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PARAMETERS INFLUENCING SHORT SEA SHIPPING PRICING SCHEME: ITALIAN OPERATORS' POINT OF VIEW

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Abstract

The Short Sea Shipping (SSS) market is strongly diversified, due to the variety of cargoes, vessel types and capacity, and segmented due to the existence of many national and peripheral submarkets. It is observed that prices differ considerably among transport services of similar distance routes and/or similar demand characteristics. Therefore, the aim of the paper is to identify the factors influencing pricing policies of SSS operators in the Mediterranean Sea, within the Italian perspective. In line with the scope, SSS market structures and intermodal transport services are examined. The approach includes both sea and inland leg of intermodal chains within the scope of an integrated framework. Additionally, the cost elements of an intermodal transport service and their relative importance within the total cost structure are studied. The analysis of data collected, through telephone and face-to-face interviews with SSS operators, reveals that the variation in fuel and port costs plus the level of competitiveness of the markets influence deeply both cost structure and pricing policy of an intermodal transport service (with fuel costs being the most important element). Pricing policy may also change according to destination and type of goods transported, while total transport cost might vary with hinterland transport cost adjustments. These findings contribute to the understanding of the SSS market and its operation. However, due to the complexity of self-organised systems, validating the presented cost and pricing structures remains a challenge, since such data is quite sensitive and hence, not easy to obtain directly.

Keywords: Short Sea Shipping, Pricing of Transport Services, Transportation costs, Intermodality, Italian SSS operators

1. Introduction

The high modal share of road transport and particularly its continued growth in freight, is leading European road transport systems to serious problems such as congestion and safety. As a result public concern about the environmental impact of road transport has started to rise. Under the given conditions, the European Union (hereinafter EU) began to support a more sustainable transport policy from an economic, social and environmental viewpoint.

Given these circumstances, Short Sea Shipping (henceforth SSS) appeared as an alternative to road transport not only because its an environmental friendly transport mode (Eurostat, 2000; Paixão and Marlow, 2002), but also due to its relatively good safety record when compared with other transport modes (CEU, 1999; Paixão and Marlow, 2002).

Already in the White paper of 1992 *"The Future Development of the Common Transport Policy: A Global Approach to the Construction of a Community Framework for Sustainable Mobility"* (COM 92/494), the need for supporting SSS is referred. However, only in 1995 the European Commission published the communication "*The development of SSS in Europe: Prospects and challenges*" (COM 1995/317) concerning the development of SSS in Europe. In the *"Green Paper on Sea Ports and Maritime Infrastructure"* (COM 97/678) more was written about SSS and in 1999, in the communication *"The development of SSS in Europe: A Dynamic Alternative in a Sustainable Transport Chain"* (COM 99/317) a definition of what is considered as SSS in Europe was given. Therefore, according to the EU, SSS is "*the movement of cargo and passengers by sea between ports situated in geographical Europe or between those ports and ports situated in non-European countries having a coastline on the enclosed seas bordering Europe*".

However, only with the *"White Paper on European Transport Policy for 2010: time to decide"* (CEU, 2001), the role of SSS became clear and evident. In this document, the European Commission stressed the relevance of SSS with the general aim to reduce road transport in order to rebalance the modal split.

Nowadays, SSS represents one of the transport sectors on which the European policy focuses more and which is currently having a high priority in the European agenda. However, despite the environmental and safety advantages of SSS (CEU, 1999), this mode appears to be undermined by its inability to integrate in door-to-door chains, its unreliability in relation to time windows, its poor image and high average age of the European SSS fleet (EP, 1996; Systema, 1999, Paixão Casaca and Marlow, 2005).

With the purpose to promote the positive effects of SSS and to improve SSS integration in the complete logistics supply chain, policy frameworks and programs have been developed, such as *"Programme for the promotion of SSS"* (COM 2003/155), which is one of the main documents regarding the measures for the implementation of SSS in Europe. Despite these actions, there are still several shortcomings that prevent the full development of SSS, as it was pointed out in the *"Mid-Term review of the Programme for the promotion of SSS"* (COM 2006/380). Some of the most important barriers are: difficulty to reach the integration of the multimodal door-to-door supply chain; the problems related to administrative procedures that differ from country to country and also the necessity to have high efficiency in port operations; which means good connections with the port hinterland, amongst others.

In this context, the last European orientation regarding maritime transport, SSS and intermodality can be found in the *"Keep Europe moving – Sustainable mobility for our continent – Mid-term review of the European Commission's 2001 Transport White Paper"* (COM 2006/ 314). In this document, the current situation of transport industry in Europe is once more analyzed, the problems remaining are pointed out and hypothetical instruments for improving the transport systems in Europe are highlighted.

Given these circumstances and bearing in mind, that the SSS market is strongly diversified (type/size vessel, etc.) and segmented (many national and peripheral

submarkets), the identification of the factors influencing pricing policies of the SSS intermodal transport are imperative to obtain a full development of the SSS in Europe.

Indeed, the growth of the SSS in Europe depends on its full integration in the transport (logistics) chain and consequently, in providing door-to-door services to customers (Paixão and Marlow, 2002) thus, the present study focused on both sea and inland leg (rail and road) of intermodal chains, within the scope of an integrated framework. Previous research on the subject is considered; findings are compared and validated against other relevant undertakings. More specifically, three EU funded research projects were analysed in detail; a) EMMA (European Marine MotorwAys); b) RECORDIT (REal COst Reduction of Door-to-door Intermodal Transport) and c) REALISE (REgional Action for Logistical Integration of Shipping across Europe). Additionally, international literature reports on SSS were reviewed, in particular the ones mentioning costs, factors influencing pricing policies and the integration of SSS in an intermodal chain. Dougall (2002) gathered costs of SSS services in specific routes and with particular vessels, while Musso and Marchese (2002) proposed a framework to identify the critical thresholds in land/sea distances and generalised costs in order to determine the competitiveness of the SSS. In Paixão and Marlow (2002), the complexity of a SSS intermodal chain is stressed and the obstacles to provide door-to-door services, when a sea-leg is introduced, are pointed out. Indeed, the authors mention that the success of intermodal transport is critical for the development of SSS. In this context and according with the EU (ECMT, 2001), intermodal transport is: *"The movement of goods in one and the same loading unit or vehicle which uses successively several modes of transport without handling of the goods themselves in changing modes"*. Within the scope, Brooks and Frost (2004) concluded that SSS has difficulties in meeting the service and price requirements of shippers.

As already mentioned, the objective of this paper is to identify the factors influencing pricing policies of SSS operators in the Mediterranean Sea, within the Italian perspective. The paper consists of seven major parts. The four initial sections incorporate the theoretical framework of the study, including the analysis of the European SSS market - the Mediterranean region, the identification of the cost structure of the intermodal transport service and also, the characteristics that may lead to price differentiation when setting the final price of a transport service. The fifth section describes the methodological framework used for the questionnaire development and content, the data collection method and the sample identification. Survey findings concerning the SSS operators' interviews, their analysis and discussion are the scope of section six. The conclusions regarding the major elements influencing the pricing policy of an intermodal transport service and the most important cost items in the cost structure of an intermodal service are presented in section 7.

2. The European SSS market: The Mediterranean region

The transport sector in Europe has witnessed an important growth in the last three decades. This increase was mainly due to road transport but also sea transport plays an important role in this growth (Eurostat, 2007). From the total freight of EU-27 transported by sea modes in 2006, SSS stand at 62%, corresponding to more than 1,9 billion tonnes.

Depending on the criteria used, SSS can be seen as a mode between an extension or the complementary part of the deep-sea shipping and an integrated part of the intermodal transport services (Brooks and Frost, 2004). In this context, SSS operators can be divided into feeder operators, which usually do not provide hinterland transport services and regional operators, which typically offer door-to-door services (Systema, 1999).

Furthermore, the SSS market can also be divided by geographical areas (North Sea, Mediterranean Sea, Atlantic Ocean, Baltic Sea, Black Sea and others) or according to the type of traffic (liquid, dry, unitized). There are many definitions for SSS, but an unambiguous one still missing (Musso and Marchese, 2002; Brooks and Frost, 2004).

The paper uses the European Commission's (CEU, 1999) definition about SSS which has already mentioned.

The scope of the paper is to analyse the Mediterranean Sea, a major field for SSS, playing a vital role in the movement of goods and passengers in Europe (Systema, 1999; ITMMA, 2007). Along with the North Sea, the Mediterranean Sea has the largest shares of SSS shipments in 2006, with 599 and 560 million tonnes, respectively (Amerini, 2008). In 2003, 68 SSS operators were operated in the Mediterranean region while 63 ports facilitated the SSS trade (Elliott, 2003). Furthermore, these SSS operators own the 39% of the EU SSS fleet (Malakasi, 2007). The average capacity of the Mediterranean fleet is 670 TEU, while the biggest ship carries about 3.428 TEU and the smallest vessel has a capacity of 126 TEU (Malakasi, 2007).

According to Amerini (2008), *"the Mediterranean is the only sea region where goods in containers represents more than 16% of the total weight of short sea shipped goods"*. These figures are not solely due to the development of the SSS market, but are mainly the result of the faster increasing rate of trade between Asia and the Mediterranean area. Although still on a much lower scale compared to the trade volume between Asia and North Europe (Vaggelas, 2007).

Nevertheless, it has to be highlighted that the total cargo transported in the Mediterranean region with the ability to be fully integrated into intermodal supply chains, Roll-on/Roll-off units and containers, is no more than 25% of the total cargo shipped (Amerini, 2008). This might be one of the reasons why SSS is facing problems in integrating in door-to-door chains.

Within the Mediterranean Sea, two submarkets can be distinguished: the Western area, which comprises by the West coast of Italy and the whole area to Gibraltar (which has experienced an amazing development since the middle 1990's); and the East area which includes all the ports and sea areas between Israel the east coast of Italy plus the island of Malta. This segmentation is based on the following three criteria:

1. Western Mediterranean market is a differentiated market regarding ports as it includes big hubs (e.g. Algeciras, Gioia Tauro, Taranto, Cagliari) and small ports.
2. Eastern Mediterranean market is characterised by equal sized and dynamic ports with few exceptions (Piraeus port).
3. Malta is situated in the middle of the previous categories.

When combining the origin and destination ports it is possible to conclude in the formation of 589 routes in the Mediterranean Sea (Malakasi, 2007). In 2003, the largest container flows were observed between Spain and Italy, 420.000 TEUs, and among Italy and Greece, 319.000 TEUs (Waals, 2005). In 2006 Italy was considered the major contributor to the SSS freight flows on the Mediterranean Sea, not only with other EU ports but also with other Mediterranean countries such as Croatia, Bosnia-Herzegovina, Montenegro, Albania, Syria, Lebanon, Occupied Palestinian Territory, Libya, Tunisia, Algeria, Gibraltar, Morocco, Egypt, Israel and Turkey (Amerini, 2008). Indeed, Italian ports (e.g. Genoa and La Spezia) play a leading role in the SSS Mediterranean market mainly due to their particular geographical position (Malakasi, 2007).

3. Cost structure and characteristics that lead to price differentiation in intermodal transport

The full development of the SSS in Europe depends not only on its physical integration in the supply chain, but also on the competitiveness of the intermodal service in terms of cost, timing, flexibility, reliability, risk of damage, type of goods and frequency (Vassalo et al., 2004).

In this context, Tsamboulas and Kapros (2000) considered the cost of the intermodal transport service as the most important criterion affecting the decision-making process of intermodal supply chain. Several studies (Zachcial, 2001; Paixão and Marlow,

2002; Nitsopoulos and Psaraftis, 2007) support that ports efficiency and port charges are considered as barriers when choosing an intermodal transport chain with the use of SSS. The latter is considered an obstacle not only due to the high tariff, but also due to the wide variability between ports, without justification (Lindsay, 1998). For example, in the Gioia Tauro–Manchester intermodal corridor, in particular in the Gioia Tauro–Genova leg, it was observed that the port charges (excluding transhipment) were between 25–30% of the total SSS cost (Vassallo et al., 2004). On the contrary, Saurí (2006) assumed that the ship capacity has a bigger impact in the total cost of the supply chain rather than the port productivity. He argues that the competitiveness of SSS basically relies on the economies of scale in deploying larger vessels (Saurí, 2006), as port operational costs do not increase proportionally with the ship capacity and therefore, the unit cost falls as ship size increases (Sys et al, 2008).

Since the costs of the intermodal transport chain are one of the most important factors influencing the choice of the transport mode, the general cost structure of an intermodal transport service is analysed as follows. Based on both EU projects RECORDIT (Baccelli et al., 2001b) and Realise (Vassallo et al., 2004) the internal costs for each activity or leg of a journey, i.e. the expenses incurred by an operator due to the movement of a Loading Unit (henceforth LU) through an intermodal door-to-door transport chain, can be divided into six categories: personnel; fixed assets/maintenance of assets (including depreciation and interests); energy/other consumption materials and communication tools; stock turn (e.g. storage of goods, transhipments); organisation (e.g. management); insurance/taxes/charges (including fuel and vehicle circulation taxes, insurance and registration, etc.). It has to be pointed out that in these cost categories the value of time (VoT) has not been taken into account, "*as it is difficult to fix a valuation of time beforehand because this depends on the specific circumstances, such as type of good, logistical organization, etc.*" (Vassallo et al., 2004).

When examining the cost structure in the three corridors: Genoa–Basel; Basel–Rotterdam; Rotterdam–Manchester, selected by RECORDIT, it can be noticed that the SSS integration in the complete logistics supply chain has not been analysed sufficiently. However, in REALISE project the corridors that have been selected (Gioia Tauro–Manchester; Athens–Gothenburg; Lisbon–Rostock; Le Havre–Gdansk or Helsinki) are more representative of the actual freight flows in Europe and therefore, the comparisons between multimodal and all-road solutions provide "*valuable insights in the integration of different freight transport modes in Europe*" (Loyd, 2003).

In the EU's SPIN project (Scanning the Potential for INtermodal transport), a decision support tool for transport operators to assess the potential for a modal shift towards intermodal transport by adding-up all (real) costs incurred in all the activities comprise between the origin and destination of a consignment movement (Tsamboulas et al, 2006).

There is nearly unanimous consensus that the evaluation of intermodal alternatives must be under a full-cost pricing framework, and as a key component in developing sustainable transportation plans (National Ports and Waterways Institute and University of New Orleans, 2004). It has been stated that external costs are important factors when defining the total costs of SSS and intermodal transportation and they have been recognised as a major problem in Europe (Nash et al., 2001). It has been argued that in many countries transport users do not actually pay all costs generated by their transport activities (CEU, 1995; Gibbons and O'Mahony, 2002; Atenco, 2001). The size of externalities varies significantly between transport modes, time frames and places (CEU, 1995). The paper is concentrating mainly on internal costs due to the difficulty of quantifying the external costs (National Ports and Waterways Institute and University of New Orleans, 2004) as there isn't a wide accepted method for achieving it (see for example the methods used by Gibbons and O'Mahony, 2002; Lloyd, 2003; De Borger et al, 2004).

Nevertheless, it has been observed that intermodal transport costs are not that closely related to intermodal transport prices and that even these prices differ considerably among transport services of similar distance routes and/or similar demand

characteristics. In fact, it is known that the variation of products and customers creates opportunities for price differentiation and the extraction of user surplus for some customers. In this context, Baccelli et al. (2001a) observed that the opportunity for differentiation between customers is reduced if there are active operators in the market willing to provide the service at marginal cost, given that the extent of price differentiation is in direct relation with the level of competition in the intermodal market.

According to Baccelli et al. (2001a) and ITMMA report (2007), the main characteristics influencing the final price of an intermodal transport service might be associated with the shipment (size, regularity, seasonality, peak/non-peak) and the content of the International Loading Unit (dangerous - extra care and increased risk, priority, high/low value and consolidated goods that may attract higher prices). Additionally, the nature of the customer (regular/irregular) is considered to have more influence in the price differentiation, rather than the nature of the consignment (Baccelli et al., 2001a). The reason for this can be for example that all the customers are not aware of the costs or the price the operator is willing to accept. According to Notteboom (2004), the future spatial development of liner schedules and inland service networks will largely depend on the balance of power between carriers and shippers.

Moreover, Niérat (1992) and Baccelli et al. (2001a) identified a group of factors associated with the nature of the intermodal system that could also lead to price differentiation such as the balance of traffic flows, the distance (due to high fixed costs), load factors (effective use of capacity on transport units), empty versus full containers (variation in net load on loaded units), different types of containers and mix of different modes (there are service attribute differences which may affect costs and the relationship between capital, fixed and variable costs).

Differences may also be observed depending on other unique characteristics associated with the country and/or the chosen corridor. Institutional framework, regulation and economic instruments like funding and incentives, are also stated to play an important role in the settlement of prices of the freight transport chain (Lloyd, 2003).

In conclusion, the forces affecting the final price of the service are complex, interdependent, difficult to survey and often difficult to measure accurately (Baccelli et al., 2001a).

5. Research Methodology

The data for this study was collected through a semi-structured questionnaire via telephone and face-to-face interviews. The latter were used to verify and support interpretation of the telephone interviews. In total, 15 SSS operator interviews constitute the primary data of the following analysis. The used semi-structured questionnaire, the data collection and the sample selection procedures are described herewith.

5.1 Semi-structured questionnaire development and content

The semi-structured questionnaire was developed in order to understand how the operators settled the prices of the transport services and which factors (not costs) could influence more the final price. All the questions concerning cost and price were left opened in order to obtain from the respondents their main drivers, as such data is quite sensitive and hence, not easy to obtain directly from the literature review or from real databases. Furthermore, the questionnaire focused as well, on market structures and services offered. Additionally, the survey aimed to identify the cost elements of an intermodal transport service and to realize their relative importance in the total cost structure.

The operators were asked to specify the type of service they offer (door-to-door, port-to-port or both). If the operators provide door-to-door service, they were asked, if they outsource the hinterland part and if they do so, what kind of contract or relationship

they have with the third party. In addition, the operators were asked which elements guide them to choose between providing door-to-door or/and port-to-port services and if they have specific routes where one, of the two services, is predominant. Secondly, the operators were asked to provide information concerning the cost and the price structure of the service, specifically to rank the three main cost items and the three major elements affecting the final price. Furthermore, the operators were asked to identify the break-even point of loading capacity for which they do not provide the service.

5.2 Data collection and sample selection

A brief field survey was made to define both the market structure and the operators working in the SSS Mediterranean area, in particular the ones specialized in Roll-on/Roll-off (henceforth Ro-Ro) or container transport. This last option was related with the ability of both Ro-Ro's and containers to be fully integrated in an intermodal supply chain, with a SSS leg. The necessary information was gathered from Internet, which is a well established research tool (Zikmund, 2000). The webpages of SSS promotion centre of Italy (http://www.shortsea.it), Greece (http://www.shortsea.gr) and France (http://www.shortsea.fr) were used to define the operators providing SSS in the Mediterranean area. A total of 48 SSS operators were recognised. The research was focused mainly on the Italian SSS operators which play a leading role in the Mediterranean SSS market. Hence, a convenience sample was used in the survey.

In total, 22 out of 48 operators SSS operators were contacted in order to participate in the research. The response rate was 68.1%, corresponding to 15 interviewed operators out of which twelve SSS operators were interviewed through a telephone interview in November 2007 and three SSS operators were interviewed through a face-to-face interview in April 2008. The other 26 operators either refused to participate or they were not reachable by telephone.

The telephone interview provides a very quick response and gives the ability to obtain additional information which is not strictly related to the stated questions (Zikmund, 2000). The same semi-structured questionnaire was used both in telephone and face-to-face interviews. Moreover, face-to-face interviews considered to be essential and very useful for validating the data obtained. Furthermore, with these meetings it was possible to gather more detailed and accurate information, which was not possible to obtain by the questionnaire itself during short telephone interviews, thus increasing the quality of the collected data.

The majority of the SSS operators that participated in the research were Italian (9 out of 15) and the remaining six operators were from Taiwan, Denmark, Turkey, Great Britain, Germany and Israel. The operators outside Italy were interviewed through their agent in Italy. The routes for interviewed operators are presented in *table 1*. The use of letters instead of the operator's name is due to the anonymity requested by the interviewees.

Table 1. Respective routes on the Mediterranean Sea of the interviewed operators.

Operator	Route(s)	Operator	Route(s)
A	Italy-Spain	H	Italy-Greece-Turkey
	Italy-Malta		Italy-Syria
	Italy-Israel		Malta-Egypt
	Israel-Greece-Turkey-Spain		Italy-Egypt
	Spain-Morocco		
	Spain-Italy-Israel	I	Italy-Egypt-Israel-Turkey
			Italy-Spain
B	Italy-Spain		Egypt-Israel-Turkey-Italy
	Italy-Turkey-Syria-Lebanon-Egypt	J	Italy-Spain
	Italy-Greece-Turkey		Italy-France
	Italy-Algeria		Italy-Tunisia
			Italy-Malta
C	Italy-Egypt-Turkey		Lines inside Italy
	Italy-Greece-Turkey		Italy-Greece-Turkey -Israel-Cyprus-Egypt
D	Italy-Egypt-Libya-Turkey		Italy- Slovenia-Greece-Israel-Turkey
	Italy-Malta		
E	Italy-Algeria	K	Lines inside Italy
	Italy-Tunisia		
	Italy-Libya	L	Lines inside Italy
	Italy-Malta		Italy-Albania
	Italy-Egypt		
	Italy-Lebanon	M*	Italy-Morocco
F	Lines inside Italy	N*	Italy-Turkey-Egypt-Cyprus-Israel
G	Italy-Turkey		
	Italy-Greece-Egypt	O*	Italy-Turkey
	Italy-Greece		
	Italy-Tunis		
	Italy-Alger		
	Italy-Malta-Libya		
	Italy-Morocco		

* Face-to-face interview
Source: websites of the interviewed operators.

Given these facts, it can be assumed that the participating operators constituted a representative sample for the research as their routes cover almost every country in the Mediterranean Sea region. The majority of the routes are starting, ending or including Italy, since the majority of the SSS operators that participated in the research are from Italy.

6. Findings of the interviews

The majority of the SSS operators provide container transport or Ro-Ro services. As can be seen from *table 2*, only one SSS operator provides both services. From the remaining operators, 3 out of 15 operators were just Ro-Ro operators and the others container transport operators. Most of the operators (14 out of 15) provide door-to-door service and only one Ro-Ro operator had a port-to-port line service. The operators offering door-to-door service cover the inland leg either with their own assets or by subcontracting the inland transport services. The specification of hinterland transport is a sub-category of door-to-door service, where only the operators offering a complete service from origin to destination need to deal with the land leg of the transport.

Table 2. Type of service of the interviewed SSS operators.

Type of service	Operators														
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
Door-to-door (container)	X	X	X	X	X		X	X	X				X	X	X
Door-to-door (ro-ro)						X				X	X				
- *Hinterland (subcontract services)*	X	X	X	X	X		X	X	X	X	X		X	X	X
- *Hinterland (internal services)*						X			X						
Port-to-port (container)	X	X	X	X	X	X	X	X	X				X	X	X
Port-to-port (ro-ro)						X				X	X	X			

*The answers from the face-to-face interviewed operators are in grey.

It appears that the operators offering door-to-door services are mostly cooperating with third parties for the hinterland transport. This could be due to the need of the customers for a complete service from the origin to destination. Therefore, when operators do not have their own means for offering the land transport, they develop partnerships (mainly through contracts for one or two years) with third parties in order to provide the initial and final part of the transport. Most of the interviewed operators prefer to outsource the land transport to road or rail operators.

In general, SSS operators have considerably midterm contracts (essentially for one year) with both rail and/or road transport providers. On the other hand, the contracts or agreements with customers or fuel providers are typically short terms contracts, on average three months and for each fuel recharge, respectively. Regarding the two operators that have internal assets for hinterland transports (F and I) their focus is on specific routes and/or loading units. It must be pointed out that the decision of offering land transport is related to the origin and destination of the cargo. There are destinations, where the door-to-door service is more easy and attractive to organise. Another important aspect influencing the decision to provide door-to-door transportation is based on the type of goods that needs to be transported.

Table 3 shows the main elements identified by the operators influencing their decision in providing door-to-door or port-to-port service.

Table 3. Reasons for offering door-to-door or port-to-port services.

Elements	Operators															Total
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	
Destination			X	X	X			X	X	X	X		X	X	X	10
Loading Unit						X										1
Competitive Market	X															1
Type of goods		X														1

* The answers from the face-to-face interviewed operators are in grey.

This table is summarising the decisive factors that the operator consider before deciding to provide a door-to-door or a port-to-port service. Based on the operators' answers (13 out of 15), there are four main factors that affect this decision: the destination of the freight, the type of goods, the loading unit and the competitiveness of the market. The destination of the goods seems to be the leading factor, as it was recognised by the majority of the SSS operators (67%), followed by the type of goods, the loading unit and the market competitiveness.

Additionally, the respondents were asked to rank the three main costs of a transport service, from the most (1) to the less (3) important item. As can be seen in *table 4*, seven SSS operators identified as more relevant fuel costs and five operators pointed out freight rates (here assumed as well as depreciation costs). Other costs having high relevance on the final price are the personnel and port related costs (operation and fees). Hinterland transportation, maintenance and SSS supplier markets costs seemed to have less importance on the total transport expenses.

Table 4. Ranking of the importance of different cost items in the cost structure of a SSS operator for specific services (1st =1, 2nd =2, 3rd =3, level of importance).

Cost items	Operators														
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
Freight rates[1]	1	2				1	1			2		2	1	1	2
Fuel costs	2	1	1	1				1	3	1	1	1	2		
Port costs		3	2	2									3	2	3
Hinterland transportation			3			2	3							3	1
Personnel costs						3		3	2	3	2				
Maintenance costs								2			3				
Markets[2]					1										
Other characteristics[3]							2		1						

* The answers from the face-to-face interviewed operators are in grey.

Concerning the elements influencing the final price (see *table 5*), the fuel cost and market competitiveness were identified eight times by the operators as two of the main elements in the variation of the annual price followed by seasonality (high peaks and low peaks related to the business trends).

Table 5. Elements influencing the final price of the SSS services.

Elements	Operators															Total
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	
Fuel costs		X	X	X		X			X	X	X			X		8
Seasonality		X	X	X		X	X					X			X	7
Competitive Market	X	X	X		X				X				X	X	X	8
Destination	X		X			X			X							4
Port costs				X					X			X		X		3
Type of goods												X			X	2
Nature of customer													X			1
Currency								X								1

* The answers from the face-to-face interviewed operators are in grey.

[1] Here freight rates are related either with the cost of hiring vessels (charter hire rate) or with depreciation costs, when operators own the vessels. Even though these two costs are not exactly the same and therefore, are influenced by different elements, it is assumed here that depreciation costs and charter hire rates are both similar fixed costs, from these operators' point of view.

[2] Here markets refer to SSS supplier markets (e.g. labour market, fuel market).

[3] e.g. size of shipment, regularity, nature of customer, etc.

Additionally, the operators considered final destination, port costs, type of goods, nature of the customer and currency as other elements that can lead to price differentiation. Furthermore, all three interviewed operators indicated the specificity of each market and the peculiar characteristics of the customer and/or shipment as important factors affecting their pricing strategy.

Finally, the operators were asked to declare the break-even point of loading capacity for not providing the service. Based on the results there is no minimum size of transhipment that allows the operator to cancel the scheduled service, as these operators admitted that have to offer the liner services despite of the demand.

In order to compare the results of this paper to other studies, the values in table 6, were replaced with weighted values. Mainly all the operators consider freight rates and fuel costs as the most important items in the final cost (*table 6*). It should be highlighted that port costs were in the third place.

Table 6. Ranking of the importance of different cost items in the cost structure of a SSS operator for a specific service, with weighted values (1st choice=15, 2nd choice=10, 3rd choice=5).

Cost items	Operators															Total
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	
Freight rates	15	10				15	15			10		10	15	15	10	115
Fuel costs	10	15	15	15				15	5	15	15	15	10			130
Port costs		5	10	10									5	10	5	45
Hinterland transportation			5			10	5							5	15	40
Personnel costs						5		5	10	5	10					35
Maintenance costs								10			5					15
Markets					15											15
Other characteristics							10		15							25

* The answers from the face-to-face interviewed operators are in grey.

These results were compared with the outcomes obtained from the EU project entitled REALISE (where the cost structure of some intermodal transport routes in Europe were described). The routes selected from the REALISE project (4 out of 5) were considered as representative of the major freight flows in Europe. Therefore, this comparison can provide valuable insights about the integration of the SSS in Europe. Depreciation of the ships was considered the most important cost item, in 3 out of the 4 routes selected from the REALISE report. Here, the interviewees pointed out freight rates (here assumed to be as well depreciation costs) as the second most significant cost. The second and third higher cost items identified by REALISE were fuel and port costs, respectively. The latter item was recognized as well by the interviewees as the third main cost. The difference is that fuel cost was mentioned in these interviews as the one having the largest impact in the total transport costs. This fact might be related with the instability of oil prices in recent years. Indeed, back in 2003/2004 when data and interviews for REALISE were collected the oil prices were not this high[4].

7. Discussion

[4] "This long stretch of stability ended in 2004, when oil topped $40 a barrel for the first time, then embarked on a steep climb that continued into this year (2008)" (Federal Reserve Bank of Dallas, 2008)

Based on the information gathered during the interviews, a relationship defined between major elements influencing the price, by operators and forwarders, and the importance of cost items in their cost functions was established.

According to this study the elements influencing the price of a transport service, with a SSS leg are: fuel costs, seasonality, competitiveness of the market, destination, port costs, type of goods (low/high value), currency and some other characteristics of the liner service such as the size of shipment, regularity and nature of customer. All these characteristics provide an opportunity for the intermodal operator to discriminate between customers and utilize the differences in their willingness to pay. For example, the market power of the customer increases with the size of the shipment and in this case, price reductions can be negotiated with the operator. The long term relations or occasional contracts are usually elements of differentiations among customers. Namely, if the operator has business relations with a customer that last for a long period, the price for service could be lower than for other customers that have occasional contracts. Most of these elements are in line both with interviews and the literature review.

In Figure 1, the relationship between different elements influencing price and cost defined by shipping operators are shown. The right side of the relationship is composed by costs, which depend on several items: fuel costs, freight rates, personnel costs, port costs, other costs, hinterland transport, maintenance costs and markets.

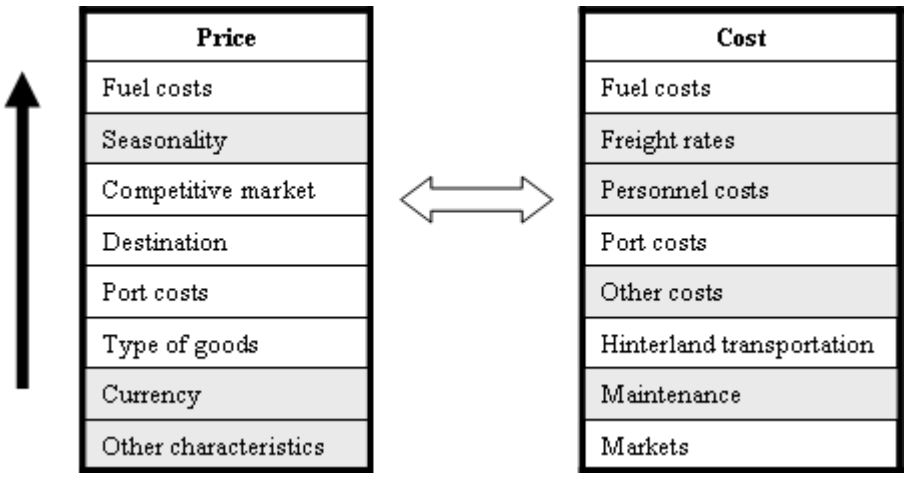

Figure 1: The relationship between different elements influencing price and cost defined by shipping operators.

In order to define the unstable factors influencing pricing policies for SSS services it is necessary to remove all the stable and residual elements from the relationship (marked as shaded grey colour in figure 2). Thus, personnel costs, freight rates and maintenance are removed, as they are assumed to be stable during the one year period. This assumption is due to the fact that operators are aware of the annual expenses related to these factors and as a result, they consider them almost fixed costs when setting their annual service prices. Concerning seasonality, operators assumed having the necessary experience based on previous periods. Therefore, possible fluctuations are internalised in their cost structure and consequently, this item is considered constant during the year. Furthermore, currency is removed, because all the money transactions in the Mediterranean area are made in euros. Additionally, other costs and other characteristics are removed as well, due to their residual nature.

On a first examination, when comparing major elements influencing the price and the importance of cost items in the cost function, seems that only fuel and port costs are included in both sides of the relationship. However, at a second glance, it is possible to see more common elements in the relationship. Indeed, there are factors appearing in both tables that despite not having the same name have the same meaning. These factors are, on the one hand, the competitive market (meaning the level of competition within the SSS

operators) which is related with the item markets which represents the several markets behind each SSS service (e.g. fuel market, market for rail and road transportation, labour market, etc.). On the other hand, the characteristics related to land transport (destination and hinterland transportation) are correlated and the type of goods is influencing the selection of inland transport mode. Thus, it is possible to say that there are, at least, four common elements in both sides. Nevertheless, it is clear that, in addition to cost items, the profit margin of the SSS operators plays a major role on their price strategy, since it constitutes the revenue of the operator.

To sum-up, some considerations can be outlined when analysing the remaining relationships defined by SSS operators:

- The fuel is considered one of the most important elements and the operators can not influence it, since the fuel price fluctuates according to the world fuel market;
- The cost of an intermodal service with a SSS leg and its final price is understood as closely dependent on the final destination and the inland transport modes used. This is related with the fact that there are destinations, where the door-to-door service is easier and cheaper to organise;
- The role of the port costs is regarded to be a critical element when defining the final price of the service and also when the operator is defining its business strategy. According to the results of EMMA project (Lindsay, 1998) port charges vary widely without apparent justification and they can be reduced by effective negotiations;
- The role of the market in the SSS sector, or rather the competition within the operators following the market dynamics, is viewed by the operators as an important element when defining their pricing strategy regarding each SSS service.

8. Conclusion

The paper contributes to the discussion regarding the pricing scheme and the cost structure of the intermodal transport with a SSS leg. It examines and analyses the existing literature related to the intermodal freight transport, especially concerning the SSS integration in the transport chain. In order to achieve the scope of research, interviews with SSS operators were performed, addressing the main elements influencing both cost structure and final price of a transport service. The analysis of collected data assists the understanding of the revealed parameters influencing both price and cost. These evidences could lead to further lines of research.

Regarding the factors influencing the operators' pricing policies, fuel was considered the most important. Indeed, fuel was considered the principal cause for annual price variations and freight rates, the second one. It as to be pointed out that in this paper the freight rates item is related either with depreciation costs or charges for hiring a ship, when SSS operators do not own them. Even though these two costs are not exactly the same and therefore, are influenced by different elements, it is assumed here that depreciation costs and charter hire rates are both similar fixed costs, from these interviewees' point of view. It is also clear that the market adds dynamics over the price strategy for every operator. The SSS market is highly competitive with a wide variety of operators on different routes. In this context, the entry to the road transport market is even easier than to maritime market since it is easier to enter the trucking industry as the trucks are cheaper to run and operate than ships. The market for rail operators is at the moment more stable as it is an oligopolistic market. However, due to the complexity of self-organised systems, validating these cost functions accurately presents a great challenge.

Regarding the cost items, the analysis of data collected revealed that the variation in fuel and port costs plus the level of competitiveness of the markets influence deeply the cost of an intermodal transport service (with fuel costs being the most important element).

The total transport cost service is also affected by changes in the hinterland transport costs. Finally, the origin and the destination of the goods influence the choice of providing the service (door-to-door or port-to-port) for the majority of the operators.

It has also been referred in other studies (e.g. Vassalo et al., 2004) that there are difficulties to obtain data concerning cost items and especially unit costs. According to REALISE project this is on the one hand due to the difficulties by extracting unit costs out of balance sheets of operators and on the other hand due to the unwillingness of the managers to provide sensitive data by interview. The research undertaken may be considered as a pilot effort to be extended in the future, in order to include more surveys (possibly containing quantitative data) and in-depth analysis of case studies, in order to produce a concrete form of the cost structure and pricing scheme structure.

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