Competition and horizontal integration in maritime freight transport

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ABSTRACT

This paper models competition for freight transport between the road and maritime sectors. Operators offer differentiated services and there are economies of scale in the oligopolistic shipping line sector. Two types of integration between shipping lines are considered: in one of them the liners production processes remain separate (like in an alliance); in another economies of scale are further exploited. Typically maritime freight post-merger goes down. However, it may increase if the merger exploits further economies of scale, they are important and transport services are sufficiently differentiated. An empirical application to the routes Valencia–Antwerp and Valencia–Genoa is undertaken to confirm the predictions of the model. It is shown that, for both types of merger, user surplus increases when transport services are weakly differentiated and economies of scale are sufficiently small. These conditions also guarantee that a merger is socially beneficial.

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1. Introduction

International seaborne trade has been steadily growing over the last decades passing from 3.7 in 1980, 4 in 1990, 6 billion tons in the year 2000 to a record 8.4 billion tons in 2010 (UNCTAD, 2011). Among other things, the industry has witnessed numerous integration processes between carriers (see Cariou, 2008; Frémont, 2009). The construction of new large container ships may stimulate further consolidation among shipping lines through mergers and acquisitions. In parallel, the increase in total road freight transport has also been notable. In the case of EU-15, road traffic has increased from 190 billions of tonne-km in 2000 to close to 300 in 2008 (International Transport Forum, 2011). Complementarities and substitutabilities between modes have been accentuated by the increment in the demand for door-to-door services. The objective of this paper is to develop a model of freight transport characterized by competition between road and maritime transport; the model accounts for product differentiation between the two modes and for economies of scale in the shipping line market. This setting allows us to study the effects on traffic distribution, prices, profits, and welfare levels following a horizontal integration move; the model is then calibrated to the routes Valencia–Antwerp and Valencia–Genoa.

Cooperation agreements involving shipping companies can take various forms including conferences, alliances and mergers.[1] These raise the concerns of antitrust authorities. In this regard, there is a sizeable number of merger cases involving ship-

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  [1] Relationships between the actors (shippers, shipping lines, stevedores, ports) in the liner shipping market are complex. Heaver et al. (2000) offer a number of examples of different kind of cooperation agreements between these actors. Here we will be concerned with horizontal agreements between shipping lines.

ping companies that are notified to the European Commission. Although many proposed mergers are cleared, some are subject to conditions. The Commission's remedies include the withdrawal of the companies from particular shipping conferences; it is in this manner that effective competition is not significantly impeded by the transaction (see e.g. Royal P&O Nedlloyd by AP Moller and CP Ships by TUI).[2] Economic theory shows that the evaluation of proposed horizontal mergers involves a basic trade-off: they increase market power, but can also create efficiency gains, as first emphasized by Williamson (1968). A given merger should be approved if it improves welfare (either aggregate surplus or just consumer surplus), a standard rule that is adopted by most antitrust authorities (see, e.g., Farrell and Shapiro (1990); McAfee and Williams (1992)). Our model adds to the received literature on merger analysis in that it considers intermodal competition where one of the sectors, the road freight sector, behaves competitively. Its features make it particularly appealing to study the derived effects of a merger, that may involve efficiency gains, in the shipping line industry.

The liner shipping market has a number of characteristics, of which the following stand out. The recent paper by Cariou (2008) offers an overview of the main trends in the liner shipping market during the last 15 years. There has been an increase in the size of firms and the emergence of global carriers. The top 20 carriers accounted for over 80% of vessel capacity deployed in 2007. Mergers and cooperation agreements have been common in the past few years. Since the 1990s, the formation of strategic alliances permits carriers to pool vessels on main commercial routes and profit from scope and network economies. The next section provides some evidence on these facts. Besides, the organization of freight transport by sea has also undergone a process of vertical integration in an effort to improve the management of logistics chains. Despite the increase in this type of structural moves, the biggest shipping lines remain the key actors in transport chains. The importance of market power and the integration of activities in the maritime sector are made clear by two recent OECD works by Frémont (2009) and Van de Voorde and Vanelslander (2009). Another feature that characterizes the liner shipping industry is that it exhibits economies of scale, related to the size of the firm as well as to trade density (Jansson and Shneerson, 1985, and by Song et al. (2005), provide evidence of economies of scale and of network economies, respectively). Finally, in the strong competition environment that characterizes the industry, product differentiation has a strong influence on performance. Panayides (2003) studies the strategy-performance relationship in ship management finding that achieving economies of scale and differentiation (through a wider range of services offered) positively influence performance. The increased emphasis on such relationship is due, among other things, to intense competition (as evidenced by the trend in cooperation already mentioned).

The model that we propose assumes competition for freight transport between the road and the maritime sectors and captures quite a number of the features that distinguish the liner shipping market. In particular, we consider a route with two shipping companies where road transport is supplied competitively. The services offered by operators are perceived as differentiated by shippers. The road transport sector does marginal cost pricing whereas the shipping companies hold market power and enjoy economies of scale. We begin by characterizing the equilibrium in this market environment. Results can be intuitively presented in terms of parameters related with product differentiation and with the size of economies of scale. Then we study the effects on traffic and welfare when the shipping lines merge (horizontal integration). This is done under two possible merger types, one where liners production processes remain separate and another where economies of scale are further exploited. Typically maritime freight post-merger goes down. However, it may increase if the merger exploits further economies of scale, they are important and transport services are sufficiently differentiated. Since a merger internalizes competition, this will produce a price increase that makes road freight relatively more attractive. The traffic reallocation will provoke changes in user surplus that are unclear. Sufficient conditions for users to be better off are that transport services are weakly differentiated and economies of scale are sufficiently small. Under these conditions both merger types are found to be beneficial in social terms. In contrast, weak economies of scale and strongly differentiated services will result in a welfare decline. The redistribution of freight across sectors following the integration of shipping lines is the driving force of the results obtained. This finding is robust to general demand and cost functions, as well as to oligopoly in the shipping line sector. The model is then applied to the routes Valencia–Genoa and Valencia–Antwerp. We use information on travel volumes, price elasticities, and estimates of costs to recover the unknown parameters in the demand functions. We may then quantitatively assess the effects on traffic distribution, prices, profits, and welfare levels under a horizontal integration move. The empirical analysis basically confirms the predictions of the model.

In a rather general setting with demand interactions, Zhang and Zhang (2006) investigate rivalry between strategic alliances where each alliance member maximizes its own profit and some share of its partner's profit. Extensive research has been devoted to study alliances and mergers in the airline industry. A theoretical analysis of an international airline alliance with a monopoly pair of carriers is provided by Brueckner (2001). Park et al. (2001) investigate theoretically and empirically the effects of two typical alliance types: complementary and parallel alliances. The papers by Adler and Smilowitz (2007) and Flores-Fillol (2009) note the relevance of network structure on welfare assessments; the former discusses the effects of alliances to establish their profitability and social desirability, whereas the latter points out the inefficient provision of flight frequencies. The basic framework of analysis bears a number of similarities with that for the maritime industry, yet these models disregard competition between modes and complementarities between them (see Zhang et al., 2007, for an exception on the air cargo market). Recent contributions on maritime freight transport include De Borger et al. (2008) and Czerny