

# The Effect of Shared Planning by Road Transport Firms and Shipping Companies on Performance in the Intermodal Transport Chain: the Case of Ro-Ro Short Sea Shipping

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In recent years short sea shipping, and specifically the so-called motorways of the sea, have increasingly become the focus of attention in the area of European Union transport policy. As an intermodal alternative to door-to-door unimodal road transport, the success of short sea shipping is dependent on properly functioning interaction among agents in the chain, particularly shipping companies and road transport firms. Taking the road transport firm perspective, this study aims to evaluate the extent to which shared planning between agents explains the firm's performance in the context of the intermodal relationship, and explores the key antecedents for shared planning in this context. The research hypotheses were tested on a sample of 106 relationships between shipping companies and road transport firms. Our study contributes to the literature on intermodality and short sea shipping by providing evidence on how shared planning positively benefits the road transport firm performance. The results also demonstrate that two factors--namely, trust in the shipping company and the road transport firm's involvement through adaptations to the partner--largely determine shared planning.

*Key-words:* Intermodal transport chain; Motorways of the sea; Performance; Ro-Ro transport; Short sea shipping; Shared planning

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## 1. Introduction

In recent years, growing interest in the development of short sea shipping (SSS) has prompted a wide range of studies in geographical regions as diverse as North America (Brooks and Trifts, 2008; Higginson and Dumitrascu, 2007; Perakis and Denisis, 2008; Puckett et al., 2011), Central America (Sánchez and Wilmsmeier, 2005) or Australia (Bendall and Brooks, 2011; Hallock, 2010), although most research has been undertaken in Europe (see, for example, Baird, 2007; Gouvelal et al., 2010; Paixão and Marlow, 2002; 2005; 2009; López-Navarro et al., 2011a; 2011b or Medda and Trujillo, 2010). Indeed, in a context characterized by an increasing flow in the exchange of products and services, the European Union now considers SSS as a transport mode priority for advancing toward sustainable mobility. Although results to date do not come up to initial expectations (Baindur and Viegas, 2011; Cappuccilli and Douet, 2011; Medda and Trujillo, 2010),

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the European Union is currently embarked on an ambitious SSS program entitled 'Motorways of the Sea' (MoS). MoS are short-sea corridors on which fast, competitive and efficient short-sea transport takes place and, as Feo et al. (2011, p. 60) suggest, "by creating Motorways of the Sea, the European Union hopes to resolve the gap between supply and demand by providing door-to-door maritime services than can compete with the road alternative".

The integration of SSS in the framework of intermodal transport chains has been pointed out as a key factor for success (Kapros and Panou, 2007; Paixão and Marlow, 2002; Perakis and Denisis, 2008). Indeed, MoS are promoted by the EU as an intermodal alternative to door-to-door unimodal road transport. Intermodal transport, by combining the advantages of each mode, enables better efficiency, cost-effectiveness and sustainability of the system (Jugovic et al., 2011). However, it is more complex than unimodal transport (Macharis and Bontekoning, 2004; Caris et al., 2008). The involvement of different parties demands coordination, and operators need to resolve their mistrust and realize the importance of integration within the transport chain (Kapros and Panou, 2007; López-Navarro et al., 2011b; Perakis and Denisis, 2008).

According to the above, shared planning between road transport firms and shipping companies would be crucial to achieving integration and successful development of SSS and MoS. Indeed, the literature on inter-organizational relationships and supply chain management reports that shared planning contributes decisively to an adequate development of the relationship (Hadaya and Cassivi, 2007; Johnston et al., 2004; Petersen et al., 2005; Simatupang and Sridharan, 2005). However, the analysis of the details of the relationship between shared planning and performance is a question hitherto unexplored by the literature in the field of SSS.

Taking as reference the road transport firm, this study aims to evaluate the extent to which shared planning between agents explains the firm's performance in the context of the intermodal relationship. Additionally, we also examine the impact of two antecedents of shared planning in the SSS context: trust in the shipping company, and involvement of the road transport firm in terms of adaptations to the partner. Support for our arguments is based on insights from Transaction Cost Analysis (TCA) (Williamson, 1975; 1985). Empirical work was carried out on a sample of 106 relationships between road transport firms and shipping companies. A partial least squares (PLS) analysis was used to identify the significant relationships in the proposed model.

The paper is structured as follows: the next section describes the conceptual framework applied to analyze the influence of shared planning on performance, as well as the main antecedents of shared planning. This is followed by a description of the empirical methodology used. The results obtained from testing our hypotheses are reported in the next section. The paper concludes with a discussion of our main conclusions.

## 2. Literature review and hypotheses

First of all, we consider that the scope of our study (Ro-Ro Short Sea Shipping) must be properly defined. Perakis and Denisis (2008) point out that SSS can be categorized according to the type of cargo transported, the types of vessels, or the waterways used. These authors identify two major types of cargo units for the transport of general cargo: freight containers and truck-trailers or semi-trailers, and SSS can provide transportation options for both. Containers are the least expensive mode of carrying goods, but they are also the slowest due to the inherent characteristics of their operations (Paixão and Marlow, 2002). Semi-trailers allow for shorter delivery times than container options. This reduction in delivery time is particularly important for trade of valuable goods in a world in which just-in-time principles are increasingly widespread (Torbianelli, 2000). A thorough analysis of the differences in operating with semi-trailers and containers can be found in Woxenius and Bergqvist (2011). As these authors point out (p. 682), "the different competitive pressures between modes and between shipping lines implies

that the business priority for the Ro-Ro operators leans towards providing customer convenience, while container segment aims at utilising economies of scale (...) Ro-Ro's focus can be characterized as being trained on service, while that of Lo-Lo is on low transport costs". Our study is limited to the segment of SSS where truck-trailers or semi-trailers are transported in Ro-Ro ships, considered as a direct alternative to all-road transport. Given that service quality is a priority in the SSS semi-trailer transport, shared planning between agents--the focus of our study--is a key element for success. Moreover, focusing our research on this segment of SSS justifies, to a large degree, our approach from the perspective of the road transport firm. Woxenius and Bergqvist (2011), taking the study of Schramm (2006) as a reference, note that the success of intermodal transport chains depends greatly on which agent acts as coordinator and how well the operations are integrated. They highlight that, while shipping companies, their agents or specialized sea forwarders take on the coordinating role in container transport, road transport firms or road-based forwarders dominate the organization of transport chains involving semi-trailers.

Furthermore, Ro-Ro operations are the main focus of the MoS (Paixão and Marlow, 2007), which have been planned by the European Union as a part of the Trans-European transport network (TEN-T) and constitute the heart of the European SSS policy.

### *2.1. Shared planning and performance*

Shared planning has been revealed as a significant factor in ensuring that inter-organizational relationships develop correctly (Johnston et al., 2004; Johnson and Kristal, 2008; Hadaya and Cassivi, 2007; Petersen et al., 2005; Simatupang and Sridharan, 2005). As Hadaya and Cassivi (2007) pointed out, to be effective, interorganizational collaboration requires some form of planning. In fact, joint planning actions define the inter-organizational processes needed to collaborate effectively (Lummus et al., 1998).

Shared planning refers to the involvement of buyers and suppliers in joint decisions, as well as the actions that both partners take towards strategic planning (Johnston et al., 2004; Johnson and Kristal, 2008). In the context of an inter-organizational relationship, partners may behave inappropriately by deliberately concealing information that could be beneficial to the other party, even though such actions may eventually lead to the breakdown of the relationship (Narayanan and Raman, 2004). Communication and shared planning between partners helps bring about mutual benefits by enabling the exchange of necessary information and by reducing misunderstandings and uncertainty (Sarkar et al., 2001); in this context it is unlikely that partners will endanger the future of the relationship. In contrast, the absence of shared planning creates an environment that favours uncertainty about partners' future behaviour, which can lead to poor performance of the relationship and even break it.

Shared planning, moreover, strengthen the relationship in the long term, since each party has a better understanding of its partner's interests and needs (Corbett et al., 1999; Hadaya and Cassivi, 2007). When companies share planning and work together to resolve their problems, they are more likely to find mutually satisfactory solutions that improve success and strengthen their relationship (Nielson, 1998). As Hadaya and Casivi (2007, p. 960) suggest, "joint collaboration planning actions assure information visibility between the partners by identifying, clarifying and establishing the information exchange characteristics required to support the collaborations processes that will ensue". SSS, and particularly MoS, should provide on-time reliable service and meet just-in-time requirements of current door-to-door transport. And this fact requires, as we noted in previous section, the close collaboration of the different agents in the context of the intermodal transport chain. Consequently, shared planning between shipping and road transport firms may be an important factor to improve the performance of intermodal relationship.

In summary, shared planning helps partners better manage uncertainty, and improve the success of the relationship due to their enhanced understanding of their counterparts' interests and needs. Moreover, several studies have highlighted the existence of a positive relationship between shared planning and performance (Johnson et al., 2004; Petersen et al., 2005) although in fields other than that addressed in this research. In light of the above, we define our first hypothesis:

*H<sub>1</sub>: Shared planning is positively related to road transport firm performance in the context of the intermodal relationship.*

## 2.2. Trust and shared planning

Several studies, such as Kapros and Panou (2007) or Saldanha and Gray (2002), report the existence of an attitude--largely of mistrust--that is unfavourable to cooperation between road transport firms and shipping companies in the context of intermodal transport chains. However, trust among supply chain partners is a vital ingredient for success (Ferrer et al., 2010). Trust refers to the reliability and integrity of the partner in the relationship (Morgan and Hunt, 1994). TCA suggests that trust is a key element in reducing transaction costs. In the framework of this theory, the assumption of *limited rationality* implies that all complex contracts formulated are necessarily incomplete; parallel to this, the existence of *opportunistic behaviours* implies the willingness of partners to take advantage for their own ends of any possible contingencies not foreseen in the contracts (Williamson, 1985: 44-52). In this context, trust implies a reduction in the levels of uncertainty over possible opportunistic behaviour by the partner (Granovetter, 1985; Madhok, 1995), thus decreasing transactional problems (Gulati, 1995; Gulati and Singh, 1998).

Shared planning within the framework of an interorganisational relationship involves sharing information, which entails assuming certain risks (Clemons and Hitt, 2003; Ferrer et al., 2010; Han et al., 2004; Maloni and Benton, 1997). The risks deriving from a partner's potential opportunistic behaviour through the inappropriate use of shared information requires a great deal of resources to control and monitor the development of the relationship (Wathne and Heide, 2000). Trust constitutes an informal control mechanism that improves the exchange of information between partners and motivates them to work inter-dependently in the pursuit of synergies and in the joint planning of activities (Steendahl et al., 2004). In the context of this study, the control of the entire door-to-door process that road transport firms enjoy with the all-road transport mode does not exist when they use SSS. From then on, the shipping companies provide the service for one section of the transport chain and the road transport firms are obliged to share information with them about questions such as the type of goods transported. There is evidence of mistrust by the road transport firms based on a fear they might lose customers, which can lead them to be reticent to shared planning (López-Navarro et al., 2005).

In sum, as Das and Teng (1998) have suggested, trust helps to reduce opportunistic behaviour as partners are expected to focus on the long term orientation of the relationship and to put aside their own short term interests. As a result, trust reduces the risks involved in sharing information and encourages shared planning of activities within the relationship. Therefore, and following the previous theoretical arguments, the greater the road transport firm's trust in the shipping company, the lower the transaction costs inherent to the relationship and the greater the shared planning; this leads us to formulate the following hypothesis:

*H<sub>2</sub>: Trust in the shipping company is positively related to shared planning.*

## 2.3. Road transport firm's involvement and shared planning

Although from the relational perspective trust is the main determinant of shared planning, in the case in hand shared planning is also conditioned by the degree of road transport firm involvement through adaptations to the partner. Adaptation is a key element in inter-

organizational relationships (Brennan and Turnbull, 1999; Hallén et al., 1991; Knoppen et al., 2010; Mukheji and Francis, 2008). However, the relationship between adaptation and shared planning has not been covered by the literature in this field. Adaptation is when one of the partners in a relationship changes or adapts its processes or the item exchanged to accommodate the other party (Walter and Ritter, 2003); consequently, its dependence on the partner increases. From the TCA, adaptation is linked to investments in specific assets (Brennan and Turnbull, 1999; Hallén et al., 1991; Williamson, 1985). The greater a firm's involvement in adapting to its partner's operations, the more clearly it is signalling its commitment to the inter-organizational relationship (Brennan and Turnbull, 1999; Hallén et al., 1991). By adapting, a firm sends its partner a sign that it is trustworthy (Ford et al., 2003), which should increase the partner's willingness to collaborate and plan operations jointly within the inter-organizational relationship. Indeed, the TCA highlights the need to adapt in order to motivate collaboration between partners (Knoppen et al., 2010). Hence, as one company perceives that its partner is involved and committed to the inter-organizational relationship, it will be more likely to expect its partner to fulfil its obligations and become a loyal partner (Walter and Ritter, 2003).

The higher involvement of the road transport firm through greater adaptation to short sea operations with the shipping company is reflected, for example, in the increased use of unaccompanied transport (López Navarro et al., 2011a). In accompanied transport mode semi-trailers are loaded together with their tractor cabs and drivers travel as passengers. In unaccompanied transport mode only semi-trailers are boarded onto the vessels, which are loaded and unloaded at the port with special vehicles; semi-trailers are then coupled with the tractor units located at either end, and moved onto their final destinations as complete units. Whilst unaccompanied transport appears to be a more economically relevant solution than accompanied transport (loading the whole truck takes up more space on board and involves higher costs resulting from inactive tractor units and drivers), it does nevertheless impose major organizational constraints and demands market requirements be met (De Solere, 2007; Desiderio et al., 2008; López Navarro et al., 2011a; Torbianelli, 2000). Accompanied transport assumes that a road vehicle can be transported without any prior conditions; in fact, this mode is almost as flexible as road transport. In contrast, unaccompanied transport implies a higher degree of adaptation by the road transport firm, which leads to lower levels of flexibility. Consequently, the road transport firm must become more involved in the relationship with the shipping company, which will normally result in more regular and higher volumes of traffic. This involvement and its consequences should be positively valued by the shipping company, which needs regular cargo flows to exploit its investments to the full; its willingness to interact and shared planning should therefore increase. In addition, apart from this aspect of willingness, the greater complexity in the organization and coordination of unaccompanied transport operations may *per se* require partners to increase shared planning.

In light of the above, there are two reasons why greater road transport firm involvement in adapting to short-sea operations with the shipping company can lead to increased shared planning. First, through its investments in adaptation, the road transport firm is sending a signal of its commitment to the shipping company, thereby encouraging the shipping company to shared planning. And second, because greater adaptation tends to lead to the use of unaccompanied transport, which implies greater organizational complexity and usually leads to a more regular and a higher flow of traffic, both of which can motivate--or rather, require--greater levels of shared planning between the agents involved. The arguments above lead us to our next hypothesis:

*H<sub>3</sub>: Road transport firm's involvement through adaptations to short-sea operations with the shipping company is positively related to shared planning.*

*Control variables*

We controlled for possible confounding effects by including two relevant control variables in the analysis: size of the road transport firm, and its degree of internationalization. According to the literature, larger companies with more resources enjoy potential advantages in regard to proper management of the relationship (Hitt et al., 2002; Klein and Rai, 2009; Patnayakuni et al., 2006). Moreover, given the international nature of MoS in the European Union, and more specifically those addressed in the empirical part of this study, the company's international orientation and the accumulation of experience in this field may also be relevant in obtaining good results when using them. We therefore assume that larger and more internationalized road transport firms will have more resources and capabilities that will allow them to better manage the relationship and obtain enhanced performance.

In summary, the research model is showed in Figure 1. The three hypotheses build up the model, linking trust in the shipping company, road transport firm's involvement, shared planning and road transport firm performance.

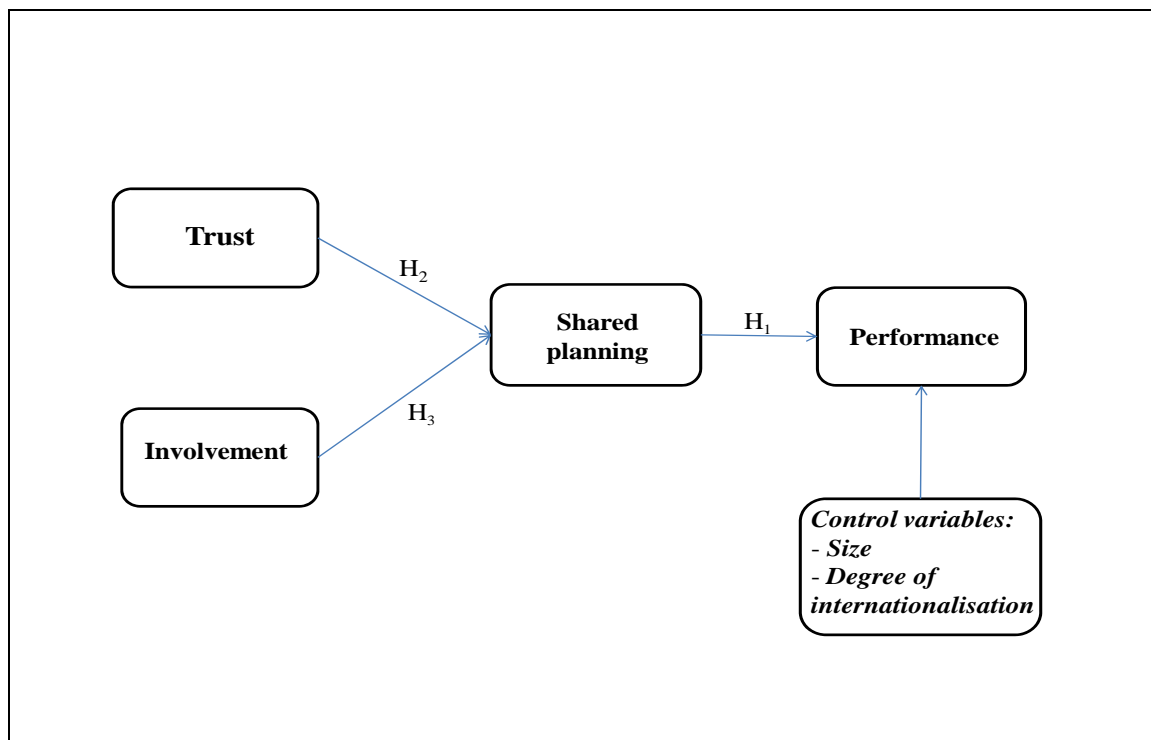


Figure 1. Research model

### 3. Methodology

#### 3.1. Data collection

The study population consisted of the international road transport firms that use SSS between Spain and Italy, specifically the Barcelona-Genoa line (operated by the shipping company *Grandi Navi Veloci*) and the Barcelona-Rome line (operated by the shipping company *Grimaldi Napoli*). This implied a substantial restriction in that no directory or database was available from which to extract information on the international road transport firms using these SSS lines. We were able to overcome this obstacle by visiting the terminals of the Port of Barcelona, where these companies operated. Efforts were made to visit the port on different days of the week, to cover the weekly period. The total number of visits was 6. The visiting times were from 15:00 to 22:00,

because it is when vessels are in the terminal to perform the operations of loading/unloading. We created a database of the Spanish, Portuguese and Italian international road transport firms using these lines through direct observation of the semi-trailers loaded and their association with specific transport firms. We identified 120 firms (53 Spanish, 4 Portuguese and 63 Italian), all of which we contacted by telephone to explain in detail the aims of the study and request their collaboration. A total of 81 firms (41 Spanish, 3 Portuguese and 37 Italian) agreed to collaborate in the study and respond to the questionnaire designed for the purposes of the investigation, representing 68% of the total number of firms contacted. However, it should be noted that the questionnaire covered the possibility that these road transport firms might work with more than one shipping company. Specifically, the firms were requested to specify which SSS lines they used between Spain and Italy. As well as the Barcelona-Genoa and Barcelona-Rome lines, there were another three lines between Spain and Italy: Tarragona-Livorno (operated by the shipping company *Suardiaz*), Valencia-Livorno and Valencia-Salerno (both operated by the shipping company *Grimaldi Napoli*). Figure 2 presents a map which displays the cities that constitute the ends of the sea links analysed. All these lines operate with a frequency that meets the requirements suggested by Valente de Oliveira -European Coordinator for Motorways of the Sea- (2008) for sea motorways, namely between 3 and 5 times a week. If we take into account the three other lines mentioned above, the firms surveyed could potentially work with three shipping companies: *Grandi Navi Veloci*, *Grimaldi Napoli* and *Suardiaz*. In all cases they worked with at least one of the first two companies mentioned, since the firms were identified in the port of Barcelona. In 25 cases the firm surveyed provided information about its relationships with two different shipping companies. Consequently, since the unit of analysis was the 'road transport firm- shipping company' relationship, the number of units of observation in our causal analysis is 106. This number of observations can be considered as enough to carry out the subsequent statistical analyses that allow us to examine our theoretical hypotheses.

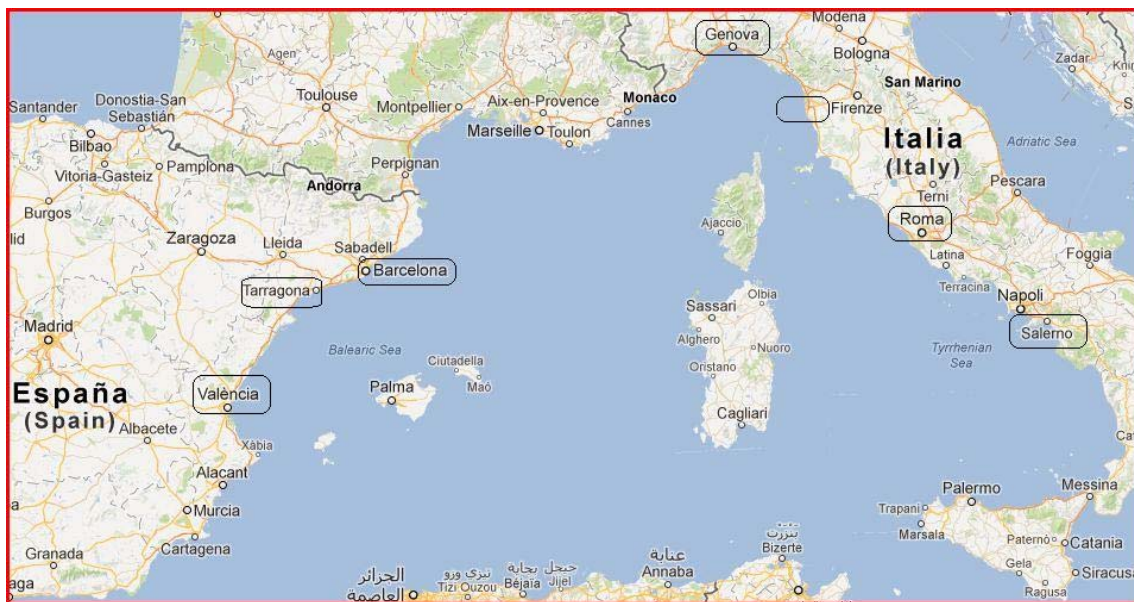


Figure 2. Locations of the cities that constitute the ends of the sea links analyzed

### 3.2. Measures

The different scales of measurement used were taken from the existing literature and subsequently adapted to the objectives of this study. Constructs were measured using five-point Likert scales with anchors 1 (strongly disagree) to 5 (strongly agree).

*Shared planning* was evaluated with three items, taking the study by Johnston et al. (2004) as a reference. These items gathered information about whether the parties keep each other informed, plan together the terms of the relationship and make joint decisions to improve the efficiency of transport operations.

*Trust* was evaluated through two dimensions (Kumar et al., 1995): (1) trust in the honesty of the partner, i.e. the belief that the partner – in this case the shipping company – is sincere, keeps its word and fulfils its obligations (5 items); (2) trust in the benevolence of the partner, i.e. the belief that it is really interested in the road transport firm's welfare, and consequently, will not make any decisions or undertake any actions that will affect it negatively (5 items).

Following the literature (Johnston et al., 2004; Hatfield et al., 1998), road transport firm *performance* in the context of the relationship was evaluated according to the degree to which its goals regarding the intermodal relationship were achieved and also considering whether the efforts made to develop the relationship had been worthwhile.

*Adaptation* was evaluated through four items taken from an exploratory study by López-Navarro et al. (2005). Specifically, the road transport firm was asked to evaluate, in the context of its relationship with the shipping company, the extent to which it had adapted in terms of: (1) fleet restructuring; (2) staff restructuring; (3) process and working method updating; (4) investments made to be able to work efficiently.

In order to measure of the size of the international road transport firms analyzed, the control variable 'number of semi-trailers' was used. This number included both the units owned by the firm and those of its regular collaborators, and measured the total number of semi-trailers normally moved by the firm. Road transport degree of internationalization, the second control variable, was measured by the percentage of the company's turnover corresponding to international transport.

### 3.3. Measurement Analysis

The model proposed was estimated using *Partial Least Squares (PLS)*. *PLS* is a confirmatory second-generation multivariate analysis technique (Fornell 1987) that allows for the examination of both latent and manifest variables simultaneously. *PLS* deals effectively with reflective and formative scales, it is distribution free, and is a powerful instrument for analyzing small samples (Chin 1998; Wold 1986).

Following the two-stage approach of Anderson and Gerbing (1988), we started by developing the measurement model and then, separately, the structural equations model. More specifically, we used the *Smart PLS 2.0* program (Ringle et al., 2005).



**Table 1. Reliability and validity of the measurement model**

		Loadings	t-value	Cronbach alpha	Composite reliability	AVE
	<b>TRUST (benevolence)</b>			0.85	0.89	0.62
1	Though circumstances change, we believe that this shipping company will be ready and willing to offer us assistance and support	0.69	7.05			
2	When making important decisions, this shipping company is concerned about our welfare	0.69	7.52			
3	When we share our problems with this shipping company, we know that it will respond with understanding	0.81	15.98			
4	In the future, we can count on this shipping company to consider how its decisions and actions will affect us	0.84	19.85			
5	When it comes to things that are important to us, we can depend on this shipping company's support	0.88	33.61			
	<b>TRUST (honesty)</b>			0.82	0.88	0.65
1	Even when this shipping company gives us a rather unlikely explanation, we are confident that it is telling the truth	0.76	12.32			
2	<i>This shipping company has often provided us information that has later proven to be inaccurate (scale reversed)</i>	<i>Eliminated (*)</i>				
3	This shipping company usually keeps the promises that it makes to our firm	0.85	28.80			
4	Whenever this shipping company gives us advice on our business operations, we know that it is sharing its best judgment	0.76	9.51			
5	Our organization can count on this shipping company to be sincere	0.85	18.36			
	<b>INVOLVEMENT (through adaptations)</b>			0.92	0.94	0.80
1	In our firm we have restructured our fleet to adapt to Short Sea Shipping operations with this shipping company	0.95	3.59			
2	In our firm we have restructured our staff to adapt to Short Sea Shipping operations with this shipping company	0.90	4.09			
3	In our firm we have updated our processes and working methods to adapt to Short Sea Shipping operations with this shipping company	0.83	2.73			
4	In our firm we have made substantial investments to be able to work efficiently via Short Sea Shipping with this shipping company	0.88	3.59			
	<b>SHARED PLANNING</b>			0.75	0.86	0.67
1	In this relationship it is expected that we keep each other informed about events or changes that may affect the other party	0.76	12.65			
2	Our firm and this shipping company plan together the terms by which our future business relationship will be determined	0.87	22.63			
3	Our firm and this shipping company make joint decisions about the ways to improve the efficiency of transport operations	0.81	12.95			
	<b>ROAD TRANSPORT FIRM PERFORMANCE IN THE CONTEXT OF THE RELATIONSHIP</b>			0.67	0.85	0.74
1	The objectives set by our company regarding this relationship have been achieved	0.79	7.46			
2	We consider that the efforts that we have made to develop the relationship has been worthwhile	0.93	15.56			
	<b>SIZE</b>					
1	Number of semi-trailers	1	--			
	<b>DEGREE OF INTERNATIONALIZATION</b>					
1	Percentage of the company's turnover corresponding to international transport	1	--			

(\*) This item was removed from the original scale because it presented a factor loading lower than the required value.

The validity and reliability were tested through the measurement model (Table 1). First, we examine item reliability according to the loadings. Following the generally accepted recommendation, we retain items with loadings higher than 0.7 (Carmines and Zeller, 1979), which implies that more than 50 percent of the item's variance (the square of the loading) can be attributed to the construct. According with this criterion, one item from 'honesty' construct has to be removed; however, with respect to the construct 'benevolence', two items are in values of 0.69 but we deem appropriate to maintain them because we consider that such items are relevant to preserve the essence of the construct. Moreover, they are very close to the threshold of 0.7 and the AVE of the construct is above 0.5, which guarantees the convergent validity. In addition, the AVEs of all the constructs are greater than the critical value of 0.5 (Fornell and Larcker 1981). Therefore, the convergent validity of the constructs is satisfactory. All constructs are reliable since the composite reliability values are greater than the recommended threshold of 0.6 (Bagozzi and Yi, 1988; Fornell and Larcker 1981). Furthermore, discriminant validity is also satisfied because, according to Fornell and Larcker (1981), the square root of a construct's AVE is greater than its bivariate correlation with the other constructs in the model.

#### 4. Results

This section provides the results obtained from the estimation of our model, in an attempt to test the hypotheses we advanced. As was pointed out in the previous section, the estimation was carried out using PLS. Table 2 shows the results. The significance of the coefficients was obtained by means of a bootstrap analysis of 500 sub-samples (Chin 1998). The R<sup>2</sup> coefficients associated with dependent variables are greater than 0.1, permitting a positive evaluation of the model (Falk and Miller, 1992). As we indicate in Table 2, the R<sup>2</sup> for shared planning and performance is 27.2 percent and 25.5 percent respectively. Additionally, and using G\*Power (Faul et al. 2007), we performed the statistical power analysis. The value obtained exceeded the minimum level of 0.8 required for social sciences research (Cohen 1988). Overall, the assessment of the measurement and structural models shows that the results of our estimation are acceptable.

**Table 2. Structural model**

Hypotheses	Standardised Beta	t-value
H <sub>1</sub> : Shared planning → Performance	0.403**	4.72
H <sub>2</sub> : Trust (honesty) → Shared planning	0.252*	2.06
H <sub>2</sub> : Trust (benevolence) → Shared planning	0.283*	2.42
H <sub>3</sub> : Involvement → Shared planning	0.236*	2.18
Control variables		
Size → Performance	-0.071	0.82
Degree of internationalization → Performance	0.311**	3.18

R<sup>2</sup> (Performance) = 0.255

R<sup>2</sup> (Shared planning) = 0.272

\* p < .05; \*\* p < .01

The first hypothesis (H<sub>1</sub>), which posited a positive relationship between shared planning and road transport firm performance in the context of the intermodal relationship, was corroborated by the results of the estimation ( $\beta = 0.403$ ;  $p < 0.01$ ). The results also corroborate the second hypothesis (H<sub>2</sub>), which predicted the existence of a direct and positive relationship between trust and shared planning. With regard to this point, our study distinguishes between two dimensions of trust--benevolence and honesty. The relationships between both dimensions and shared planning were positive and significant: honesty ( $\beta = 0.252$ ;  $p < 0.05$ ) and benevolence ( $\beta = 0.283$ ;  $p$

< 0.05). Lastly, the results of the estimation confirm our third hypothesis ( $H_3$ ), which predicted a positive relationship between road transport firms' involvement through adaptations to the partner and shared planning ( $\beta = 0.236; p < 0.05$ ).

With regard to the control variables--road transport firm size and degree of internationalization--the only positive and significant relationship was found between degree of internationalization and road transport firm performance in the context of the relationship ( $\beta = 0.311; p < 0.01$ ). Given the international nature of SSS links considered in our study, this finding indicates that those road transport firms with a greater degree of internationalization meet specific capabilities that enable them to obtain better performance in the use of these SSS links.

## 5. Discussion

This paper has focused on SSS, and specifically on the MoS, to analyze, from the perspective of road transport companies, the effect of shared planning on firm's performance in the context of the relationship, and to evaluate simultaneously the effect of two antecedents on shared planning: road transport firm trust in the shipping company and its involvement through adaptations to the partner.

Firstly, the findings confirm that shared planning between operating companies--road transport firms and shipping companies--improves the performance of the road transport firm in the framework of the relationship. Shared planning helps to find mutually satisfactory solutions, and achieves greater integration of both agents in the intermodal transport chain, which unquestionably contributes to value generation and improved performance. This finding validates in an empirical way the interest that literature have recently shown in needing the collaboration between operators in the field of SSS and MoS (Jugovic et al., 2011; Kapros and Panou, 2007; Perakis and Denisis, 2008). Moreover, although the study was approached from the road transport firm perspective, it appears reasonable to assume that shared planning would also have a positive effect on shipping company performance.

Secondly, and regarding the antecedents of shared planning, the research results confirm that trust, both in terms of honesty and of benevolence, has a positive effect on shared planning. Trust enhances the road transport firm belief that the shipping company will not take advantage of any unforeseen contingencies that may arise in the course of the relationship. Shared planning necessarily requires the exchange of valuable information, and trust establishes expectations that reduce the perceived risk of possible opportunistic behaviours by the shipping company in the use of such information. Road transport firms are the coordinating agents in the Ro-Ro segment of SSS, and trust in the shipping company is a relevant question, not only to change their traditional way of operating from exclusive road use to intermodal transport (involving a certain loss of control over operations in the sea journey, as compared to the all-road alternative), but particularly to do so efficiently by sharing information and jointly planning operations with the shipping company.

Finally, our findings also suggest that road transport firm involvement, evidenced by specific adaptations to operate more efficiently with shipping companies in the short-sea context, is another relevant factor to explain the shared planning between the two agents. This road transport firm involvement helps to build an image of trust in the sight of the shipping company, by sending signals of the road transport firm's commitment to the relationship. Furthermore, adaptation resulting from more involvement should enable the road transport firm to make greater use of the unaccompanied transport mode, which usually generates larger and more stable volumes of cargo. It might be assumed that this would enhance the shipping company's attitude towards the road transport firm, since by stabilizing levels of occupation in the ship it effectively contributes to the recovery of the high investment required to start up and keep a SSS

link with the characteristics required by a MoS. This favourable attitude is reflected in a greater willingness to shared planning. Moreover, given the greater complexity and organizational requirements of unaccompanied transport, it also adds to the need for increased shared planning between the two partners.

## 6. Conclusions

Within the framework of European Union transport policy, the promotion of intermodal transport is an essential line of action to achieve transport sustainability. Beyond this consideration, the present study has addressed the recommendations in the literature to explore the collaboration between actors in intermodal transport chains. From an academic perspective, the paper contributes to the literature in the field of SSS and MoS by demonstrating that shared planning effectively influences road transport firm performance. It also provides valuable insights regarding the antecedents that favour shared planning between operators, specifically the trust that shipping companies engender in road transport companies and the involvement of the latter, giving signals to the shipping companies of their commitment. These results suggest the need to encourage a greater effort in the study of interorganisational relations between operators to promote the successful integration of SSS in the framework of intermodal transport chains.

Although European institutions acknowledge that development of intermodal solutions is essential to compete more effectively and sustainably, insufficient emphasis is given to stressing the need for cooperation and shared planning between operators. EU policies have focused primarily on financial support for establishing and developing new and feasible SSS services, with special emphasis at present on MoS. That SSS has not developed as expected to date may be due to several reasons, but from the point of view of users – the road transport companies – it can be largely explained by the organisation of these firms being structured around all-road transport, and introducing the SSS option involves significant modifications to the way they organise their transport operations (Gouvernal et al., 2010; López Navarro et al., 2011b). However, EU policies have not devoted the attention necessary to stimulate collaboration and integration of operators as a mechanism to increase competitiveness of the intermodal transport chain. The paper's results suggest the desirability of a greater institutional effort in this area. By improving collaboration and, by extension, efficiency and quality of services, the perception of SSS in general, and of the MoS in particular, will undoubtedly improve in the context of door-to-door transport solutions. This point is especially pertinent, given that the image of SSS is one of the weaknesses repeatedly highlighted in the literature (see, for instance, Paixão and Marlow (2007)).

Beyond theoretical and institutional implications, results from this study also have implications for managers. First, since the paper indicates the presence of incentives for collaboration between operators, managers should overcome problems arising from the confrontation between the two modes of transport. Road transport and shipping companies, while partners, should be open to jointly planning the operations to improve their performance and provide the shippers with a better transport service. Second, the study shows that shipping companies have to strive to create a favourable climate of trust within the relationship and must therefore make a considerable effort in this task. Third, taking into account the usual resistance to change in organizations, the paper should also serve to show road transport firms the positive effects of a greater involvement through adaptations to the intermodal transport operations with shipping companies. However, it is important to note that road transport companies should be aware that greater adaptation may also involve greater dependence on the shipping company, with the consequences arising from this. Understanding of these issues may help both road transport firms and shipping

companies to improve their relationship and simultaneously to enhance the competitiveness of the intermodal transport chain.

As for the limitations of our study, it should be noted that the results obtained are contingent on the context analyzed. This study does not aim to provide an exhaustive model to explain road transport firm performance in the use of SSS and MoS. Its goal is limited to evaluating the effect of shared planning on road transport firm performance in the context of the relationship and more specifically, to analyzing two antecedents of shared planning: trust in the shipping company and road transport firm involvement. However, there may be other variables affecting performance which would help to explain this dimension better. In this sense, future studies should help to conceptualize and to estimate more complex models by incorporating some of these variables. We encourage the extension of our study in order to lend greater confidence to its findings.

## References

- Anderson, J.C. and Gerbing, D.W. (1988). Structural modeling in practice: a review and recommended two-step approach. *Psychological Bulletin*, vol. 103, no. 3, pp. 411-23.
- Bagozzi, R.P. and Yi, Y. (1988). On the evaluation of structural equation models. *Journal of the Academy of Marketing Science*, vol. 16, no. 1, pp. 74-94.
- Baindur, D. and Viegas, J. (2011). Challenges to implementing motorways of the sea concept-lessons from the past. *Maritime Policy & Management*, vol. 38, no. 7, pp. 673-90.
- Baird, A.J. (2007). The economics of motorways of the sea. *Maritime Policy and Management*, vol. 34, no. 4, pp. 278-310.
- Bendall, H.B. and Brooks, M.R. (2011). Short sea shipping. Lessons for or from Australia. *International Journal of Shipping and Transport Logistics*, vol. 3, no. 4, pp. 384-405.
- Bontekoning, Y.M., Macharis, C. and Trip, J.J. (2004). Is a new applied transportation research field emerging? A review of intermodal rail-truck freight transport literature. *Transportation Research Part A*, vol. 38, pp. 1-34.
- Brennan, R. and Turnbull, P. (1999). Adaptive behavior in buyer-supplier relationships. *Industrial Marketing Management*, vol. 28, pp. 481-95.
- Brooks, M.R. and Trifts, V. (2008). Short sea shipping in North America: understanding the requirements of Atlantic Canadian shippers. *Maritime Policy and Management*, vol. 35, no. 2, pp. 145-58.
- Cappucilli, J.F. and Douet, M. (2011). A review of short sea shipping policy in the European Union. *Journal of Transport Geography*, vol. 19, no. 4, pp. 967-76.
- Caris, A., Macharis, C. and Janssens, G.K. (2008). Planning problems in intermodal freight transport: accomplishments and prospects. *Transportation Planning and Technology*, vol. 31, no. 3, pp. 277-302.
- Carmines, E.G. and Zeller, R.A. (1979). *Reliability and Validity Assessment*. Sage, Beverly Hills, Ca.
- Chin, W. (1998). The partial least squares approach to structural equation modelling. In Marcoulides, G.A. (ed.) *Modern Methods for Business Research*. Lawrence Erlbaum, Mahwah, NJ.
- Clemons, E.K. and Hitt, L.M. (2004). Poaching and the misappropriation of information: transactions risks of information exchange. *Journal of Management Information Systems*, vol. 21, no. 2, pp. 87-107.
- Cohen, J. (1988). *Statistical Power Analysis for the Behavioural Sciences*. Lawrence Erlbaum, Hillsdale, NJ.
- Commission of the European Communities (2011). White Paper: Roadmap to a Single European Transport Area – Towards a Competitive and Resource Efficient Transport System. COM (2011) 144, Brussels.

Corbett, C.J., Blackburn, J.D. and Van Wassenhove, L.N. (1999). Partnerships to improve supply chains. *Sloan Management Review*, vol. 40, no. 4, pp. 71-82.

Das, T. and Teng, B.S. (1998). Between trust and control: developing confidence in partner cooperation in alliances. *Academy of Management Review*, vol. 23, no. 3, pp. 491-512.

De Solere, R. (2007). Study of relevance criteria governing long-distance unaccompanied road transport. The choice for sustainable development. Pre-Proceedings of the 23<sup>rd</sup> PIARC World Road Congress, Paris, 17-21 September.

Desiderio, M., Reffet, F., Potier, M., Le Bourhis, P., and De Solere, R. (2008). Motorways of the sea and rolling highways: from the users' point of view. Paper presented at the *European Transport Conference*, Association for European Transport.

Falk, R.F. and Miller, N.B. (1992). *A Primer for Soft Modelling*. University of Akron Press, Akron, OH.

Faul, F., Erdfelder, E., Lang, A.G. and Buchner, A. (2007). G\*Power 3: a flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior Research Methods*, vol. 39, no. 2, pp. 175-91.

Feo, M., Espino, R. and García, L. (2011). An stated preference analysis of Spain freight forwarders modal choice on the South-west Europe motorway of the sea. *Transport Policy*, vol. 18, pp. 60-67.

Ferrer, M., Santa, R., Hyland, P. W. and Bretherton, P. (2010). Relational factors that explain supply chain relationships. *Asia Pacific Journal of Marketing and Logistics*, vol. 22, no. 3, pp. 419-40.

Ford, D. Gadde, L-E., Hakansson, H. and Snehota, I. (2003). *Managing Business Relationships*. Wiley, Chichester.

Fornell, C. (1987). A second generation of multivariate analysis: classification of methods and implications for marketing research In Houston, M.H. (ed.) *Review of Marketing*, American Marketing Association, Chicago, IL.

Fornell, C. and Larcker, D.F. (1981). Evaluating structural equations models with unobservable variables and measurement error. *Journal of Marketing Research*, vol. 18, pp. 39-50.

Gouveral, E., Slack, B. and Franc, P. (2010). Short sea and deep sea shipping markets in France. *Journal of Transport Geography*, vol. 18, no. 1, pp. 97-103.

Granovetter, M. (1985). Economic action and social structure: a theory of embeddedness. *American Journal of Sociology*, vol. 91, pp. 481-510.

Gulati, R. (1995). Does familiarity breed trust? The implications of repeated ties for contractual choice in alliances. *Academy of Management Journal*, vol. 38, no. 1, pp. 85-112.

Gulati, R. and Singh, H. (1998). The architecture of cooperation: managing coordination costs and appropriation concerns in strategic alliances. *Administrative Science Quarterly*, vol. 43, no. 4, pp. 781-814.

Hadaya, P. and Cassivi, L. (2007). The role of joint collaboration planning actions in a demand-driven supply chain. *Industrial Management & Data System*, vol. 107, no. 7, pp. 954-78.

Hallen, L., Johanson, J. and Nazeem, S-M. (1991). Interfirm adaptation in business relationships'. *Journal of Marketing*, vol. 55, pp. 29-37.

Hallock, S. (2010). SSS as an element of supply chain for Melbourne's future east west cargo flows. Paper presented at the *Australian Transport Research Forum*, Canberra, 29 September-1 October.

Han, K., Kaufman, R.J. and Nault, B.R. (2004). Information exploitation and interorganizational systems ownership. *Journal of Management Information Systems*, vol. 21, no. 2, pp. 109-135.

Hatfield, L., Pearce, J.A., Sleeth, R.G. and Pitts, M.W. (1998). Toward validation of partner goal achievement as a measure of joint venture performance. *Journal of Managerial Issues*, vol. 10, no. 3, pp. 355-72.

- Higginson, J. K. and Dumitrascu, T. (2007). Great Lakes short sea shipping and the domestic cargo-carrying fleet. *Transportation Journal*, vol. 46, no. 1, pp. 38-50.
- Hitt, L.M., Wu, D.J. and Xiaoge, Z. (2002). Investment in enterprise resource planning: business impact and productivity measures. *Journal of Management Information Systems*, vol. 19, no. 1, pp. 71-98.
- Johnston, D.A. and Kristal, M.M. (2008). The climate for co-operation: buyer-supplier beliefs and behaviour. *International Journal of Operations & Production Management*, vol. 28, no. 9, pp. 875-98.
- Johnston, D.A., McCutcheon, D.M., Stuart, F.I. and Kerwood, H. (2004). Effects of supplier trust on performance of cooperative supplier relationships. *Journal of Operations Management*, vol. 22, pp. 23-38.
- Jugovic, A., Debelic, B. and Brdar, M. (2011). Short sea shipping in Europe factor of the sustainable development transport system of Croatia. *Scientific Journal of Maritime Research*, vol. 25, no. 1, pp. 109-24.
- Kapros, S. and Panou, C. (2007). Coastal shipping and intermodality in Greece: the weak link. *Research in Transportation Economics*, vol. 21, pp. 323-42.
- Klein, R. and Rai, A. (2009). Interfirm strategic information flows in logistics supply chain relationships. *MIS Quarterly*, vol. 33, no. 4, pp. 735-62.
- Knoppen, D., Christiaanse, D. and Huysman, M. (2010). Supply chain relationships: exploring the linkage between inter-organisational adaptation and learning. *Journal of Purchasing & Supply Management*, vol. 16, pp. 195-205.
- Kumar, N., Scheer, L.K. and Steenkamp, J-B. E. M. (1995). The effects of perceived interdependence on dealer attitudes. *Journal of Marketing Research*, vol. 32, no. 3, pp. 348-56.
- López-Navarro, M.A., Moliner, M.A., Sánchez, J., Callarisa, L. and Rodríguez, R.M. (2005). Análisis del proceso de adaptación de las empresas de transporte internacional por carretera de la Comunidad Valenciana al transporte marítimo de corta distancia. Castellón: UJI-FEPORTS.
- López-Navarro, M.A., Moliner, M.A., Rodríguez, R.M. and Sánchez, J. (2011a). Accompanied versus unaccompanied transport in short sea shipping between Spain and Italy: an analysis from transport road firms perspective. *Transport Reviews*, vol. 31, no. 4, pp. 425-44.
- López-Navarro, M.A., Moliner, M.A. and Rodríguez, R.M. (2011b). Long-term orientation of international road transport firms in their relationships with shipping companies: the case of short sea shipping. *Transportation Journal*, vol. 50, no. 4, pp. 346-69.
- Lummus, R.R., Vokurka, R.J. and Alber, K.L. (1998). Strategic supply chain planning. *Production and Inventory Management Journal*, vol. 39, no. 3, pp. 49-58.
- Macharis, C., and Bontekoning, Y.M. (2004). Opportunities for OR in intermodal freight transport research: a review. *European Journal of Operational Research*, vol. 153, pp. 400-16.
- Madhok, A., (1995). Revisiting multinationals firms' tolerance for joint ventures: a trust-based approach. *Journal of International Business Studies*, vol. 26, pp. 117-37.
- Maloni, M.J. and Benton, W.C. (1997). Supply chain partnerships: opportunities for operations research. *European Journal of Operations Research*, vol. 21, no. 1, pp. 49-73.
- Medda, F. and Trujillo, L. (2010). Short-sea shipping: an analysis of its determinants. *Maritime Policy & Management*, vol. 37, no. 3, pp. 285-303.
- Morgan, R.M. and Hunt, S.D. (1994). The commitment-trust theory of relationship marketing. *Journal of Marketing*, vol. 58, pp. 20-38.
- Mukherji A. and Francis, J.D. (2008). Mutual adaptation in buyer-supplier relationships. *Journal of Business Research*, vol. 61, no. 2, pp. 154-161.
- Narayanan, V.G. and Raman, A. (2004). Aligning incentives in supply chains. *Harvard Business Review*, November, pp. 94-102.

Nielson, C. (1998). An empirical examination of the role of "closeness" in industrial buyer-seller relationships. *European Journal of Marketing*, vol. 32, no. 5/6, pp. 441-63.

Paixão, A. and Marlow, P. (2002). Strengths and weaknesses of short sea shipping. *Marine Policy*, vol. 26, pp. 167-78.

Paixão, A. and Marlow, P. (2005). The competitiveness of short sea shipping in multimodal logistics supply chains: service attributes. *Maritime Policy & Management*, vol. 32, no. 4, pp. 363-82.

Paixão, A. and Marlow, P. (2007). The impact of Trans-European Transport Networks on the development of short sea shipping. *Maritime Economics & Logistics*, vol. 9, pp. 302-23.

Paixão, A. and Marlow, P. (2009). Logistics strategies for short sea shipping operating as part of multimodal transport chains. *Maritime Policy and Management*, vol. 36, no. 1, pp. 1-9.

Patnayakuni, R., Rai, A. and Seth, D. (2006). Relational antecedents of information flow integration for supply chain coordination. *Journal of Management Information Systems*, vol. 23, no. 1, pp. 13-49.

Paulauskas, V. and Bentzen, K. (2008). Sea motorways as a part of the logistics chain. *Transport*, vol. 23, no. 3, pp. 202-07.

Perakis, A.N. and Denisis, A. (2008). A survey of short sea shipping and its prospects in the USA. *Maritime Policy & Management*, vol. 35, no. 6, pp. 591-614.

Petersen, K.J., Ragatz, G.L. and Monczka, R.M. (2005). An examination of collaborative planning effectiveness and supply chain performance. *Journal of Supply Chain Management*, Spring, pp. 14-25.

Puckett, S.M., Hensher, D.A., Brooks, M.R. and Trifts, V. (2011). Preferences for alternative short sea shipping opportunities. *Transportation Research Part E*, vol. 47, pp. 182-189.

Ringle, C. M., Wende, S. and Will, A. (2005). SmartPLS 2.0 (beta). University of Hamburg: Hamburg.

Saldanha, J. and Gray, R. (2002). The potential for British coastal shipping in a multimodal chain. *Maritime Policy & Management*, vol. 29, no. 1, pp. 77-92.

Sánchez, R.J. and Wilmsmeier, G. (2005). Short-sea shipping potentials in Central America to bridge infrastructure gaps. *Maritime Policy & Management*, vol. 32, no. 3, pp. 227-44.

Sarkar, M.B., Echambadi, R., Cavusgil, S.T. and Aulakh, P.S. (2001). The influence of complementarity, compatibility, and relationship capital on alliance performance. *Journal of the Academy of Marketing Science*, vol. 29, no. 4, pp. 358-73.

Schramm, H-J. (2006). Governance of multimodal transport chains: a brokerage roles approach. Paper presented at the *Logistics Research Network Annual Conference 2006*, Newcastle, 6-8 September.

Simatupang, T.M. and Sridharan, R. (2005). An integrative framework for supply chain collaboration. *The International Journal of Logistics Management*, vol. 16, no. 2, pp. 257-74.

Steendahl, N., Boer, H., Gertsen, F. and Kaltoft, R. (2004). The influence of power, trust and political behavior in the process of collaborative improvement. Paper presented at the 5<sup>th</sup> *International CINet Conference*, Sydney, Australia, 22-25 September.

Torbianelli, V.A. (2000). When the road controls the sea: a case study of ro-ro transport in the Mediterranean. *Maritime Policy and Management*, vol. 27, no. 4, pp. 375-389.

Valente de Oliveira, L., (2008). Fostering Seamless Transport in the European Region. Motorways of the Sea in the European Logistics Chain. September, Annual Report, Brussels.

Walter A and Ritter, T. (2003). The Influence of adaptations, trust, and commitment on value-creating functions of customer relationships. *Journal of Business & Industrial Marketing*, vol. 18, no. 4/5, pp. 353-65.

Wathne, K.H. and Heide, J.B. (2000). Opportunism in interfirm relationships: forms, outcomes, and solutions. *Journal of Marketing*, vol. 64, no. 1, pp. 36-51.



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Williamson, O.E. (1975). *Markets and Hierarchies. Analysis and Antitrust Implications*. The Free Press, New York.

Williamson, O.E. (1985) *The Economics Institutions of Capitalism: Firms, Markets, Relational Contracting*. The Free Press, New York.

Wold, H. (1986). Partial least squares. In Kots, S.J. and Johnson, N.L. (eds.) *Encyclopedia of statistical sciences*, 6, John Wiley & Sons.

Woxenius, J. and Bergqvist, R. (2011). Comparing maritime containers and semi-trailers in the context of hinterland transport by rail, *Journal of Transport Geography*, vol. 19, pp. 680-88.