Master Thesis

Concentration of maritime advanced producer services:
The case of Northwest Europe

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To the memory of my mother Geovanny Beyleveld-Diaz, who encouraged and inspired me to do my best, to follow my dreams and to pursue my goals.

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Christina Beyleveld

EXECUTIVE SUMMARY

In a globalising world economy clusters become more important. Increasingly, competitive advantages are to be found in local embedded knowledge and relationships which distant rivals cannot replicate. The research of this thesis focuses on a part of the maritime cluster, more specifically on the location choice of maritime advanced producer services. Over the last couple of decades the tertiary sector grew immensely due to technological progress which enhanced globalisation. Consequently, business service providers such as the maritime advanced producer service organisations started to operate globally. These firms are generally linked to each other through networks and concentrated in port cities. The location choice of an industry can be random, but when the industry starts to grow economies of scale arise. The positive externalities lead to the concentration of both, industries in clusters and aggregate activity in cities. These positive externalities are also known as agglomeration economies and do not arise from the mere presence of a cluster, but they have several specific sources. A theory developed by Marshall focuses on the concentration of activity within an industry which leads to specialisation opportunities from which localisation economies arise. A second theory, introduced by Jacobs, argues that it is the aggregated activity of the city that creates so called urbanisation economies.

In this research I examined whether the localisation economies or the urbanisation economies are of greater importance to the maritime APS industry in Northwest Europe, more specifically the 'Hamburg – Le Havre range'. The political and economic situations are similar in this area and more important it forms the European economic core and most populated area of Northwest Europe. During the research the location choice of the maritime APS firms has been evaluated and the relative size of the port of a city, in which the (local) head office of the maritime APS organisation is located, represents a proxy for the importance of the advantages of localisation economies from the concentrated maritime industry in the port and the advantages of the urbanisation economies from aggregated activity of a city to the APS organisations.

The outcomes of this research suggest that the maritime advanced service producers find the localisation economies more important when the local head office is more specialised on a maritime level and when the local office is older. Regarding the characteristics of the total organisation the results show that localisation economies are more important to APS organisations when they operate in the consultancy and/or survey business, or when they are a maritime organisation. Finally, this is also the case for relatively large firms in terms of the total number of employees. Unfortunately, none of the explanatory variables are found to be significant and thus more research on this topic is recommended in the future.

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Chapter 1: INTRODUCTION – RESEARCH AIM AND QUESTIONS

1.1 Background Research

Over the last couple of decades increasingly more research has been conducted on agglomeration economies (Rosenthal and Strange, 2004; Duranton and Puga, 2004). In several researches it has been stated that the impact of agglomeration economies differs by types of businesses and by types of sectors (Combes, 2000; Henderson, 1997). In a globalising economy, networks, such as global supply chains and global production networks are considered to be the essential unit of analysis (Dicken et al, 2001). On the other hand it is also said that knowledge and relationships are embedded locally (Porter, 1998; Boschma 2005), and thus proximity remains of great importance. The focus of this research will be on maritime advanced producer services in Northwest Europe, which are generally linked to each other through networks and concentrated in port cities.

Up to now some research has been done on the maritime sector and the concentration of port related services (de Langen, 2002; Thedoropopoulos, 2006), but the research on the concentration of maritime advanced producer services specifically, has been limited (Jacobs et al, 2009). Because little research has been done in this area, the study will contribute to the theoretical and empirical understanding of the geographical and functional-economic structure of maritime advanced service provision. The study will also be practically relevant because, as Jacobs et al (2009) mentioned, port cities do not only compete for capturing traffic but also for attracting port related firms, because these (maritime) advanced producer services add value to port cities. Knowledge-based industries like advanced producer services stimulate innovation through finance and consultancy, which in turn leads to higher economic growth for the city and/or region in which the industry is located. It is hard to determine the causality of this phenomenon, because it is also stated that when a city or region reaches a certain size and level of infrastructure, it attracts headquarters of companies. These headquarters need the support of advanced producer services and thus advanced producer services will locate in the large cities (Sassen, 2000; Moulaert and Gallouj; 1993). After identifying where the maritime advanced producer services are concentrated, the characteristics of the APS firms will be examined in order to find out which type of maritime organisations prefer to locate in a city with a large port so they can enjoy the benefits of location economies and which organisations prefer to be located in a large city, which provides a large scale of diverse resources from which urbanisation economies arise.

1.2 Objective of the thesis

The objective of this thesis is to gain insights in the importance of localization economies and urbanization economies for the maritime advanced service provision, in order to have a better understanding of the location choice of advanced service producers in cities in the Northwest Europe.

1.3 Research question

Which type of agglomeration economies is more important to do maritime advanced producer services in Northwest Europe, localisation economies or urbanisation economies?

1.4 Methodology

In this thesis two types of research methods will be used. Firstly, an overview is given of the theoretical literature research based on previous research conducted by other researchers in the field of urban economics and the maritime sector and the advanced producer services. Secondly, empirical research will be conducted through a case study using online data-base research via the World Shipping Register. The focus in the first part of the thesis will be on clusters and agglomeration economies. In chapter two an introduction to the topic of clusters will be presented. Thereafter the general characteristics of agglomeration economies are discussed. More specifically, the industrial scope of agglomeration economies [localization economies (Marshall, 1920; Porter, 1990) and urbanization economies (Jacobs, 1969)] is examined in chapters three and four. Also the theory on the location choice of advanced producer service organisations (e.g. Insurance companies, Legal services, Consultants) is evaluated in chapter four and followed by the characteristics of port cities. The case study will focus on the 'Hamburg – Le Havre range'. In this area the political and economic situation for each country is nearly the same more important it forms the European economic core and most populated area (London, Randstad, Flemish Diamond, Paris, Rhein-Ruhr, Hamburg). Consequently, it hosts the busiest seaports of Europe. Additionally, a large part of Scandinavia namely Norway, Denmark and Sweden are included, because these countries are in terms of maritime advanced producer services important. The description of the data en model used in this research is presented in chapter five. Also the first statistics about the location of the APS firms will be introduced in this chapter. Thereafter the results of the research are found in chapter six, followed by the conclusion and recommendations for future research in chapter seven.

Chapter 2: CLUSTERS & MARTIME ADVANCED PRODUCER SERVICES

2.1 Clusters

Where you will find people there will be economic activity. Economic activity can be defined as the production and distribution of goods and services. The most simple and ancient form of economic activity is the agrarian production of food and the distribution of this food among family members. The most efficient way of production in this case would be to search for the best piece of land suitable for the product and weather conditions in the proximity of their residence and to use the most efficient tools to work on the land. Once the food is harvested, the distribution of it will take the least amount of energy when relatives live close by.

In the early days, when different families started to trade with each other, specialisation became possible. Families started to produce the goods and services which they could produce the most efficiently or for which there was a large demand. As time passed more families started to trade with each other, the trading distances increased and as a result distribution became more expensive in terms of energy, money and time. The first physical markets were the solution to this problem, because people could trade with multiple families in one place. As trading became more important over time markets became bigger and they started to specialise into submarkets. There were different markets for different types of goods and services.

After many centuries we see that not only labour and capital are concentrated in cities, but individual industries are clustered as well. One of the most well known examples is the ICT cluster Silicon Valley in California, USA. Davidson (2000) stated that it is the most intensely innovative enterprise zone in the world. It employs more than one million people and created more than 275,000 new jobs since 1992 (US Government, 2000). The income of the median family living in the valley was about $US 87,000 per year in 2000, which was the third highest in the USA. This indicated that the individual companies in this region are not the only that profit from the cluster, but the whole industry and region itself. This is a result of the fact that next to market forces which encourage private firms to seek out and use the advantages in clusters, local governments too enable firms to profit from the advantages by investing in public infrastructure and consequently the local population can profit from these investments.

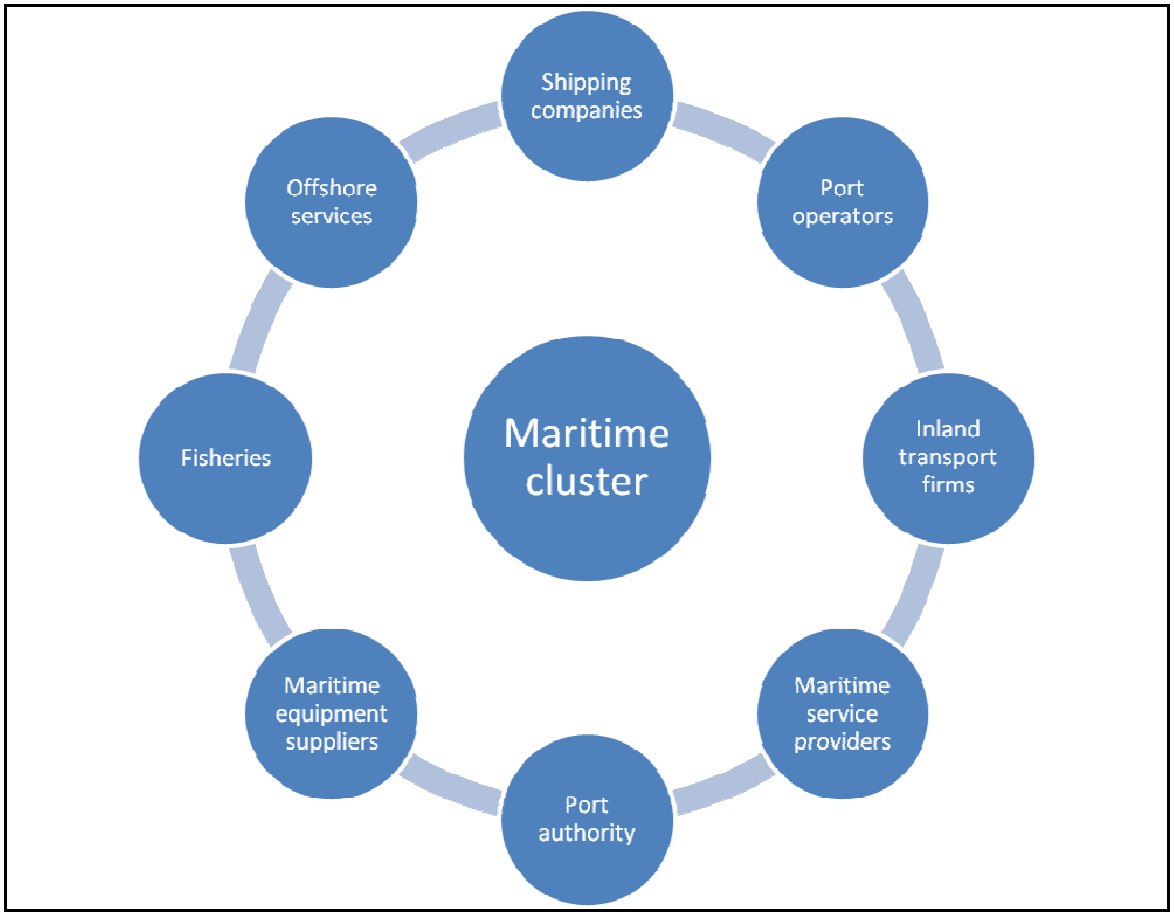
There are many different types of clusters, but essentially they are a spatial and sectoral concentration of firms (Bresnahan et al., 2001). Clusters were often described as industrial districts and Alfred Marshall first described an industrial district in his Principles of Economics (1920) to be a concentration of industries specialised in a particular local product. Later on another famous

economist, Porter, added an additional dimension to this definition by saying that clusters are geographic concentrations of *interconnected* companies and institutions in a particular field and they encompass an array of linked industries and other entities important to competition (Porter 1998).

2.2 Maritime cluster

In ports we find a similar concentration of economic activities. A traditional maritime cluster includes all the economic activities that are directly or indirectly linked to the shipping industry and maritime transports. Nowadays these activities are also linked to the utilization of the sea's resources, such as the fishing industry, the energy industry and the activities connected to the extraction of minerals below sea level (Thedoropopoulos, 2006). According to Thedoropopoulos (2006) each country's maritime cluster is different in size and in composition (with respect to the sectors it includes), and it appears to be independent of the size and the rate of growth of a country's shipping (maritime) industry. On the other hand the basic function of any port is the throughput of cargo and so the core activity is cargo handling. In order for this activity to take place efficiently many different actors are required.

Figure 1: Maritime cluster



Source: realized by author based on de Langen and Nijdam (2006), de Langen (2002) and Porter (2000).

The most important actors which are directly or indirectly involved in cargo handling are the port (terminal) operating companies, shipping lines, inland transport firms, maritime service providers such as transport intermediaries, logistic service providers, port and related service providers and finally the port authority. Other actors in the maritime cluster are the maritime equipment suppliers, such as shipyards which provide (new) vessels, other equipment suppliers and as mentioned before also the fishing industry and offshore industry, which is involved in energy are a part of the cluster. For a complete overview of the actors see Figure 1, which was realized based on the publications by de Langen and Nijdam (2006), de Langen (2002) and Porter (2000).

Chapter 3: EXTERNALITIES

3.1 Sources of agglomeration economies

The positive externalities that arise from clusters are also referred to as agglomeration economies and lead to the concentration of both industries in clusters and of aggregate activity in cities (Rosenthal and Strange, 2004). Agglomeration economies exist when the scale of the urban environment adds to productivity level. Agglomeration economies do not arise from the mere presence of a cluster, but they have several specific sources, such as sharing, rent-seeking and knowledge spillovers. Though, it is important to mention that the actual sources of agglomeration economies are a product of the concentration of companies and agents. Marshall (1920) was the first to define these sources and stated that the crucial advantage of a cluster is the ability to share critical resources such as skilled labour and specified suppliers (Sorenson, 2004). Marshall defined three main sources of agglomeration economies: the possibility of labour market pooling, the sharing of inputs and the presence of knowledge spillovers.

The presence of economies of scale in clusters is the basis of Marshall's notion that agglomeration economies arise from clusters. The scale economies lead to the sharing of inputs and thus cost reduction. Holmes conducted a research in 1999 in which he tests this theory by suggesting that vertical disintegration should be greater in areas where industries localize. He found -even though he limited his research to the manufacturing sector in the U.S.- a positive relationship between vertical disintegration and industrial concentration. For example, his data show that 62 percent of national employment of the carpets and rugs industry is concentrated in Georgia and that the purchased-inputs level in this centre is 73 percent, whereas this is 62 percent nationally. He found that this is not only the case for the carpets and rugs industry, a similar pattern can be found in other concentrated manufacturing industries. These findings indicate that input sharing is a source of agglomeration economies.

Secondly, clusters attract and create qualified labour. Usually multiple companies of the same or related industry cluster together, as a result employees are willing to invest in specific skills, since the majority of companies is looking for employees with the similar type of skills. This is not only an advantage for the employees, but the companies too can profit from the large labour pool. They can look for the very best employees locally and thus save time and expenses. The downside of labour pooling is the risk that competition for the best employees can raise the wages locally to such an extent that the potential employees become too expensive and the companies will look outside the cluster and region for labour. At that moment the situation turns against the employee, since he can find no work after having invested in specific skills and has to face the lock-in effect that he has created for himself.

The extended division of labour can also be considered to be a source of agglomeration because the scale advantages lead to specialisation in certain parts of the production process, which in its turn can lead to an increase in productivity and cost reduction. On the other hand specialisation can in time also lead to a lock-in effect and this can be dangerous for the continuity of the company, because it becomes inflexible and is unable to change its course when the situation changes. In this situation agglomeration economies turn into diseconomies.

Another important source of agglomeration economies is presence of knowledge spillovers in clusters. When considering the concept knowledge, one has to make a distinction between tacit and explicit knowledge. Explicit knowledge is also referred to as codified knowledge because it can be written down. Because it can be written down, it can be broadcasted via the internet or books and articles. Assuming that everyone can read and has the access to the internet and books, we may consider codified knowledge to be a public good, because it is non-excludable. It is also non-rival, because the marginal cost of an extra person reading the codified knowledge is about zero, especially when it is published on the internet, such as patents.

Tacit knowledge on the other hand cannot be written down, because it is often a skill someone obtained through learning-by-doing. Because this knowledge cannot be written down, it is not easily or freely accessible and thus considered private. The way to obtain this knowledge is by learning-by-doing or through face-to-face contact, because the owner of the knowledge might be able to transfer the knowledge by expressing him- or herself in ways which are only possible through face-to-face contact. It is this tacit knowledge that can be spillover. The advantage of these spillovers is that knowledge shared between different companies can increase the speed of the creation and development of innovations. On the other hand knowledge spillovers are not transfers and thus leave the company unintentionally and can be considered as knowledge leakages which can harm the competitive advantage of a company.

3.2 Other sources

Marshall was not the only one to define sources of agglomeration economies. Paul R. Krugman was the first to introduce the home market effect as a source and followed Marshall's notion that this could only work in a situation when there are increasing returns to scale. In his model (Krugman, 1980) he also stresses the importance of transportation costs and states that there will be an incentive to concentrate the production of a good near its largest market, even if there is some demand for the good elsewhere. Scale economies can be realized when all production units are located in one place and when they are located near the largest market. This way the employment is also concentrated in one place and additional transportation costs can be minimized as well. This way the home market size

expands in a self reinforcing process of agglomeration. This model was tested in 1996 by Davis and Weinstein and they rejected it on the basis of OECD data. This indicates that Krugman's model does not apply in an international setting, but when tested by Davis and Weinstein in 1999 on a regional level, using Japanese data they found that the home market effect does matter.

Glaeser et al (2001) found another source for agglomeration which applied to concentrated urban areas specifically. They state that urban consumption opportunities can create external economies because large cities can enhance consumption in four ways. Firstly, there may be goods and services available in large cities that are not available elsewhere. Secondly, large cities may offer various aesthetic charms, such as the climate in Los Angeles and the architecture in Paris. Thirdly, large cities may allow the provision of public goods that would not be possible in a smaller place, such as public transport and specialised schools. Finally, the relative dense settlement of a large city allows speed of interaction that would not be possible in a smaller one. These advantages cannot only enhance the consumption, but also increase the productivity level in a city. On the other hand a large city can also become too concentrated and advantages can become diseconomies and have a negative effect on the economic performance. For example the concentration of the business centre in New York have lead to overcrowded roads in certain parts of the city and for example when a businessman, who has an appointment is stuck in traffic can lose a business deal because he was unable to attend the meeting on time as a result of the traffic jam.

3.3 Cooperation and competition

The basis for the sources and advantages of agglomeration economies on an industrial level are the intensity and the way in which firms, that are concentrated, cooperate and compete with each other. The sources of agglomeration economies that are mentioned before can only exist when companies are in a certain proximity of each other. For example, firms can only benefit from shared inputs if they have the ability to share. When firms share similar characteristic and are geographically proximate, they can for instance order large quantities from certain suppliers together, so they can benefit from discounts and share transportation costs and risks.

On the other hand it has been suggested that local competition also plays an important role in the success of clusters. Porter made this very clear in his research of 1998, in which he defines clusters as '*critical masses in one place of linked industries and institutions from suppliers to universities to government agencies – that enjoy unusual competitive success in a particular field*'. He states that local competition encourages innovation by forcing firms to innovate or fail and he concludes that this applies for any set of industrial clusters, competition pressure enhances productivity (Porter, 1990).

The success of local competition is a result of the concentration of firms and other agents in a certain area. According to Porter (1998) clusters affect competition on three broad ways, namely by increasing the productivity level of companies located in the cluster, secondly by driving the direction and the pace of innovation and thirdly, by stimulating the formation of businesses within the cluster. Rosenthal and Strange (2003) support the third statement by suggesting in their research that the average establishment size within the own industry has a significant and positive influence on new arrivals because firstly, the presence of small establishments implies that there is a environment which has a higher level of competition and that competition is good for growth and secondly because the establishment size may be associated with a different way of doing business. This is in line with the findings by Glaerser et al (1992) who state that an increase in competition is positively associated with growth. They conducted this study to test whether Marshall (1920), Arrow (1962) and Romer (1986) who share a very different opinion on the subject of clusters and competition were right. They stated that the local competition will not increase, but decrease productivity because of incomplete property rights, but as mentioned before he found a positive influence. Henderson (2003) comments on the study by Rosenthal and Strange that the localisation economies do not arise from the size of the establishments though, but from the presence of establishments as such.

Contrary to Marshall's notion, Porter theory is not based on the presence of scale economies. He states that modern competition does not depend on the access to inputs or the scale of individual enterprises, but on productivity. Next to this he adds that the industry does not have an influence on the level of productivity, but on the way in which the company competes. Saxenian (1994) shares a similar view on a broader scale and suggests that the primary source of differences in the performance between clusters is the difference in local industrial organisations and culture. She compared the performances between Silicon Valley and Boston's Route 128 and found that Silicon Valley has a better performance because it has a more entrepreneurial culture. None the less, Porter claims that clusters do create other advantages for the companies located in it, because it '*allows companies to operate more productively in sourcing inputs, accessing information, technology and needed institutions, coordinating with related companies and measuring and motivating improvement*' (Porter, 1998). This is especially important since local competition becomes more important in a globalising world. The competitive advantage lies in the local things, knowledge, relationships and motivation that distant rivals cannot replicate.

Chapter 4: SPECIALISATION VS. DIVERSIFICATION

4.1 Geographic Scope

The externalities extend over several dimensions and Rosenthal and Strange (2004) refer to the extent of the externality as its scope. Firstly, there is the geographic scope. It is commonly known that knowledge creation and learning is critical to the competitive advantage of firms and regions. Geographical, cognitive and organisational proximity are key dimensions in understanding interactive learning and innovation (Boschma, 2005). The basic reasoning of this scope is that as the proximity between the agents increased, there is more potential for interaction. Industrial district theory regards spatial (geographic) proximity as the basic factor that facilitates personal interaction. Such interactions form social embeddedness that helps the development of trustful relationships. Marshall suggests that geographical proximity provides opportunities in cost reduction based on specialisation, labour market economies and knowledge spillover effects. Moreover, due to urbanization effect cross-fertilization among technologies and sectors provides advantages for knowledge development and innovations (Johannson, Lundberg 2007).

On the other hand according to Boschma (2005) social networks -based on personal acquaintances acquired by working together- not only provide the main channel for knowledge diffusion[1], but also produce most knowledge. But in comparison to what was mentioned before, these networks are not necessarily localized geographically close to each other, because there is nothing inherently spatial about networks (Boschma, 2005). For the process of interactive learning, which is needed for the acquaintance of tacit knowledge cognitive proximity is needed. Cognitive proximity is the proximity of operating and knowledge. When two firms operate in the same field and on the same level, their cognitive proximity is high. However, it is essential to stress that the exchange of tacit knowledge still requires face-to-face contact, this is also possible by bringing people together by travelling now and then.

4.2 Industrial Scope

Secondly, there is the industrial scope which is the eldest scope defined. It represents the degree to which agglomeration economies extend across industries and possibly even across all industries in a city, rather than being confined within industry boundaries. This means that when agents become closer in industrial space, their production processes become more alike and there is a greater potential for interaction.

[1] Diffusion involves passing information or knowledge from one agent to another.

Within the industrial approach there are two different theories which handle the issue of the source of the externalities. Firstly, Marshall (1920) argues that economies of scale arise from the spatial concentration of activity within an industry and states that specialisation enhances that economies of scale. Secondly, Jacobs (1969) says that the sole concentration of an industry (within a city or region) cannot explain the existence of agglomeration economies and argues that all the activity of the city and thus the size of the city can create economies of scale. Following this theory it is better to diversify because this fosters the cross-fertilisation of ideas. The basic difference between the two theories is the level of interaction. With localisation economies interactions arise between agents within a certain industry and the interactions in the theory of urbanisation economies occur between industries and thus depend on overall activity in an area (Combes and Overman, 2004).

4.3 Location or urbanisation economies

The origin of an industry in a particular city or area could be the result of natural resources or simply a historical accident (Carlino, 1987). Once the industry develops in a the geographic location, firms from a related industry often take advantage of the agglomeration economies by also locating there, for example Silicon Valley in California. The computer manufacturing firms in this cluster occasionally require highly specialised workers who maintain and repair the manufacturing machines and instruments. If the repair firm would be located far from the manufacturing company, the manufacturing firm would have to spend much time and money on bringing the repair specialist to its location or it would have to decide to employ a full-time repair specialist. But if these manufacturing companies decide to cluster together, their combined needs for the repair of their instruments and machines can support at least one firm that specialises in repairing manufacturing machines. Consequently, those services can be provided at a lower cost from a local firm and this way all the computer companies in the cluster can enjoy a lower average cost of production. This advantage of course is also realised when the companies share other sources.

As Carlino (1987) mentions, some kinds of business are found only were specific industries are concentrated, and others such as financial and business services are generally found in urban areas (cities). Urbanisation economies involve the more general cost savings that a firm in any industry may receive by locating in a metropolitan area. These areas provide access to large and varied labour pools, such as in New York where the labour market is so large that it offers not only a large number of placement firms, but also a large number of agencies that specialise in particular types of personnel. Also the presence of data processing, legal and other specialised business services increase the urbanisation economies in a city. But the positive effects of urbanisation economies make up just one side of the equation and the diseconomies which are a result of congestion for households and firms

brought on by the city's growth make up the other side. The efficient size of a city is the result of a trade-off between urbanisation economies and urban crowding (Duranton and Puga, 2003).

Glaeser et al (1992) did a research on the effects of industry specialisation and diversification of the city's employment in a particular sector and compared this to the city growth for multiple cities in the U.S. over the period of 1956-1987. In contrast with the effects of localization economies by Marshall, they found no evidence that specialisation encourages growth. Later on Henderson et al (1995) did a similar research over the period of 1970-1987, but they used a different measure for specialisation. They used the share of an industry in a city's employment. This means that the measure in contrary to Glaeser et al is not divided or normalized by the industry's national share in employment, also a different set of control variables was used, and moreover a distinction was made between mature and high-tech industries. They found that specialisation has a positive effect on both types of industries, but that diversification mattered for the high-tech industries. Harhoff (1999) found similar results in his research and states that local cross industry spillovers are key to growth. Combes (2000) responded to the finding of Henderson et al by stating that it is very important to keep in mind that the interpretation of specialisation can differ and argued that specialisation could only be greater, holding sectoral employment constant, when the entire city would become smaller. This indicates that specialisation and thus localization economies by itself cannot explain the economies of scale as mentioned before. On the other hand Dumais, Ellison and Glaeser (1997) found that the most important factor behind the location decision is suitability of the local market, which is consistent with Marshall (1920). In contrast, they suggest that localised spillovers of intellectual nature are of secondary importance.

4.4 Location choice of business service providers

The focus in this research is on maritime advanced service producers and they are not physically tied to the ports, since they do not need fixed assets related to the port, such as quays or warehouses. This suggests that they could locate anywhere. Open global markets, rapid transportation and high-speed communication should allow any company to source capital, goods, information and technology from around the world at any time. But preliminary research has shown that at least 80 percent of maritime advanced service providers in Northwest Europe are concentrated in cities. The relevant question in this research is whether these cities are port cities.

When choosing the office location business service providers have to keep several factors in mind, such as their image, resources and competition. When the service (tertiary) sector started to grow in the 1980s Dunning and Norman (1987) conducted a research in which they examined the factors that influence location choice of international offices. They suggest that the primary influences on location

choice were market size and the need for personal presence to serve this market. This indicates that companies will locate there, where more service providers are found and also near the customers, which are located in the port in the case of this research. On the other hand they also found that although proximity to London -where the largest market is located- remains important, there was a clear tendency to consider locations further from London and they expected that this tendency would be further encouraged with the continuous development of technology which improves communication facilities and the development of domestic travel infrastructure.

Decades later communication facilities have improved and globalisation has become a commonly used term. Because of these changes many companies have turned into multinational enterprises (MNE) and this also applies to firms operating in the service sector, especially because they require little hardware to operate. Nachum, Zaheer and Gross (2008) researched the location choice of multinational enterprises. More specifically they looked at the proximity of a country to the rest of the world and found that it has an impact on MNEs choosing that specific country as a location. Moreover, they state that proximity to the world's knowledge and markets are stronger drivers than proximity to the world's resources. The shipping industry in itself is highly international, in which distant centres of supply and demand are linked through the transport of goods. This tendency of shipping companies going international implies that advanced service providers also need to have an international orientation when providing their product. Michaelowa and Krause (2000) state that the majority of world trade is transported by ship, and in combination with the growth in world trade generally, there is an increase in the demand for international shipping services. The findings from Nachum, et al (2008) suggest that in the case of multinational maritime APS, there would be a tendency of these companies to locate in cities with a large port and more specifically near the port cluster itself, since the knowledge and market of this industry is located in the port. The main resource of the service providers is the labour force. Most of the employees need to be highly skilled and thus they will receive their education in universities, which are located more often in large cities than in port cities. It is important to remember that large cities in general can create a powerful bandwagon effect[2], as mentioned in the previous chapter.

Jacobs, Ducruet and de Langen (2009) state that the location of maritime APS is the result of two opposing forces. On the one hand, APS firms derive benefits from co-location with firms in port-industrial complexes. As mentioned before in this chapter, they too suggest that physical proximity fosters the exchange of ideas and the building of trust. For example, an insurance company that specialises in marine terminals, vessels or storage facilities will have lower transaction costs and be able to monitor market demands closely if located in the port city. On the other hand APS located in a

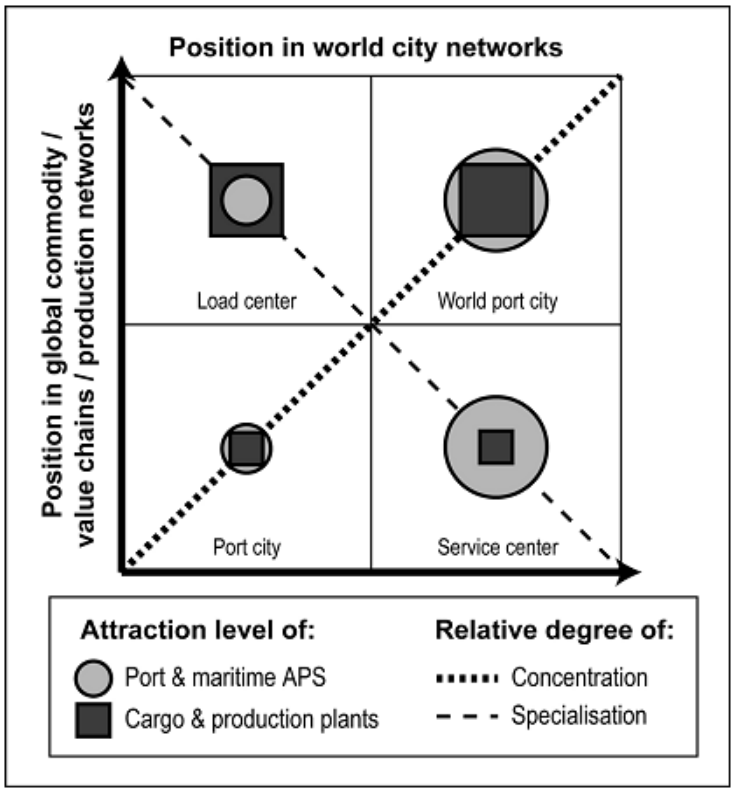
[2] The bandwagon effect arises when people's preference for a commodity increases as the number of people buying it increases.

large city benefit from skilled labour as well as from relations with other APS firms. Bennet (2001) conducted a research on the role of co-operative self-regulation, or co-management, in safety and environmental regulation of the P&I Clubs in the shipping industry. He shows that in a situation where the geographic distance is large, insurance products can easily be offered to companies in the port from a large city, with face-to-face contacts limited to occasional meetings.

4.5 Port cities

Ports move upstream due to rising scale of port activities and because of this more downstream port areas become out of date (de Langen and Nijdam, 2009). These areas can be used for the development of new urban functions and many port cities choose to attract advanced knowledge-based industries because these industries add value to port-cities (Jacobs et al, 2009). Also the development of urban projects lies in the interest of port institutions, for example the Bombay port authority generates more income from real estate than from port operations (de Langen and Nijdam, 2009). Knowledge-based industries like advanced producer services stimulate innovation through finance and consultancy, which in turn leads to higher economic growth for the city and/or region in which the industry is located. It is hard to determine the causality of this phenomenon, because it is also stated that when a city or region reaches a certain size and level of infrastructure, it attracts headquarters of companies.

Figure 2: Analytical framework and port city typology



Source: Jacobs, Ducruet and de Langen (2009).

These headquarters need the support of advanced producer services and thus advanced producer services will locate in the large cities (Sassen, 2000; Moulaert and Gallouj; 1993). Jacobs et al (2009) found in their research that the extent to which port cities attract APS firms differs. In some cases advanced service providers are not present in the geographic proximity of the maritime cluster at all and in other cases, such as London almost all APS firms are located in the port area. They created a framework to empirically classify port cities in respect to extent to which port cities attract APS firms (see figure 2). On the horizontal axis it shows the position of a port city regarding the attraction of port and maritime APS and the vertical axis it shows the volumes of commodities that pass through the port.

Chapter 5: DATA DESCRIPTION & MODEL

5.1 The sample

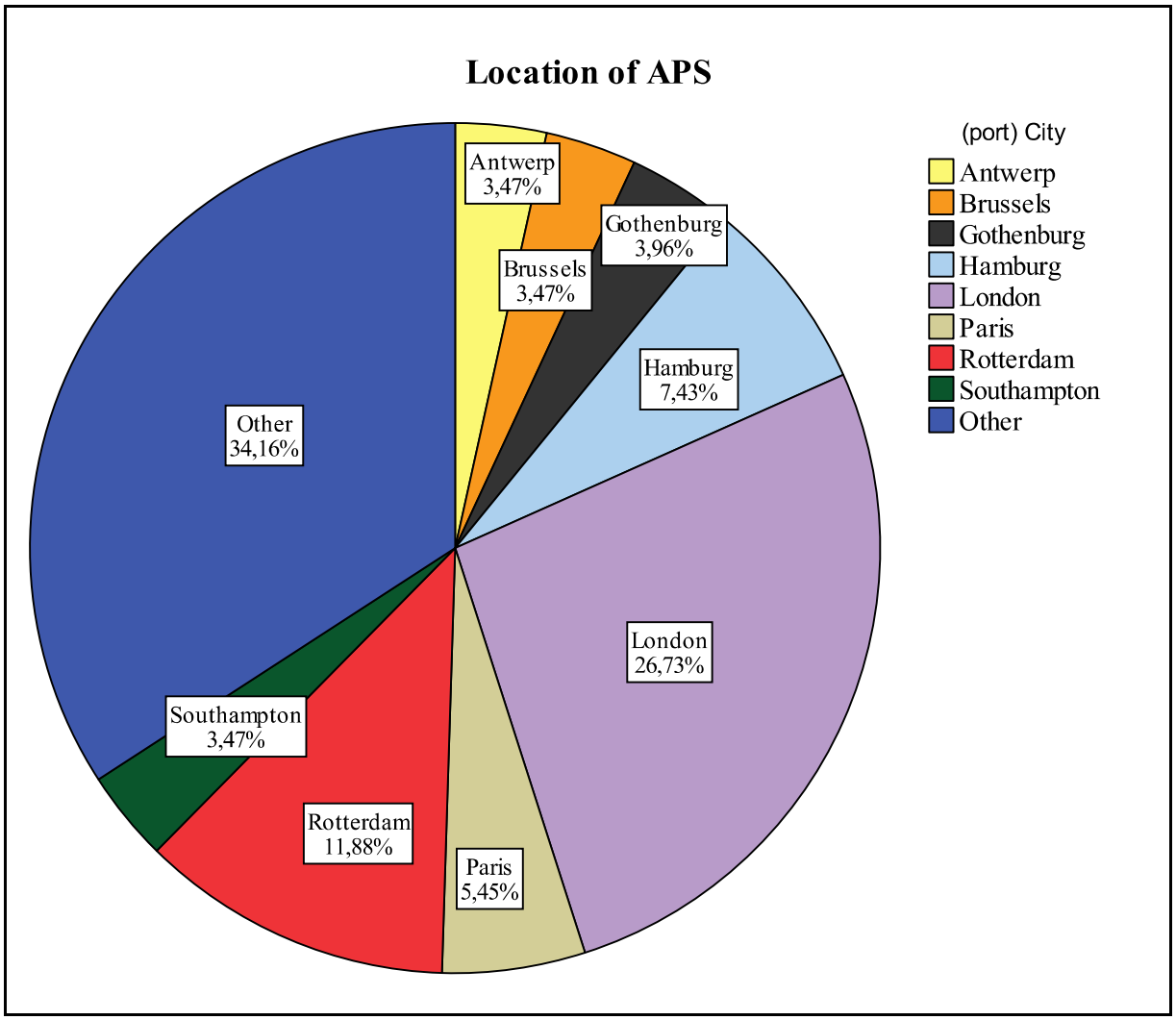
In this chapter a description is presented of the data set and the variables used in the analysis (see table 1). After which an overview is given with the characteristics of the sample and subsequently the variables are defined, categorized and subdivided according to their type. Subsequently, the hypotheses are presented.

The data used to study the Concentration of maritime advanced producer services in Northwest Europe originates from the World Shipping Register. The database contains information about more than 200 maritime advanced producer services firms distributed over three subsectors: consultants and surveyors, P&I, insurance and law and maritime organisation, in the 'Hamburg – Le Havre range'. In this range political and economic situations are similar and more important it forms the European economic core and most populated area (London, Randstad, Flemish Diamond, Paris, Rhein-Ruhr, Hamburg). In addition, and consequently, it hosts the busiest seaports of Europe. Additionally a large part of Scandinavia, namely Norway, Denmark and Sweden is included, since they are important in terms of maritime advanced producer services.

It is of the essence to choose an area in which there is a level playing field because Ades and Glaeser (1995) recognized another source of agglomeration economies in their research. They found that certain economic and political factors have a large influence on the level of urbanization, which they refer to as urban primacy. For example, tariff barriers lead to a higher rate of urbanization and a decrease of this rate when there is a development of the intercity transport network. Ades and Glaeser (1995) add that the political factors may even be of a greater importance since they found that dictatorships have central cities that are, on average, 50 percent larger than their democratic counterparts. The force that leads to the concentration of the population in mega cities seems to be the ability to engage in rent-seeking. Henderson (2003) did a similar research and found that not only centralized governments have a significant influence on the urban primacy, but also poor national road networks. This type of urbanization does not lead to positive externalities, since Henderson found that in some cases there is even a negative impact on growth. This again implies that too much concentration, in this case of the government, does not increase the productivity of a region.

When taking a first look at the location of the APS in figure 3, we see that more than 25 percent of the APS firms are located in the largest city and financial centre of Europe, London. This figure suggests that the urbanisation economies are more important for the APS than localisation economies. On the

Figure 3: Location of APS



other hand we can see that Rotterdam is the second most favourable city to locate in and even though it is not a very big city, it does have the largest port in Europe and used to be the biggest port in the world between 1962 and 2004. To get a better understanding of the location choice of the advanced service providers we will take a closer look at the characteristic of the firms in the sample.

5.2 Key variables and hypotheses

City's port size

In order to find out which agglomeration economies are more important for the APS firm, the urbanisation economies or localisation economies, it is essential to look at the characteristics of the city in which the advanced service providers locate their (local) head offices. Because we are dealing with maritime APS it is crucial to find out whether the city has a port and when the city has a port it is important to examine the size of the port. The maritime cluster usually increases with the size of the

Table1: Descriptive statistics for the variables used

	Variable	Description
1.	City's Port Size	This variable represents the relative size of a port compared to the size of the city in which it is located and represents a proxy for the importance of localisation economies and the urbanisation economies. Calculated as the total number of tonnage cargo handled in the port in 2008 divided by the population of the city in the beginning of 2009.
2.	Firm Age Local Office	It is the age of the head office in a country. Calculated in years as the difference between the founding year of the local office and the year of the observation (2010).
3.	Firm Size Total Company	This is the size of the company as a whole, including all branches and offices. It is measured by the number of employees.
4.	Maritime Specialism	This variable represents the specialisation in the maritime sector of the local office in maritime. It is calculated as the percentage of the number of employees in the local office that is specialised in the maritime sector.
5.	Consultants & Surveyors	This represents one of the types of maritime advanced producer service. It is a dummy which is set to equal 1 when the service provider is a consultant or surveyor.
6.	P&I, Insurance, Law	One of the types of maritime advanced producer service. The dummy variable is set to equal 1 when the service provider is involved in (maritime) insurances or legal services.
7.	Maritime Organisation	It is one of the types of maritime advanced producer service. The variable is a dummy which is set to equal 1 when the organisation is a maritime organisation.
8.	Firm Age Total Company	This is the age of the company as a whole. Calculated in years as the difference between the organisation's founding year and the year of the observation (2010).
9.	Firm Size Local Office	This is the size of the head office in a country. It is measured by the number of employees.
10.	Belgium	This is a dummy variable set to equal 1 when the office is located in Belgium.
11.	Denmark	A dummy variable which is set to equal 1 when the office is located in Denmark.
12.	France	This is a dummy variable set to equal 1 when the office is located in Northern part of France.
13.	Germany	A dummy variable which is set to equal 1 when the office is located in Germany.
14.	Netherlands	This is a dummy variable set to equal 1 when the office is located in The Netherlands.
15.	Norway	A dummy variable which is set to equal 1 when the office is located in Norway.
16.	Sweden	This is a dummy variable set to equal 1 when the office is located in Sweden.
17.	UK	A dummy variable which is set to equal 1 when the office is located in Great Britain.

port. Consequently a larger market can be found because more port related firms within the cluster would need the service support of the advanced service providers. Since service providers find it important to be present in the market in which they operate, it is inevitable that the large ports attract APS firms. Thus, I expect that more advanced service producers will locate in large ports as compared to small ports, but up to a certain size so they can benefit from location economies.

On the other hand advanced service providers are not directly linked to the port and do not need facilities offered in the port, such as terminals or waterways to operate. This characteristic will be elaborated later. The most important asset of the APS firms is their high-skilled human capital and human capital is relatively mobile. This suggests that APS will locate where they have easy access to the labour market for people with a high education. Most universities are located in large cities and thus I expect that more APS firms are located in large cities than in small cities. Next to this, APS organisations often offer their services to firms in different sectors and by locating in a large city they can profit from the diversification in the city and thus urbanisation economies.

The relative size of the port in a city is the dependent variable in this research and it represents a proxy for the importance of the advantages of localisation economies of the concentrated maritime industry in the port and the advantages of the urbanisation economies from aggregated activity of a city to the APS organisations and it is hard to predict which type of agglomeration economies is more important, since I expect that both large ports and large cities attract APS firms. Figure 3 shows that most APS locate both in the largest city of Europe and the largest port of Europe. Consequently, one would expect that most APS firms will locate in average (medium) sized port cities.

Firm age local office

The age of the local office of the APS organisation has a great influence on the location choice when founded. The world and European history shows the differences in trade flows in the world over time and also the attractiveness of countries, regions and cities. In the early 19th century Western-Europe became very powerful and colonised great parts of the Asia and Africa. The colonisation increased the trade flows by water and it was around this time the first maritime advanced producer services were provided by P&I clubs. The Industrial Revolution which spread through Western-Europe transformed the world's economies tremendously. Mass production was introduced and consequently specialisation appeared on micro and meso levels. New methods of transport such as steamships were developed and shrank the world. This era also brought about the Age of Reason, which led to the beginning of modern democracy. The Industrial Revolution and development of democracy led to an increase in the quality of the average standard of life. Because of this increase in wealth the demand for foreign goods increased as well, resulting in an increase of trade. Due to this increase, port cities became more wealthy and attractive for firms to locate themselves in.

During the late 19th century and the early 20th century nationalism became an important factor in Europe and it indirectly led to World War I. The war destroyed Europe and was followed by the Great Depression. After the war nationalism still played a very important part in the world and as a result countries tried to protect their own economies by closing their borders. During this time the world economy decreased tremendously and consequently also the world trade flows. As a result port cities became less important and large cities became more attractive for companies to locate in, if they were able to start-up.

After World War II the United States and West European countries decided not to close their borders like they did after the First World War to avoid another depression. During these decades the African and Asian colonies won their formal independence, but suffered from neo-colonialism poverty. These new countries were exploited by companies in Western countries, which were able to buy goods for very low prices and sell them with high profits in the West. Also the trade within Europe became more attractive due to formation of the European Union. All these events led to an increase in trade by rail, road and water, which again led to an increase of the attractiveness of the port cities.

As a result of the two World Wars there was an exponential progress in science and technology, which among other things increased the standard of living and as explained earlier more wealth leads to an increase in demand, which in its turn leads to an increase in trade and transportation. The Age of Information started in the 1970s with the development of the personal computer. The worldwide use of the pc and other hi-tech products in the 1980s led to an increase in globalisation and to the development and growth of the tertiary (service) sector. Now it became important for service providers to locate in the places where this new technology and support was available, which was in the large cities starting in the West. Nowadays the business service sector in Europe employs about 17 percent of the non-financial business economy workforce[3]. Due to the continuous development of the supporting technology of APS and the increase in globalisation of the world economy proximity to ports becomes less important and the urbanisation economies become more important. Thus, APS firms nowadays will choose to locate their local head office, which is usually younger than the total company, near a (financial) business centre in a large city instead of in the proximity of a large port.

Hypothesis 1:

Ha_1: APS organisations find localisation economies more important than urbanisation economies when their local head office is old.

[3] Eurostat European Commission, European Business Facts and Figures, edition 2009.

Firm size of the total organisation

Economists have recognized for a long time that a firm's size can affect its productivity. When a firm increases in size, it can lead to an increase in productivity through specialisation, or by using its capital equipment more efficiently (Carlino, 1987). When advanced service producers reach the size where they decide to specialise, they often create a separate department which handles cases from different sectors. If the company reaches an even bigger size it will create different branches, with offices spread over a country or even the world. Thus, I think that large APS firms are more diversified as a whole and have specialised departments. Since we are looking at the local head offices in this research, I expect that the APS organisations will locate their local head offices near the financial business centres in large centres to profit from the economies of scale that arise from the diversification of the city (urbanisation economies) and that they will have separate regional offices that are located in the proximity of the important large ports.

Hypothesis 2:

Ha_2: APS organisations find urbanisation economies more important than localisation economies when the size of the total organisation is large.

Specialisation of organisation

Maritime advanced service providers can differ in specialisation in two different ways. First, maritime APS firms can differ from industry and secondly they can differ in the extent in which the local office is specialised in the maritime sector. In order to explain the first difference, we need to go back to the maritime cluster. Most of the actors in the cluster are directly related to the port and are located in the port area. As mentioned before, port related service providers on the other hand do not always need to be in the proximity of the port. The range in which the firms are connected can differ. Companies that are clearly linked to the port are for instance pilots, who provide nautical guidance to ships, or towage companies, which provide towage services. Customs on the other hand are not only directly linked to the port, but to the cargo and trade in the port, this is why you can find them also in various places such as airports.

The service providers which do not seem to be directly linked to the port deal for instance with maritime law or the finance of ships and trade, and the management, broking or classification of ships. These service providers are also called maritime advanced service providers. In this research these service providers are subdivide into three different groups, namely 1) consultants and surveyors, 2) insurance and law and 3) maritime organisations. When looking at the data it appears that all three groups are approximately equally large[4].

[4] See appendix 1

Maritime consultancy firms basically provide advice about management related issues to organisations in the maritime cluster. In practice this means that they do market research, feasibility studies, traffic studies and write business plans, look into fund syndication and equity research, deal with computer software and also focus on technical design such as the conceptual design and implementation operational engineering. Maritime surveyors appraise and evaluate the worth of a ship and also the extent of damages to a ship. Surveys can be done for different types of reasons, the basic surveys are a pre-purchase survey of a vessel, an insurance survey, an appraisal inspection or a damage inspection. Many maritime consultancy firms have incorporated a survey department in their company since the conduction of a survey is often a part in a larger process in which other (consultancy) services are needed. Consultancy firms usually give advice to several sectors and have a department which specialises in the maritime industry, which includes the surveyors. This is why I expect the consultant and surveyors to locate in a place where they can benefit from urbanisation economies (diversification) and consequently they will locate in a large city.

Hypothesis 3:

Ha_3: APS organisations that are in the maritime consultancy and/or surveying business find urbanisation economies more important than localisation economies.

Maritime insurance is the oldest known form of insurance and today is a must for all ship owners and cargo transporters. Protection and indemnity insurance, also known as P&I, is the marine insurance against third party liabilities and expenses arising from owning ships or operating ships as principals. The origin of the P&I insurance lies in the United Kingdom, where the first P&I Club was founded around 1850. The first protection association, the Ship owners' Mutual Protection Society, was intended to cover liabilities, which were excluded by other insurers, such as the for loss of life and personal injury and also the risk of collisions. In the course of the next decades the number of liabilities insured by P&I clubs increased greatly. The clubs are able to offer unlimited coverage, except for pollution caused by oil, because of combined re-insurance. P&I is distinct from other forms of maritime insurance purchased by ship owners such as hull insurance and war risk insurance. Next to the ship owners, other parties such as shippers and charterers can protect themselves against liabilities and expenses from third parties, through the purchase of other marine insurances, e.g. charterers' liability insurances'. Maritime law, formally known as admiralty law is, in effect, the law of the sea. It governs everything from injuries to seamen and collisions between vessels to pollution. However, for purposes of business, the two main concerns of admiralty law are dealing with cargo and personal injury claims at sea, and the way the law governs companies that run operations in national and international waters. Federal courts have exclusive jurisdiction in admiralty and maritime law actions. International maritime law is mostly standardized; however some variations apply between countries. Insurance companies and firms that provide legal services, like consultants and surveyors, have a

department which specialises in the maritime industry. But unlike the previous group, this group includes a service which is only provided to certain actors in the maritime industry, namely P&I insurance. I think that even though insurance companies and legal advisors prefer to locate in large cities, P&I insurance providers will locate in the proximity of ports and since they are very specialised and can profit from location economies. I expect that this group will locate in the proximity of a large port.

Hypothesis 4:

Ha_4: APS organisations that provide maritime insurance and/or legal services find localisation economies more important than urbanisation economies.

Maritime organisations are associations and societies which represent and promote the interests of different stakeholders in the maritime industry. The Society of Maritime Industries for example refers to itself as the '*voice of the UK's maritime business sector, which promotes and supports companies which build, refit and modernise ships, and supply equipment and services for all types of commercial and naval platforms, ports and terminals infrastructure and maritime security, offshore oil & gas, and marine science and technology*'[5]. Associations and societies represent their own group of stakeholders and this is why maritime organisations are very specialised organisations. Since they represent the interests of the stakeholders of the maritime cluster I expect that these organisations will locate in the proximity of a large port. This indicates that localisation economies are more important to them than urbanisation economies.

Hypothesis 5:

Ha_5: APS organisations which are maritime organisations find localisation economies more important than urbanisation economies.

As mentioned before APS firms can differ in the extent in which their local head office is specialised in the maritime sector. In this research this type of specialisation is approached by looking at the number of employees working in the maritime department of the local head office and dividing this number by the total number of employees working in the same office. Naturally, the higher the number of employees working in the maritime department, the greater the specialisation in the maritime industry. Consequently, APS firms with high specialisation rates will locate in the proximity of a large port, since they value the localisation economies more than the advantages of diversification from the urbanisation economies.

[5] http://www.maritimeindustries.org

Hypothesis 6:

Ha_6: APS organisations which are more specialised in the maritime industry find localisation economies more important than urbanisation economies.

5.3 Control variables

Firm age of total organisation

Rosenthal and Strange (2004) considered the geographic and industrial scope to be out of date and introduced the temporal scope. This scope is dynamic compared to the other two approaches and Rosenthal and Strange argued that it is possible that one agent's interaction with another agent at a point in the past continues to have an effect on production in the present. The degree to which these time-separated interactions continue to have influence defines the temporal scope of agglomeration economies. The age of the total organisation is included as a control variable because it is necessary to control for the effect of the lifecycle stage in which the organisation is at the moment it founds the local head office.

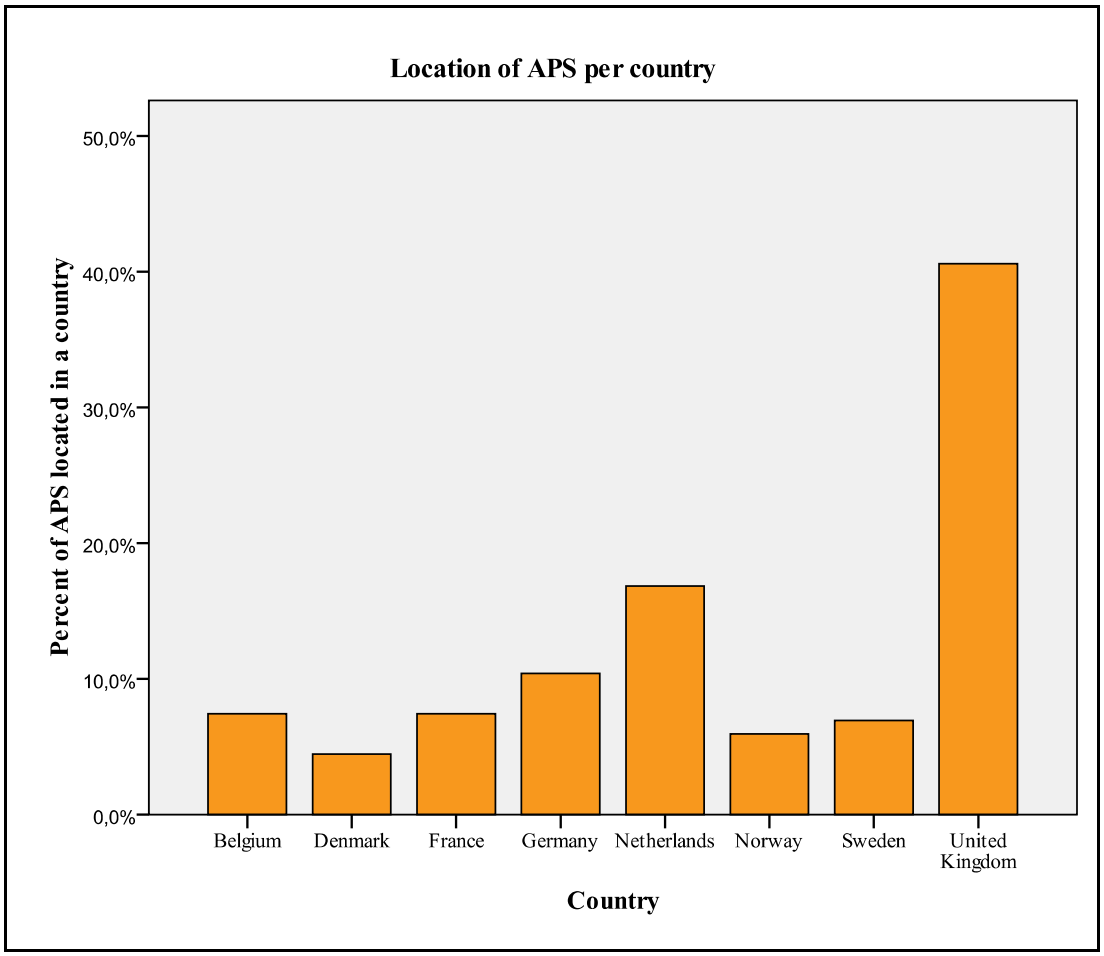
Firm Size (local office)

The size of the local office can determine the characteristic of the office. It can be the only office of the organisation. It is also possible that the head office of the organisation is located in a foreign country and that the local office is the only establishment present in a specific country. A third possibility, the local head office actually is the head office of the organisation. And finally, the office can also be the local head office of an organisation, which main head office is located in a foreign country and there is at least one other regional office established in that country. The characteristic of the office partially determines its maritime specialisation. When the office functions as a main or as local head office it most probably more diversified than when it is the only office of the organisation. Even though this variable cannot define the actual characteristic it can give an indication, since larger offices often represent head offices.

Country

The initial idea in this research was to choose an area in which there is a level playing field and this is why the 'Hamburg – Le-Havre range' including a part of Scandinavia was chosen. But when taking a first look at the data, figure 4 shows that the APS firms are not evenly distributed among the eight countries. Thus, it is necessary to control for the country effect, which will be done by the creation of a dummy variable for each country.

Figure 4: Location of APS organisation per country



5.4 Descriptive statistics

Table 2 presents the descriptive statistics of the independent and continuous dependent variables in the analysis. It shows the mean, median, standard deviation, range, skewness and kurtosis. The latter two measures show which variables are normally distributed and which have to be modified in order to get a normal distribution. I assume that when a variable has a skewness and kurtosis between the -2 and 2 it is approximately normally distributed. All variables apart from 'City's Port Size' and 'Maritime Specialism' are far from normally distributed and thus need to be altered. To get them normally distributed the natural logs of these variables will be taken in the univariate and multivariate analysis. It appears that according to this measure the variables 'City's Port Size' and 'Maritime Specialism' are the only two variables which seem to be normally distributed. The variable 'Maritime Specialism' is normally distributed because it is not continuous and so it is not a standard scale variable. The variable has a lower bound of 0 and an upper bound of 100. To check the goodness-of-fit of this variable, a Pearson's chi-square test was conducted and it shows that it is a significantly fit (see appendix 2).

Table 2: Descriptive statistics for the variables that are continuous

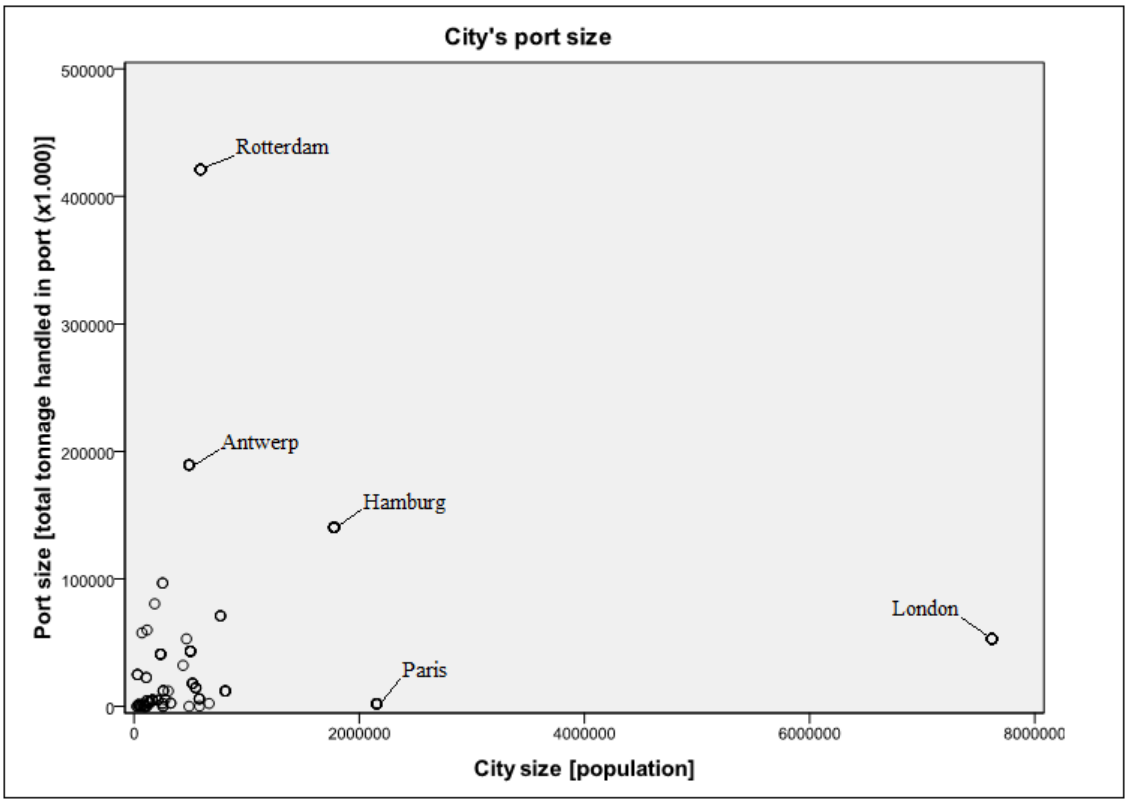
Variable	Mean	Median	Std. Dev.	Rang	Min	Max	Skewness	Kurtosis
N = 202								
City's Port Size (tonnage per inhabitant)	150.56	22.91	251.87	832.93	0	832.93	1,7	1,25
Firm Age Local Office (years)	51.03	27	68.88	500	0	500	3.55	17.93
Firm Size Total Company (employees)	2377.15	40	7967.36	58999	1	59000	5.26	29.86
Maritime Specialism (% size of maritime dept.)	70.77	100	39.85	100	0	100	-0.82	-1.13
Firm Age Total Company (years)	78.98	45.50	80.91	498	2	500	2.11	6.7
Firm Size Local Office (employees)	99.40	20	281.74	2499	1	2500	6.65	52.08

Table 2 shows that the mean of the relative size of a city's port in Northwest Europe is about 150. This indicates that on average 150 metric tonnes of cargo is handled per inhabitant in the city in which the advanced service producer is located. Though, next to this we see that most producer services can be found in relatively smaller ports (median is 23). This finding indicates that APS can be found in either large cities with medium ports or average cities with small ports. In figure 5 it appears that most cities in which APS are located are relatively small in terms of population and port size. But it is crucial to remember that almost 40 percent of the APS are located in three of the four largest cities in Northwest Europe, which are London, Paris, Berlin and Hamburg[6].

About the age of the organisation the table shows that the average is 79 years which would indicate that the APS business in the maritime sector started to bloom around the 1930s, which is remarkable since this was the time of the Great Depression. When checking for outliers it appears that there are two outliers (see appendix 3). The robustness of the average will be tested later with the goodness- of-fit-test, the Kologorov-Smirnov Test. This test will check whether the natural logarithm version of the variable is normally distributed (including the outliers). The median on the other hand is rather robust regarding outliers and it appears that half of the (maritime) APS businesses started around the 1960s. Most probably, this would be a result of the recovery of the international economy and trade after the Second World War and thereafter the development of the high technology. At that time the development of hi-tech led to a large decrease in costs for the tertiary sector resulting in the increase of the size of the sector.

[6] European Spatial Planning Observation Network, Study on Urban Functions (Project 1.4.3), Final Report, Chapter 3, (ESPON, 2007).

Figure 5: Scatterplot of the relative port size of a city



When looking at the age of the local office of the organisation, we see that on average more than 50 years ago most APS offices were founded. But again, when checking for outliers we find four outliers (see appendix 4), which could create a bias in the data. As mentioned before, the also goodness-of-fit-test of this variable will be tested later. Going back to table 2, it seems that more than 75 percent of the local offices were founded after the World War II. This could be a result of the increased relationship between the United States and Western Europe after the Second World War. Due to this development trade flows between the two regions increased and more maritime APS were required to support the maritime industry. Thereafter the development of hi-tech made the advanced service business internationally more attractive. The new technology increased the productivity and efficiency of service providers immensely. This led to a higher profitability, which made the tertiary sector very attractive. Because of this increase in profitability and the globalisation of the world economy it also became interesting countries for these companies to operate internationally and to open offices in foreign.

The results on the total firm size show on the one hand that APS organisations are fairly large on average, but on the other that most of the firms tend to be much smaller. This is the result of multiple outliers in the database (see appendix 5). There are 5 outliers that stand out and these firms seem to be very successful because they employ more than 38,000 people. The bias effect of these companies maybe significant and thus it is interesting to look at these companies separately, just in case they need

Table 3: Location of multinationals

Organisation	Number of Employees	Country	City	City Size	Port Size
A	59,000	France	Paris	2,155,000	2,102,000
B	55,000	Germany	Hamburg	1,776,000	140,400,000
C	47,462	UK	London	7,620,000	52,965,000
D	38,772	Belgium	Antwerp	489,000	189,390,000
E	38,000	UK	London	7,620,000	52,965,000

to be left out. Table 3 shows that four of the largest companies are located in three of the four largest cities in Northwest Europe. The head office of the fourth organisation (in Northwest Europe) is located in the second largest port of Europe[7]. This indicates the urbanisation economies in general are more important to the largest organisations than the localization economies, regarding their head offices. This of course does not mean that they do not have additional regional offices near ports.

As expected, the size of the local office itself is, much smaller than that of the total company, because almost 50 percent of the organisations have more than one office[8]. This variable seems to have several outliers[9] and the significance of the effect will be tested later in the Kolmogotrov-Smirnov Test. The specialisation of the local office is about 70 percent, which indicated that not all of the APS firms are completely specialised in the maritime sector. Moreover, we see that in 7 percent of the cases there is no maritime specialisation at all (see appendix 8). These organisations are mainly consultants and surveyors or insurance and legal advice providers, who occasionally handle cases of the maritime sector and they do not have a specialised department in the local office.

The variables depicted in appendix 9 are the natural logs of the four variables that contain multiple outliers. In this table the goodness-of-fit of the variables is tested by checking whether the variables are normally distributed. Unfortunately, the table shows that the variable 'Ln (Size Total Company)' is not normally distributed. However, when a sample size is large, even unimportant deviations from normality may be technically significant in this test. For this reason the normality distribution is checked with Q-Q plots and by looking at the skewness and kurtosis[10]. After doing so, it appears that the variable is positively skewed, but also normally distributed. This is why the variable 'Ln (Size Total Company)' will be included in the following univariate and multivariate analysis. The goodness-of-fit of the dummy variables for the type of APS firm and the countries have also been tested by using the Pearson's Chi-squared test. The statistics of this test shown in Appendix 13, shows that all dummy variables are significantly fit and can be used in the univariate and multivariate analysis.

[7] De Langen and Nijdam (2006).
[8] See appendix 6.
[9] See appendix 7.
[10] See appendix 10, 11 and 12

5.5 Univariate statistics

In this paragraph the hypotheses are tested by using the Pearson's correlation to take a look at the relation between the continuous independent variables and the dependent variable. The results are presented in table 4. It shows some interesting findings. The age of the local office has a very small positive relation with the city's port size, which suggests that location economies are more important to the APS firms with older local offices. The reason for this very small effect may arise from the differences in the attractiveness of cities throughout history. Ports increase and decrease in size, depending on the total amount of cargo handled. Two hundred years ago a port may have been very important for the national economy in terms trade and thus of cargo handling, but over time due to technological progress or historical events a port could lose its function as main driver of the economy, as has happened in London. The characteristic of London partially changed over time, it used to be one of the most important ports of Western Europe, but overtime its tertiary industry grew in size and importance, and nowadays London hosts the largest European financial centre in the world. On the other hand we see that the port in Rotterdam grew in size and importance over time due to its direct waterway access to the sea and the ability to grow. This large increase only started after the Second World War. On May 14th in 1940 the city and port of Rotterdam were bombed by the German Air Force. This was very unfortunate, but it also created an opportunity for the city and port to be rebuilt with growth potentials and the latest technology. Because of these change, it is may not be possible to directly link the age of the local office to the city's port size. This uncertainty may be the reason that this variable does not have a significant influence on the city's port size. On the other hand, the table shows that this variable has a significant influence on the continuous control variables. Though, it is only strongly correlated with the age of the total organisation, which is not surprising. This indicates that in many cases the age of the local office is equal to the age of the organisation itself, because the local office is the first office of the firm.

Secondly, the table shows that the size of the total organisation has a small negative relation with the city's port size. The reason for this small effect is probably due to the large variance in number of employees. When small organisations employ more people, the effect would be much larger than for multinationals which employ ten thousand people. Unfortunately the relation of this univariate statistic appears not to be significant. On the other hand we see that this variable is significantly correlated with the maritime specialisation of the local office and the two continuous control variables. The weak relation with the Maritime Specialism is negative, which indicates that when the size of the total company increases the local office is less specialised or the less likely option that when the local office becomes more specialised, the size of the local office decreases. This is in line with the arguments supporting this hypothesis. The size of the total company has a strong correlation with the size of the

Table 4: Pearson's correlation coefficients between continuous variables

Variable	City's Port Size *N = 202*	Ln(Age Local Office) *N = 198*	Ln(Size Total Comp) *N = 202*	Ln(Maritime Specialism) *N = 188*	Ln(Age Total Comp) *N=202*	Ln(Size Local Office) *N = 202*
City's Port Size *N = 202*	1					
Ln (Age Local Office) *N = 198*	.039	1				
Ln (Size Total Company) *N = 202*	-.076	.116	1			
Ln (Maritime Specialism) *N = 188*	.166	-.076	-.362**	1		
Ln (Age Total Company) *N = 202*	-.032	.704**	.412**	-.158*	1	
Ln (Size Local Office) *N = 202*	-.118*	.236**	.779**	-.511**	.391**	1

** Correlation is significant at the level of .01 (1-tailed)
* Correlation is significant at the level of .05 (1-tailed)

local office. This indicates that in many cases the size of the local office is approximately equal to the size of the organisation itself, since the local office is in fact the head office of the firm.

The third explanatory independent variable has a positive relation with the relative size of the port. This suggests that when the local office becomes more specialised in the maritime industry it is more likely that the office will be located in the proximity of a large port instead of a large city in general, so that it can profit from the location economies. Again the table shows that this effect is not significant. Though, it appears that the variable is significantly correlated to almost all other continuous variables, except for the age of the local office. It has a negative medium correlation with the size of the local office. This suggests that the percentage of specialised personnel is higher in smaller local offices. This is in line with earlier arguments. The high correlation rate may cause multicollinearity[11] in the following regressions and thus it is important to look at this particular variable when testing for multicollinearity.

A second variable that might be suffering from multicollinearity is the control variable 'Ln (Size Local Office)', which is significantly correlated to all continuous variables. This means that it also that has a significant influence on the city's port size and the relation seems to be a negative one, suggesting that the local office has a higher chance of being located in cities with relatively small ports when the size of the local office increases. This will probably be the case when the character of the local office also

[11] Multicollinearity is a statistical phenomenon in which two or more predictor variables in a multiple regression model are highly correlated. In this situation the coefficient estimates may change erratically in response to small changes in the model or the data (http://en.wikipedia.org/wiki/Multicollinearity).

depends on its size. The chance that a large office is more diversified is greater than a small office. And as mentioned before, the benefits from urbanisation economies, which rise from diversification possibilities in a large city, are more important to large offices than the advantages of the location economies which rise from the specialisation possibilities offered in an industrial clustered area. These univariate statistics present an interesting first glance at the validity of the hypotheses, but it is a pity that they do not show the direction of the relation between APS and the city's port size and only present results about the continuous variables. In the next chapter all the relations will be tested in multivariate regressions.

Chapter 6: MULTIVARIATE TESTING RESULTS

6.1 Linear regression and assumptions

The method used to test the influence of the firm's age, size and specialism regarding the importance of location and urbanisation economies to APS firms is the Ordinary Least Squares model. In this model the linear regression is used to test the hypotheses. It is an estimation of the linear relationship between a dependent variable and the independent variables. The linear regression gives the equation of the straight line that best describes the association between two variables. To make the equation measurable, all continuous variables need to be logarithmically transformed. This means that the only variable that needs to be altered is 'City's Port Size'. Table 2 showed that the minimum relative size of a city's port can have the value of 0, this means that no cargo is handled in the port at all, which indicates that there is no port present in that city. Because of the log-normal nature of the OLS model, it cannot deal well with zero-counts, since the logarithm of zero is undefined. To tackle this problem two regressions with different dependent variables will be run. In the first model the dependent variable in the equation is named 'Ln (City's Port Size)' and it represents the natural logarithm of the variable 'City's Port Size' in which the undefined counts will be treated as missing values and left out of the regression. This means that the model becomes less realistic since in reality APS firms do locate in cities without ports. In the second model these values were kept in by changing the values of the port size from 0 to $1x10^{-19}$. To indicate the difference the dependent variable in the second equation is named 'Ln (Relative Port Size)'. The following equations have been used to test the hypotheses.

$$\begin{aligned}\text{Ln(City's Port Size)} = {} & \beta_0 + \beta_1 \text{ Ln(Age Local Office)} + \beta_2 \text{ Ln(Size Total Company)} \\ & + \beta_3 \text{ Ln(Maritime Specialism)} + \beta_4 \text{ Consultants \& Surveyors} \\ & + \beta_6 \text{ Maritime Organisation} + \beta_7 \text{ Ln(Age Total Company)} \\ & + \beta_8 \text{ Ln(Size Local Office)} + \beta_9 \text{ Belgium} + \beta_{10} \text{ Denmark} \\ & + \beta_{11} \text{ France} + \beta_{12} \text{ Germany} + \beta_{14} \text{ Norway} + \beta_{15} \text{ Sweden} + \beta_{16} \text{ UK} + \varepsilon\end{aligned}$$

$$\begin{aligned}\text{Ln(Relative Port Size)} = {} & \beta_0 + \beta_1 \text{ Ln(Age Local Office)} + \beta_2 \text{ Ln(Size Total Company)} \\ & + \beta_3 \text{ Ln(Maritime Specialism)} + \beta_4 \text{ Consultants \& Surveyors} \\ & + \beta_6 \text{ P\&I, Insurance, Law} + \beta_7 \text{ Ln(Age Total Company)} \\ & + \beta_8 \text{ Ln(Size Local Office)} + \beta_9 \text{ Belgium} + \beta_{10} \text{ Denmark} \\ & + \beta_{11} \text{ France} + \beta_{12} \text{ Germany} + \beta_{14} \text{ Norway} + \beta_{15} \text{ Sweden} + \beta_{16} \text{ UK} + \varepsilon\end{aligned}$$

The assumptions of linear regression have been tested by means of a residual analysis for both regressions. First of all, the normality of the residuals has been tested. When residuals of the dependent variable are normally distributed at every value the assumption of normality is not violated.

A lack of normality may bias the position of the regression slope and create incorrect standard errors. However, usually for large samples with more than 20 values, non-normality does not harm the regression results seriously. The variable Ln(City's Port Size) appears to be normally distributed, but the kurtosis value of the variable of the second model, Ln(Relative Port Size), appears to be a bit too high[12] (see appendix 14). Kurtosis is a measure of the 'peakedness' of the probability distribution, a high valued kurtosis indicates that a large part of the variance is the result of infrequent extreme deviations, as opposed to frequent modestly sized deviations[13]. As mentioned before this will not be a problem in this research, because the size of the sample is large enough and the difference in the value that was measured and that is approved is small. The second assumption of homoskedasticity is tested with the Breusch-Pagan test. In a situation of homoskedasticity the variance of the residuals for every set of values for the independent variable is equal. The complementary notion is called heteroskedasticy, which we don't want in our data because in that case the standard errors are incorrect, even though the parameter estimates are correct. The test shows that in both models signs of heteroskedasticity were detected (see appendix 15). The way to solve this problem is to re-estimate the equation with White (robust) standard errors. This is not possible in the SPSS programme and this is why the statistical programme EViews was used to re-estimate the data. The third assumption of linear regression is linearity, because a linear relationship between the dependent variable and the independent variables is required. All relationships between the dependent and continuous independent variables in both models are linear (see appendix 16).

No autocorrelation is the fourth assumption that needs to be checked. It examines whether the expected correlation between residuals for any two cases is zero. This means that all cases should be independent of one another, knowing the value of one case should not tell anything about the value of other cases. The first model shows minimal signs of autocorrelation, but not enough to be alarmed. In the second model autocorrelation is detected (see appendix 17). The fifth and final assumption of the linear regression is no multicollinearity. Collinearity is the extent to which the independent variables are correlated. Independent variables should not be linear functions of one another, because in that case the stability of the parameter estimates are influenced and thus the standard errors of the parameter estimates too. Some variables in both models show signs of multicollinearity (see appendix 18) and because of this there is an absence of two variables in both equations. The small tolerance value indicates that the variables under consideration are almost a perfect linear combination of the independent variables already in the equation and that it should not be added to the regression equation. In the first model both the variables 'Insurance, P&I and Law' and 'Netherlands' have a tolerance value of zero and thus it is not possible to compute their Variation Inflation Factor (VIF).

[12] I assume that when a variable has a skewness and kurtosis between the -2 and 2 it is approximately normally distributed.

[13] http://en.wikipedia.org/wiki/Kurtosis.

Because of this, I am not able to test hypothesis 4 in Model 1. The same is the case for the variables 'Maritime Organisation' and 'Netherlands' in the second model. In this case it is not possible to test hypothesis 5.

6.2 Regression results

Before examining the coefficients in the models, it is important to look at the quality of the mode and the results are depicted in table 5 (previously we looked at the quality of the data). Firstly, the R-square is the proportion of variance in the city's port size which can be predicted by the independent variables. It shows that the first model explains almost 50 percent of the variance of the city's port size, but when corrected for the number of independent variables and sample size, the model explains only 45.5 percent of the relative size. The F-test examines whether the independent variable reliably predict the dependent variable. The p-value for the F-test for model 1 shows that the group of independent variables has a statistically significant relationship with the city's port size. The second model on the other hand only explains 10.5 percent of the variance of the city's port size and only 3.2 percent when corrected for the number of independent variables and sample size. The most worrying statistic presented in this table is the p-value, which is larger than 0.05 and even larger than 0.10. This means that the group of independent variables in this model does not show a statistically significant relationship with the dependent variable, or that the group of independent variables does not reliably predict the dependent variable. Unfortunately this implies that the second model cannot be used and thus only the outcomes of the linear regression of the first model will be evaluated. The outcomes of the second regression are depicted in appendix 19.

In table 6 the outcomes of the regression of model 1 are presented. It shows that the age of the local office has a positive relation with the city's port size. This finding suggests that, similar to the theory supporting hypothesis 1, the urbanisation economies are more important to local APS offices now than in the past. This is most probably due to the continuous development of the supporting technology of APS and the increase in globalisation of the world economy. Because of this, proximity to large ports becomes less important. As a consequence APS firms will nowadays choose to locate their local head office, near a (financial) business centre in a large city instead of in the proximity of a large port. Unfortunately the outcomes and thus hypothesis 1 appear not to be significant and thus I cannot conclude for certain that urbanisation economies are more important for local APS offices nowadays than they were in the past.

Table 5: Model summary

Statistic	Model 1	Model 2
R-square	.499	.105
Adjusted R-square	.455	.032
S.E. of regression	1.419	13.568
Sum of squares	320.287	31848.07
F	11.326	1.442
Sig. (F)*	.000	0.138

* Statistically significant at the level of .05 (2-tailed)

Table 6: Regression result of Model 1

Variable	Model 1 *N = 174*
(Constant)	6.242***
	(10.206)
Ln (Age Local Office)	.110
	(.812)
Ln (Size Total Company)	.046
	(.640)
Ln (Maritime Specialism)	.026
	(.245)
Consultants, Surveyors	0.273
	(.945)
Maritime Organisation	.078
	(.299)
Ln (Age Total Company)	-.080
	(-.494)
Ln (Size Local Office)	-.166*
	(-1.556)
Belgium	-1.567***
	(-3.704)
Denmark	-2.491***
	(-9.502)
France	-4.437***
	(-5.315)
Germany	-2.185***
	(-6.475)
Norway	-2.688***
	(-5.276)
Sweden	-2.493***
	(-7.767)
UK	-3.587***
	(-13.515)

*** Statistically significant at the level of .01 (1-tailed)
** Statistically significant at the level of .05 (1-tailed)
* Statistically significant at the level of .10 (1-tailed)

Surprisingly the relation of the second explanatory variable, the size of the total company appears to be positive with the dependent variable. This finding is contradictive to my expectation because this outcome suggests that location economies are more important in the location choice of larger APS organisations. The outcome shows that large APS organisations have a higher chance of locating their local head offices in the proximity of large city ports than small APS organisations. This would suggest that the actual head office of large organisations is not the same as the local head office and that the actual head office is located in a foreign country. In this case it is possible that the local office is more specialised than the foreign actual head office of the total organisation and thus is located near large ports. A second possibility is fact that the dummy country variables included in the regression altered the effect. Figure 4 showed that most APS firms are located in Great Britain and the Netherlands come in second place. The absence of 'Netherlands' in the regression could influence the outcome since the largest port of Europe, the Port of Rotterdam, is located in the Netherlands. Though, these possible explanations are not of great importance since the coefficient of the variable and thus hypothesis 2 appears not to be significant. Because of this I cannot conclude and state that the location economies are more important to the local offices of large organisations than of large small organisations.

The third explanatory variable is the maritime specialisation of the local office and table 6 shows that it has a positive relation with the city's port size. It shows that local offices that are more specialised in the maritime industry have a higher chance of being located in a city with a relative large port and consequently find the localisation economies, that the port provides, more important. This outcome is similar to the expectations formulated in hypothesis 6. Again I have to conclude that I cannot state that APS organisations find localisation economies more important than urbanisation economies, because the coefficient does not appear to be significant and consequently I have to state the same about hypothesis 6.

Another explanatory variable which represents a different type of specialisation is 'Consultants, Surveyors'. Contrary to my expectations it appears that this variable has a positive relation with the city's port size. This indicates that organisations that operate as consultancy companies and/or surveyors find localisation economies more important than urbanisation economies, because they have a higher chance of being located in a city with a relative large port than a city with a relative small port. This suggests that among the APS companies which are included in the database and are subdivided in this group, more companies focus on surveying than on consultancy. Probably the surveyors benefit more from localisation economies since they evaluate the value and damage of ships. For example, the knowledge about the evaluation of ships is most likely to be found in ports. Consequently, also the specialised labour pool can be found in large ports from which the advantages of shared labour pooling arise. As explained before, the APS firms that focus on consultancy on the

other hand, usually give advice to several sectors and thus they will locate in a place where they can benefit from urbanisation economies (diversification), which can be found in large cities. Unfortunately I cannot state that this relation is significant and thus I have to conclude that hypothesis 3 also is not significant.

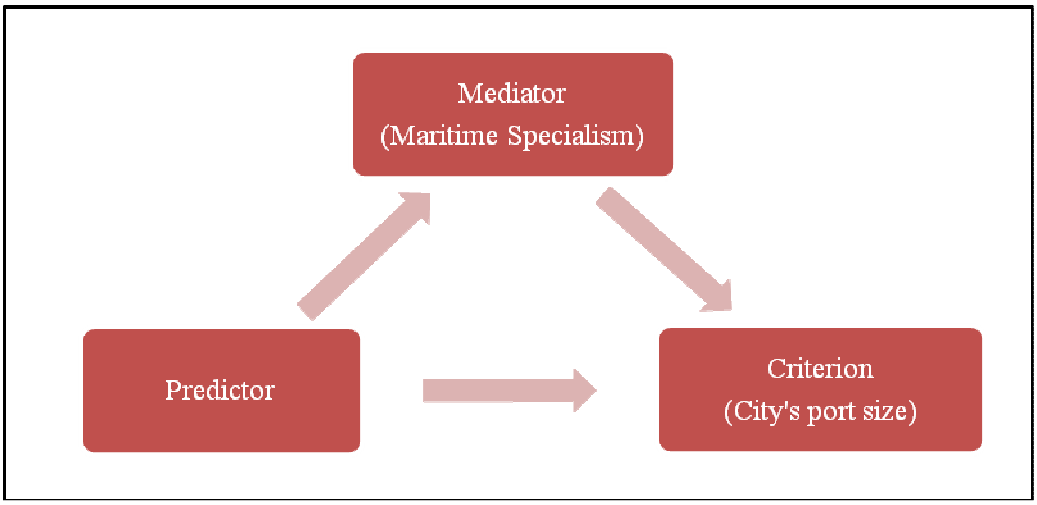
The fifth and final explanatory variable in this model indicates whether the organisation is a maritime association or society. Similar to my expectations table 6 shows that maritime organisations have a positive relation with the city's port size. This outcome suggests that location economies are more important to maritime organisations and consequently there is a larger chance of them being located in cities with relatively large ports. As mentioned before, these associations and societies represent stakeholders in the maritime industry and thus they will locate in the proximity of a large port. For example, the knowledge about the group which they represent is located in the port cluster because these groups operate in ports. Though, the coefficient and thus hypothesis 5 appears not to be significant. Because of this I cannot conclude with certainty that maritime organisations find localisation economies more important than urbanisation economies.

Table 6 shows that the coefficient of the variable 'Ln (Size Local Office)' is significant. As explained before this probably has to do with the character of the local office and how that depends on its size. The chance that a large office is more diversified is greater than a small office. The mentioned benefits from urbanisation economies are more important to large offices than the advantages of the location economies. The table finally shows that the effect of each dummy country variable appears to be significant. Apparently, it was important to include these control variables in the equation. It also seems that all country dummies have a negative relation with the relative port size. This means that when an APS organisation is located in one of the seven countries which were included, it has a higher chance of being located in a city with a relative small port. Unsurprisingly, the coefficient of the relation is the largest with France where most of the APS organisations are located in Paris, in which very little cargo is handled. Unfortunately, the Netherlands are not included in this equation. It would be interesting to see whether this variable would have a positive or negative relation, since Rotterdam has a relative large port.

6.3 Mediation effect

After conducting the linear regressions and examining the results, I suspected the presence of a mediating effect in the analysis created by the variable 'Ln (Specialism)'. The definition of a mediating variable according to Baron and Kenny (1986) is: *'In general, a given variable may be said to function as a mediator to the extent that it accounts for the relation between the predictor and the criterion. Mediators explain how external events take on internal significance. Whereas moderator*

Figure 6: Mediation effect



Source: realized by author based on Baron and Kenny (1986).

variables specify when certain effects will hold, mediators speak to how or why such effects occur'. In it research this means that the predictor variables 'Ln (Age Local Office)', 'Ln (Size Total Company)', 'Consultants, Surveyors' and 'Maritime organisation no longer affect the criterion variable 'Ln (City's Port Size)' at all after the mediator 'Ln (Specialism)' has been controlled, or the influence of the predictor has been reduced in the case when the mediator is controlled (see figure 6). To test for mediating effects the Sobel test is used and it examines whether the indirect effect of the predictor on the criterion via the mediator is significantly different from zero. From the results depicted in table 7, I can conclude that the analysis does not suffer from mediation effects.

Table 7: Sobel Test

	Mediator	**Criterion**	**Sobel test**	**Sig.***
Ln (Age Local Office)	Ln (Specialism)	Ln (City's Port Size)	-.668	.504
Ln (Size Total Company)	Ln (Specialism)	Ln (City's Port Size)	-.842	.400
Consultants, Surveyors	Ln (Specialism)	Ln (City's Port Size)	.914	.360
Maritime Organisation	Ln (Specialism)	Ln (City's Port Size)	.281	.779

* Statistically significant at the level of .05 (2-tailed)

Chapter 7: CONCLUSION

7.1 Conclusion

In a globalising economy clusters become more important, because increasingly the competitive advantage lie in local knowledge and relationships which distant rivals cannot replicate. The research of this thesis focused on maritime advanced producer services, which are a part of the maritime cluster. Over the last couple of decades the tertiary sector grew immensely due to technological progress which enhanced globalisation and consequently business service providers such as the APS organisations started to operate globally. They are generally linked to each other through networks and concentrated in cities. The location choice to start an industry can be random, but when it starts to grow agglomeration economies start to arise. These positive externalities lead to the concentration of both industries in clusters and of aggregate activity in cities. According to Marshall and other economists these agglomeration economies are a result of the presence of scale economies. These economies of scale lead to the sharing of inputs, which in its turn lead to the possibility of specialisation. Contrary to Marshall's notion, Porter states that it is the local competition that changes the way in which companies compete, which leads to an increase in productivity. Agglomeration economies do not arise because of the mere presence of a cluster, but they have several specific sources. There are two main theories that address this issue. The first focuses on the concentration of activity within an industry which lead to specialisation and consequently localisation economies arise. The second theory argues that the aggregated activity of the city create the so called urbanisation economies.

The purpose of this research was to evaluate whether the localisation economies or the urbanisation economies are of greater importance to the maritime APS industry in Northwest Europe. In order to conduct this research I have examined the location choice of these maritime advanced service providers. More specifically, I used the relative size of the port of a city in which the (local) head office of maritime advance service producers is located as a proxy to determine the importance of proximity to the port and thus the maritime industry for APS organisations. The first results of the research show that more than 25 percent of the APS organisations are located in London, which is not only one of the largest cities in Northwest Europe, but it also hosts the largest financial centre in the world. On the other hand we find Rotterdam in second place with more than 10 percent and it has the largest port in Northwest Europe. These statistics are interesting, but do not really show which type of agglomeration economies are more important to APS firms.

The location choice of maritime advanced service producers is also determined by the characteristics of the firm and office, this is why I examined which type of maritime APS organisation benefits more

from location economies and which type benefits more from urbanisation economies. These organisations differ in type and extent of specialisation. First, maritime APS firms can differ in the extent in which their local head office is specialised in the maritime sector. Unsurprisingly, the outcomes of this research show that when a high percentage of employees working in the local office is specialised in the maritime industry, there is a higher chance that the office is located in a city with a relatively large port. Thus the outcomes suggest that when APS firms become more specialised, they find localisation economies more important than urbanisation economies.

Secondly, APS firms also operate in different industries. The APS firms in the database were subdivided into three groups: 1) Consultants and Surveyors, 2) P&I, Insurance and Law and 3) Maritime Organisation. Unfortunately, the second group appeared to show signs of multicollinearity and had to be excluded from the equation used in the linear regression. Contrary to the expectations, consultancy and survey firms appeared to find localisation economies more important since there is a higher chance that their local office is located in a city with a relatively large port. Consultancy companies usually work in different sectors at the same time and have a separate department dealing with cases of the maritime cluster and thus I expected that there was a higher chance that their local office would be located in a large city (with a small port), to profit from the urbanisation economies that arise from diversification. On the other hand, the market which the surveyors serve is located in the port and thus it is logical for them to local their office in the proximity of a large port so that they can profit from the localisation economies that arise from the specialisation possibilities in the maritime cluster. Therefore I suspect that the majority of maritime APS firms that are subdivided in this group are surveyors. The results also show that maritime organisations find localisation economies more important, because there is a higher chance that the local head office is located in a city with a relatively large port. This is not very surprising because these associations and societies represent stakeholders from the maritime industry and thus they will locate in the proximity of a relatively large port, where they can benefit from the localisation economies that arise from specialisation possibilities in the maritime cluster.

Other firm characteristics that could explain the location choice of a maritime APS organisation are its age and size. More specifically, I examined the age of the local head office and the size of the total organisation. Similar to the expectations, the outcomes of the research show that when local offices are older, maritime advanced service producers find localisation economies more important because there is a higher chance that their local head office is located in a city with a relatively large port. Because of the continuous development of the supporting technology of APS and globalisation of the world economy, proximity to large ports becomes less of a necessity. Because of this, nowadays APS firms will choose to locate their local head office, near a (financial) business centre in a large city

instead of in the proximity of a large port to benefit from urbanisation economies, as compared to offices that were established many years ago.
The outcomes on the size show that large APS organisations find localisation economies more important than urbanisation economies. This contradicts with the initial expectations, because there is a preference for large APS firms, being more diversified, to locate in large cities. This might be explained by the fact that this applies to the main head office, which must be located in a foreign country, but not to the local (head) office. The local head office is more specialised than the foreign head office of the total organisation and consequently the local office would want to locate near large ports in order to profit from the localisation economies.

The outcomes of this research suggest that the maritime advanced service producers find localisation economies more important if their local head office is more specialised and older and also when the total organisation is a consultancy and/or survey organisation, or a maritime organisation and/or relatively large in terms of the number of employees. Unfortunately, none of the explanatory variables appeared to be significant and thus I have to conclude that the conclusions from this research are not conclusive.

7.2 Recommendations future research

The absence of significance in the research may be the result the shortcomings of this research. Future research could check the robustness of the conclusions by conducting a similar research, with an elaborated dataset. Regarding the sample size I have to mention that more than 200 maritime APS organisations were included in the dataset, but in reality over 2,000 maritime APS firms operate in cities in Northwest Europe. Secondly, some of the variables chosen may not reflect the characteristic of the city and the local office accurately. The dependent variable shows the relative size of the city's port, but does not illustrate the absolute size of the city or port on its own. For example, when the relative size of a port is small it could that the APS is located in either a large city with a medium size port or an average sized city with a small port and the same is true for relatively large port sizes. In the future an alternative measurement might give a better picture of the characteristics of the city and port in which the APS are concentrated. Similar it is fair to say that the size and age of a local office do not directly determine the characteristic of the office.

It is possible that the variables used in this research do not affect the location choice of APS firms, because the wrong measurements have been chosen. In future research alternative measures could be chosen. For instance, one could try to use the yearly turnover of a firm to illustrate its size, although it is important to remember that many maritime organisations are non-profit organisations. It might also be interesting to see whether the market share of organisations have an influence on the location

choice. An alternative approach would be to include a different set of variables. For example, APS firms often operate in networks and thus it might be a good idea to include the network size of a advanced service provider in the research and as mentioned earlier, human capital is the most important asset of APS firms and so one could evaluate whether the type of labour employed in these organisations (high and low skilled) has an influences on location choice of maritime advanced producer service organisations.

REFERENCES

Ades, A.F. and Glaeser, E.L. (1995) 'Trade and Circuses: Explaining Urban Giants', *The Quarterly Journal of Economics*, Vol. 110, No. 1, pp. 195-227.

Baron, R.M. and Kenny, D.A. (1986) 'The moderator–mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations', *Journal of Personality and Social Psychology*, Vol. 51, No. 6, pp. 1173-1182.

Bennett, P. (2001) 'Mutual risk: P&I insurance clubs and maritime safety and environmental performance', *Marine Policy*, 25 (1), 13–21.

Boschma, R.A. (2005) 'Proximity and Innovation: A critical Assessment', *Regional Studies*, Vol. 39, No. 1, pp. 61-74.

Bresnahan, T., Gamardella, A. and Saxenian, A.L. (2001) ''Old Economy' Inputs for 'New Economy' Outcomes: Cluster Formation in the New Silicon Valleys', *Industrial and Corporate Change,* Vol. 10, no. 4, pp. 835-860.

Carlino, G.A. (1987) 'Productivity in Cities: Does City Size Matter?', *Federal Reserve Bank of Phildadelphia Business Review*, Vol. November/December, pp. 3-12.

Combes, P.P. (2000) 'Economic structure and local growth: France, 1984-1993', *Journal if Urban Economics*, Vol. 47, pp. 329-355.

Combes, P.P. and Overman, H.G. (2003) 'The Spatial Distribution of Economic Activity in the European Union', *CEPR Discussion Paper,* 3999 (forthcoming in V. Henderson and J-F. Thisse (eds.) *The Handbook of Regional and Urban Economics,* Vol. IV*,* North Holland).

Davidson, A. (2000) 'Into the valley', *Management Today*, Haymarket Publishing Ltd, p. 72.

Davis, D.R. and Weinstein, D.E. (1996) 'Does Economic Geography Matter for International Specialisation?', NBER working paper no. 5706.

Davis, D.R. and Weinstein, D.E. (1999) 'Economic geography and regional production structure: An empirical investigation', *European Economic Review,* Vol. 43, pp. 379-407.

Dicken, P., Kelly, P.F., Olds, K. and Yeung, H. W-C (2001) 'Chains and networks, territories and scales: towards a relational framework for analysing the global economy', *Global Networks*, Vol. 1, No. 2, pp. 89–112.

Dumais, G., Ellison, G. and Glaeser, E.L. (1997) 'Geographic concentration as a dynamic process', NBER Working Paper no. 6270, November. Cambridge, MA.

Dunning, J. and Norman, G. (1987) 'The Location Choice of Offices of International Companies', *Environmental Planning A*, Vol. 19, pp. 613-631.

Duranton, G. and Puga, D. (2004) 'Microfoundations of Urban Agglomeration Economies', in Henderson, J.V. and Thisse, J., *Handbook of Regional and Urban Economic*s.

Ellison, G. and Glaeser, D. (1997) 'Geographic Concentration in U.S. Manufacturing Industries: A Dartboard Approach', *Journal of Political Economy*, Vol. 105, pp. 889-927.

Glaeser, E. Kolko, J. and Saiz, A. (2001) 'Consumer City', *Journal of Economic Geography*, Vol. 1, pp. 27-50.

Glaerser, E.L., Kalla, H.D., Scheinkman, J.A. and Shleifer, A. (1992) 'Growth in Cities', *Journal of Political Economy*, Vol. 100, pp. 1126-1152.

Harhoff, D (1999) 'Firm formation and regional spillovers', *Scandinacian Journal of Economics*, Vol. 94, pp. 29-47.

Henderson, J.V. (2003) 'Marshall's Scale Economies', *Journal of Urban Economics*, Vol. 53, pp. 1-28.

Henderson, J.V. (1997) ' Externalities and Industrial Development', *Journal of Urban Economics*, Vol. 42, pp. 449-470.

Henderson, J.V., Kuncoro, A. and Turner, M. (1995) 'Industrial Development in Cities', *Journal of Political Economy,* Vol. 103, pp.1067-1085.

Jacobs, J. (1969) *The Economy of Cities*, Vintage, New York.

Jacobs, W. Ducruet, C. and Langen, P.W. de (2009) 'Integrating World Cities into Production Networks: The Case of Port-cities'.

Langen, P.W. de (2002) 'Clustering and performance: the case of maritime clustering in The Netherlands', *Maritime Policy & Management,* Vol. 29, No. 3, pp. 209-221.

Markusen, A. (1996) 'Sticky Places in Slippery Places: A Typology of industrial Districs', *Economic Geography*, Vol. 72, No. 3, pp. 293-313.

Marshall, A. (1920) *Principles of Economics,* MacMillan, London.

O'Brien, Robert M. 2007. "A Caution Regarding Rules of Thumb for Variance Inflation Factors," *Quality and Quantity* 41(5)673-690).

Porter, M.E. (1998) 'Clusters and The New Economics of Competition', *Harvard Business Review*, Vo. 76, No. 6, pp. 77-90.

Rosenthal, S.S. and Strange, W.C. (2004) 'Evidence on the Nature and Resources of Agglomeration Economies', in Henderson, J.V. and Thisse, J., *Handbook of Regional and Urban Economic*s, pp. 2119-2171.

Rosenthal, S.S. and Strange, W.C. (2003) 'Geography, Industrial Organisation, and Agglomeration', *Review of Economics and Statistics*, Vol. 85, No. 2, pp. 377-393.

Sassen, S. (1991) *The Global City*. Princeton , NJ: Princeton University Press.

Thedoropopoulos, S. (2006) 'Cluster formation and the case of maritime cluster, Paper Presented at the International Conference "Shipping in the era of Social Responsibility", University of Piraeus, Argostoli, Cephalonia, Greece.

APPENDICES

Appendix 1: Type of APS

	Frequency	Percent
Consultant & Surveyors	67	33.2
P&I, Insurance, Law	68	33.2
Maritime Organisation	67	33.7

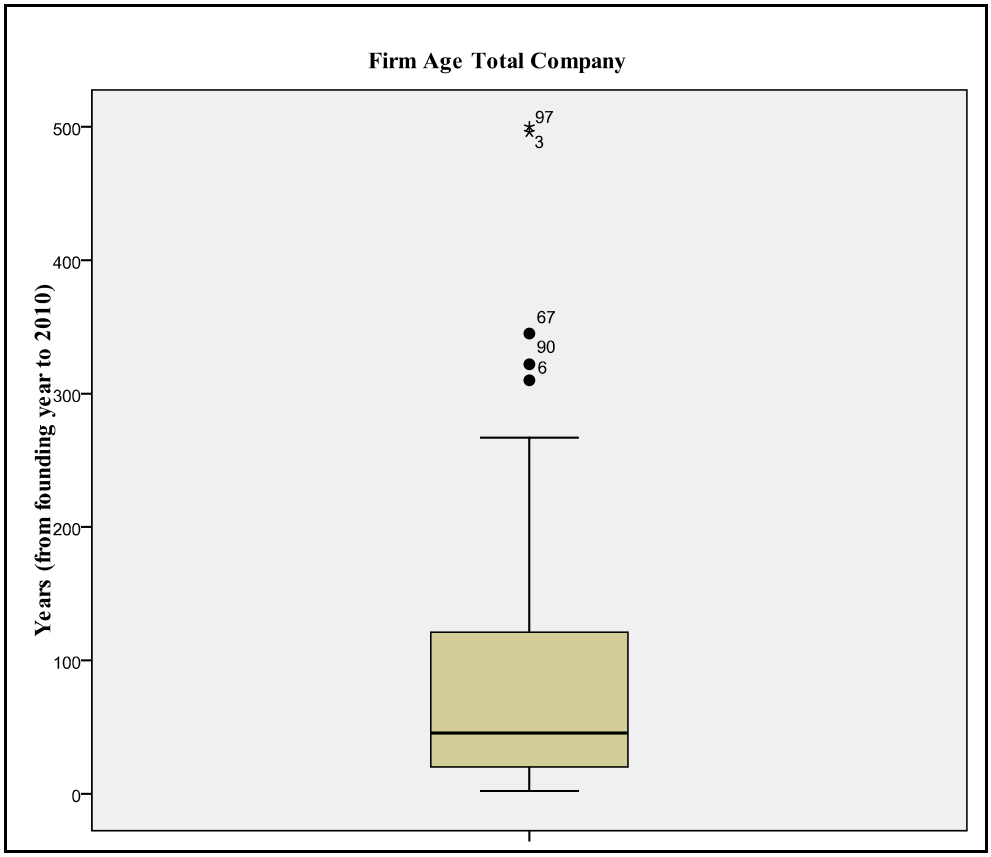
Appendix 2: Pearson's chi-sqeare test

Variable	Chi-Square	df	Asymp. Sig.*
Maritime Specialism	4160.713[a]	61	.000

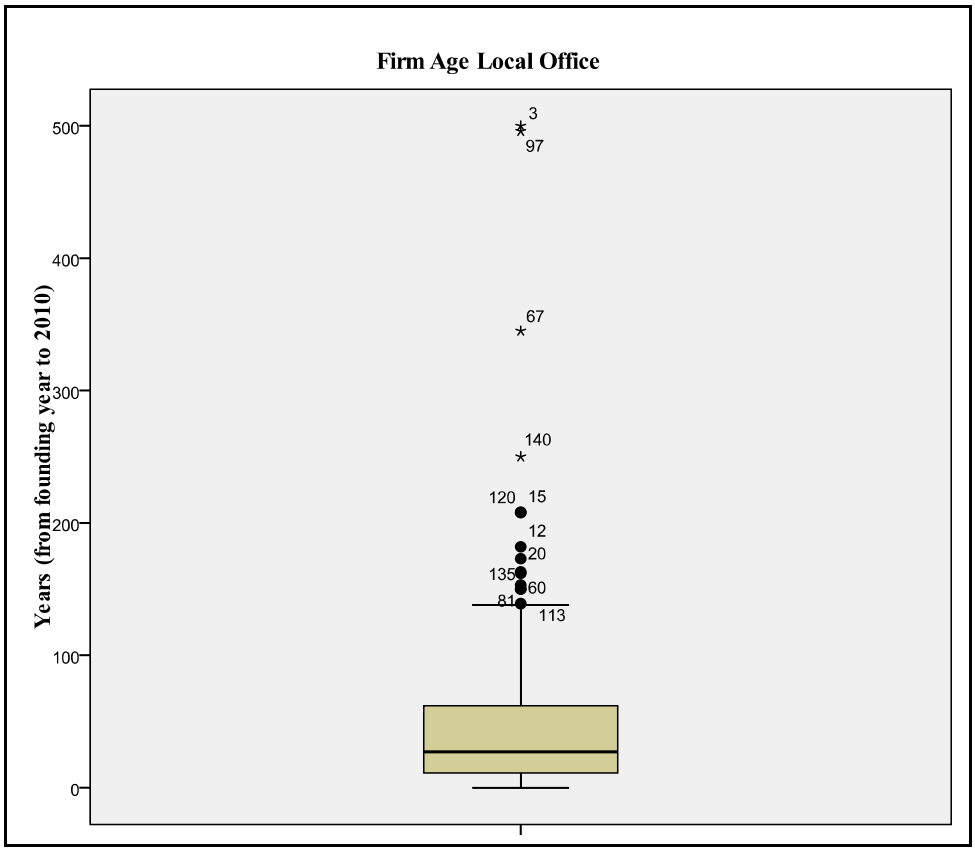
a. 62 cells (100,0%) have expected frequencies less than 5. The minimum expected cell frequency is 3,3

* Statistically significant at the level of .05 (2-tailed)

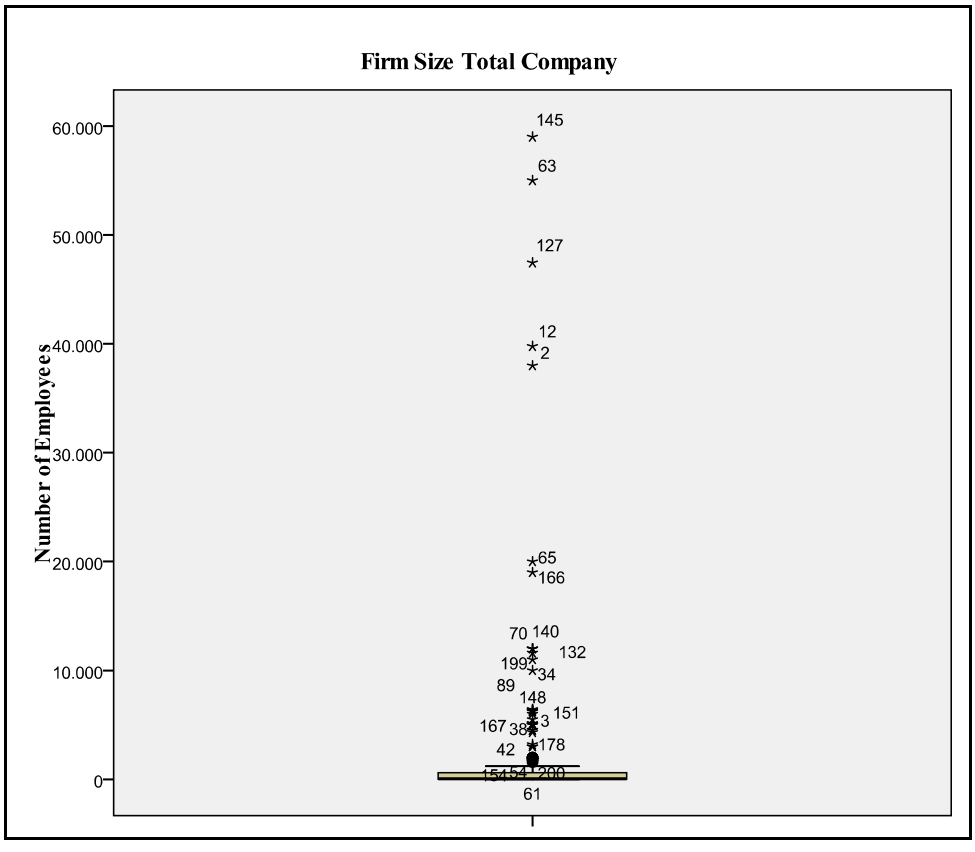
Appendix 3: Boxplot of the age of the organisation



Appendix 4: Boxplot of the age of the local office



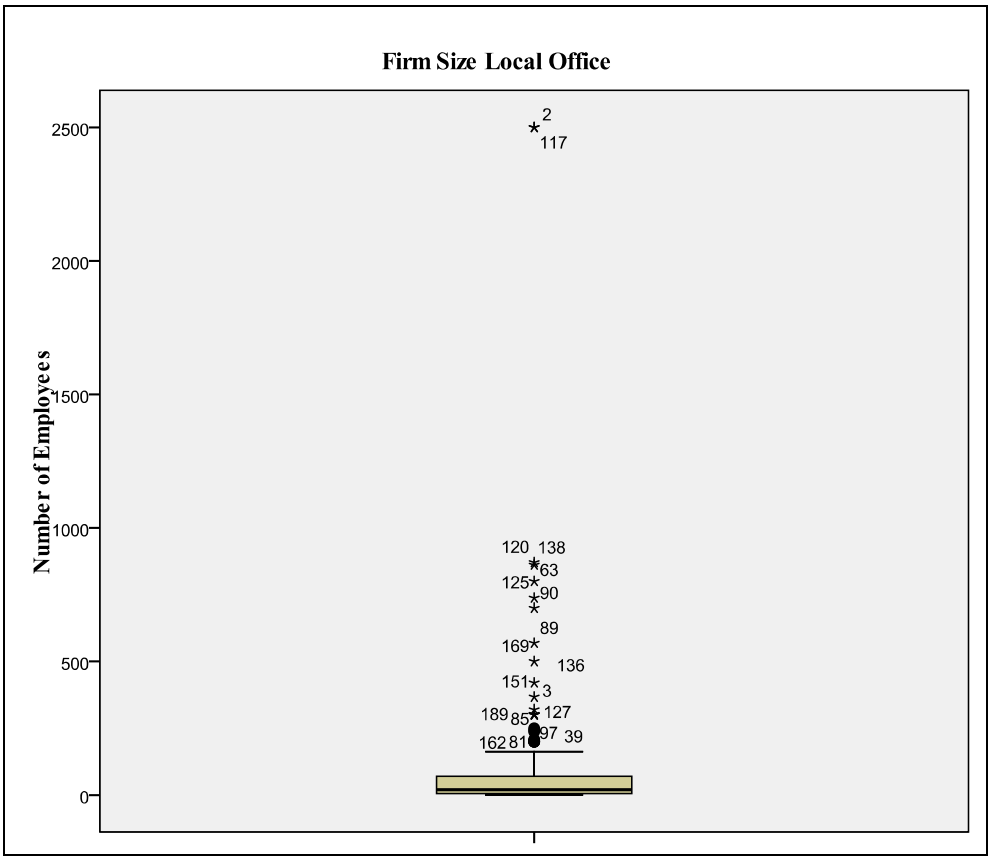
Appendix 5: Boxplox of the size of the total organisation



Appendix 6: Size difference

	Frequency	Percent
No difference	102	50.5
Difference	100	49.5

Appendix 7: Boxplot of the firm size of the local office



Appendix 8: Specialisation within local offices

	Frequency	Percent
No specialisation	14	6.9
Specialisation	188	93.1

Appendix 9: One-Sample Kolmogorov-Smirnov Test

Variable	Normal Parameter: Mean	Kolmogorov-Smirnov Z	Asymp. Sig. (2-tailed)*
N = 202			
Ln (Age Local Office)[14]	3.39	.600	.865
Ln (Size Total Company)	4.33	1.779	.004
Ln (Age Total Company)	3.90	1.185	.120
Ln(Size Local Office)	3.09	.842	.478

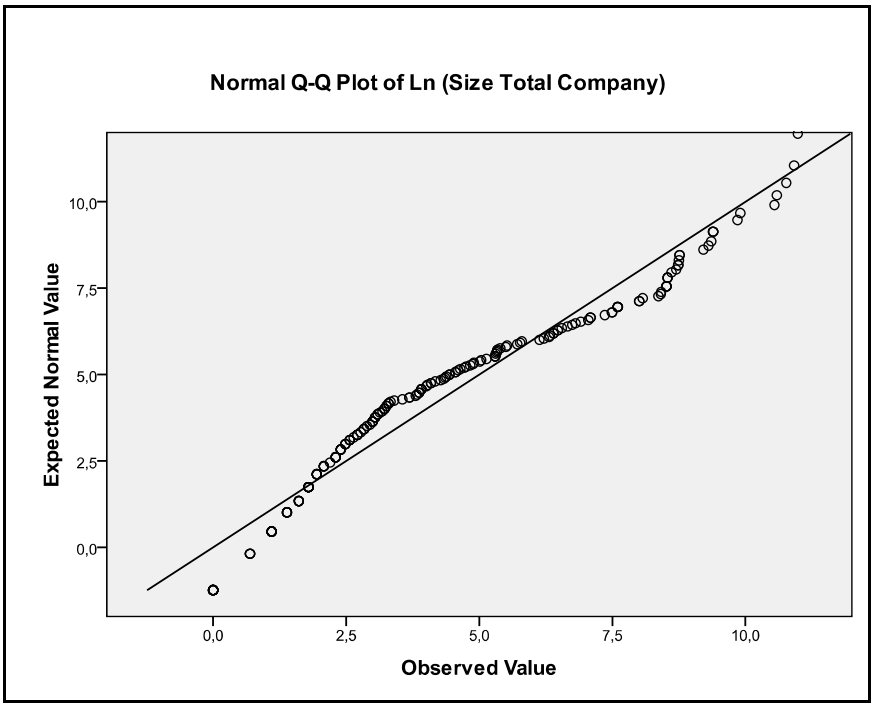
* Statistically significant at the level of .05 (2-tailed)

[14] N = 198.

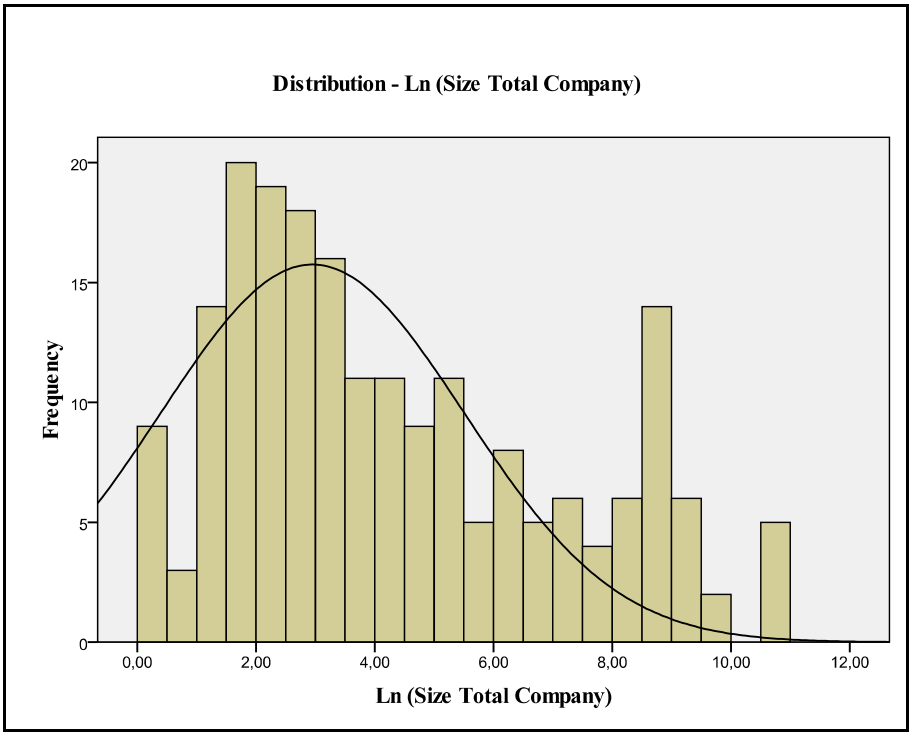
Appendix 10: Skewness and Kurtosis of total company size

Variable	Statistic	Value
Ln(Size Total Company)	Mean	4.33
	Skewness	.570
N = 202	Kurtosis	-.068

Appendix 11 Q-Q Plot of the natural log of firms size of the total company



Appendix 12: Distribution of the natural log of firms size of the total company



Appendix 13: Pearson's Chi-Square Test

Variable	Chi-Square	df	Asymp. Sig.*
Consultants & Surveyors	22.891[a]	1	.000
P&I, Insurance, Law	22.891[a]	1	.000
Maritime Organisation	21.564[a]	1	.000
Belgium	146.455[a]	1	.000
Denmark	167.604[a]	1	.000
France	146.455[a]	1	.000
Germany	126.733[a]	1	.000
Netherlands	88.891[a]	1	.000
Norway	153.347[a]	1	.000
Sweden	149.881[a]	1	.000
UK	7.921[a]	1	.000

a. 0 cells (,0%) have expected frequencies less than 5.
The minimum expected cell frequency is 101,0.
* Statistically significant at the level of .05 (2-tailed)

Appendix 14: Normality dependent variable

Variable	N	Mean	Skewness	Kurtosis
Ln (City's Port Size)	188	3.54	-.139	.879
Ln (Relative Port Size)	202	-.69	-3.299	9.287

Appendix 15: Breusch-Pagan Test

Statistic	Model 1	Model 2
F-statistic	3.077	2.020
	(.000)	(.019)
Obs*R-squared	37.096	26.414
	(.001)	(.023)
Scaled explained SS	65.250	91.803
	(.000)	(.000)

Appendix 16A: Linearity Test Model 1

Variable	F	Sig.*
Ln (City's Port Size) * Ln (Age Local Office)	2.00	.160
Ln (City's Port Size) * Ln (Size Total Company)	2.19	.143
Ln (City's Port Size) * Ln(Maritime Specialism)	.86	.355
Ln (City's Port Size) * Ln (Age Total Company)	.03	.869
Ln (City's Port Size) * Ln (Size Local Office)	3.29	.072

* Statistically significant at the level of .05 (2-tailed)

Appendix 16B: Linearity Test Model 2

Variable	F	Sig.*
Ln (Relative Port Size) * Ln (Age Local Office)	1.03	.313
Ln (Relative Port Size) * Ln (Size Total Company)	.15	.701
Ln (Relative Port Size) * Ln(Maritime Specialism)	3.84	.052
Ln (Relative Port Size) * Ln (Age Total Company)	.01	.914
Ln (Relative Port Size) * Ln (Size Local Office)	.08	.783

* Statistically significant at the level of .05 (2-tailed)

Appendix 17: Durbin-Watson Test

Model	Durbin-Watson[15]
1	1.444
2	1.831

Appendix 18: Collinearity Statistics

	Model 1[a]		Model 2[b]	
Variable	Tolerance	VIF[16]	Tolerance	VIF[16]
(Constant)				
Ln (Age Local Office)	.344	2.909	.378	2.648
Ln (Size Total Company)	.290	3.453	.318	3.143
Ln(Maritime Specialism)	.661	1.513	.696	1.437
Consultants,Surveyors	.656	1.525	.694	1.441
Insurance, P&I, Law	.000	-	.689	1.451
Maritime Organisation	.657	1.522	.000	-
Ln (Age Total Company)	.329	3.044	.350	2.853
Ln (Size Local Office)	.272	3.678	.298	3.360
Belgium	.674	1.485	.690	1.449
Denmark	.795	1.258	.812	1.231
France	.644	1.552	.677	1.478
Germany	.604	1.655	.659	1.518
Netherlands	.000	-	.000	-
Norway	.750	1.334	.742	1.347
Sweden	.684	1.461	.718	1.392
UK	.439	2.278	.469	2.132

a. Dependent Variable: Ln (City's Port Size)

b. Dependent Variable: Ln (Relative Port Size)

[15] Absence of autocorrelation if statistic are between 1.5 and 2.5. Situation becomes alarming when statistics are below 1.

[16] Multicollinarity when statistic are below .20 or above 5.

Appendix 19: Regression result of Model 2

Variable	Model 2 *N = 188*
(Constant)	-10.112
	(-1.167)
Ln (Age Local Office)	-1.814
	(-1.248)
Ln (Size Total Company)	-.582
	(-.708)
Ln(Maritime Specialism)	1.980*
	(1.433)
Consultants,Surveyors	-4,217*
	(-1.390)
P&I, Insurance, Law	1.166
	(.492)
Ln (Age Total Company)	1.372
	(.854)
Ln (Size Local Office)	1.090
	(.858)
Belgium	3.805
	(.818)
Denmark	-3.620
	(-.435)
France	3.955
	(1.039)
Germany	8.587**
	(2.253)
Norway	-2.621
	(-.389)
Sweden	6.679**
	(1.954)
UK	3.305
	(.245)

*** Statistically significant at the level of .01 (1-tailed)
** Statistically significant at the level of .05 (1-tailed)
* Statistically significant at the level of .10 (1-tailed)

