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## **Analysis and assessment of port/shipping choice criteria in the ro-ro sector: a case study on the Italy-Greece axis**

### **Abstract**

European and national policies stress the need of increasing the competitiveness of Short-Sea Shipping (SSS) so as to avoid the negative effects of an all-road transport system. In the paper, a best practice of SSS is examined, having reference to the ro-ro traffic along the Adriatic Corridor on the Italy-Greece axis. The goal is that of identifying and evaluating the main port choice criteria by key actors of the logistics chain so as to come up with a general choice model of ports. First, a quite comprehensive literature review is performed. Among other things, literature highlights how port choice criteria (and their relative weights) vary depending on the specific context (logistics chain) and on time. This implies that a generalized and unique choice model does not exist while the need to consider specific case-studies is necessary. Then, by using a methodology mainly based on primary data – i.e. in-depth interviews and questionnaires to a sample of key actors – the decision-making process of logistics operators is analysed and the results from responses are discussed and presented by means of a process-oriented model. It shows, partly according to the literature and partly in contrast with it, a hierarchical structure of choices (shipping company first/port second) in which it is highlighted the relevant role of choice factors related to the quality of service and to logistics needs of deliveries (supply chain context). Likewise, the model emphasizes the predominant role of 'human' aspects (attitudes, perceptions, experience, tradition, etc.) of decision-makers. Factors related to economic convenience (total and partial costs, etc.) definitely seem to play a minor role.

**Key words:** port choice criteria; ro-ro traffic; decision-making process

### **1. Introduction**

The aim of this paper is to study the decision-making process involving port-shipping choices in the ro-ro sector. On the basis of a best practice, i.e. the ro-ro traffic along the Adriatic Corridor on the Italy-Greece axis, we firstly aims at understanding and identifying the various maritime and port choice criteria and their relative importance so as to assess the competitiveness of the Italian ports in the Adriatic Corridor. Specifically, we refer the analysis to the North-Adriatic ports. Then, we try to model

the decision-making process.

The need to investigate port choice criteria and to modelling the decision process in the ro-ro sector through specific case-studies derives from a variety of reasons, both of political and scientific type. From a general and political point of view:

- the development of concrete initiatives of short-sea shipping services is a primary goal either at European and national level, above all for sustainability issues;
- the axis we examine is one of the main (international) maritime traffic corridors along the Adriatic existing today, hence it represents a real ‘success story’ of the ro-ro transport;
- furthermore, this maritime axis provides a case of ‘non mandatory’ short-sea shipping services (as opposed to mandatory services such as those connected isles to the mainland, for which maritime transport faces no competition). It consists in really ‘alternative’ short-sea shipping services with respect to land-based alternatives<sup>1</sup>. As such, it is of high importance for the assessment of competitiveness of maritime services in a specific context.

From a scientific standpoint – here we anticipate some of the results that will be discussed later on – the scientific literature highlights how port choices in the ro-ro sector do not allow us to build a single generalized decision-making process, rather it is demonstrated that choices vary over time, among different markets and depending on the type of decision-maker Mangan *et al* [1] [2]. It strictly stems from this the need of deepening our knowledge on the basis of a number of case-studies.

The paper is organized as follows: first, we present a quite comprehensive survey on the main decision variables and models of port choice criteria in the ro-ro sector. Then, we introduce and develop our case-study (port choice criteria in the ro-ro sector in the Adriatic). Specifically, we present the general framework of the case study, the employed methodology and main results. A comparison with the literature results is carried out.

## **2. Literature review**

### **2.1 The decision variables of port-shipping choices in the ro-ro sector**

The literature we examine is concerned with the issue of choice criteria in the port-shipping sector, specifically in the ro-ro one. We note that – even if the issue refers to the general topic of mode choice – the focus on the ro-ro sector is somehow neglected

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<sup>1</sup> The services we consider compete both with the land-based Adriatic corridor along the Italian Peninsula and – since recently after the Balkan war – with the historical land-based alternatives through the Balkans, even though the latter is still problematic due to the political situation in the area.

but it has increased of importance over time, mainly in recent studies.

In the next section we present and discuss the main contributions presented so far and the most important approaches employed for modelling the decision-making process.

Murphy and Hall [3] conducted a survey of main studies in the '70 and '80. They present the following rank of decision variables (in descending order of importance): reliability, costs (tariffs), transit time, characteristics of carriers, market considerations made by the shipper, safety of cargo. It should be underlined how the need of proceeding with further researches in this field is stressed. More recently, Mangan *et al.* [2] highlight that 'new variables are emerging from studies of transport choice in the 1990s, such as the ability of carriers to cope with emergency situations, the negotiation of tariffs, the negotiation of the overall service, the willingness to improve the service.

A ro-ro-specific study related to the 1990s is that of D'Este and Meyrick [4]. They distinguish between 'quantitative' choice factors (ie, frequency of service, costs, etc), which can be measured and compared, and 'qualitative' ones (tradition, marketing, etc.), which are more subjective in the choice process. It is stressed the need of considering the impact of both type of factors on choice process in order to be able to identify those that are crucial for the specific market or transport segment analysed. The authors also point out that while the issues of mode choice and carrier selection with regard to land-based transport are quite well developed, on the contrary studies regarding the factors influencing and determining the choices in the ro-ro sector are scarce. Thus, they present a case-study in which the structure of the decision-making process is analysed by highlighting factors determining choices and their relative weights. Three broad categories of quantitative factors are identified:

- factors related to route (frequency, transit time, capacity, number of calls);
- factors related to costs (freight rates, insurance, etc.);
- service factors (reliability and delays, risk of damages and losses, ability to manage emergencies, documents and ability of tracing, etc.).

Factors of mainly 'qualitative' type are added to the list, such as: flexibility, tradition, personal contacts, cooperation between shipper and carrier. The authors point out that the level of 'perceived' performance of shipper does not always coincide with the actual one, and this fact impacts on the distinction between quantitative and qualitative factors. In some cases related to land-based transport [5] it was found that the perceived delay of deliveries was much higher than the real one and that the difference between perceived delay and actual one was much higher in the railway sector than in the road one.

The case-study of D'Este and Meyrick [4] is specifically concerned with port-maritime services in the Bass Strait. The maritime market of the Bass Strait consists in the commercial traffic between Melbourne and the ports on the northern coast of Tasmania. The Bass Strait is 200 nautical miles large and shipping transit time (port time included) is around 14 hours. It is a minor market nevertheless it is a very competi-

tive one, in which operators can choose among four different shipping lines. Services offered by shipping lines are similar, in that they use ro-ro ships carrying containers and trailers and sailing overnight.

In 1989 a two-stage survey was carried out on some 40 companies regularly buying shipping services and representing about 90% of market. The first stage consisted in sending a questionnaire to company executives responsible for buying shipping services (shipping managers). Questionnaires asked for information related both to maritime activities of the firm (statistical data) and to preferences, perceptions and attitudes of shipping managers (stated preferences). Emphasis was given to the classification (rating) of choice factor importance. About 2-3 weeks were left to respondents to fulfill the questionnaires. Afterwards, respondents were visited personally for a follow-up interview. The follow-up interviews were needed in order to clarify some questions, submit further ones and discuss about the general situation of the market. In particular, the usefulness of the follow-up interview was that of a better understanding of the – sometime emerging – gap between ‘stated’ choices and actual ones.

Overall, the two-stage procedure allowed a fine-tuning understanding of the decision-making process and of the main trade-off among choice factors. Authors recommended it to be used for further researches.

As for the specific contents of the research, it was asked to shipping manager to rate the following factors on the basis of a scale ranging from ‘irrelevant’ through ‘not important’, ‘slightly important’, ‘moderately important’ and ‘very important’ to ‘vital’:

- long terms commitment of carrier in the specific market;
- willingness of carrier to enter long-term contract;
- technical characteristics of ships;
- reputation of carrier for damage to cargo;
- ability of carrier to provide door-to-door services;
- service frequency;
- willingness of carrier to negotiate flexible contracts that provide for variable circumstances;
- freight rate;
- reputation of carrier for punctuality;
- transit time;
- marketing activities of carrier;
- fast response to problems.

At the end, responses identified the following main factors:

- frequency;
- punctuality;
- transit time;
- freight rate;
- fast responses to problems.

It seems to us that the first three factors can be seen together as the need of ship-

per to benefit of a carrier service which is fast and reliable. If we group these three factors the following final classification of factors (in descending order of importance) is obtained:

1. fast and reliable service;
2. freight rate;
3. fast responses to problems;
4. safety of cargo;
5. long term commitment in the market;
6. availability of additional cargo space if necessary.

We argue – on top of suggestions given by the authors – that factors 3. and 6. reflect a need of ‘flexibility’ of service by the shipper with respect to carrier performance, while factor 4. (and 5., also) can possibly be included in factor 1. (‘reliability’).

The authors underline that the predominance of factors relating to ‘service’ is not surprising and it was already found in other studies. In fact, there has been over time a shift in the relative importance from that of factors related to ‘economic convenience’ to factors concerned with the quality of the services. One of the explanations refers to the changes in the pattern of transported goods, given that cargo flows of high value is predominant today. Already in Brooks [6] it was found that shippers have a sort of lexicographic preference structure, in which cost factors are used to compare carriers that are similar in terms of service quality or to re-negotiate the service with the same carrier over time. In the study of D’Este and Meyrick [4] it was found that some 90% of shippers had a maximum price that they were willing to pay and as long as the actual price stays below this threshold the characteristics of service come first in the decision-making process. Also, some 90% of respondents stated that they considered a minimum price for which they were not willing to compromise, in the sense that a reduction of price could not be compensated by a reduction in the quality of service. Indeed, 75% of respondents was willing to pay a higher price in order to be assured about the maximum punctuality of service and the safety of cargo transported.

On the other hand, factors related to promotional activities (indeed, this factor was not indicated by any respondent), willingness of carrier to negotiate long term and flexible contracts, ability of providing door-to-door services and finally technical characteristics of ships are found to be of far lesser importance.

Given the fact the ports have clearly a strong role in the overall door-to-door services, it was asked to shipper managers to assess their influence in the decision-making process by considering a number of port attributes, such as:

- proximity of port to the point of production/delivery;
- port costs;
- reputation of port for strike record;
- cargo facilities;
- traditional links with the shipping line;
- promotional activities;

- speed of port operations;
- port accessibility (rail, etc.).

85% of respondents stated that ports are indeed a relevant element in the decision-making process, therefore it was asked respondents to assess the relative importance of factors in a way similar to that used for maritime service – ie, using a scale from ‘irrelevant’ to ‘vital’. Results showed that the most important factors were the proximity to production/delivery points (port location), speed of port operations, strike record and the availability of special cargo facilities. On the contrary, factors such as promotional activities, port costs and historical/traditional links seems to be of lesser importance.

Maritime and port services are factors that both interact in the choice of vector, sometime in an ambiguous way<sup>2</sup>. In the study it was then asked to shipping managers to show what kind of ‘decision-making process’ are used between the following:

- port first: it is first decide the port to use and subsequently the maritime carrier is selected among those calling that port;
- carrier first: it is first decided the shipping line to use and then a port is selected among those that are called by the shipping company.

Results showed that ports are just one of the various elements of the choice process, suggesting that most shippers are not ‘linked’ with one or few particular ports. Rather, they balance the various maritime and port factors so as to come up with a final selection of carriers.

As follow-up interviews showed, there was a number of subjective aspects of the decision process that must be definitely highlighted:

- shipping managers tend to adopt a conservative approach to decisions: they hardly accept risky options that are potentially profitable, on the contrary they tend to accept only calculated risks and doing so only occasionally (they are definitely risk-averse);
- personal contacts and experience of the manager in the specific sector play a major role in the decision-making process. In particular, only a small proportion of respondents showed that they were rationally conscious of the decision-making process they used in selecting carriers and ports. Many of them stated that they used intuitive tools based on perceptions, and that they had difficulties in explaining the decision-making process from a rational point of view. About 2/3 of respondents did not have a formal evaluation procedure of different alternatives, let alone collecting statistical data. Overall it was demonstrated that the most part of decision processes was based on personal aspects and perceptions rather than on actual performance and data. It should

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<sup>2</sup> In fact the authors ask themselves: port first or shipping company first? We should underline – as we will discuss later on – that this interaction between port and maritime services is of high importance in the understanding of the structure of the overall decision-making process.

also be pointed out that such a conclusion did not seem to surprise shipping managers, indeed they often stated that decisions were taken rapidly with the information on hand, that personal contacts were of importance and that they are driven by personal experience rather than by a formal procedure of evaluation;

- the previous point is also related to the quite low importance assigned to promotional activities carried out by carriers and port operators: personal relationships count much more, and one could then suggest public and private bodies concerned with port activity development to commit themselves more on consolidating personal relationships than to launch ‘impersonal’ promotional activities;
- it was also found that managers tend to use more than one carrier/port combination whereby promoting competition (better quality and low costs), while avoiding the risk to rely on one combination only.

From the above study the following ‘components’ of the decision-making process seems ultimately to emerge:

- shipping managers are rather conservative in their attitudes to taking decisions: they are definitely risk-averse;
- the decision-making process is often based on intuitive techniques of selection and on perceptions rather than on formal evaluation procedures;
- shipping managers first select carriers/ports that are currently able to carry out the required service and subsequently they eliminate the inferior options;
- a minimum level of service quality and a maximum level of price exist: within this range factors related to service (reliability and frequency of sailing) come first with respect to price;
- carriers and ports are evaluated on the basis of their overall performance;
- managers tend to diversify the risks by using different carriers;
- managers take decisions in order to some carrier/port combination and once they have done so they maintain the choice for a certain period without relevant changes.

These results are quite in line with those of other studies. Furthermore, the authors affirm that a quite generalized behaviour pattern of shippers across all modes of transport exists and that their results seem to be transferable to other markets. However, some specific market and cargo conditions can determine a different relative importance of some factors. Finally – and ironically – the authors underline the fact that results show how much the reality of transport operations appears to be far from the theoretical paradigm of neoclassical economics in which actor behaviour is driven by the minimization of short-term costs (!).

On top of the study of D’Este and Meyrick [4], other studies have more recently tackled the issue of the port/shipping choices with particular regard to the ro/ro sector.

Mangan *et al.* [2] report a summary of main studies, in which choice factors are classified in descending order of importance (table 1).

Table 1: Summary of main studies on port/shipping choices  
Source: adapted from Mangan *et al.* (2002)

Cullinane and Toy [7] define the following hierarchy of choice variables:

Relative factors for shipping company choice			
Mangan and Gray (1993) Trade Sea - all types of container traffic	Speers <i>et al.</i> (1992) Ro-ro traffic in the English Channel	D'Euse and Meryck (1992) Ro-ro traffic between Tasmania and Australia (choice of ro-ro shipping company)	D'Euse and Meryck (1992) Ro-ro traffic between Tasmania and Australia (port choice)
Ship punctuality On-board space availability Service frequency Response to problems Off-peak rate Arrival time Departure time Sea transit time Inventory or production/delivery point Distance	Service frequency Container scheduling Delays and cancellations Speed of port entry On-board space availability Fuel cost Port charges Cost of demurrage Frigid rate Port facilities Pre-loading facilities Choice for direct berth Facilities for direct cargo use of access to the quay	Frequency Price Transit time Reliability Changes Container Ability Technology Sea space On-board services Flexible container Long term contracts Miscellaneous	Priority as a type of cargo Speed of port operations Reputation for service record Facilities Misc. cargo Port tariffs Tradition

- cost/price/tariff;
- speed;
- reliability of transit time;
- characteristics of goods;
- service.

Authors stress the importance of accurately identifying the relevant factors in transport choices so as to produce effective forecast models.

One of the characteristic aspects emerging from the literature [8] is that different choice criteria are evaluated differently depending on the type of decision-maker involved (shipper or receiver, shipping manager, etc.). Matear and Gray [9] show how shippers and forwarders use different choice criteria for the transport service. D'Este



and Meyrick [4] found different perceptions of the same criteria between shipper and carrier and then – on average – a different rating.

Hall and Wagner [10] point out how key choice criteria vary depending on the mode of transport and generally on the specific context, thus raising the need of developing a number of case studies.

## 2.2 Choice models

By identifying and evaluating various decision variables determining port/shipping choices in the ro-ro sector a number of modelling approaches have been proposed in order to specify the decision-making process. D'Este and Meyrick [4] and Mangan *et al.* [2] group them in three broad categories:

- input-oriented models;
- outcome-oriented models;
- process-oriented models.

Input-oriented models emphasize the identification of factors (the 'ingredients') of the decision-making process and the assessment of their relative importance. Examples are: calculating importance means [10], factor analysis [11], the Aaker and Day model [12], [13], [14], [15]. With reference to the latter model Brooks [12], [13], [14], [15] cites the following quote of Aaker and Day [16]: 'Just because an attribute is judged to be important by a large proportion of respondents doesn't necessarily mean that it is a 'determinant' (of choice) – in the sense of making a difference in the purchase or patronage decision.... Importance is therefore a necessary but not a sufficient condition of attribute determinance'. Consequently, Brooks uses the term of 'salient factors' to indicate the determinant factors of choice. For instance, in the ro-ro sector, the 'availability of onboard services for drivers' is usually shown to be a very important factor, yet it hardly comes up to be a determinant one. In other words, if we take two alternatives, one is chosen the other is not, it does not turn out to be that the chosen alternative is better than the other with respect the 'onboard services for drivers' factor.

Various authors (e.g. [17]) raise the need of shifting the analysis from choice **factors** (as in the case of input-oriented models) to the **activities** actually performed within the decision-making process.

Outcome-oriented models represent the results stemming from a certain decision situation and they mostly emphasize the predictive capacity of the models rather than their explanatory ability. Gray [18] indicates three 'theories' regarding decision-making behaviours:

- Economic positivism. This approach is based on the neoclassical theory of the firm and assumes that firm maximises its profit in an uncertain and certain environment. Essentially, the decision unit – the firm – tries to maximize its short-term revenues or to minimize its short-term costs, in a situation in which also the transport system is considered.

- Technological positivism. By this approach choices are explained by the relationships between the physical aspects of goods (weights, volume, etc.) and those of the transport system. Choices are represented as a dependent variable in functional relationships with some aspects of the transport system. See for example [19].
- Perceptual approach. It is an approach similar to the previous one, the difference is that the independent variables influencing choices are given by subjective perceptions of individuals rather than by objectively measurable variables. Such an approach assumes that the decision unit can have a ‘wrong perception’ of different alternatives and that in the decision-making process such an impression can be more important than the actual performance.

In conclusion, the main difference among these approaches lies in the decision unit of analysis: the first approach focuses on the firm, the second on the consignment and the third on the single decision-maker. Yet, they have a common characteristic consisting in the aim of predicting the aggregate results of decisions rather than building a framework for understanding the decision-making process.

Outcome-oriented models are mainly formulated in mathematical terms that try to present an aggregate representation of the results of a certain decision action. Examples are the logit model [20], the Analytic Hierarchy Process [21] and the conjoint analysis [16]. These models have been criticized because they have not contributed very much in improving the level of understanding of decision-making processes, rather they have emphasized the mathematical formulation of the results of some behaviours [18]. This aspect is particularly pointed out by D’Este [22] in the context of ro-ro choices. Brugha [23] notes that very often decision-makers think in terms of qualitative differences, thresholds, goals depending on particular situations, hierarchies of needs, preferences and values – all aspects that can not necessarily be represented in mathematical terms.

In the process-oriented models one tries to understand how various factors ‘entering’ the decision-making process interact in order to produce some results. For instance, D’Este [24] identifies a strategic level of interaction that can be represented through a flowchart, and an inferior level related to single choice factors. The risk of some studies is to try to explain the decision-making process on the basis of a few factors only without trying to ‘link’ every factor alltogether. On the contrary, the goal should be that of putting together all relevant factors and understanding how they interact so as to determine – at the end – the overall choice behaviour (behavioural framework). D’Este [24] tries to do so by using his previous survey about shipping manager choices of maritime carriers and ports [4]. One of the significant results of that study concerns the kind of shipping manager behaviour that is identified and that can be classified – according for instance to marketing literature – as a mix of ‘straight rebuy’ or ‘modified rebuy’. In other words, shipping managers tend to re-examine choices only periodically while in the meantime they continue to use the selected carrier/port combination (‘routine’

behaviour). Thus, modelling the choices by assuming a continuous set of alternatives (ie, carriers and ports) from which shipping managers select (say, daily or for each delivery) the best one is far from adopting a realistical approach.

The study of D'Este [24] represents a good example of research in which one tries to come up with modelling the decision-making process by analyzing a specific case study. D'Este [22] builds a model given by two parts:

- the first regards the ‘ingredients’, i.e. the choice factors and their relative importance;
- the second relates to the way in which these ingredients are combined, i.e. in which quantities, order and for which goal. In other words, he tries to identify ‘some behavioural mechanism that governs the way that various factors interact’ and then ‘a theory of underlying philosophy of the choice process’.

We note that while the literature on mode choice turns out to be quite extensive, conversely there are few researches dealing with the choice of competitive carriers/ports within the same mode of transport, although the two issues are clearly linked.

When building a behavioural framework it is first necessary to consider the ways in which various factors interact. Such ways can be of two types:

- compensatory: a high performance of one factor (ie, transit time) can compensate a poor performance of other factors (frequency, cost, etc.). If the model is of compensatory type, then all the effects of different factors are combined in a single decision variable (usually, cost or utility). In such a case, regression models are often used;
- non compensatory: a high performance of one factor can not always be compensated by a poor performance of other factors. Instead, options are compared on the basis of single attributes and a minimum acceptable level of performance exist.

Strictly linked to the way of interaction among factors is the nature of the objective function of the decision-maker. Neoclassical economic theory assumes that this function must maximize some kind of variable. Yet, many empirical studies have shown that very often decision-makers search for a ‘satisfying’ solution rather than an optimal one.

It should be noted that no theory – of those mentioned above – has resulted in the best one so far. Indeed, the validity of one of such theories in a specific context does not imply that it is the most suitable for every situation.

D'Este [24] tries to assess the various theories on the basis of the results of the study on the Bass Strait. The fact that the decision-making process of shipping managers is clearly conservative (they are risk-averse) and based on perception, intuition, experience – rather than on formal procedures - basically demonstrates that the decision-making process in the port-shipping sector is a ‘human’ activity. Even if this can be seen as an obvious statement, nevertheless it is forgotten in all those models in which humanity and individualism in the choice process are sacrificed to objectivity

and universalism [22].

Also, it was found in many studies of firms that the activities of shipping managers are not taken in high consideration within their company, given the fact that transport decisions are not considered strategic and productive. Even if this attitude is changing rapidly, it could explain the 'conservative' behaviour of managers and their reluctance to take decisions that can incur in damages to goods flow management. As such, shipping managers are conscious that they can be 'important' only when things go wrong. In other words, the conservative behaviour can be explained on the basis of a 'hierarchy of needs' within the firm (see [25] which reflect the 'hierarchy of human needs' of Maslow [26]).

Another result – already cited – in the study on the Bass Strait is that managers take decisions which are usually based on their personal experience in the sector and their personal relationships: this fact can explain why decisions are intuitive, not strictly rational and taken without formal evaluation processes. Also, very often decisions are taken rapidly with the available information on hand.

It appears clear then that these dimensions favour a behavioural framework of the perceptual approach.

Other results of the study identify a structure of the decision-making process in which some 'filters' are used. For instance, it was understood that carriers are first selected on the basis of their current ability to provide the service. Shipping managers tend not to rely on carriers and ports that do not have an existing service (these are simply ignored in the choice process). This shows how shipping managers are adverse to experimenting new services. They apply a sort of technological non compensatory filter.

Furthermore, the decision process requires successive comparisons in order to progressively reduce the choice set. Thus, the idea that all the available options are simultaneously considered and then completely evaluated does not seem to be realistic. After all, this seems to be quite obvious since shipping managers do not use a formal evaluation process: it will be practically impossible to consider all the available options in the assessment process if the process were 'intuitive'. On the contrary, it seems to be quite natural that decision-makers try to reduce the complexity of problems.

The study result regarding the existence of a quality-price range shows how inferior options are eliminated: the existence of a minimum level of service quality and a maximum level of price represents *de facto* a non compensatory test to distinguish between non satisfying and satisfying alternatives. Carriers and ports are compared with respect to some threshold values of performance (which are moreover not absolute values but context-related ones). From another standpoint, this aspect partly explains the conservative attitudes of managers.

In a second stage of the decision-making process – when minimum level of service and maximum price criteria are satisfied – carriers and ports are selected on the basis of a different approach. Specifically, they are selected on the basis of their overall performance: this suggests a compensatory approach. It should also be noted

that decision-makers consider the overall performance but very often they are not capable of explaining its meaning (measurable? Which trade-off considered?). What has been clearly understood is that the most important choice factors are: frequency of services, cost, punctuality of delivery, transit time and the ability to solve problems related to deliveries. Then, the main trade-offs considered are those between quality of service and cost.

It should be underlined that shipping managers give more relevance to 'indirect' and 'long-term' costs – meaning potential losses of market shares or of specific markets, losses of some customers, and generally losses of opportunities<sup>3</sup> – rather than to short-term direct costs. It could be argued that indirect costs are not quantitatively expressed by the shipping managers (again, the 'intuitive' process) but through the emphasis on the quality of service. Then one could summarize such an analysis on the decision-making process of carrier/ports saying that compensatory, perceptual and positivist aspects are found.

Another result of the study regards – as already said – the strong tendency of shipping managers to rely upon more than one carrier. Such a tendency can be explained as follows:

- managers want to maintain a high level of competition among carriers, possibly favouring the development of new services towards which redirecting their goods and thus 'threatening' current carriers. The 'competition' factor is used in order to have high standards of service and low costs;
- managers do not want to run risks that could potentially stop the traffic flows, therefore they avoid the strategy of putting 'all the eggs in one basket'.

A two-steps process can then be derived:

- a first component (base line) of transport services is allocated among almost all the carriers/ports and
- a discretionary component is allocated among 'preferred' carriers/ports (one or few).

Authors point out that this kind of process highlights the role of risk management in contrast with the all-or-nothing rationale of traditional choice models.

More generally, D'Este [22] notes how the results of the study on the Bass Strait do not allow the kind of decision-making process identified to be assigned to one of the theories indicated early. In fact, it owns some characteristics of every theory, thus suggesting that reality is more complex than its theoretical interpretations.

D'Este [22] then put forward a multi-stage modelling interpretation, in which each stage has a distinctive character. The first stage consists in eliminating all the op-

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<sup>3</sup> Various marketing researches show that the ratio between the cost to maintain a customer and the cost to acquire a new one is in the order of 1/10, thus suggesting the importance of fidelization.

tions that are able to carry out the required service ('take the actual options only'). For instance, it could happen that a carrier can not carry living animals or certain types of dangerous goods, or he simply does not a convenient arrival/departure time. Although this could seem common sense, practically it could happen that just one feasible option remains at the end. In such a case, the choice process stops at the first stage and the problems of carrier/port competition simply does not exist.

At the second stage only the options having a satisfying level of performance (feasible options) are considered on the basis of a non compensatory test (thresholds of cost and service). As said, this is the result of the conservative attitude of the decision-maker and of the hierarchy of firm needs. At this stage no trade-off is considered, in that all the alternatives satisfying the minimum service and maximum price requirements are equally taken into consideration. It should be pointed out that very often the level of performance comes out not so much from absolute and actual values, rather from 'perceived' levels.

At a third stage the effective ranking of feasible options is singled out by using the overall performance parameter. In other words, a compensatory test is used by considering the trade-off between cost and service. Subsequently, services are allocated among carriers/ports on the basis of the attitudes towards risk diversification: shipping managers allocate a base line services to feasible carriers (many basket) and the rest is allocated to carriers and ports for which managers have a strict preference (discretionary component). The strict preference derives from a compensatory-perceptual approach, as we described early. At the end of the day, managers generally use just one preferred carrier (ie, a preferred carrier/port combination) and take a 'second choice' in the case the preferred carrier is not able temporarily to perform the service.

In conclusion we note – and state again – how the decision-making process regarding carrier/port choices is much more complex than its representation in traditional economic theories. It is a multi-stage process in which compensatory and non compensatory elements, maximising and satisfying behaviours are mixed together with a good level of risk aversion. Options are 'filtered' in such a way to eliminate those that do not reach a minimum level of standard or that are too risky. Of the remaining options – all satisfying – some receive a base line service, the other are the preferred ones. For instance, the tendency towards allocating services by diversification is a difference between the study of D'Este [24] and of Stock and La Londe [27].

The decisions about carriers and ports can not then be conceived as isolated in time and space, and with a generalized and 'technical' internal structure. Instead, past, present and future elements must be taken into consideration, and human ones as well, both at a sector level and at a level of the specific context in which decision-makers operate [29]. There is thus the need – particularly stressed by the recent literature [2] – to put the decision-making issue in a much broader ('holistic') perspective, in which the choice process 'should be understood and not just measured' [22]. Brooks [14] points out how markets are not homogenous as far as the required characteristics of carriers and ports are concerned and that 'choice criteria are a moving target over time

and vary significantly between segments of the market for a single mode'. Similarly, Mangan et al. [1] stress 'the necessity to take a holistic view of the transport choice process rather than just look at the actual nature and structure of the transport choice decision, *per se*. Such a holistic view considers, inter alia, that transport choice changes over time, is different for different markets, involve multiple actors, ...'. It stems from this that one should carry out further researches on the issue by means of a number of case-studies in which technical, economic (perhaps measurable), social, cultural, historical, geographical factors are considered in order to define the specific context. Our research goes right in this direction.

A recent study addressing the decision-making process on the basis of the new 'holistic' perspectives is that of Mangant *et al.* [2]. Authors adopt a methodology that uses both the input-oriented (through values calculation, factor analysis, etc.) and the process-oriented approach. Methodologically the study consists in three steps:

1. The context (case study): analysis of the Irish ro-ro market (on certain routes) and interviews to 24 key actors, plus 245 short interviews to road hauliers. The goal is to preliminary identify the main problems related to the structure and operations of the traffic;
2. Analysis of the choice process regarding ports and ferry services through: a sampling exercise among main decision-makers of the ro-ro traffic; development of a pilot test on the basis of a questionnaire format (9 interviews); personal interviews (57) with decision-makers by means of the questionnaire; analysis of the results through various tools and techniques;
3. Further analysis of the results (19 interviews) using the construct elicitation technique.

At step 2 a factor analysis on the elicited factors is conducted using the principal component method. The complete list of factors is the following:

- availability of onboard space when required;
- frequency of service and convenient scheduling;
- risk of cancellations or delays;
- total transit time;
- proximity of ports to production/destination points;
- cost of maritime service and discounts;
- speed of port operations;
- total journey cost;
- technical characteristics of ships;
- availability of service information;
- services and onboard facilities for drivers;
- opportunity for driver rest break;
- preferences of shippers/receivers;
- intermodal connections between ports.

The factor analysis produces - at the end - 3 aggregate factors which are named as follows:

- factor 1: speed (time) / risk;
- factor 2: cost;
- factor 3: driver.

As far as the first two factors are concerned, there is nothing new. However, the third factor has never been considered in the previous literature.

Afterwards, it is asked to 57 respondents to score the different criteria. The result is a ranking of criteria based on their relative mean importance, which – for convenience - we have already described in the correct order above.

In order to deepen the knowledge about the relative importance of factors, in step 3 a technique called ‘construct elicitation’ is employed. It is an interview methodology based on the Kelly’s theory of personal constructs. Basically, the idea is not to ask respondents about a number a predefined questions, rather to let them represent a specific context through their personal constructs, i.e. the factors they think to be the most relevant ones. In other words, more freedom for interpretation is given to respondents – rather than just ask them to answer.

From all these steps a holistic process-oriented model has been built similar to that of Brooks [13] and D’Este [24]. The decision model shows the following hierarchy of ‘aspects’ considered:

- a) aspects related to the overall origin-destination path;
- b) aspects related to the maritime service;
- c) aspects related to the port service.

The fact that port aspects are given lesser importance is in line with the findings of Fleming [30], Slack [29] and D’Este and Meyrick [4].

In the general model the relationships between producers and transport operators must be first considered. There is the tendency of transport operators to become logistics operators by providing a broad set of services to producers. The study on the Irish market is a good example of this in that shipping companies tend to integrate vertically by providing door-to-door services.

It should be noted that very often the manufacturer-haulier relationship is based on reciprocal trust rather than on written contracts, and the same is true for the haulier-shipping company relationship. Manufacturers use many hauliers for the consignments.

Decisions on path choices on the overall origin-destination trip are delegated by the manufacturer to the haulier, both for inbound and outbound trips. Also, the role of drivers must definitely not to be underestimated as far as the maritime and port choices are concerned.

By following the a)-b)-c) hierarchy (structure of the decision-making process) it must be noted that at level a) the conservative attitude of hauliers emerges, in that



they tend to choose already-available options of maritime services. Mangan *et al.* [2] worthily note that there is a current trend towards partnership between ferry companies and hauliers rather than towards competition. We will come back to this point later since it is a strong one in our research.

The risk factor is relevant also – as in D’Este [22] – in the Irish market, in the sense that for stable flows hauliers tend to use more than one ferry-port combination, although the bulk of traffic is allocated to just one combination. Moreover, once the ferry-port combination is chosen, it is revisited only occasionally. This clearly stems from the previous consideration – partnership: once a partnership is established it is maintained for a certain period of time. The only exception regards urgent consignments, for which the haulier look for the next available ferry service from any port.

As stated, in the choice of the ferry-port combination the most important factors are those related to the overall origin-destination route, rather than those strictly related to the maritime services. Then, the port factors are considered.

At level b) (maritime services factors) step 3 of analysis has allowed to highlight that the most relevant factors are the cost of the ferry service and the ability to get discounts. At the end of the day, it seems that the final hierarchy of choice factors is:

- onboard space availability;
- cost and discounts;
- time factors: arrival/departure time; speed; frequency (above all for accompanied transport);
- risk factors: cancellations or delays due to weather or to technical reasons;
- technical factors: ships suitable for certain kind of cargo (special cargo, hazardous goods); facilities for drivers; cargo safety.

At level c) – port factors – three main categories of factors can be defined:

- factors related to time and risks: port located on the fastest overall origin-destination path; risk of delays; high access time to port; strike; police controls;
- specific constraints: opportunity for drivers to break; driving bans;
- network factors: familiarity with certain paths; configuration of the logistics network of transport operators (port depots, etc.); proximity of port to origin-destination of cargo.

From the standpoint of the impact of the study on theory, the following issues seem to be of importance:

- the effectiveness of researches on transport choice is related to the need of not assuming markets to be homogenous; instead, choice criteria vary depending on the specific mode of transport, time, market or segment, etc.;
- if the goal is to model the decision-making process, then the context in which decisions are taken must be considered specifically and there is the need to adopt a holistic approach.

In conclusion, Mangan *et al.* [1] [2] indicate, among the recommendations for future researches, the need to develop further researches to be based on the holistic approach and to test them in other markets. Our research does so.

### **3 The case-study: the ro-ro traffic in the Adriatic on the Italy-Greece axis**

#### **3.1 Introduction and methodology**

The above literature review highlights, among other things, that:

- decision variables determining port choices in the ro-ro markets are not still clearly defined and they present variability over time, in particular since the '90;
- there is the need to analyze the critical factors for specific contexts, since it is realized that key decision variables for a certain mode of transport can not be valid and applicable for other modes;
- it is necessary to highlight the weights and impacts of specific port choice criteria for each market, logistics chain or transport segment;
- different port choice criteria are evaluated differently depending on the type of decision-makers (forwarders, carriers, shipowner, etc.): transport service choices are different depending on the type of decision-maker.

In short, shipping-port choices in the ro-ro sector can not be understood within a unique and generalized decision-making model, rather they vary over time, among markets and depending on the kind of decision unit. It stems from this the need to analyse a large number of case studies so as to verify the main 'regularities' and compare the results.

Our case study concerns the market of ro-ro traffic along the Adriatic Corridor on the Italy-Greece axis (see figure 1), with particular reference to the (Italian) North Adriatic ports.

The main goals are:

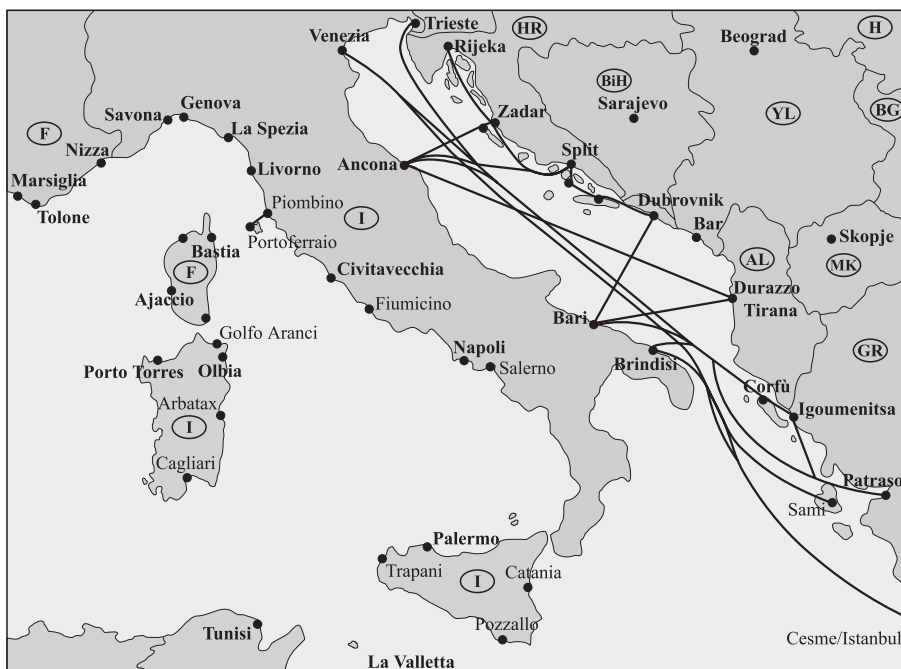
- to identify the port choice criteria – ie, the competitiveness factors – adopted by operators of the logistics chain and to evaluate them (relative importance);
- to model the decision-making process with specific regard to port-shipping choices.

The methodological approach employed is the following:

- using the results of the literature review (secondary data) and the information from a number of interviews (about 20) with operators of the traffic in order to:
  - build and design the decision-making process of the logistics chain of interest;

- build a structured questionnaire format to be used to achieve the above mentioned goals'
- conducting about 50-60 interviews to key actors of the logistics chain by means of the questionnaire format (primary data);
- elaborating and discussing the responses to questionnaires/interviews so as to come up with modelling the decision-making process.

Figure 1: Main international short-sea shipping routes in the Adriatic



The first methodological step has been that of studying – by using secondary and primary data – the structure and configuration of the logistics chain of interest. In other words, we aim at identifying the various decision-makers involved and their interdependencies. The traffic of concern is operated mainly by Greek operators, specifically road hauliers, intermediaries and shipowners. Main operators are:

- manufacturers;
- road hauliers;
- drivers;
- brokers;
- shipping companies.

The road haulier can be a big one (called ‘padroncino’), in this case he is an operator who owns a number of road vehicles and manages the relationship with the

manufacturer, often operating as forwarder as well. According to the literature, the manufacturer tend to leave every shipping decision to the transport operator. Thanks to the dimension of the firm, the road haulier has a direct relationship with the shipping company, in particular for assuring the availability of onboard space for his vehicles (ie, with reference to the traffic volumes he operates).

Another type of operator is the 'small' road haulier, that is, a road haulier owning one or two road vehicles only. Since there is a disproportion of market power between he and the shipping company, the haulier relies on an intermediary - the broker: the latter has the goal of organizing the diffused traffic by finding/assuring the necessary onboard space on behalf of the small road hauliers. It is the broker who then has a direct relationship with the shipowner. Often, brokers are big operators having relationships with more than one shipping company and the relationship with them are crucial for the shipping company. The broker receives a fee both from the shipping company (for each vehicle embarked) and from the small road haulier and he detains a strong market power with respect to the shipping company. Quite often disagreements emerge between brokers and shipping companies: if the shipping line does not guarantee an 'adequate' number of vehicle onboard ship to the broker, the broker can threat the shipping line to divert all its traffic away.

In the case of 'padroncini' (ie, big road hauliers), they approach the shipping line as the brokers do.

As for the port-shipping choices it should be noted that while brokers assure the onboard space for road vehicles on behalf of the hauliers, it is then the driver who expresses a (strong) preference in order to the shipping company to be chosen (maritime service choice) and therefore the port to sail (port service choice). This is a very important insight of the decision-making process we examine: it is the road haulier who decides the shipping line he wants to use. The choice of the shipping company is done directly – in the case of the 'padroncino' – or indirectly – in the case of the small haulier (through the broker). In other words, there exists a strong partnership relationship between the haulier and the shipping company (fidelization). The reasons for such a partnership agreement are basically three:

- the haulier is aware that if he continuously (over time) chooses the same shipping company, i.e. he assures the shipping line with a stable traffic flow, he will always get a place onboard for his vehicle. In other words, he will not run the risk to be 'refused' (thus losing remunerative trips), particularly when finding a place onboard is crucial (for instance, during peak days);
- the haulier is aware that thanks to the partnership agreement he will always get a comfortable cabin. From our analyses we see that this criterion is of absolute importance in the shipping-port choices, and this is also demonstrated by the importance attached to the availability of services and other funny activities onboard. To be put in a cabin together with other 'colleagues' is almost always judged to be unacceptable by many drivers;
- the partnership relationship allows the haulier to pay the freight rate at the end

of each month. The haulier, thanks to the relationship with the broker – if he is a small haulier – or directly with the shipping company – if he is a ‘padroncino’ – gets the benefit for which he is let to pay the ferry tickets at the end of each month cumulatively, instead of at the check-in<sup>4</sup>.

These three benefits of the haulier<sup>5</sup> (meaning that flows are organized on continuous basis) explain also the reasons why such a partnership normally does not imply monetary incentives. ‘Discounts’ are not generally given to the hauliers, in that the above mentioned benefits are judged to be ‘sufficient’ and they can be interpreted as benefits in terms of quality of service<sup>6</sup>. On the other hand, it is the broker who benefits incentives by the shipowner, since he gets a fee for each of the road vehicle embarked.

We think that many of our results can be explained by this hierarchical-lexicographical aspect of the decision-making process related to the partnership/fidelization between shipowner and hauliers. The choice is then of port-maritime – ie, combined - type and not related to maritime services **and** port service independently. Due to the above mentioned benefits every haulier has a lasting partnership with a given shipping company. Hence the port choice is indirect: the choice set of ports will be that of the shipping company. Such a result answers the question posed by other studies whether the choice process is ‘shipping company first’ or ‘port first’. We identify a choice process in the ro-ro sector in which choices are basically among carriers on given origin-destinations, rather than related to ports or mode of transport. Indeed, the interest of the research is that we deal with the choice of carriers/ports within the same mode of transport, rather than with the general issue of mode choice.

Also, the strict preference of hauliers towards shipowner (partnership) is partly in contrast with other studies that show a tendency of the decision-makers to diversify their carrier/port choices.

In the view of this hierarchical criterion of partnership one can correctly interpret the competition among ports. A practical example: the kind of competition between the port of Trieste (North Adriatic) and the port of Ancona (Medium Adriatic) – in which both ports are called by the same shipping company (Anek Lines) - is a different one with respect to the competition between the port of Trieste and that of Venice – in which the shipping companies calling Trieste do not call Venice and viceversa.

On such basis, we could also suggest an adjustment of the traditional interpretation of the ro-ro market saying that it is the road sector having the biggest market and decision power. This view, which is correct in general, should be slightly modified in

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<sup>4</sup> To be allowed to get ready the ticket at the check-in (already stamped) without being forced to have money with himself is judged a very important criterion of the decision-making process by hauliers.

<sup>5</sup> In other words, thanks to the assurance of a stable flow over time the haulier gets a good “treatment” by the shipping line.

<sup>6</sup> With the exception of the monthly payment of the rate which is clearly a monetary aspect.

so far as it is certainly true that the haulier chooses among different combination of port-shipping services, however these services are not seen as similar. The haulier wants to get 'good' port-maritime services, however he can get them only if he establishes a partnership with some shipping company<sup>7</sup>. The need of programming the deliveries over time does not allow 'random' port-maritime choices (ie, risky ones) in a context of 'wild' competition: this is true for the operators and also as long as the customer (consignee) requires a regular and reliable transport service, thereby promoting cooperation between hauliers and shipowners.

As far as the questionnaire format is concerned, input data – as said – come from the results of the literature review and the information from a number of interviews with key-actors of the logistics chain (secondary + primary data).

The first part of the questionnaire/interview has the aim of integrating the traditional statistical information with other additional (primary) data, such as:

- overall origin-destination route;
- typical maritime and land-based paths;
- kind of cargo transported;
- frequency of trips;
- transported quantity;
- percentage of empty trucks;
- total transit time;
- land-based transit time.

In the second part of the questionnaire format the discussion on the criteria of maritime-port choice and their relative role (weights) is in depth analysed. Criteria are classified – according to the literature – in three categories:

- choice criteria related to the maritime services;
- choice criteria related to ports;
- choice criteria related to the overall performance of the services.

In the first category we identify the following criteria:

- partnership / personal contacts with the shipping company;
- technical characteristic of ships (with regard to the kind of cargo transported);
- availability of onboard services for drivers;
- risk of damage to cargo (reputation of the shipowner);

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<sup>7</sup> Another practical real-life case: it is certainly true that a haulier coming from Germany with a full-truck load having a Greek destination can potentially choose among a number of Italian ports: Trieste, Venice, Ancona, Brindisi, etc. However, if he does not have a partnership with any shipping company he can hardly get a place onboard ship for its vehicle in any of the ports, let alone the possibility to get a comfortable cabin onboard. We point out, however, that this is true in normal conditions, i.e. when ship load factor is satisfying (normal and peak load periods). In "low seasons" periods it could be easier for hauliers to find space onboard ship, although the "partnership factor" prevails anyway.

- punctuality of service (arrival/departure);
- transit time of the maritime segment;
- freight rate;
- availability of space onboard ship (probability to find a place onboard).

In the second category we discuss the following criteria:

- speed of port operations (loading/unloading, check-in, etc.);
- frequency of arrivals/ departures;
- convenience of arrival/departure time;
- proximity to the production/delivery point;
- port costs and tariffs;
- technical characteristics of ports (layout, facilities, services, etc.);
- port marketing;
- port accessibility (congestion);
- risk diversification (more than one port used).

The last category deals with criteria such as:

- total cost of overall origin-destination trip;
- total transit time;
- constraints on land-based segments;
- availability of cargo (picking-up of cargo along the way).

Having identified the structure of the decision-making chain and built a structured questionnaire format we conducted a number of on-the-field interviews. In particular, interviews were performed in the months of November, December 2002 and January 2003 at the ferry terminal of Venice. Respondents were 50 hauliers (on a total number of 60 to whom we submitted the format) mainly coming from the Greek ports of Patras and Igoumenitsa (the major Greek ports of interest). They were Greek hauliers since – as said - they represent almost all the users of the ro-ro services analysed. It must be noted that the choice of conducting the bulk of interviews with hauliers stems from the structure of the decision-making process, which highlights the major role of them. However, on top of the 50 interviews with hauliers, other interviews were conducted with key-actors of the shipping sector and with brokers, both in Italy and in Greece.

The shipping companies of reference were the Minoan Lines and the Blue Star Ferries, both Greek. Additional information were obtained from Anek Lines calling the port of Trieste.

Through the first part of the questionnaire information that integrate traditional statistical data were obtained. Responses show that the main markets for the Venice port are Germany (using typical paths such as Venice-Brennero-Munich or Venice-Villach-Munich), Austria and Italy; other markets are the UK, France and The Netherlands. Promising markets are expected to be Norway, Spain and Sweden. Goods mainly consist in finished products on the North-South direction and agricultural products

(and groupage) on the South-North direction. The accompanied technique prevails (about 60% of traffic). Trip frequency by the hauliers is every two weeks on average.

The shipping companies operating in the port of Venice manage ferry services that regularly carry cargo throughout the year, and passengers during the summer time as well. Two types of ships are used: one it is of more recent technological type and similar to fast ships (Minoan), the other is technologically more traditional (Blue Star). The Minoan Lines have a daily frequency on the Venice-Igoumenitsa-Patras route departing at 15.00 from Venice and arriving at 20.30 in Patras the second day after. From Patras there is a daily service departing at 24.00 and arriving in Venice at 6.30 on the day after. Blue Star Lines have a service from Venice on Tuesday and Wednesday (departure at 19.00 arrival at 6.00 of the second day after) and on Saturday and Sunday (departure at 12.00 and arrival at 21.00 second day after). From Patras the Blue Star Lines schedule departures each Monday, Thursday and Sunday at 23.55 and arrival in Venice at 9.00 on the second day after.

Ships have a gross tonnage ranging between 27.000 and 30.000 tons and a speed ranging between 24 and 31,5 knots. They can carry between 70 and 130 road vehicles. Freight rates on the Venice-Patras route are some 600 Euros for a semi-trailer and 700-800 Euros for a full-truck. On the Patras-Venice route freight rates are reduced on average of some 15%.

Finally, as far as the freight traffic flows are concerned, there are annually two peak periods: one in March-April (Easter) and the other on June-July. In the period 1999-2002 freight traffic increased in Venice of some 30% on average, with about 30.000 loadings and 34.000 unloadings currently.

In the second part of the questionnaire we study the choice criteria by using the following scale:

- 0: not important;
- 1: slightly important;
- 2: important;
- 3: very important.

Since we wanted to maximise the amount of information from the respondents, the second part of the questionnaire was further divided in two parts, referring to the Greece-Europe and Europe-Greece directions. In the former case we discuss the choice criteria for the (Italian) port of unloading, in the latter the choice criteria for the (Italian) port of loading. Moreover, it was asked to respondents – by means of an open question – the reasons for choosing those Adriatic ports they usually do not choose.

In short, the underlining reasoning is that of having an understanding about why a certain port (for unloading and loading) is chosen by hauliers and how much each criteria counts on the basis of the above mentioned scale. As said, the goal is that of finding some regularities (choice model or theory) from the specific best practice.

### **3.2 Results and discussion**



Results are first presented in descriptive terms using percentage values (% on the total number of respondents). In particular, results are shown in an aggregate way both for unloading and loading choice, since we realize the two situations are similar. A summary is shown in table 2.

Table 2: Summary of main results (percentage values)

Criteria	Degree of importance (scale)			
	0	1	2	3
Practicality				99
Partnership / fidelisation				90
Availability of space onboard ship	61			
Availability of onboard services for drivers				95
Safety of cargo		30		34
Journey sea time				84
Freight rate		54		
Proximity to market (loading/unloading)				93
Port accessibility			34	40
Speed of port operations				73
Service frequency				97.5
Arrival / departure time (scheduled)				98
Port cost		63		
Technical characteristics of the port				95
Promotional activities / marketing		61		
Total O-D cost	39	34		
Total O-D transit time				83
Constraints on land-based equipment	84			
Availability of cargo		84		
Risk diversification	99			

Basically all respondents (99%) do not diversify their port choices so as to reduce risks, on the contrary they choose one of the port that are called by the shipping company with which they have established some partnership agreement. The partnership criterion is judged to be very important by basically all respondents (99%). Some 61% of respondents gives no importance to the availability of space onboard ship.

For the 93% of respondents the port choice is dictated (very important criterion) by the proximity of port with respect to market, whereby having the possibility to deliver the goods the same day or arrival. The arrival and departure time and the punctuality

of service is of the highest importance, respectively for the 98% and basically 100% of respondents. The the same degree of importance – for the 95% of cases – is the availability of good onboard services for drivers<sup>8</sup>, while quite important – on average – is the criterion regarding the safety of cargo. Also, crucial – for some 97,5% of respondents – is the frequency of service.

Respondents judge the port costs (63%) and the freight rate (56%) less important factors. Similarly, the total journey cost is judged to be not so important (39% not important, 34% slightly important), while on the contrary the total journey time is considered of high importance (84%) and the same is true for the sea transit time. Very important – for the 95% of respondents – are the technical characteristics of the port, such as quays, facilities, services, while slightly important are the promotional activities made by the port (61%). The accessibility to port is considered relevant (36% important, 40% very important), while some 73% of cases say that the speed of port operations is very important. Probable constraints on the land-based segments of trip (eg, ecopoints to travel through Austria<sup>9</sup>, police controls, etc.) are not considered important (84%). Finally, slightly important (84%) is the need to pick up cargo along the way (availability of cargo).

The responses suggest some comments and insights.

We firstly highlight the relevance of the fundamental criterion concerned with the partnership between haulier and shipowner. Such a criterion is just mentioned in the literature as a current trend, however without giving it the relevance we find in our case-study. Consequently, the need of diversifying port and carrier choices does not emerge in the case-study, as conversely shown in the literature [2].

Once the partnership has been established, we see the predominance of the criteria related to the quality of service rather than to those of a monetary nature. This is again a result which contrasts the recent literature (not the past one, however) – [2] in particular – that confirms the relevance of monetary elements (discounts) and the availability of space onboard ship as well (see *infra*). The predominance of ‘service’ elements in the choice criteria is explained by a number of things. First, it is demonstrated that basically all the respondents gives a high importance to factors such as ‘convenient scheduling’ (98%), ‘punctuality’ (100%) and ‘frequency’ (97,5%), and to ‘availability of onboard services for drivers’ as well (95%) (which means comfort). The relevance of convenient scheduling (arrival/departure time) shows that the port-maritime service is competitive as long as it responds adequately to the logistics needs of deliveries for the shipper/receiver. This is also confirmed by the importance of the criterion related

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<sup>8</sup> The “availability of onboard services for drivers” factor can – on another standpoint – be included in the partnership criterion, in the sense that drivers ask for comfortable cabin, on top of the availability of space onboard ship for the vehicle and the possibility to pay at the end of each month. From this standpoint – in contrast with Brooks [14] [15] – onboard services for drivers are actually “salient” factors.

<sup>9</sup> At the time of the interviews.

to proximity of the port to market with the possibility to reach it within the same day of arrival/departure (93% of cases).

In other words, it seems that operators ask for regular, reliable services which must be compatible with the logistics needs of cargo (functional requirements) while they do not so much look for cheap services (both for the overall trip and the single land-based and maritime segments). From this point of view, it should be noted that the 'scheduling' factor is an element of market segmentation *per se*. A practical example: if we use the criterion, say, 'departure on Monday from Trieste at 18.00' we identify a different market with respect to the criterion, say, 'departure on Wednesday from Trieste at 12.00', even if the port is the same. This is so because the two services refer to different logistics needs of cargoes. Thus, it is misleading to discuss generally in terms of **port** choice. Conversely, we should discuss about the level of **service-to-market** provided by the port. Recently, for instance, a new service was created in the port of Ancona having an arrival time at mid morning – few operators thought it could be a success: instead, in a short period of time it has really created a 'new market' resulting in a very competitive service for Ancona. Generally speaking, however, Ancona is less competitive with respect to Venice and Trieste particularly for German destinations, because hauliers arriving in Ancona at noon can reach the Italian-Austrian border only late in the evening, thus being forced to stop overnight. Conversely, if they choose Trieste or Venice they can travel all the day to delivery the goods<sup>10</sup>. If they use Ancona, then, they loose overnight the time saving<sup>11</sup>: they arrive at the port 6 hours earlier but they delivery – for instance, if we assume a common German destination, say, Munich – only few hours earlier. On top of that, they also get monetary savings (not essential but not neglectable): it has been estimated that a haulier saves in road transport costs about 250 Euros if he chooses Trieste *vis-a-vis* to a more expensive freight rate of only 30 Euros. However, if we consider the overall transport service with respect to the logistics needs of cargo (ie, those dictated by the manufacturer/receiver) we can easily imagine a situation as the following. Suppose you take the Patras-Cologne route. Those choosing the port of Venice arrive at destination, say, at noon of the same day. Instead, those choosing Ancona arrive at destination the evening of the day before, so they must delivery the goods the day after anyway. Thus, the higher speed of the trip (less transit time) has a small impact on the logistics needs (delivery time) and generally on the round-trip time.

Similarly, we should distinguished for each port (talking about port competitiveness on the same O-D axis) 'back' and 'forth' markets. This distinction also relates to the 'availability of cargo' criterion. From the responses to interviews we realize that there is a strong preference of the hauliers to maximize the maritime segment in the case of full-truck load. This means that Trieste and Venice are strongly preferred – for

<sup>10</sup> Also, after a comfortable night onboard ship.

<sup>11</sup> We refer to not-fast services.

full-truck load deliveries to/from German markets – to Ancona or other South Adriatic ports. Reasons are related to better comfort (ability to take a rest, onboard comfort, etc.), more convenient service (functionally) and the possibility of monetary savings. However, traffic flows are often unbalanced (except in the seasons of agricultural products) and the percentage of empty trucks originating from Greece is high. Thus, hauliers – headed say to German markets - often must choose, say, Brindisi (the South-east port of the Adriatic) because in doing so they can pick up cargo along the Italian road segment. From this standpoint, we could say that Brindisi is very competitive for South-North trips: by choosing Brindisi the haulier has higher transport costs (road transport costs higher than maritime ones) but – at the same time - higher revenues (payload) with respect to the choice of a northern Adriatic port. Conversely, on the North-South direction trucks very often are full-loaded and therefore the strong preference to use the sea ‘as much as possible’ definitely emerges: hence, the north Adriatic ports are chosen. In conclusion, hauliers choosing the north Adriatic ports are those who are normally able to maximise the capacity of their trucks in both directions (or at least to have a good load rate) or those who find the north-south trip satisfyingly remunerative. In this way, we explain why the respondents in the port of Venice do not judge the factor ‘availability of cargo’ to be of importance.

Furthermore, we realize that the proximity of the port to the market is definitely important. In other words, the economic geography of markets plays a major role and fix in some way constraints to the competitiveness of ports. North Adriatic ports mainly serves the German and Austrian markets, while Medium Adriatic ports mainly refer to French, Italian, British and Dutch markets. However, when there is some market overlapping (eg, German and Italian markets) one – given the strong preference to maximising the maritime leg – could infer a potential increase of competitiveness of North Adriatic ports provided they strengthen and improve their services. Take the German market: Trieste is the most preferred port because the scheduling is convenient, one can get monetary savings, etc. (see *infra*). Ancona is chosen as a second-best option<sup>12</sup>. Then, if the North Adriatic ports – while satisfying the partnership constraint<sup>13</sup> - offer a higher frequency on those markets then they would capture more traffic. On the ‘frequency’ criterion, however, the speed of ships play a determinant role. An increase of speed by the ships – aiming at improving the quality of service through higher frequencies - makes (economically) sense if it actually allows an increase in the number of calls. If this is true, then the increase of costs due to the speed increase (higher number of operating ships, higher operating costs, etc.) is outbalanced by the increase in revenues due to the amount of payload (perhaps further increased if larger vessels are used – say, carrying 130 vehicles). On the contrary, if one can not increase

<sup>12</sup> For instance, if the haulier loses the ship from Trieste at 12.00 he can get a ship from Ancona at 16.00.

<sup>13</sup> Remember that the shipping lines calling Venice do not call Trieste and viceversa.

the number of round-trips by increasing speed, then the increase of speed only implies cost increases. The length of routes –which speed is clearly linked to – then plays a crucial role and it explains why fast services have been introduced in Ancona but not so in Trieste.

A further comment refers to the pretty low importance attached to the ‘availability of space onboard’ factor. This could seem a paradox at a first glance and in contrast with the recent literature as well. However, the explanation lies in the meaning of the criterion of partnership and fidelization: the problem of finding space onboard ship does exist but it is simply solved ‘upstream’ through the establishment of a partnership agreement.

Quite significant, in policy terms, is the low importance attached to the promotional activities of the port. In fact, it seems that hauliers are well informed about maritime and port services and they organize their activities on the basis of partnership agreement. Therefore, as suggested by literature, ‘personal relationships’ are very important while the ‘impersonal’ marketing activities performed by the ports seem not to impact very much. What counts more is – we state again - the availability of a service which must be ‘useful’ for the deliveries, i.e. it must understand and reflect the logistical needs.

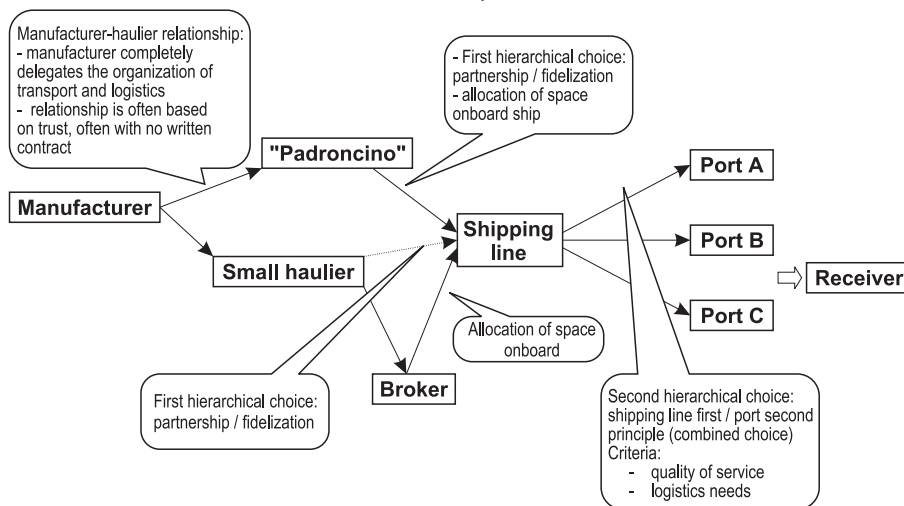
As far as the factors regarding the technical characteristics of the port – that are judged to be very important – we should point out that by deepening this issue with the respondents (by follow-up interviews) we realized that this criterion is no doubt very important, but it does not result in a determinant (‘salient’) one. However, we must note the relevance of a number of criteria related - in one way or another - to infrastructural needs (see also the accessibility issue which is judged to be important by 36% of respondents and very important by some 40%).

In more general terms it strongly appears – from the interviews – that the decision-making process has the following characteristics as they are suggested by the literature:

- decision-makers often are not conscious about the characteristics of the decision-making process from a strict rational point of view. They decide on the basis of intuitions, attitudes, perceptions, experience, and have difficulties in explaining the process rationally. They do not have a formal procedure for evaluation of different alternatives, let alone statistics. Actual performance of actors does not count so much;
- the decision-making process is of straight rebuy or modified rebuy type: decision-makers are conservative in their choices in that they only periodically revisit them (thus, for extensive time periods they do not raise the problem of choices). This means that they do not consider a continuous set of options, rather – when the choice is made – they adopt some *routine* behaviour;
- the fact that the decision-making process in the ro-ro sector shows a conservative (risk-averse) attitudes by the decision-makers and a process which is based on intuitions and perceptions, personal relationships and experience (rather than on rational and formal procedures) demonstrates – once again - that the

choice process is a ‘human’ activity [22]. Another example of this kind – in our study – is that certain land-based paths are chosen not for rational reasons but ‘simply’ because hauliers are familiar with them.

Fig. 2: the port-shipping choice model (process-oriented) in the Adriatic ro-ro market on the Italy-Greece axis



In conclusion we are able to illustrate the general structure of a decision model (fig.2) which can be classified as a process-oriented model on the basis of the literature. It can be summarized as follows:

- the manufacturer is basically not interested in transport and logistics organization and he leaves all such decisions to hauliers;
- the haulier made a first-level choice (hierarchically) with which he establishes a partnership agreement with a shipping company; personal relationships, perceptions, conservative attitudes prevail on the rationality of choices, on top of the concrete benefit he gets from the agreements. The haulier does not diversify their port-maritime choices – in contrast with Mangan et al. [2] – and solves the problem of finding space onboard ship through the partnership agreement;
- the shipping company organizes and provides their services by calling certain ports; the port choice is then determined by the principle shipping line first – port second;
- on the basis of this principle, haulier (second-level of choice) chooses the maritime-port service basically by considering the quality of service (functionally), i.e. giving priority to the needs of ‘fluidity’ of traffic and of the logistics of deliveries. Monetary aspects are secondary, in contrast with some recent literature [2].

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## **Analiza i procjena kriterija za izbor luke/prijevoza u sektoru ro-ro prometa: primjer talijansko-grčkog pravca**

### **Sažetak**

Europske i državne politike naglašavaju potrebu za unaprijeđenjem konkurentnosti kratke plovidbe (SSS) radi izbjegavanja nepovoljnih učinaka sustava cjelovitog cestovnog prijevoza. U ovom se radu istražuju najbolja iskustva s kratkom plovidbom, s osvrtom na ro-ro prijevoz Jadranskim koridorom na talijansko-grčkom pravcu. Cilj je uočiti i procijeniti glavne kriterije za izbor luke pomoću ključnih sudionika u logističkom lancu kako bi se došlo do općeg modela za izbor luka. Na prvome mjestu se donosi sadržajni pregled literature. Između ostaloga, literatura ističe kako kriteriji za izbor luke (i njihova odnosna težina) variraju u ovisnosti o specifičnom kontekstu (logistički lanac) i vremenu. Time se implicira nepostojanje općenitog i jedinstvenog modela izbora, dok uzimanje u obzir istraživanja specifičnih slučajeva predstavlja nužnost. Zatim, koristeći metodologiju koja se uglavnom temelji na primarnim podacima – tj. detaljnijim intervjuima i upitnicima za ključne sudionike iz uzorka – analizira se postupak odlučivanja logističkih subjekata te slijedi rasprava o rezultatima dobivenim iz odgovor i njihovo iznošenje pomoću modela usmjerenog prema postupku. Iz toga proizlazi, djelomično u skladu a djelomično u suprotnosti s literaturom, hijerarhijska struktura izbora (brodarsko društvo prvo / luka druga) u kojoj se ističe relevantna uloga faktora izbora povezanoga s kakvoćom usluge i logističkim potrebama isporuka (u kontekstu distribucijskog lanca). Isto tako, taj model naglašava pretežit ulogu 'ljudskih' vidova (pristup, uočavanje, iskustvo, tradicija itd.) onih koji odlučuju. Faktori povezani s gospodarskim pogodnostima (ukupni i djelomični troškovi itd.) sasvim sigurno imaju manje značajnu ulogu.

**Ključne riječi:** kriteriji za izbor luke, ro-ro prijevoz, postupak odlučivanja

## **Analisi e valutazione dei criteri di scelta marittimo-portuale nel settore ro-ro: un caso studio sull'asse Italia-Grecia**

### **Sommario**

Le politiche europee e nazionali sottolineano da tempo la necessità di migliorare la competitività della navigazione a corto raggio in modo da evitare le conseguenze negative dovute ad un sistema di trasporto basato sul tutto-strada. Nel paper viene esaminato un caso di successo di navigazione a corto raggio internazionale, consistente nel traffico ro-ro lungo il Corridoio Adriatico sull'asse Italia-Grecia. L'obiettivo è quello di identificare e valutare i principali criteri di scelta portuale utilizzati dai

principali soggetti decisori della catena logistica in modo da arrivare a definire un modello generale di scelta portuale. Innanzitutto, viene presentata una rassegna estesa dei principali contributi in letteratura. Tra le altre cose, la letteratura mette in evidenza come i criteri di scelta portuale – ed i relativi pesi – variano nel tempo ed a seconda del contesto operativo specifico. Ciò implica che un modello unico e generalizzabile di scelta non può essere identificato, mentre al contrario appare necessario procedere esaminando casi studio specifici. Successivamente, utilizzando una metodologia basata su dati primari – ossia interviste in profondità e questionari sottoposti ad un campione di decisori – viene analizzato il processo decisionale degli operatori logistici, vengono discusse le risposte ai questionari/ interviste e viene presentato un modello del tipo process-oriented. Esso evidenzia, in parte in accordo con la letteratura ed in parte no, che esiste una struttura di scelta gerarchica (prima la compagnia di navigazione, poi il porto) in cui viene evidenziato il ruolo svolto dai criteri inerenti la qualità del servizio e le esigenze logistiche delle spedizioni. Parimenti, il modello enfatizza il ruolo predominante di fattori di scelta di carattere “umano” (attitudini, percezioni, esperienza, tradizioni, ecc.) da parte dei decisori. I fattori legati a considerazioni di convenienza economica (costi totali e parziali, ecc.) sembrano svolgere assolutamente un ruolo minore.

**Parole chiave:** criteri di scelta portuale; traffici ro-ro; processi decisionali