

Criteria for Container Port Choice: Focus on the Mediterranean

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IN A COMPETITIVE PORT ENVIRONMENT, ports act as interfaces between different transport modes. Therefore, it is important to determine the key factors that guide freight forwarders in choosing a specific port. This paper aims to identify those factors and criteria influencing their decision in choosing a port, detailing the elements that influence the choice between Mediterranean ports and the northern range ones. A detailed literature review reveals a considerable range of factors affecting the decision of port choice. This theoretical step is complemented by a survey method applied to the Mediterranean port of Genoa and compared to the northern port of Antwerp that are strategic nodes for the traffic flows toward Central Europe. The data collected were analysed using the Factor Analysis method. This research shows that the main elements affecting port choice can be grouped into four broad factors: port connectivity, electronic information, cost and port productivity, and logistics and administration of the container. It is discussed how these factors are evaluated from the freight forwarders' perspective.

INTRODUCTION

Globalisation and increased competition are two of the main forces currently shaping the development of the port sector. The novelty in this global economy is the degree of interdependence between actors and the possibility to choose worldwide the inputs, intermediate or finished products and services. This leads to increased competition in every step of the logistics chain. There is, therefore, an international decomposition of productive processes and a global delocalization of manufacturing. As markets became global, so did transport chains, and concepts such as integrated logistics and supply chain management emerged. These trends in manufacturing and logistics require more transport and more often, i. e. transport intensive.

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Ports act as interfaces between different actors, such as road, rail, inland waterway, maritime transport and logistics operators. In a competitive port environment it is important to determine the key factors that guide the users in choosing a specific port. The knowledge of these factors can help a port in improving its market share and growth. Efficiency gains, which are generated within the container port, will have a direct impact on the competitive advantage of its users and affect the economic potential of both origin and destination hinterlands.

The purpose of this paper is to identify what are the main factors and criteria influencing the freight forwarders' decision in choosing a port. The attention will be focused on the selection between Mediterranean ports and north European ports. When analyzing these factors it is relevant to bear in mind that the choices of the economic actors are based upon different elements. Such elements are related not only with the technical characteristics of the port, but with hinterland and logistic services offered. The topic of the current paper is a well-known problem, which has not been properly tackled by port authorities nor by transport operators.

The strong competition between northern and southern European ports is explained by the constant effort to the steal market share from the competitor. Currently most of the traffic going to the centre of Europe is shipped through the northern ports. The Mediterranean ports are facing a complex situation, not being able to attract enough volume to allow for real competition.

From an European transport policy, there is a willingness to improve connectivity between different transport modes and along key transport corridors. An example is the European rail corridor 24, connecting the port of Rotterdam to the port of Genoa; this action is seen as one of the most urgent measures for promoting a more sustainable modal split of the freight transport within the European Union.

In this paper two European ports have been selected as a case study: the port of Genoa in Italy and the port of Antwerp in Belgium. The two ports are different in terms of morphological development, traffic volume and business activities, but nevertheless linked by their important role in the European maritime context and by their function as gateways to central Europe.



Antwerp and Genoa are representative of the Northern Europe Hamburg–Le Havre range and the Mediterranean range, respectively. The reason for not selecting the biggest transshipment ports, such as Rotterdam and Gioia Tauro, is due to the fact that they do not compete on their hinterland; while Genoa and Antwerp could be competitors in central Europe. [141]

The choice of the port of Genoa was mainly due to its relevance in the Mediterranean maritime scenario. Genoa is one of the main ports in southern Europe and, given its favourable position in the north of the Mediterranean, constitutes a strategic node for freight flows towards central Europe (Bacelli, Ravasio, and Sparacino 2007). In 2008 Genoa was the 7th largest port in the Mediterranean range and the 15th biggest in Europe in throughput. It handled 1767 million TEU and was the 2nd Italian port after the transshipment port of Gioia Tauro (www.ci-online.co.uk).

The port faces some challenges to its future growth. On the one hand, the location of the port poses a problem to hinterland connections, as the city of Genoa is surrounded by the Apennines Mountains and effective rail and road connections to the prosperous northern Italy and central Europe are still missing. On the other hand, the lack of available space for the port's expansion is a major issue that constrains its development.

According to Midoro, Ferrari, and Parola (2007), the potential for growth in port throughput is directly correlated to the improvements in port infrastructure for logistics activities, accessibility to the port area, administrative procedures and port operations efficiency.

The port of Antwerp, it is the 2nd largest in Europe for overall traffic with 189 million tonnes handled in 2010 (www.ci-online.co.uk). Antwerp's central location in north west Europe allows for excellent accessibility to the major European industrial centres and a large potential consumer base; Antwerp lies on the river Scheldt, and as a port it is dependent on the river. In order to ensure navigability and cater for new developments in shipping there are plans to deepen the navigation channel. Some of the elements that prevent the port of Antwerp from becoming a market leader are related to its accessibility despite a transport network of around 270 km of roads, 1000 km of railway lines and 300 km of pipelines (Huybrechts et al., 2002).

In the last two decades there has been an increased rate of containerization in the Mediterranean ports. This trend is expected to lower the unit transport cost and help to reduce the margin between the cost of trade between Northern Europe and Mediterranean countries.

[142]

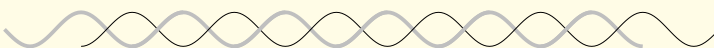
The choice of interviewing freight forwarders allowed the authors to obtain a broad and clear idea of the current situation of the ports, as these operators have a wide perspective of the transport and logistic chain.

To meet this paper's purpose a methodology based on qualitative analysis has been developed. First, a detailed review of the literature on port choice reveals a considerable range of factors affecting the decision in choosing a port. Second, based on the literature review, a set of elements was considered and a 5 – point Likert scale questionnaire was elaborated (refer to annex 1). Third, the questionnaire was submitted to a sample of 46 companies, with a positive response from 39 freight forwarders, currently operating in the ports of Genoa and Antwerp. The interviewed were asked to rank each of the elements on a scale from 1 (not relevant) to 5 (very relevant). The data collected were analysed using a Factor Analysis (FA) method.

Some of the relevant elements that can influence the companies in the decision making process of choosing a port are: availability of efficient equipment, access to the hinterland of the port through rail and road connections, freight charges for the service, operational performance of the port, transit time, port service reliability, logistics facilities, efficient customs procedures, availability of added value services and presence of electronic data tools (Morchio 2003).

The results of the FA show that in the case of Genoa and Antwerp the factors affecting the choice of the port can be distinguished in four factors: (1) connectivity of the port, (2) electronic information, (3) cost and port productivity and (4) logistics and administration of the container. The findings of our mathematical approach lead us to confirm what has been argued in the literature review, and also in the general understanding of the operators dealing with port problems on a daily base.

The remainder of the paper is organised as follows: in the next sec-



tion a description is given of the methodology used. In section three, a detailed review is presented on the existing literature on factors influencing port choice. Section four presents the questionnaire design and responses, while section five handles the descriptive and statistical analysis, the FA and the results. The final section draws some conclusions and comments on future research. [143]

METHODOLOGY

The methodology used in this research is based on qualitative analysis and consists of four steps that build on the previous one:

- 1 Review of the literature on the existing academic research on the topic of port choice and outline the major findings;
- 2 Development of a questionnaire using the information from the previous step. We opted for a 5 – point Likert scale questionnaire, ranging from 1 (not relevant) to 5 (very relevant). Submission of the questionnaire to a sample of freight forwarding companies operating in the ports of Genoa and Antwerp. The interviewed were asked to rank each of elements.
- 3 Analysis of the data collected through this survey using the FA method.
- 4 Validation of the findings of these case studies against previous academic research.

As mentioned above, the analysis of the relevant criteria for the port choice has been done using an FA approach. FA is a multivariate statistic data reduction technique that aims to explain the common variance in a number of variables within a single variable called factor. The main purpose of FA is to generate groups of correlated elements taken from the initial data set, and through this process it is possible to capture latent or not clearly observed dimensions (Stevens 1986). In other words, if two variables show a strong correlation with the same factor, some of the correlation between the two variables is explained by their common factor (Dillon and Goldstein 1984).

This method allows for the substitution of the original variables with a lower number of factors, not naturally interdependent, obtained with a linear transformation of the original ones. Following this pro-

cess it is possible to reduce the number of variables that explain and describe a phenomenon (Kim and Mueller 1978).

LITERATURE REVIEW ON PORT CHOICE

[144] Several studies (Slack 1985; D'Este and Meyrick 1992; Dalenberg, Daley, and Murphy 1988; 1989; 1991; 1992a; 1992b; Daley and Murphy 1994; Lirn et al. 2004; Song and Yeo 2004) rely on surveys of port users to get information on factors influencing port choice. Slack (1985) established that the number of voyages and the inland freight rates were most important factor concerning port choice. Relevant port characteristics included the connection to inland transport services and availability of container facilities. The author concluded that 'the choice of port depended more on the price and quality of service offered by land and ocean carriers than on the attributes of ports themselves.'

D'Este and Meyric (1992) conclude that in most cases the port is just another factor that the shipper evaluates in the selection of a carrier. The authors suggested that as carriers increased their scale of operations and shippers began soliciting prices for door-to-door service rather than individual segments, the port selection shifted from the shipper to the carrier. With the deregulation of the maritime industry, rates were no longer so closely related to distance. Carriers could offer less-direct routes that were cost-efficient for the shippers as well as themselves. As shippers adjusted to the deregulated environment, carriers began to select the route for shipments. In selecting the route, carriers would consider the shippers' interests to capture their business. The authors concluded that in the selection of a port, decision makers seem to value service characteristics more highly than price characteristics.

Considerable research has been done on factors used by various parties in their selection of international maritime ports, namely: the viewpoints of worldwide maritime ports, water carriers (Dalenberg, Daley, and Murphy 1989), US based international shippers (Dalenberg, Daley, and Murphy 1991; 1992b), international freight forwarders (Dalenberg, Daley, and Murphy 1992a), and purchasing managers (Daley and Murphy 1994). The authors gather the perspectives of the various parties, since they represent different interests and roles in global



logistics. These studies have discovered numerous differences between shippers and carriers, but mainly between ports and the other players. Yet, analysis of the relative importance of the selection factors shows a high degree of similarity between shippers and carriers.

In order to analyse liners transshipment port selection, Lirn et al. (2004) applied the Analytical Hierarchy Process (AHP) method to 47 selected relevant service attributes established from a literature review. The authors then conducted two rounds of Delphi surveys involving experts in industry and academia. This process allowed for categorizing these attributes into four main service criteria: physical and technical infrastructure, geographical location, management and administration and terminal cost. These are further subdivided into 12 sub-categories. [145]

The results of the AHP analysis targeting 20 carriers and 20 port operators show that both container carriers and port service providers have a similar perception about the most important service attributes, for port selection; however, the weights among the sub-criteria reveal some differences between the two survey groups. Through the AHP survey the authors revealed that the five services attributes such as handling cost, proximity to main navigation routes, proximity to import/export areas, infrastructure condition, and feeder network are the most important service attributes of transshipment ports.

Song and Yeo (2004) aimed at identifying the factors contributing to the overall competitiveness of Chinese main ports. Their focus is on elements concerning geographical location as well as logistics and operational services provided by the ports. A survey was conducted on a sample of 180 professionals including ship-owners, shipping company executives, shippers, terminal operators and academics and researchers. This resulted in a list of 73 factors for port competitiveness. Then at a second step, the opinions of 70 specialists narrowed this list down to the five most important criteria for the port competitiveness, namely cargo volume, port facility, port location, service level and port expenses.

Similarly to Lirn et al. (2004), an AHP method was used to evaluate the priorities among the identified factors, concluding that the location factor plays the most significant role for a port's competitiveness. The

authors argue that port facilities and services can be improved upon, whereas geographical location and cargo volume are considered to be taken for granted.

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An alternative approach to researching the factors influencing port choice is to base the analysis on the observed port decisions. Examples in the literature of statistical analysis of a targeted set of shipments are Malchow and Kanafani (2001; 2004), and Tiwari, Itoh, and Doi (2003). Both these studies gather data on import shipment choices for a given point in time, select commodities and then estimate a multinomial logit model to identify the effect of certain factors on the port choice.

To explain the selection of a port for four types of cargo exported from the US, Malchow and Kanafani (2001) used a multinomial logit model. The authors' intention was to test the significance of distance (ocean and inland), frequency of sailings, and average size of vessels sailing along a route. They conclude that ocean distance and inland distance have a significant influence on export port selection, but sailing frequency and vessel capacity are not considered as important criteria.

In 2004, Malchow and Kanafani applied once again a discrete choice model to the assignment of shipments to vessels/ports. The purpose was to evaluate competition among US export ports. The authors assumed that shippers' preference for a port is established by choosing a carrier providing a service through that port. Findings reveal that geographic location, port characteristics and characteristics of vessel schedules are critical port selection factors, with port location being the most significant of the three factors.

Tiwari, Itoh, and Doi (2003) use data obtained from a survey of shippers of containerised cargo in China in 1998 to model the port choice behaviour of shippers using a discrete choice model. The authors conclude that the most important factors are the distance of the shipper from port, distance to destination (in case of exports), distance from origin (in case of imports), port congestion, and shipping line's fleet size. The authors also analyse the elasticities of changes in these variables and their impact on the market share of shipping line-port combinations.

Blonigen and Wilson (2006) examine port choices of US import



shipments for the period 1991–2003 using a model of bilateral trades. This model was developed to capture factors such as locations of the traders, total transportation costs on the links and nodes that connect the traders, including the ocean rate, the port costs, and the internal transportation rate. In a following step, the impacts of each of these factors on the ocean port choices made by shippers for imports into the USA are tested. The study findings stress that distance and transport prices are very significant factors with quite elastic responses by shipments. It is interesting to note that unlike in previous studies, the authors conclude that the efficiency of an individual port has a significant role in determining its share of activity.

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Based on the literature review, a set of elements was considered and a 5 – point Likert scale questionnaire was elaborated and submitted to a sample of freight forwarding companies currently operating in the ports of Genoa and Antwerp. The next section explains the survey conducted and used in this research.

SURVEY

The survey was conducted through a structured questionnaire that was submitted to freight forwarding companies in the ports of Genoa and Antwerp. The contacts were taken from the Genoese Freight Forwarder Association and from the Belfirst data base. For the purpose of our research we decided to contact the largest companies which have a more significant market share. Thus, the sample selection was done according to the level of annual sales, number of employees and to the type of ownership, as indications of the dimension of the company.

The field work was comprised of two phases: a telephone contact followed by a face-to-face interview. A first contact with the Genoese companies was taken through telephone interviews, in March and April 2008. During this first step the purpose of the research was explained and a check was made on availability for a face-to-face interview to be conducted in May 2008. For the interviews in Antwerp, the telephone contacts were taken in September 2008 and the face-to-face interviews took place in October and November 2008.

In the first phase a sample of 46 companies were contacted. Out of the 46, 41 declared their availability for participating in the study.

TABLE I Schematic summary of literature review on port choice

Author(s)	Scope	Research Findings
Slack (1985)	Survey of port end users and freight forwarders engaged in trans-Atlantic container trade between the US mid-West and Europe to identify port selection criteria.	Most important elements in the selection of a port are: number of voyages, inland freight rate, port's connection to inland transport services, availability of container facilities
D'Este and Meyrick (1992)	Study the potential determinant factors of port choice. A survey of companies purchasing shipping services in overnight RO/RO ferry trade was conducted.	Determinants of port choice may be quantitative: route factors, cost factors and service factors, and qualitative: flexibility and ease of use, port's marketing efforts, tradition, personal contacts and level of cooperation that may be developed between the shipper and the port.
Dalenberg, Daley and Murphy (1988)	Identify and explain port selection factors from the viewpoint of worldwide water ports (1988); water carriers (1989), US-based international shippers (1991; 1992b), international freight forwarders (1992a), and purchasing managers (1994).	A survey was conducted on those five different groups using the following factors: large and/or odd-sized freight, large volume shipments, handling charge, loss and damage, equipment availability, pickup and delivery, shipment information, claims handling, and special handling.
Lirn et al. (2004)	Analysis of liners transshipment port selection using the AHP method.	The survey revealed that the five most important service attributes of transshipment ports are: handling cost, proximity to main navigation routes, proximity to import/export areas, infrastructure condition, and feeder network

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However, during the second phase of the field work two other companies declared their unwillingness to take part. The final sample of forwarders was composed of 39 operators, which means an 85% response rate. The face-to-face interviews took place at the freight forwarders' offices. The vast majority of the offices have the same location, in the port area of the two cities, along or very close to the port access.



[148]

TABLE 1 *Continued from the previous page*

Author(s)	Scope	Research Findings
Song and Yeo (2004)	Identify factors contributing to competitiveness of Chinese main ports.	The five most important criteria for the port competitiveness are: cargo volume, port facility, port location, service level and port expenses
Malchow and Kani-fani (2001)	Explain the selection of a port for four types of cargo exported from the US using a multinomial logit model.	Tests the significance of: distance (ocean and inland), frequency of sailings and average size of vessels sailing along a route. The study shows that ocean distance and inland distance have significant influences on export port selection. Frequency of sailings and vessel capacity are not considered as important criteria.
Malchow and Kani-fani (2004)	Evaluate the competition among US export ports by applying once again a discrete choice model to the assignment of shipments to vessels/ports.	The critical port selection factors are: geographic location, port characteristics and characteristics of vessel.
Tiwari, Itoh, and Doi (2003)	Analysis of port and shipping line selection criteria using a discrete choice model where each shipper faces a choice of 14 alternatives based on shipping line and port combinations.	The empirical results indicated that these elements are important: distance of the shipper from port, distance to destination (in case of exports), distance from origin (in case of imports), port congestion, and shipping line's fleet size.
Blonigen and Wilson (2006)	Analysis of port choices of all US import shipments from 1991–2003 using a model of bilateral trades.	Concluded that: distance and transport prices are very significant factors and the efficiency of an individual port has a significant role in determining its share of activity.

[149]

It is relevant to stress that the interviewees were general managers and chairpersons of the companies. This allowed us the possibility of gathering more accurate and precise information.

During the interviews, the respondents were asked to fill in the

[150]

questionnaire in annex with the support of the interviewer. The questionnaire was mainly divided into two parts: the first part concerns some general information about the company, while in the second part the interviewed were asked to express their opinion on 35 variables, i. e. elements potentially affecting port choice; and rank them on a 5 – point Likert scale, from 1 that stands for ‘not relevant’ to 5 ‘very relevant.’

The data collected through this survey were analysed using the FA method. FA has shown to be a useful approach when investigating port competitiveness among ports and choice criteria affecting port users (Haezendonck 2001; Gardner, Lalwani, and Mangan 2002).

In this paper a correlations matrix was performed and the FA was conducted in exploratory form. The FA was conducted through an iterated principal component analysis, and the first iteration, considering just the factors with an eigenvalue greater than one, produced a result of 9 factors.

Considering the high number of factors obtained from the first step, it was decided to proceed with the identification of a more appropriate number of factors. To identify factors, the total variance explained and the screen plot were considered. In the screen plot the shape of the curve was analysed; a shape fall in the eigenvalues curve often suggests that the factors on the upper side of the fall curve are the ones that should be maintained.

In the FA, a Varimax (orthogonal) rotation was performed and the SPSS software was used to process the data.

ANALYSIS OF THE RESULTS

An important clarification, related to the number of variables and the total observations of the survey needs to be pointed out. The companies interviewed were 39, and the initial numbers of variables were 35, later reduced to 30 as explained below. It is possible to argue that the number of observations is too small when compared to the number of variables, and this aspect has to be considered when analysing the final results of the FA.

The reduction from 35 to 30 variables was also due to the low relevance of some of them; the process of selection of the relevant variables



was conducted by looking at the ‘component score coefficient matrix’ and excluding the ones that scored very low in all the four factors.

The companies in the sample are located in a specific area of the cities of Genoa and Antwerp, close to the container terminals. Due to historical and economical reasons, the forwarding activity is traditionally located very close to port facilities; in fact, for the case of Genoa, the managerial offices are located within 1 km of the SECH container terminal and within 15 km of the Voltri container terminal. The average distance of the offices from the port of Antwerp is 5 km; in this case it is important to notice that the port is developed over several channels and along the river Scheldt.

[151]

The distance between the port and the offices is an important criterion for choosing a port. Nevertheless, in the case of the selected ports, this element may not be considered of great influence, since the location of the managerial offices is almost equal for all the operators.

A descriptive statistic approach shows that the average number of employees of the freight forwarders in the sample is 58, and the average annual sales was 27.8 million Euro in 2007. Another indicator of the company dimension is related to the legal type of ownership and in our sample 64% of the forwarders are ‘public limited company’, 33.3% ‘limited liability company’ and just 2.5%, i. e. one company is a ‘commercial partnership.’

In the questionnaire it was asked who takes the decision of choosing a port: the forwarder, the sender or the consignor of the good. The results show that for 62% of the companies the forwarder is the operator who chooses the port, 15% of the companies declared that the sender or consignor selected the port with the forwarder, 13% declared that the sender chooses the port, and four companies did not answer this question.

The data collected through the freight forwarders’ interviews show

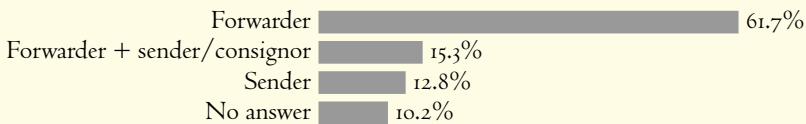


FIGURE 1 Who decides which port to call?

TABLE 2 Explained variance of the factors

Component	Initial Eigenvalues		
	Total	% of variance	Cumulative %
1	9.452	31.505	31.505
2	3.111	10.371	41.876
3	2.730	9.101	50.977
4	2.080	6.177	57.911

[152]

the relevance of 30 variables that can potentially affect the port choice; the results were analysed using the FA method. After performing the FA, the results led us to have four factors affecting the choice of selecting a port.

- 1 Connectivity of the port;
- 2 Electronic information;
- 3 Cost and port productivity
- 4 Logistics and administration of the container.

These four factors explain 57.91% of the total variance, while the first factor alone accounts for 31.5% of the total variance, as can be seen in table 2.

It can be observed that the first factor constitutes the most important criterion that the freight forwarders consider when choosing a port. This result appears clear when looking at the screen plot, since the first factor is considerably above one in the eigenvalue scale (figure 2). There is a clear distinction between factor 1 and all the other components.

Table 3 clearly shows the weighed relevance of each of the variables in the detected factors.

The first factor named ‘connectivity of the port’ comprises several variables related to customs procedures and characteristics, such as customs hours (0.712), customs efficiency (0.711) and also customs procedures. This element is particularly relevant for the freight forwarders since it is related to the legal procedures the goods have to follow for entering and exit the port. Another variable strictly related to the connections that the port has with the several stakeholders is handling facilities, and this variable scored also very high (0.639).



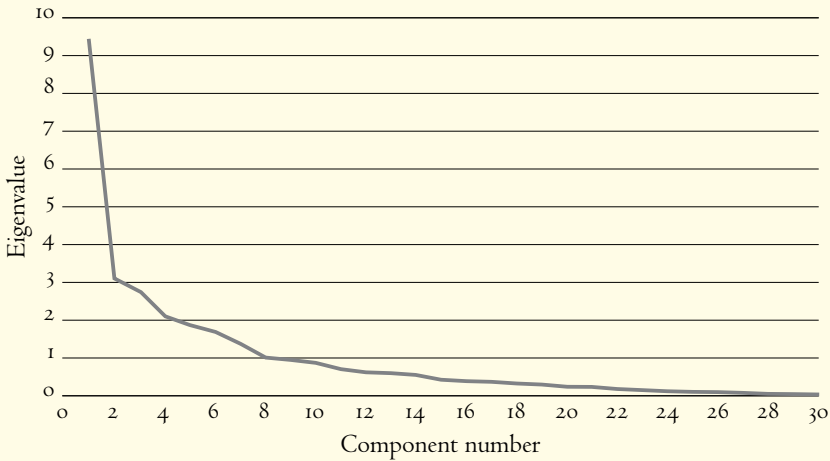


FIGURE 2 Scree plot

In relation to the port connectivity, it is important to underline one aspect that emerged from the responses of the Genoese interviewees, i. e. the lack of efficiency in the procedures and the numerous operations that need to be carried out. By contrast, it appeared that the same operations in the North of Europe are faster and less complicated.

The relevance that forwarders give to hinterland connections is represented by the variables related to the road/train connections and costs. The rail component, connections (0.672) and costs (0.656), score more than road connections (0.530) and road costs (0.321); also the generic variable hinterland connections is present in factor 1. Road, rail and hinterland connections constitute the physical connections that the port requires.

Although this second factor is important in both, in reality a major difference exists between the two ports. While Antwerp is connected to the hinterland via road, rail and inland navigation, Genoa can use just the first two, for obvious reasons. In this respect, the problem is not just related to the lack of inland waterways, but also to the scarce efficiency of the rail services, which means that most of the cargo is arriving at or leaving the port by trucks.

Other variables related to the connections of the ports are the presence of forwarders in the port and the frequency of the maritime service; both of these variables score lower in factor 1.

TABLE 3 Rotated component matrix

Item	Component			
	1	2	3	4
Customs hours	.712	.363	.225	
Customs efficiency	.711	.457	.121	
Rail connections	.672			.198
Rail cost	.656	.116	.118	.128
Handling facilities	.639		.360	
Customs procedures	.606	.404	-.123	.346
Hinterland connections	.550		.483	-.238
Road connections	.530	-.266	.161	
Forwarders' presence	.509		.135	-.413
Frequency of maritime service	.325	.229		.291
Road cost	.321	.288	.219	-.214
Track/trace	-.132	.835	.144	
E-commerce		.791		.118
Electronic information		.772	.184	
Added value service	.209	.736	.239	
Electronic customs procedures	.554	.623		.314
Total time of container in port	.200	.510	.230	.166
Transit time	.210	.365		

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[154]

It is relevant to focus the attention on the first four variables of factor 1, two of which are related to customs activities and the others related to the rail connections of the port. These elements constitute, according to this analysis, the most important ones to be considered when choosing a port.

Factor 2 corresponds to 'electronic information', so named since the vast majority of the variables included in this factor are related to information technologies and exchange of information. The variable that scores the highest correlation with the factor is the possibility of tracking and tracing the goods (0.835), followed by the relevance of e-commerce (0.791) and availability of electronic information devices (0.772). The other variables included in factor 2 are, in order of relevance, added value services, electronic customs procedures, total time

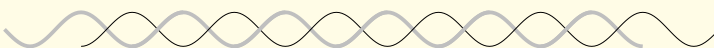


TABLE 3 *Continued from the previous page*

Item	Component			
	1	2	3	4
Terminal productivity	.169	.301	.825	.183
Strikes		.215	.738	.277
Terminal competition	.347	.113	.695	.216
Port charge		.356	.668	
Working port hours	.533		.640	
Working relation with port workers	.111		.629	
Maritime companies competition	.423	.148	.552	.341
Availability of empty container at inland port		.112	.328	.808
Availability of empty container at port			.344	.806
Location taking/delivering container	.312	-.284	.138	.595
Fill/clear out procedures	.409	.430	.221	.565
Booking documentation reliability		.393		.560

[155]

of the container in the port and transit time, those last two variables being directly related to the availability of electronic procedures that allow a faster operation.

The third factor titled 'cost and port productivity' comprises seven variables that are related to the port itself and the activities and services offered. The first variable is exactly related to the terminal productivity (0.825), followed by the possibility of having strikes at the port and terminal competition. The variable 'port charges' is the one related to the cost of the port (0.668).

All the other variables are strictly related to the activities and characteristics of the port, as is the number of working hours in the port which – together with the presence of maritime companies – has a strong correlation with factor 1. The variable 'working relation with port workers' has an impact on the productivity and the performance of the entire port system.

The fourth factor is identified as 'logistics and administration of the container', and the three variables correlated with the logistics of the container are: availability of the container in the inland port (0.808), availability of the container at the port (0.806) and location for taking and delivery of the container (0.595). The remaining two

variables are more related to the administrative procedures that the container has to follow, such as the procedures of fill and clear out and the booking and documentations.

[156] Summarising, using the FA it was possible to identify four factors that shed light on the elements that influence forwarders when choosing a port for their operations. These four factors, in order of importance, are:

- 1 Connectivity of the port;
- 2 Electronic information;
- 3 Cost and port productivity;
- 4 Logistics and administration of the container.

As has been already observed, these four factors explain 57.91% of the total variance, while the first factor alone accounts for 31.50 % of the total variance. It can be observed that the first two factors, connectivity of the port and electronic information, explaining 41.87% of the total variance, constitute the most important criteria that the freight forwarders stated to consider when choosing a port.

What has been concluded in this paper follows the finding of the previous literature dealing with this topic. As Lirn et al. (2003) remark, the location of the port is crucial in choosing a port, as well as the administrative and management aspects; two elements that appear also from factor 1 of our FA. Our results were also in line with the study by Song and Yeo 2004, where they stress the importance of port location, service level and port expenses.

CONCLUSIONS

A review of the literature on port choice revealed that considerable research has been conducted on this topic. Several studies rely on surveys of port users to get information on factors influencing port choice (Slack 1985; D'Este and Meyrick 1992; Dalenberg, Daley, and Murphy 1988; 1989; 1991; 1992a; 1992b; Daley and Murphy 1994; Lirn et al. 2004; Song and Yeo 2004). It is also common to use AHP to prioritize survey responses in a determined way by giving weights to various factors (Lirn et al. 2004; Song and Yeo 2004).

An alternative approach to researching the factors influencing port



choice is to base the analysis on the observed port decisions (Malchow and Kanafani 2001; 2004; Tiwari, Itoh, and Doi 2003). These studies gather data on import shipment choices for a given point in time, select commodities and then estimate a multinomial logit model to identify the effect of certain factors on the port choice.

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In early studies a number of factors such as geographical location, port characteristics and port fees are identified as relevant.

A case study with 39 forwarders operating in the ports of Genoa and Antwerp was performed. The respondents were asked to evaluate the relevance of several variables on a Likert scale and the data were processed through an FA method. The results of the FA lead to the conclusion that the main factors affecting the forwarders port choice behaviour are four: connectivity of the port (factor 1), electronic information (factor 2), cost and port productivity (factor 3) and logistics and administration of the containers (factor 4).

The outcome of this statistical approach leads us to confirm what was already argued in the literature review and allows us to underpin analytically what can be learned from the experience and empirical knowledge of the forwarders.

As previously mentioned, the main problems of the port of Genoa are related to its location, port (in)efficiency and to the time spent in the operational procedures due to bureaucratic and administrative reasons, while for Antwerp the critical aspects are mainly related to the port accessibility. The competition between the northern and Mediterranean ports seems to be played also on the hinterland side of the port. In this context Genoa has to improve its hinterland connections and optimise their efficiency. This aspect can be considered also in terms of missing infrastructure and links, therefore the European interventions could be a substantial help in promoting the role of the Genoese port. The other crucial aspect is mainly related to bureaucratic reasons and chiefly to customs procedures. Also in this case the problem could be seen as a local issue, although the general national customs system seems to lack behind compared to what is happening in North Europe.

These elements seem to be, at the same time, the main criteria that the forwarders consider. Therefore, the growth and future devel-

opment of the ports of Genoa and Antwerp depends on proactively solving these issues.

[158] Whilst we understand that restricting this analysis to two ports does not allow us to generalise results, we would like to propose further research on this topic that could be developed, in the future, in three different areas, namely:

Enlarge the type of companies in the sample to include other port users, such as terminal operators and shipping lines. This would enable us to understand whether the identified factors for port choice are perceived to be the same or if there are other factors to be considered. Additionally, it would also be interesting to confront the results stated by freight forwarders with the perception of port operators.

Systematise this research to other ports in the Hamburg–Le Havre and Mediterranean range to understand if the decision factors identified above are common to the ports in these two areas or if factors are specific the ports of Antwerp and Genoa.

Thirdly, it would be interesting to understand how these factors would change if different types of ports were to be considered such as, for instance, a pure transshipment or regional port.

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