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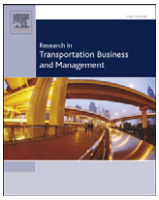

Competition between ro–ro and lo–lo services in short sea shipping market: The case of Mediterranean countries

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ABSTRACT

A relevant portion of the scientific literature focuses on the competition of short sea shipping (SSS) with land transport in presence of international programmes that provide financial support to SSS services (e.g. Motorway-of-the-Sea).
The paper analyses the competition inside the maritime SSS market, comparing roll on–roll off (ro–ro) vs. lift on–lift off (lo–lo) services. The market has two structural pillars: (a) the analysed services connect Italy and a set of countries belonging to the south-eastern range of the Mediterranean basin, then without any financial support to the services; (b) there are no available land transport services for all the considered relationships.
The two above pillars allow to quantify the reciprocal advantage of the two maritime services, by purifying the market from the bias generated by the presence of available land transport services and of any kind of financial support to SSS services.
An aggregate discrete choice model, simulating the split between ro–ro and lo–lo services of freight flow exchanged by sea between countries facing the Mediterranean basin, has been specified and calibrated. The important element that emerges, in general terms, is the segmentation of the market in relation to the distances existing between each couple of countries.

1. Introduction

The paper presents a comparative analysis between roll on–roll off (ro–ro) and lift on–lift off (lo–lo) services belonging to the short-sea shipping (SSS) market.

The SSS market has not a unique definition in literature. EU adopted in 1999 a definition with precise geographical boundaries: "*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. Short Sea Shipping includes domestic and international maritime transport, including feeder services, along the coast and to and from the islands, rivers and lakes. The concept of Short Sea Shipping also extends to maritime transport between the Member States of the Union and Norway and Iceland and other States on the Baltic Sea, the Black Sea and the Mediterranean*" (EU Commission, 1999). In 2005 US Maritime Administration defined SSS as: "*a commercial waterborne transportation that does not transit an ocean. It is an alternative form of commercial transportation that utilises inland and coastal waterways to move commercial freight from major domestic ports to its destination*" (see Douet & Cappuccilli, 2011).

Both the definitions exclude oceanic services and consider domestic and international maritime ones. The EU definition includes maritime services operating in (closed) sea basins, and even if the first definition considers only the relationship between states with a coastline, the final inclusion of Norway and Iceland, extend the SSS to all states in a not oceanic market.

The paper, according to the above definitions, analyses the competitive advantage of using ro–ro or lo–lo services in a closed sea basin, as it is the Mediterranean Sea.

An aggregate discrete choice model simulating the split between ro–ro and lo–lo services of freight flow exchanged by sea between countries facing the Mediterranean basin, has been specified and calibrated.

The paper presents the advancement of activities in the behalf of a research line whose general objective is the evaluation of geographic factors affecting the maritime services in (closed) sea basins. In a recent paper, Russo and Musolino (2013) demonstrated that transhipment services are more developed in regions of the world with closed sea basins (e.g. Mediterranean Sea basin), in which the port system is hierarchically composed of one (or more) hub port(s) and more feeder ports (e.g., hub-and-spoke structure).

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The paper is articulated as follows. Section 2 provides an overview about the SSS market structure, illustrating the demand and supply sides. Section 3 presents a review of existing studies on SSS. Section 4 describes two theoretical approaches in dealing the analysis of competition between ro–ro and container (lo–lo) services: deterministic supply and probabilistic demand. Section 5 focuses on the specification and calibration of a maritime service model with two alternatives: lo–lo and ro–ro. The specification of the expected value of perceived utilities and attributes associated to each available alternative and the results of a calibration process are presented. Finally, the Conclusions are reported in the last section.

2. SSS market in the Mediterranean area

On the demand side, SSS refers to the maritime transport of goods on domestic and international routes, not crossing oceans (for instance within the EU); by contrast, deep sea shipping (DSS) operates on higher distances, involving trans-oceanic routes.

Table 1 provides the split between SSS and DSS traffic concerning northern Mediterranean countries. The SSS share represents nearly 63.3% of unitised maritime traffic.

A further element on SSS can be introduced by comparing domestic cabotage and international shipping of northern Mediterranean countries (Table 2). The domestic cabotage accounts for about 163 million tons, representing the 8.4% of maritime traffic of northern Mediterranean countries. By excluding the above 8.4% from the 63.3%, the remaining 54.9% is therefore attributable to international SSS traffic.

The international SSS traffic defined above embraces different types of load: liquid bulk, dry bulk, and container (lo–lo), ro–ro. Fig. 1 reports the amount of total traffic (SSS + DSS) per type of load in the Mediterranean in the year 2012. The sum of container and ro–ro traffic is 366 millions tons (34.4% of market share).

By multiplying the above amount for the percentage of 63.3% of SSS (from Table 1) and, by subtracting the percentage of 8.4% of national cabotage (from Table 2), it is obtained – in a rough way – an amount of 213 million tons of SSS traffic using lo–lo and ro–ro services travelling inside the Mediterranean.

By considering the supply side, the SSS market "*can embrace different ships, from conventional to innovative ones such as fast ships, with a variety of cargo handling techniques (horizontal, vertical or a mixture of both), ports, networks and information systems*" (Paixão Casaca & Marlow, 2002). According to Paixão Casaca and Marlow (2002), three categories of ships have been identified:

- *bulk carriers and tankers*, engaged in the pure and conventional dry and liquid bulk trades such as mineral oil products, chemicals, liquefied petroleum gas (LPG), coal, iron ore and grain.
- *container feeder vessels*, which carry high value cargoes and provide a link for deep-sea container vessels employed in the transoceanic routes;
- *ferries*, capable of carrying both passengers and/or a whole range of cargoes that include palletised cargo, accompanied and unaccompanied trailers, semi-trailers, pallets, swap-bodies, railway waggons, cassettes, project cargo and machinery.

Table 1
Split between SSS and DSS traffic of northern Mediterranean countries. Year 2012.

Country	SSS		DSS		Total
	Ton $*$ 10^6	%	Ton $*$ 10^6	%	Ton $*$ 10^6
Spain	191.4	47.6	211.1	52.4	402.5
Italy	285.5	74.0	100.3	26.0	385.8
France	170.9	65.0	91.9	34.9	262.8
Greece	90.3	79.7	22.9	20.3	113.2
Slovenia	8.8	52.3	8.0	47.6	16.8
Croatia	12.1	82.6	2.5	17.4	14.7
Cyprus	5.7	56.4	4.4	43.6	10.1
Malta	3.0	52.4	2.7	47.6	5.8
Northern Med	767.7	63.3	444.0	36.7	1211.7

(*source*: http://ec.europa.eu/eurostat).

Table 2
Domestic cabotage and international shipping of northern Mediterranean countries. Year 2012.

Country	Domestic		International		Total
	Ton $*$ 10^6	%	Ton $*$ 10^6	%	Ton $*$ 10^6
Spain	36.0	9.2	356.5	90.8	392.5
Italy	83.2	21.6	302.6	78.4	385.8
France	17.3	6.4	252.0	93.6	269.3
Greece	25.8	22.8	87.4	77.2	113.2
Slovenia	0.0	0.0	16.9	100.0	16.9
Croatia	1.1	7.5	13.5	92.5	14.6
Cyprus	0.0	0.0	6.1	100.0	6.1
Malta	0.0	0.0	3.3	100.0	3.3
Northern Med	163.4	8.4	1038.3	91.6	1201.7

(*source*: http://ec.europa.eu/eurostat).

The dry component of the first category has seen a progressive decrease in the SSS market share in favour of the other two categories (container feeder vessels and ferries), due to the introduction of unitised cargos.

3. Existing studies on SSS

Studies on short sea shipping (SSS) may be classified according to two main classes.

The first class concerns the analysis of financial programmes, such as the European Motorway-of-the-Sea (MoS), in order to make SSS competitive vs. road haulage. Among the numerous studies, the following papers are recalled. Paixao Casaca and Marlow (2001) presented a review of European shipping policies conceived to achieve the goal of economic and sustainable growth of the EU member-states. The outcome of the above policies was the shift of freight from road haulage to unused transport capacity existing by sea. In Paixão Casaca and Marlow (2002), the analysis of SSS strengths and weaknesses showed the complexity of the logistics network necessary to implement SSS. The authors concluded that, although several strengths exist (geographical, financial, knowledge/skills-based/human resources, energy, environmental, underused capacity, ancillary activities), SSS still was not a reliable transport alternative within multi-modal transport chains. Baird (2010) described how the MoS programme was capable to re-affirm the centrality of maritime transport in relation to land transport modes. However, some examples of implemented MoS emphasised

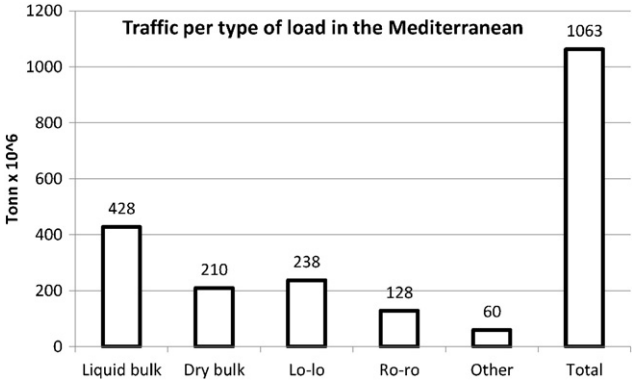

Fig. 1. Traffic in the Mediterranean per type of cargo. Year 2012. (source: http://ec.europa.eu/eurostat).