping industry.

In order to estimate the shipping industry’s contribution to UK GDP the report used data from the Office of National Statistics (ONS) on turnover figures provided to the Chamber of Shipping and then applied estimates for total bought-in costs and changes in stocks from ONS National Accounts data. Indirect and induced effects are estimated using derived multipliers from ONS data, calculated through an econometric model of the UK economy developed by Oxford Economics.

In order to gauge the impact of the introduction of the tonnage tax regime in 2000, two scenarios are considered under assumptions of no change of the previous tax regime: Scenario 1 (British tonnage had continued to decline at the rate it had immediately prior to the regime change) and Scenario 2 (British tonnage would be half its 2007 level). Based upon these scenarios, Oxford Economics estimate the GDP contribution, employment and taxes attributable to the tonnage tax regime.

Abstract
In 2007, the UK shipping industry directly employed 96,000 workers, or 0.3% of national employment. Of these, 30% were UK officers and ratings, 10% were UK nationals in shore based employment and 60% foreign officers and ratings. This estimate for direct industry jobs places shipping just above the advertising industry as well as the electricity distribution and generation industries in terms of employment.

On a turnover of £9.5 billion, the UK shipping industry directly contributed £4.7 billion to UK GDP. To give a sense of scale, this contribution to GDP is slightly greater than beverages industry, the treatment and coating of metals, and furniture manufacturers. The value added generated has grown markedly, with 17% per annum between 1999 and 2007, far higher than the overall economy.

The UK shipping industry was estimated to have contributed around £594 million to the Exchequer in tax receipts in 2007.
The report further considers the indirect effects of the shipping industry. The indirect income multiplier is estimated at 1.7, so that each £1 million of output generates £0.7 million elsewhere in the UK economy. The induced multiplier is estimated at 1.2. With regard to employment effects, one additional job in shipping leads to creation of 2.2 jobs through the indirect and induced multiplier impacts.

Based upon these multipliers, the industry’s spending on inputs of goods and services is estimated to have supported 79,000 jobs in the UK. These workers output generated a contribution to UK GDP of £3.5 billion. The consumer spending of those directly employed by the shipping industry and in its supply chain, is estimated to have created a further 37,000 jobs and generated £1.6 billion in GDP.

Summing together its direct, indirect and induced impacts, the UK shipping industry is estimated to have contributed 212,000 jobs, £9.8 billion in GDP and £2.9 billion to the Exchequer through taxes in 2007.

However, Oxford Economics argues that the overall economic impact is even greater than the figures above. For instance, London is one of the world’s major centres of maritime services providers, with more than 14,000 people employed. The presence of a strong shipping industry in the UK is considered a highly important factor in its continued success. Also, the industry is a crucial part in UK’s transport infrastructure and works to enhance British productivity and competitiveness, as many other areas of the economy are highly dependent upon its existence for exports/imports. Since the introduction of the tonnage tax regime, the education of UK seafaring officers increased with more than 60%. The report found that for around 16,000 shore-based jobs ex-seafarers are preferred or essential, meaning that the industry plays an important role in building required human resource skills bases in the economy.

In addition to assessing the economic contribution, Oxford Economics also evaluates the current economic impact of the introduction of the tonnage tax regime in July 2000. They argue that the economic rationale for introducing the tonnage tax was strong, enabling the UK shipping industry to compete on a level playing field in a global industry affected by tax competition, as countries seek to attract inward investments because of the economic benefits that the shipping industry generates.

The report estimates that today the UK shipping industry is three to five times larger than it would have been without the tonnage tax. Thus, because of the tonnage tax system, the shipping industry generates additional benefits of around £5.5 billion to GDP and around £1.4 billion more a year of tax payments to the Exchequer.

**Conclusion**

The findings of this report were combined with those of the Oxford Economics report, “Economic Contribution of Ports to the UK Economy”, also from 2009, and double-counting of estimates were corrected to show the combined significance of the two sectors.

Directly, indirectly and through induced impacts, ports and the shipping industry were estimated to have supported 490,000 jobs or 1.7% of total UK employment in 2007. Accounting for “double counting” problems, this estimate is 84,000 fewer people than calculated by simply summing all jobs supported directly and by multiplier (indirect and induced) effects in the two industries. Total direct employment in the two industries combined is estimated to have been 221,000 in 2007. In turn this implies the employment multiplier of ports and the shipping industry combined is 2.21, or
for every 100 workers directly employed by the two industries combined, 121 workers are supported in their supply chain and elsewhere in the economy.

Directly, indirectly and through induced impacts, ports and the shipping industry were estimated to have contributed £23.4 billion or 1.7% of total UK GDP in 2007.

Having, removed the “double counting” problems, this estimate is £4.3 billion less than calculated by simply summing all GVA contributed to GDP directly and by the multiplier effects of the two industries. The direct GDP estimate of the two industries combined is £11.4 billion, implying an activity multiplier of 2.05. Therefore for every £1 created by the two industries directly, another £1.05 is created in their supply chain and through staffs’ consumer spending.
The Economic Contribution of Ports to the UK Economy

Oxford Economics

Purpose
The purpose of the study was to quantify the economic contribution of ports to the UK economy, taking into account broader, indirect effects and induced effects from economic activity in the ports sector.

Methodology
Oxford Economics’ report considers the economic contribution of the ports sector focusing on three channels of impact: direct, indirect, and induced. The direct impact measures the economic activity and jobs generated by ports themselves. This activity causes a ripple effect in the rest of the economy, stimulating output and employment in other industries. The indirect impact captures the effect ports have on activity and jobs in their supply chain. Meanwhile the induced impact considers the effect of wages and salaries paid to staff within ports and their supply chain on the rest of the economy through consumer spending.

To calculate employment the report combines SIC codes, to delineate the ports, with data from the Office of National Statistics (ONS) in the UK. Contribution to GDP is calculated using the ‘output’ approach, summing the gross value added created through the production of goods and services. The gross value added figure is estimated by multiplying the number of employees with average worker productivity in that industry. Induced and indirect effects are calculated using derived multipliers from ONS data.

Abstract
The study by Oxford Economics finds that the UK ports sector directly employs 132,000 workers, or 0.5% of total employment in the UK. 65,000 of those work in transport or transport related activities, with another 11,000 employed in cargo handling and storage. Ports also directly contributed £7.7 billion to GDP, roughly 0.5% of total output of the UK economy. To put it in context, it is slightly more than the hotels sector and aircraft/spacecraft manufacturing. It is estimated that the sector contributed £3 billion in tax receipts, of which £1.4 billion from personal income taxes and £1 billion from corporate taxes.

When indirect (activities down the supply chain) and induced effects (activity supported by consumer spending of those employed in the ports sector) are combined with the direct effects, the ports sector supports 363,000 jobs, or 1.3% of UK employment, of which 132,000 directly, 150,000 indirectly, and 80,000 through induced effects. Thus, for every job generated in a port, another 1.74 jobs will be generated elsewhere in the economy.

In total, the ports sector supports £17.9 billion in GDP, or 1.2% of total. Of this, £7.7 billion is generated in the ports directly, £6.7 billion indirectly in their supply chain, and £3.4 billion through induced effects. The income multiplier is estimated 2.34, so that for every £1 million generated in the ports sector, £1.34 million is generated elsewhere.

In terms of tax contributions, the ports accounted for £7.1 billion in tax receipts to the Exchequer.

In addition to the above figures, the report argues that the overall economic impact is even greater, as the ports enable a host of other industries to function, such as fishing (£363 million to GDP), dredging (£114 million to GDP), industries reliant on bulk raw materials import (£6.9 billion to GDP).
GDP), restaurants and bars in port areas, relying on port to attract visitors (£870 million to GDP). Also, 95% of UK imports and exports by volume and 75% by value pass through British ports. The sector is the largest in Europe in terms of tonnage, with 580 million tonnes of freight handled in 2007.

**Conclusion**

The ports sector undoubtedly holds considerable significance to the British economy, as evidenced by the quantifications presented above. The ports and shipping sectors are quite interlinked in terms of production and employment. The findings of this report were combined with those of the Oxford Economics report, “Economic Contribution of the UK Shipping Industry”, also from 2009, and double-counting of estimates were corrected to show the combined significance of the two sectors.

Directly, indirectly and through induced impacts, ports and the shipping industry were estimated to have supported 490,000 jobs or 1.7% of total UK employment in 2007. Accounting for “double counting” problems, this estimate is 84,000 fewer people than calculated by simply summing all jobs supported directly and by multiplier (indirect and induced) effects in the two industries. Total direct employment in the two industries combined is estimated to have been 221,000 in 2007. In turn this implies the employment multiplier of ports and the shipping industry combined is 2.21, or for every 100 workers directly employed by the two industries combined, 121 workers are supported in their supply chain and elsewhere in the economy.

Directly, indirectly and through induced impacts, ports and the shipping industry were estimated to have contributed £23.4 billion or 1.7% of total UK GDP in 2007. Having, removed the “double counting” problems, this estimate is £4.3 billion less than calculated by simply summing all GVA contributed to GDP directly and by the multiplier effects of the two industries. The direct GDP estimate of the two industries combined is £11.4 billion, implying an activity multiplier of 2.05. Therefore for every £1 created by the two industries directly, another £1.05 is created in their supply chain and through staffs’ consumer spending.
Attracting the Winners:  
The Competitiveness of 5 European Maritime Industries

Erik Jakobsen, Ari Mortensen, Martin Vikesland, & Alexander Cappelen

Purpose
The book aims to evaluate the relative strengths and competitiveness of national maritime industries in Denmark, Germany, Norway, the Netherlands, and the United Kingdom, as well as the countries’ attractiveness as hosts for maritime activities.

Methodology
The authors carry out benchmarking for the years 1998-2001 of the five countries in a number of areas:

- Sophistication of national companies (measured in terms of internationalization, HR strategies, R&D and innovation).
- Domestic companies’ satisfaction, and country attractiveness as a host for foreign companies (viewed through survey responses of intent)
- Competitiveness of public policy (in taxation, industry-government cooperation)
- Cluster Dynamics (internal/external linkages, cooperation, and pressure for innovation from customers and competition)

The analysis consists of two main parts – First, the authors describe numerically the characteristics of each maritime cluster, its relative importance to the national economy vis-à-vis the other nations, and considers the compositions of the clusters in terms of Shipping, Marine Equipment, Marine Services, and Shipbuilding. Only direct significance to the economy is considered, not indirect. Second, the benchmark rankings within each of the areas (see bullets above) are shown and discussed.

It has to be emphasized that the conclusions of the surveys are drawn from a narrow statistical basis, with a total of 483 respondents across the five nations, a sample which represents roughly 5% of the population of firms.

For purpose of illustration, the results are summarized with emphasis upon Denmark, due to the extensiveness of the treatment of the five maritime clusters.

Abstract
Denmark’s maritime sector is of medium significance in terms of value creation (sum of operating profits and wages) relative to the other four countries, while Norway is far more dependent upon its cluster. The authors argue that a partial reason is that the Danish sector is far less complete – shipbuilding activities are negligible, while A. P. Møller – Maersk is the only large, dynamic, international player, contributing more than 60% of the cluster’s value.

The return on assets of the Danish maritime sector is much less than the national average, but still high compared to the other 4 nations – also, as ROA is a before tax measure in this case, the favourable tax regime will enhance the positive effect. Overall, Denmark gets the lowest rank of past performance, due to its relatively small size and few foreign investments in the Danish sector. However, its export significance is very large indeed, and shipping’s share of gross exports increased
exponentially in the late 90s. Germany scores the highest, based primarily on its very strong base of manufacturing firms with significant linkages to shipping, and good performance in maritime equipment and shipbuilding.

The table below summarizes the main figures presented for the 5 respective maritime clusters in terms of their contributions to the national economies.

<table>
<thead>
<tr>
<th></th>
<th>Denmark</th>
<th>Germany</th>
<th>Norway</th>
<th>The Netherlands</th>
<th>United Kingdom</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maritime Revenues ($Bn)*</td>
<td>13.6</td>
<td>35.1</td>
<td>19.4</td>
<td>15.5</td>
<td>35.5</td>
</tr>
<tr>
<td>Maritime value creation ($Bn)**</td>
<td>1.9</td>
<td>9.7</td>
<td>4.8</td>
<td>4</td>
<td>8.6</td>
</tr>
<tr>
<td>Maritime/National value creation***</td>
<td>1.7%</td>
<td>1.4%</td>
<td>7.4%</td>
<td>3.0%</td>
<td>2.1%</td>
</tr>
<tr>
<td>Value creation/GDP**</td>
<td>1.1%</td>
<td>0.5%</td>
<td>2.9%</td>
<td>1.1%</td>
<td>0.5%</td>
</tr>
<tr>
<td>Employees (no. direct)*</td>
<td>28,000</td>
<td>115,000</td>
<td>70,000</td>
<td>66,000</td>
<td>186,000</td>
</tr>
</tbody>
</table>

**Distribution of national value creation:****
- Shipping: 60% 46% 50% 40% 55%
- Marine Equipment: 26% 21% 20% 32% 12%
- Marine Services: 8% 25% 14% 14% 20%
- Shipbuilding: 6% 8% 16% 14% 9%

<table>
<thead>
<tr>
<th></th>
<th>Maritime Return on Assets****</th>
<th>National Return on Assets****</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>8.4% 5.3% 7.1% 4.2% 8.5%</td>
<td>18.1% 6.4% 6.8% 7.1% 11.1%</td>
</tr>
</tbody>
</table>

**Country share of each sector's value creation relative to others:**
- Shipping: 8% 32% 17% 10% 33%
- Marine Equipment: 8% 31% 16% 23% 22%
- Marine Services: 3% 41% 14% 11% 31%
- Shipbuilding: 3% 30% 23% 18% 26%

*2000
**average 1999-2000
***Average 1998-2001
****Average 1999-2001

Country Attractiveness:
Denmark is ranked of medium attractiveness. The survey and analysis show that more then 70% of Danish maritime companies are satisfied with Denmark as their headquarter location particularly due to favourable public policy and tax regimes, but only 9% of foreign firms would consider relocating to Denmark. Denmark is less attractive as location of operations and R&D. The reason that DK comes in third to the Netherlands and UK is partly due to size differences, but also that the two latter countries are more attractive for foreign firms who wish to relocate activities, due to strong clusters and presence of greater maritime financial services. In addition, the Danish law favours holding companies, rather than operating ones. So, Denmark is attractive as host for companies, but less so for locating production activities, while foreign companies are unlikely to relocate there at all.

Company Sophistication:
Danish maritime firms are more international and more strategically oriented towards innovation and expansion than their counterparts, where Norway, for instance, looks more towards cost strategies. However, the Danish firms are among the least knowledge intensive; they show the lowest level of investments in competence development, few firms have well-managed career paths for talents, and rely less on financial incentives. Although The Danish service companies are the least sophisticated, A.P. Møller - Maersk is highlighted as a highly sophisticated firm, just as several
manufacturing firms are shown to score quite well. Overall, Denmark gets the lowest ranking, while Germany and the Netherlands score the highest, due to their knowledge intensity, internationality of operations (German firms), and their comprehensive HR strategies.

Cluster Dynamics:
Denmark also receives the lowest rank in terms of competitive cluster dynamics. The authors attribute this primarily to the ‘narrow scope’ of the cluster, with fewer activities outside of the dominant shipping sector, i.e. little or no shipbuilding. 75% of manufacturing firms have no or few linkages to other maritime firms – the main area of cooperation is within regulatory areas, though cooperation on innovation is above average for both manufacturing and service firms. The most important impacts of a strong cluster is its ability to foster knowledge diffusion and create an internal pressure for innovation, which will lead firms to upgrade themselves and become more competitive. Denmark is found to have low scores in both these areas – Germany, Norway, and the Netherlands score better in terms of stronger cluster linkages, which result in higher levels of innovation than Denmark is able to achieve. This is in part due to below average inward linkages from international companies.

The book does, however, propose a big caveat, saying that the internal dynamics within Maersk will constitute a cluster dynamic unto itself and provide a strong, innovative environment.

Public Policy:
Denmark gets the highest score on public policy, because of the favourable corporate tax regime, labour market policies, and the reforms carried out in the late 90s. The competitive tonnage tax scheme and seafarer’s salary tax rules, along with the good government-business relations, are partial factors that also make domestic companies likely to retain their headquarters in Denmark.

Conclusion
The authors conclude that cost factors are more important than cluster factors in ‘attracting the winners’ and their value creating activities, to a country, though both are relevant. Shipowners are especially focused upon tax levels, and consider these more in location choices than cluster benefits – this is in contrast with the service providers, who value cluster factors far higher. As more countries are hoping to attract maritime activities, reforms in policy conditions are likely, and tax competition indicates that the industry will remain fragmented among a number of European clusters.

While scores are low on a number of the variables, Denmark get high rankings on the areas that are shown to matter most to shipowners – public policy, labour market policies, and cooperation along with competitive tax regimes. In contrast, Germany and Norway are far less competitive in costs and tax areas.

Denmark is less likely to see domestic companies moving abroad than these two countries – however, foreign companies are similarly unlikely to come to Denmark, and foreign inward investments in the sector is limited. In addition, the regulatory and market environment is more favourable to holding companies than actual value creating operations, partially due to high labour costs and a small domestic base.

The book argues that the Danish maritime cluster’s core advantage is the presence of the dominant A. P. Moeller – Maersk group, which forms the base for most other maritime activities. As the shipping industry historically has shown far larger contributions to the Danish economy than the other parts of the cluster, its importance can hardly be overstated.
The Danish Maritime Cluster: 
An Agenda for Growth

Danish Maritime Authority  
the Ministry of Economics and Business Affairs

Purpose
The report by the Danish Maritime Authority focuses upon the framework conditions for the maritime cluster, in relation to the clusters ability to grow, innovate and compete internationally. To develop an action plan for growth and innovation, the structural conditions of the cluster is analysed. This is done towards developing Denmark to become the most attractive place in Europe to operate international quality shipping, while conditions for growth and innovation should be enhanced in the entire maritime cluster.

Methodology
The report utilizes a combination of methods to assess the state of the Danish maritime cluster’s competitiveness. Input/Output tables are used to evaluate the direct and indirect economic significance of activities in the cluster, as well as the level of interdependencies, seen through intermediate supply and demand. In addition, interviews, industry consultation, as well as questionnaire research were employed to discuss statistical findings and the strength and structure of the clusters considered.

The report defines the Danish maritime cluster to consist of core and related industries, secondary industries, and supporting institutions. The related industries (Navy, fisheries and leisure) have not been included in the analysis. To evaluate the framework conditions of the Danish maritime cluster, comparisons are made between Denmark and Germany, the Netherlands, the UK, Isle of Man, Greece, Cyprus, Singapore, and China.

Abstract
The report finds the Danish maritime cluster to enjoy a good position and occupy a place as a leading maritime nation. Danish shipping, in particular, is highly competitive in global terms.

The maritime cluster (year 2002 data) accounts for a production value of DKK 193.3 billion, or 8.3% of the total Danish economy. The gross value added contribution is 73.5 billion, a contribution to Danish GDP of 6.3%. Total direct employment is 75,712 people. When including the indirect economic effects, the maritime cluster accounts for a production value of DKK 216.1 billion, or 9.3% of the economy, while employment reaches 106,914, or 3.9% of total Danish employment. That same employment figure is equal to 6% of the private workforce.

The largest contributors in the cluster are the shipping industry, maritime services, and offshore resource extraction industries. Shipping accounts for by far the largest production value, offshore the largest gross value added, while the maritime services sector is the largest employer. In relation to the maritime cluster as a whole, the shipping industry contributes 46% of direct production value, 20% of gross value added, and 19.6% of cluster employment. An approximate direct export figure for the shipping industry is DKK 86 billion, compared to the next largest, marine equipment production, with 15.5 billion. In addition, with net foreign currency earnings of DKK 20 billion in 2004, Danish shipping is a vital contributor to the Danish balance of payments.
Compared to the other countries mentioned above, Danish shipping has by far the largest turnover. Still, due to the very large fleet of chartered ships operated by the Danish shipowners, the gross value added is at level or lower than that of the comparison countries. Greece and Denmark are the only OECD countries, the authors write, with stable profits from maritime transport, and hence, the only ones with positive net foreign currency earnings.

The report includes an evaluation of ship registers. It is found that the most popular registers for Danish shipping companies are in Denmark, then Singapore, Norway, and the UK. Also, it is found that hardly any foreign shipping companies use the Danish International Ship register. This reflects a general pattern, in that Denmark attracts few economic activities from foreign companies.

The tax regimes in a country are vital in determining the impact on competitiveness of the companies and the relative attractiveness of a location. All the countries considered have tonnage taxation schemes, except Isle of Man (where no corporate tax is paid) and China. The Danish taxation scheme differs, as sales margins from purchase/sale of ships are not included in the tonnage taxation scheme, just as pool fees are not included either (only Germany is similar to Denmark in this respect), and are subject to ordinary taxes. Taxation for seafarers is fully competitive with the compared countries.

The interdependency between different levels of a cluster can be considered from the perspective of intermediate supply and demand using input/output analysis. From a demand perspective, the report argues that it is characteristic that shipping has the greatest interface with the other industries in the cluster. From a supply perspective, however, there is not a high degree of interdependence, as apart from the maritime equipment industry, there is only a limited amount of reciprocal supply. However, from a subcontractor point of view, the cluster holds great significance to a number of other industries outside the maritime cluster.

The strongest interdependency is argued to be the economic contribution to society and the consequent demand generation, along with a common market for knowledge and labour. For instance, the need for human resources with sea-going experience in land-based activities in all parts of the cluster creates a certain degree of interdependence to ensure the right education and skill sets in the common labour pool.

The degree, to which interaction and interrelationships exist between different levels of the maritime cluster and other industries, research and supporting institutions, and the public sector, is a key determinant in fostering the dynamics needed for innovation and growth. Questionnaire research was used, where respondents were required to label the level of interaction with each level/sector from 1 (lowest) to 4 (highest). The results indicated that the linkages between production industries and the maritime cluster were at level with or lower than the compared countries. The linkages with service industries, in turn, were somewhat higher in Denmark than in the other countries. Common for the results across the different maritime clusters is that the shipping companies display consistently higher levels of linkages with both service and production industries, than other sectors in the cluster do.

**Conclusion**
An action plan to achieve the stated purpose of the report was created on the basis of the findings. Seven focus areas were established:

- Better education and greater flow of skilled labour into the Danish maritime cluster
- Research, development, and innovation
- Taxation and development financing
- Reduced administrative burdens and fewer Danish National requirements
- Promotion of Danish influence and market access
- Greater focus on quality shipping
- An efficient, service-oriented and modern administration.

Among a number of initiatives related to these areas, some relate to potentially including pool fees and sales margins on purchase/sale of ships in the tonnage taxation scheme, the establishment of tailored bachelor and master degrees related to maritime skills needs, as well as dedicated, national R&D programmes, and improving the terms of entrepreneurship in the cluster.

Overall, the findings show the great economic significance of the maritime cluster to the Danish national economy. The shipping industry stands out as the largest contributor in a number of areas. Furthermore, its level of linkages to the rest of the cluster and externally is a driver of growth and innovation. In this regard, the report argues that “One of the fundamental assumptions of this work has been that the key is the existence of shipping companies undergoing growth…These will in turn create growth opportunities for secondary maritime industries”.

Navigating Blue Denmark: 
Structural Dynamics and the Evolution of the Danish Maritime Cluster 

Henrik Sornn-Friese

Purpose 
The stated purpose of this research project was to delimit the Danish maritime cluster from the rest of the Danish economy, to quantitatively and qualitatively describe its significance and dynamics, and on this basis analyze some of its most important structural characteristics (for instance specialization patterns, the horizontal and vertical division of labour in the cluster, inter-firm linkages, ability to learn and innovate, and so on).

Methodology 
The author sub-categorises the maritime cluster into water transport; maritime services; shipbuilding; Maritime equipment; as well as Offshore oil and gas extraction. Having defined industry clusters and the benefits often associated clusters (in short, centres of learning and innovation), the author then outlines the Danish maritime cluster in detail, focusing on the sub-categories as above, and the supporting institutions. He moves on to analyze and describe through quantitative, statistical analysis, the direct and indirect economic significances of the maritime sector to the Danish economy as a whole. All figures are from 1998 unless otherwise stated.

In his analyses Sornn-Friese utilizes a 1998 Danish input/output table to estimate intermediate inputs/deliveries, total production, sector linkages, which is presented together with employment effects. In addition, he calculates the multiplier effects of each sub-category, and for the cluster as a whole, to show total production and employment effects to the Danish economy.

Abstract 
Sornn-Friese highlights the significance of the Danish maritime cluster due to its size, diversity, relative technological intensity, and its many external linkages. It is one of Denmark’s major competitive areas, it accounts for 21% of 1998 total exports (DKK 71 billion) and direct employment is 81,000 (or 3% of total).

The cluster purchased intermediate inputs of 75 billion, 25 billion from Danish producers. It received inputs from 125 out of 130 Danish industries. Similarly, it sold intermediate deliveries worth 36 billion to 129 of 130 industries. Thus, the cluster has links with most manufacturing and service industries through trade, which amounts to significant direct AND indirect impacts.

The direct production value (output) of the cluster was DKK 120 billion (6.4% of economy). As the author estimates the output multiplier (including indirect effects) at 1.35, the overall economy-wide impact is an output of 160 billion (8.5% of economy). The multiplier effect signifies that a 1% increase in final demand for goods and services of the cluster would translate into an economy-wide impact of DKK 1.6 billion.

Total cluster value added is estimated at 45 billion (4.5% of Danish economy), of which water transport and maritime services accounted for more than half. While core maritime cluster accounts for 81,000 jobs or 3% of employment, as mentioned above, when including also indirect effects, the employment impact rises to 119,000 Danish jobs or 4.4%. Sornn-Friese also find 52 industries out of 130 to be strongly connected to the core maritime industries and 78 to be connected to some extent.
Comparing the internal configuration of the maritime cluster across time, Sornn-Friese finds that the water transport sector has consistently been the greatest contributor to the Danish economy in terms of production value, followed by the maritime services industry. In 1993 these two sectors accounted for 65% of the production value of the entire cluster. By 1998, it had increased to 68%. In absolute terms, the water transport sector generated output valued at 55 billion, which including indirect effects means that the sector generated 63 billion to the economy, making it the most important industry in the Danish cluster.

The highlighted strengths of the Danish maritime cluster are strong social and geographical proximity to external actors such as the Danish Shipowners’ Association, the fact that the cluster consists of high skilled labour, many support services, interactive learning opportunities, and clear network benefits. The linkages within and external to the core are quite strong.

**Conclusion**
The report concludes that the Danish maritime cluster has a significant direct impact (both in absolute and relative terms) on the Danish economy’s total production and employment, and moderate, though positive, indirect effects. The large majority of industries are linked to the cluster, so on the basis of the above figures one may argue that the cluster is embedded to a significant degree in Danish economic activity.
The Finnish Maritime Cluster

Mikko Viitanen, Tapio Karvonen, Johanna Vaiste, & Hannu Hernesniemi

Purpose
The report aims at defining and describing the Finnish maritime cluster networks, assessing its economic and social impact, as well as its international competitiveness. In addition, the report provides an overview of existing maritime cluster research carried out by other European nations.

Methodology
First, the report describes its research foundations, partly based upon the overview of the other European cluster studies. Second, it describes the state of the Finnish and World maritime markets, focusing upon shipbuilding and yards, and merchant fleets. Third, the report examines the cluster using Porter’s cluster analysis and his Diamond competitiveness model. Fourth, the authors carry out an Economic Impact Analysis by building a number of possible policy scenarios, based upon extensive data, and then assessing the economic impacts of each.

Methods for data collection are secondary statistics from national and international bodies, input-output tables, along with industry surveys.

Abstract
The Finnish maritime cluster is made up of the core (shipping companies, shipyards, ports, shipyard subcontractors, companies related to shipping companies, port operators and other port companies), and spurs activity in related areas, including public sector administration, education, research and development, and related fields such as financing, insurance and classification, as well as interest groups and associations.

The authors argue that “it is typical for companies of related fields ... to develop in the cluster, if its core is large enough and if its influence is extensive enough. The maritime cluster core companies have to remain strong if the related businesses are to be sustained”. Thus, a strong development of a number of industries in a region or country depends upon a strong core within the maritime cluster.

The combined turnover of shipbuilding, maritime transport, ports and port companies and their contractors, subcontractors and associated companies was €11.4 billion in 2001. This total amount was divided among the different sectors as follows: shipbuilding €1.5 billion, maritime transport €2.1 billion, port operations €182 million and all of the companies related to the different maritime sectors €7.5 billion. The turnover of all companies directly or indirectly related, however, amounted to €90 billion.

The maritime cluster (roughly 2,500 companies) employs some 47,000 people in the private sector and in ports. This is its direct impact on the economy and on employment. Maritime sector companies that came up in the study directly or indirectly employ over 300,000 people. The public sector, in addition to ports, is also an important employer in the maritime cluster.

The significance of employment increases when considering items such as taxes, pension and social security contributions, and of course wages. The shipping companies paid their 10,156 employees at sea some €252 million in 2001, which spreads through the economy as consumption.
Large maritime cluster companies have formed broad and diverse company networks. The shipyards, their largest subcontractors and the companies related to shipping companies and ports (117 companies) made purchases worth a total of over €3 billion in 2001. Almost 60% of these were domestic purchases. Through the subcontractor networks, “the impact of the large maritime companies can be felt all over Finland and in the entire society.”

The whole maritime cluster accounts for 11.5% of all Finnish exports with €5.5 billion. Of these shipping companies contribute 1.5 billion of exports, or roughly 3.1% of Finnish exports, while shipping company subcontractors add 2.3 billion or 4.8%.

The authors argue that the different fields of the Finnish maritime cluster have benefited greatly from mutual demand. That is, increased activity in some sector of the cluster will spur demand in the rest, through extensive networks. The single most important factor linking the different fields is a mutual basis, a common pool, of know-how (education and research) and shared networks. Taking care of education and research and developing these activities is the prerequisite for the existence of the maritime cluster.

The report finds, however, that several unfavourable trends are occurring in the Finnish maritime sector. Firstly, shipyards are ailing due to increased low-cost competition from Asian competitors, despite high technological standards. The authors point to the fact that shipbuilding companies act as development laboratories for new technologies that can create potential growth in other parts of the core, as well as new businesses in related industries. In experience, several companies have grown to internationally competitive technology firms based upon maritime involvement. The shipyards utilize a wide network of subcontractors and technology providers that could be harmed by their decline.

Secondly, Finland is becoming less attractive as a location for shipping activities, primarily due to the public policy and tax regime, which is far from competitive. Also, the manning costs are far above most of Finland’s neighbours – the cost of manning a 1,500 GT cargo ship is 72,140 EUR/month in Finland, compared to 40,775 in Denmark. Of the shipping companies interviewed, 11 out of 15 were considering out-flagging their ships, and some had already partially done so. Most companies also said that if they bought new ships, they would immediately be registered in another country.

The report considers the effect of out-flagging of ships on the national economy through Economic Impact Study methods. They show that a passenger ship with 300 employees contributes to society EUR 4.5 million. However, if this ship was out-flagged from Finland to Sweden, it would cause a deficit of 4.2 million to the Finnish economy. However, were the Finnish public policy to grant the maximum amount of subsidies allowed by the EU to a shipping company, thereby keeping the ship under Finnish flag, the society would still get a positive effect (but of course smaller than without the subsidy and no out-flagging) and competitiveness would be greatly enhanced.

Considering the importance of the core maritime activities in order to develop related industries and a competitive cluster, it is concerning that manning costs and tax regimes are leading the shipping companies to look for other locations.

Through interviews with companies regarding the extent of cluster linkages and cooperation, the authors find that clusters, for instance, create significant client spill-over effects, where companies in networks refer clients to each other, or client awareness of other maritime firms, products and services increases once they engage with one company.
As a whole, cooperation in the Finnish cluster has increased. In 2001, 61% of interviewees cooperated with others in production and product development, while 53.8% had links to others in distribution and marketing activities. Among shipping companies, 50% if those interviewed said that networks are very important for competitiveness through political lobbying, as well as client networks.

**Conclusion**

The researchers are adamant that a Finnish maritime cluster does exist. They show that people within the industry considers networks, positive spillovers, and cooperation as a source of competitiveness. Also, they show the importance that a strong maritime cluster can have to a (remotely located) small nation state, contributing a large share of GDP and exported goods and services. Also, with 90% of exports and 70% of imports transported by sea, the industry takes on additional significance.

The authors argue for more favourable terms to the shipping industry and the other parts of the core. As the Finnish regime has become less attractive, the large shipping companies are considering reducing their registered tonnage, as well as some of their activities in the country. However, the strength of the core of the maritime cluster is a key factor in enabling growth of businesses that supply services, inputs, i.e. technology, to the core. Thus, to protect and encourage domestic industry, it is essential to retain the competitiveness of the companies in the core maritime cluster.
Den Svenske Sjöfartsnäringens Ekonomiska och Geografiska Nätverk og Kluster

Johanna Palmberg, Börje Johansson, & Charlie Karlsson

Purpose
Entitled, 'The Swedish Shipping Sector’s Economic and Geographic Network and Cluster’, the objective of the report was to analyse the structure of the Swedish shipping industry and its role in the Swedish economy from an international network perspective; to identify, quantify, and analyse the maritime clusters by describing the linkages among the market actors; illuminate the efficiency of Sweden’s maritime sector; and to describe the general development of the shipping industry in a global context.

Methodology
To assess the concentration in regions of core shipping industry, and surrounding industries (port operations, vessel construction and repair, suppliers, cargo handling for shipping etc) they define the following parameters (either 1 and 3, or 1 and 2 should be observed):

1. high specialization in region (specialization=industry employees in region/all employees in region.
2. strong customer or supplier relations
3. same clients, same suppliers, same worker skill-profiles

They describe regions and industries using industry classification numbers and Sweden’s economic regions.

Abstract
The report reviews the development of Swedish and global shipping, with a particular focus upon the positive externalities resulting from maritime clusters, providing theoretical and practical arguments for the significance of network linkages between market actors.

The authors argue that maritime sector development and innovation levels are dependent upon strong concentrations – the formation of clusters positively affects profitability and productivity of the actors involved, i.e. ship owners by bringing positive externalities: the geographical closeness bring larger levels of interaction, which fosters innovation and far larger levels of information sharing, which can boost competitiveness. With larger concentrations of firms, firms tend to specialize, bringing benefits of scale, thus reducing costs and increasing productivity. Around the clusters specialized skills within human resource markets develop. In addition, the report points out that the above represents a dynamic, cumulative process, so gains grow exponentially.

Network strategies are necessary in order to effectively organize logistics for higher efficiency – Thus, the authors recognize importance of an integrated system, or network, of the different levels and actors. They particularly focus upon the need for cooperation in a network of the ship owners, the brokerage firms, and port operators in the ‘Core’ of the sector.

In their analysis model, the authors distinguish between the core (shipping companies and support services) and surrounding industries (the ‘closely related’ and the ‘less close’. In Sweden, in 2001, 18,500 people were employed in the ‘core’ (13,500 in shipping, 5,000 in support services). Meanwhile, roughly 200,000 people worked in the surrounding industries. Thus, on a national level the
The maritime sector employed close to 220,000. The value added (contribution to GDP) was 9.1 billion SEK of the shipping industry, while they estimate the total contribution of the sector to GDP at 104 billion SEK, showing the importance of the maritime cluster.

Per employee, the shipping industry contributes 700,000 SEK to GDP, as compared to 470,000 SEK in the private sector as a whole.

The production of goods and services in 2000 by the shipping industry was 54 billion SEK, or roughly 1% of total production, though sources are cited with estimates as high as 2.8%.

The maritime clusters are primarily in Gothenburg, Stockholm, and Helsingborg, where 80% are situated. In these clusters, the surrounding industries are typically knowledge intensive. As a whole, the 15 largest companies account for 60% of industry employment and 70% of net turnover. However, the authors find that Sweden lack a maritime cluster of competitive, European dimensions. Thus, an even larger internal variety is needed, with more cooperation between and integration of the sector participants to increase innovation, facilitate sharing of information and knowledge, and enable existing and new firms to take advantage of business opportunities that develop in such larger concentrations of economic activity.

The report argues for encouragement of these maritime clusters because they are based upon significant investments in networks and skills – should the cluster contract, a similar environment of innovation for other industries will take a long time to develop.

They conclude that Göteborg is the only region with potential to develop into a cluster of European dimensions, as it is the most well-diversified region, where a large majority of both core and surrounding industries are situated.

**Conclusion**

The authors argue for the development of a stronger, more varied maritime cluster, as this can bring along many positive externalities in the form of more economic activity, more employment, increased innovation levels in both core and surrounding industries. They also show that not only do knowledge intensive industries gather around a geographical maritime cluster, but also, the average employee’s contribution to GDP is far higher than the private sector as a whole. They warn that if the maritime sector declines, or is not encouraged, a similar economically important cluster will take long time and much investment to develop.
A Cluster Analysis of the Maritime Sector in Norway

Gabriel R. G. Benito, Eivind Berger, Morten de la Forest, Jonas Shum

Purpose
The report aims to examine the competitiveness of the maritime sector in Norway, primarily through an assessment of the strength of the maritime cluster

Methodology
The paper examines the maritime sector from a cluster perspective.
- Firstly, it uses accounting data obtained from the Norwegian register of company accounts to discuss developments over the years 1988-2002, combined with international trade data from OECD.
- Secondly, they employ survey data gathered from interviews with 101 senior managers within the maritime sector, to gain an understanding of the perceptions of the cluster linkages within the industry actors.

They define the maritime sector as two sub-clusters, (1) shipping and shipping services, (2) ship building and associated services.

The clusters are examined within Porter’s Diamond model of competitive advantage (Demand conditions; Firm strategy; Structure and rivalry; Factor conditions; related and supporting industries; government and chance)

Abstract
The authors conclude that while the maritime sector is strong, it is far from a ‘super cluster’. On the one hand, the sector has shown higher growth from 1988-1998 than the Norwegian economy as a whole (210% versus 63%), it appears to remain internationally competitive, and particularly among the shipping companies, some strong linkages seem to exist within the cluster.

Weaknesses, on the other hand, are also present: shipyards are ailing; the surveys indicate that there is an insufficient focus on innovation and new products, surprisingly little contact with R&D institutions; and the linkages between shipping companies and ship industries (manufacturing-oriented) are very weak - in fact, rather than being part of a maritime cluster, they appear as two distinct clusters. Overall, it seems that while the Norwegian cluster holds potential, it focuses more on competition than on cooperation. The few instances of medium to high cooperation were found in areas such as lobbying and competence development.

The share of the maritime sector in Norwegian exports fell from 20% to 15% between 1992 and 2002. Most significantly, employee numbers in shipbuilding have fallen since the mid-1970s from 45,000 to 6,000 in late 1990s. Meanwhile, Return on Assets fell from 8.5% to 5.8% and Return on Equity fell from 17.2% to 8.5% between 1988 and 1998. On the positive side, sales increased 209.4% from 1988 to 1998 to NOK 128 billion. The gross value creation of the sector is estimated at NOK 35 billion, an increase of 227.5% in the same timeframe. The shipping sector accounts for roughly half of all exported services from Norway.

The authors are very much in favour of strong industrial clusters. They argue that these can reinforce individual firm and sector performances through (a) pressure for innovation, (b) complementary resources and skills for innovation and efficiency gains, and (c) knowledge externalities.
Thus, they find it concerning that the value of cooperation does not seem acknowledged and argue that if the clusters decrease in size from flagging-out of vessels, downsizing of industry, or reduced cooperation, then a strong cluster infrastructure will be less viable in the future, and will therefore reduce international competitiveness.

**Conclusion**

The maritime sector carries considerable weight economically in the Norwegian society, accounting for half of all exported services, while it is critical for the transportation of goods as majority of foreign trade passes through seaports. Combined with the fact that the shipping sector is a large source of economic activity all along the Western coastline, they argue the importance of a strong maritime cluster for innovation and continued international competitiveness.

For a cluster to entail the aforementioned benefits of innovation and externalities, the authors argue that it should be complete, i.e. all parts of the value creating system should be represented. The Norwegian cluster fulfilts to a great extent this requirement. However, the study indicates that the full potential is not sufficiently exploited.

Although wary of the risk of distortion from tax-based differentiated policy schemes, the authors argue that these should not ruled out either, as “they can be influential in keeping shipping companies in a country, which in Norway’s case would seem particularly important given the key role such companies play as the core actors within the maritime cluster”.
The Second Maritime Economy Report:
The Economic and Employment Impact of the Italian Maritime Cluster

Censis

Purpose
The report seeks to estimate the macroeconomic importance of the Italian maritime cluster, both directly and indirectly, on an aggregated level and on a sector-by-sector basis. It follows up on a similar report conducted with 1992 data and discusses the changes in the measurements. Finally, the report discusses the nature of clusters using the Dutch cluster as an example to follow.

Methodology
The report considers primarily macroeconomic data gathered from input-output tables and the Italian census from 2002. The focus of the authors is the relative significance of the sectors within the cluster from an economic perspective. Thus, it is beyond the scope of the report to more qualitatively describe any linkages within the cluster, even though they argue for the importance of inter-cluster co-operation.

The following sectors are included in the Italian maritime sector: maritime transport, maritime transport support services (terminal operators, tug-boat services, etc.), merchant shipbuilding, leisure boating, and fishing – These five sectors are termed ‘industrial maritime activities’. Categorized as ‘other maritime activities’, the Navy, Coast Guard, Port Authorities, Italian Naval Registry, and the maritime social security institute are also considered as part of the cluster.

Abstract
In the year 2000 all maritime activities generated almost 26,300 million Euros of value - approximately 2.3% of the national GDP – If ‘other maritime activities’ are not considered, the cluster would represent 24,230 million, or 2.1% of GDP.

Maritime transport creates roughly 50% of cluster’s wealth with 12,600 million, which would be more than 1% of GDP by itself. Furthermore, closely connected to that sector are the maritime transport support services, whose GDP contribution is 3,455 million Euros. The GDP of merchant shipbuilding and fishing are 2,515 and 2,925 million Euros, respectively. Finally, the contribution of recreational boating, net of the maritime tourism branch, is 1,635 million Euros, to which the 3,520 million share generated by tourism should be added.

As a whole, the maritime cluster creates employment, directly and indirectly for 356,000 or approximately 1.5% of Italian employment. Of these, 310,540 (1.3%) average worker units (AWU) are accounted for by ‘industrial maritime activity’ sectors. 185,830 are employed directly in maritime activities and the remainder in related upstream (88,985) and downstream (81,260) economic sectors.

Fishing accounts for 88,850; Leisure boating for 82,220; Maritime transport for 81,510; Maritime support services for 44,460; and merchant shipbuilding for 32,650.

Accordingly, Italian maritime sectors generate a global output higher than traditional national production sectors, including the textile-clothing sector (23,714 million Euros), post and telecommunications (22,991 Euros), automotive industry (9,425 Euros), and the wood industry (6,408).
In employment terms as well, the size of the maritime sector taken as a whole proves quite substantial, surpassing sectors like post and telecommunications (260,200 AWUs) and the wood industry (196,300 AWUs).

The authors put extensive focus upon multiplier effects extending to the economy as a whole. The direct multiplier effect of demand is 0.924, meaning that for every 100 Euros of demand for maritime activities, domestic demand will rise 92.4 Euros. If you also consider effect on indirect upstream (1.199) and downstream (0.209), the total multiplier with both direct and indirect effects becomes 2.333 – 100 Euros of demand for maritime activities increases the Italian economy with 233 Euros.

The employment multiplier for industrial maritime activities is 2.153 – for every 100 additional average work units in maritime activities (which will result from rises in demand) will increase the economy with 215 work units.

Maritime transport stands out in a number of ways: The largest value added, as mentioned above, and the highest export level (10,720 million Euros - equalling 76.7% of total cluster exports, or 85% of all maritime transport GDP contribution.). The direct impact multiplier (0.981) and total impact (2.782) on production are considerably greater than the average of the maritime industry (respectively, 0.924 and 2.123). Overall, it is a sector with a high capacity for generating revenue: for every 100 Euros of added final demand that is directed to this industrial maritime sector, the national economic system creates production of 270.8 Euros. Using a total of 81,510 AWUs and with an employment multiplier of 3.041, it is a sector that strongly impacts the national labour market: 100 additional work units in maritime transport activate a total of 304 AWUs. Finally, it is a sector with a particularly high work unit productivity: on average, in 2000, the production of one direct work unit was 518,000 Euros (comparable to production per employee) and a value added by one work unit of 182,000 Euros (value added per employee). The corresponding values for the maritime industry in its entirety are 140,000 Euros (production per employee) and 61,000 Euros (value added per employee).

In eight years, both production per employee and the annual average value added per employee in maritime transport doubled (2002 prices), going from 295,000 to 518,000, and from 92,000 to 182,000 Euros, respectively.

Finally, the authors refer to the Dutch maritime cluster as the closest thing to a model of excellence, which nations should be aspiring to replicate, partly as all the clusters except the Dutch were still in initial, experimental design stage at the time of writing the report.

They argue that the developments of clusters is continuous and ongoing in many locations, as industry actors aspire to group in order to promote the interests and needs of the maritime sectors in a unified manner on national and international levels with greater relevance compared to the importance of the individual components of the group.

Citing a number of Policy Research Corporation recommendations they write: “The initiatives that should be developed by the maritime industry, mainly pertain to support operations of enterprise, in addition to providing support to new initiatives focused on the following issues: innovation, exporting, international receptivity of operators, capital markets, communication and image promotion, work market, training and personnel search. The measures necessary pertaining to the internal market, the infrastructures, the reconfiguration of transport modes and the concordance between industry and government require (primarily) the support of the government”.

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Conclusion
The researchers are able to show that the economic contribution of maritime activities is very important indeed to the Italian society. Particularly, it is evident from the figures that maritime transport, or shipping, is a vital contributor to GDP, exports, with large value added and production per employee. Also, maritime transport has significant production and employment multipliers, meaning that positive increases in demand will have a multiplied positive effect on the Italian economy and its employment.

One of the strengths of the report is that it builds upon a previously utilized method on the Italian economy, in an effort to make it easier to compare across time and national borders the developments of the maritime cluster and its significance.

When discussing the nature of clusters, the authors indicated that a cluster is something you actively, purposefully create with the commitment of key players, institutions, and the nation as a whole. It cannot be enforced, but only negotiated as initiatives are encouraged and supported to cooperate in multiple spheres such as innovation, export forums, promotion and recruitment, and policy development. However, the benefits of a cluster will very likely be far higher than the sum of the activities of its individual members.

Censis

Purpose
The report aims to analyse the economic and social impact of the Italian maritime cluster, address topics of human resource training and environmental impacts, while referring to maritime policy at the European level. In doing so, it follows up on two previous publications from 1992 and 2002 in order to trace the developments and dynamics within the cluster.

Methodology
The report utilizes a similar methodology as in the 2002 report, basing their analyses upon macro-economic and input/output tables.

The Italian maritime cluster is composed of ‘maritime industrial activities and services’ and ‘Institutional subjects of the maritime cluster’. The former consists of maritime transport, activities of port logistics and services assisting maritime transport, naval construction and the construction of leisure vessels (plus the ancillary economic activity tied to nautical tourism) and fishing. The latter includes the Italian navy, the harbourmaster’s office, the port authorities and the Ipsema (the maritime social security institute).

Abstract
The Italian maritime cluster as a whole is found to contribute 2.7% of the Italian GDP, generating 36.5 billion euro of value in 2004. In contrast, the second maritime economy report found a GDP contribution of 2.3% in the year 2000 with 26.3 billion euro. What is more, the cluster sets in motion spending of 1.6 billion on intermediate consumption and gross fixed investments, equal to 4.2% of the investments registered in Italy. The exports from the cluster amount to 14.1 billion euro, 4.7% of national exports. In a comparison with other sectors, maritime activities is the fifth largest contributing sector to GDP, and the second largest in terms of value added.

The estimate of the GDP of each sector for the year 2004 points to noteworthy differences within the maritime cluster. Maritime transport, with a GDP of 15.684 billion euro, currently accounts for 53% of all the wealth generated by the maritime manufacturing and tertiary activities considered herein, showing itself to be closely connected to port activities and operations involving assistance to the transport system, whose gross domestic product amounts to 4.467 billion euro. The gross domestic product of naval construction and fishing are equal to respective figures of 2.510 and 4.436 billion euro. Finally, the contribution of leisure boating, not including the ancillary economic activity generated by nautical tourism, was 2.443 billion euro, to which the amount generated by tourism, equal to 4.6 billion, must be added. Figures at lower levels, but still of note, characterise the institutional sectors, such as the Italian Navy, which registers a GDP of more than 2 billion euro.

The number of workers directly employed in maritime cluster activities in 2004 totalled 122,386 units, in addition to which there were 106,927 units employed upstream of maritime operations and 104,297 units downstream, including 68,394 associated with ancillary activities tied to pleasure boating. Thus, total labour units (net of duplicated activities) amount to 318,484, or roughly 1.5% of Italian employment.
Looking at maritime industrial and service activities as a whole, the value added per labour unit is 101,000 euro.

The report finds that the maritime cluster increasingly resembles an industrial chain of activities, where significant ties exist among different components of the cluster, who all take part in one or more aspects of the broader production. Taken together with the linkages up- and downstream of the cluster, the report estimates the multiplying effects in terms of income and employment: The income multiplier is estimated at 2.24 and the employment multiplier at 2.41. Thus, with 100 Euros of additional demand of goods and services in the maritime cluster, 224 Euros is generated as income in the Italian economy, and demand for 241 labour units are created.

**Conclusion**
The results presented in the 3rd maritime economy report highlight the importance of the maritime cluster both in absolute and relative terms to the Italian economy. In addition, the report reflects the commitment by actors in the Italian maritime industries to monitor the significance and development of the cluster across time, to better tailor policies and initiatives to the actual dynamics of value creation in the cluster.
Additional Maritime Cluster Studies


   - *The United Kingdom’s Maritime Cluster*. Mark Brownrigg.
   - *The French Maritime Cluster*. Francis Vallat; Philippe Perennez