The Trade Reducing Effects of Restrictions on Liner Shipping

The definitive version of the text was subsequently published in

Journal of Comparative Economics, 44(2), 2016-03-06

Published by Elsevier and found at http://dx.doi.org/10.1016/j.jce.2016.03.001

Accepted Manuscript

The Trade Reducing Effects of Restrictions on Liner Shipping

Fabien Bertho , Ingo Borchert , Aaditya Mattoo

PII: S0147-5967(16)00021-4
DOI: 10.1016/j.jce.2016.03.001
Reference: YJCEC 2517

To appear in: *Journal of Comparative Economics*

Received date: 13 April 2015
Revised date: 25 February 2016
Accepted date: 6 March 2016

Please cite this article as: Fabien Bertho , Ingo Borchert , Aaditya Mattoo , The Trade Reducing Effects of Restrictions on Liner Shipping, *Journal of Comparative Economics* (2016), doi: 10.1016/j.jce.2016.03.001

Highlights

- We estimate the effects of regulatory institutions in the liner shipping sector on maritime transport costs and on seaborne trade flows.
- The cost-inflating effect of policy restrictions ranges from 26 to 68 percent.
- The resultant reduction in trade flows ranges from 48 to 77 percent.
- We show how the effect of maritime trade costs varies by destination country.
- We demonstrate how the distance elasticity of trade flows can be decomposed into a direct and an indirect effect through trade costs.

The Trade Reducing Effects of Restrictions on Liner Shipping

Fabien Bertho

Treasury, Government of France
fabien.bertho@sciences-po.org

Ingo Borchert*

* Corresponding author
University of Sussex
Department of Economics (BMEc)
Falmer, Brighton
BN1 9SL, UK
I.Borchert@sussex.ac.uk
+44-1273-678731

Aaditya Mattoo

The World Bank
amattoo@worldbank.org

Abstract. The costs of shipping containerized cargo on liner vessels play a pivotal role in determining a country's integration into international trade. We examine how policy governing the liner shipping sector affects maritime transport costs and seaborne trade flows. Using a novel dataset of services trade policy information, we find that restrictions, particularly on foreign investment, significantly increase maritime transport costs. The cost-inflating effect ranges from 26 to 68 percent, and the resultant reduction in trade flows from 48 to 77 percent, depending on the level of restrictiveness. We estimate the elasticity of seaborne trade flows with respect to distance to be nearly unity, and are able to disentangle the direct effect of distance from the one that is operating indirectly through higher maritime transport costs. Since the bulk of global merchandise goods trade is seaborne, the magnitude of frictions identified in this paper and their spatial distribution have ramifications for connectivity and growth.

JEL Classification: F13, F14, L80

Keywords: Maritime transport, trade costs, services trade policy, investment restrictions, connectivity.

Acknowledgements. The authors would like to thank Meredith Crowley, Pierre Latrille, Barry Reilly and L. Alan Winters for valuable comments, and Jan Hoffmann for sharing data. The advice of an anonymous referee was most helpful. This paper is part of a World Bank research project on trade in services supported in part by the Multidonor Trust Fund for Trade and Development and the Strategic Research Program. The funding sources had no involvement whatsoever in this study, neither in terms of research design nor in terms of findings/interpretation nor in any other way.

Disclaimer. The findings, interpretations, and conclusions expressed in this paper are entirely those of the authors. They do not necessarily represent the views of the International Bank for Reconstruction and Development/World Bank and its affiliated organizations, or those of the Executive Directors of the World Bank or the governments they represent, or any of the aforementioned individuals or institutions.

1. Introduction

Since most manufactured and semi-manufactured goods are transported in liner vessels, access to efficient and competitive liner shipping is crucial for a country's engagement in international trade. In fact, for trade with developed economies, maritime transport costs (MTCs) today matter more than tariffs. *Ad valorem* MTCs of exports to the United States are on average more than three times higher than the average US tariff, and to New Zealand are more than twice as high.[1] The current perception is that the scope for lowering MTCs through policy reform is limited because the market for maritime liner shipping services is largely free of distortions. Governments now generally desist from both sins of commission, such as reserving cargo for national shipping lines, and sins of omission, such as exempting liner conferences from competition policy. However, a new services trade restrictions database reveals that protection persists. It now takes the form more often of restrictions on foreign investment in maritime transport services than of restrictions on cross-border trade or port services, which have been the focus of the existing literature.

This paper seeks to assess the impact on MTCs and seaborne trade flows of policy measures currently affecting trade in liner shipping services, with a focus on hitherto neglected restrictions on foreign investment or commercial presence – 'mode 3' in WTO parlance. There are two principal reasons for this focus. First, the most significant barriers to cross-border trade (i.e. 'mode 1' in WTO terms) have indeed diminished in significance. Cargo reservations only affect a few specific goods and cover a tiny share of total seaborne trade, and many countries have narrowed the scope of exemptions from competition law for liner transport. Therefore, the total impact of mode 1 measures on MTCs is likely to be small.

[1] The comparison is based on figures of average tariff rates, taken from WITS (2007), and maritime transport costs, taken from OECD (2007), respectively, both in ad valorem terms as of 2007.

Second, even though cross-border trade is the key mode of supply for international shipping services, the ability to establish a commercial presence is crucial for the efficient provision of liner shipping services. Thus, provisions governing mode 3 are likely to affect maritime transport costs and trade flows.

The focus on policy barriers to foreign investment in the shipping sector addresses a blind spot in the existing literature on the determinants of maritime transport costs. One strand of the literature has studied aspects revolving around infrastructure and connectivity. In their seminal paper, Limao and Venables (2001) look at the quality of transport infrastructure as a whole. Other papers take up specific aspects of infrastructure such as port efficiency (Sanchez *et al.* 2003), different port characteristics (Wilmsmeier *et al.* 2006), or port infrastructure endowments (Wilmsmeier and Hoffmann 2008). The latter paper also addresses aspects of connectivity between ports,[2] as do Marquez-Ramos *et al.* (2011). In contrast, few papers investigate public policy. For instance, Wilmsmeier and Martinez-Zarzoso (2010) focus on the impact of being an open registry country whereas Clark *et al.* (2004) study the impact of anti-competitive practices in the liner shipping sector. Fink *et al.* (2002) quantify the effect of certain policies relative to other determinants of trade costs and find that both public policy—in the form of mandatory port services—as well as private anti-competitive practices have a substantial effect on transport costs.

This paper makes two principal contributions: first, we estimate the impact of policy restrictions on maritime transport costs and hence on seaborne trade flows, highlighting in particular the role of investment barriers which have not been studied before. Second, we examine how distance affects maritime transport costs and seaborne trade flows, respectively,

[2] UNCTAD has pioneered the construction of composite indices summarizing the frequency, capacity and quality of services to and from countries, see UNCTAD's 'Liner Shipping Connectivity Index' (LSCI).

recognising that changes in transport costs have knock-on effects on trade flows. To the best of our knowledge, this is the first paper to focus attention on the cost-inflating effect of a comprehensive set of measures, and to disentangle the various channels linking policy, distance, transport costs and trade flows.

We find that more restrictive liner shipping policies are associated with appreciably higher shipping costs, and investment restrictions matter most. Specifically, maritime transport costs on routes with restrictions are between 26 and 68 percent higher than on 'open' routes, depending on the level of restrictiveness. The cost-inflating effect is therefore substantial in magnitude. In terms of the derived effect on seaborne trade, maritime transport costs are the most important determinant of seaborne trade flows by a wide margin. We estimate that policy barriers lower trade flows by 48 to 77 percent through higher transport costs, with the size of the effect depending in part on the destination country.

Turning to the effect of distance, we find that the elasticity of seaborne trade flows with respect to distance is nearly unity. We show that this number can be decomposed into a direct effect, which accounts for about three-quarters of the impact, and a smaller indirect effect of distance through higher maritime transport costs. Without properly accounting for transport costs, the estimated coefficients of conventional gravity variables such as distance represent a mixture of such direct and indirect effects.

While multilateral trade negotiations have been successful in many areas, efforts to open up maritime services during the Uruguay Round negotiations under the auspices of the GATT/WTO were a notable failure, and hardly any progress has been made in recent Doha negotiations. This paper's findings suggest that the lack of progress in these negotiations

leaves in place serious impediments to countries' integration into global markets. Breaking the stalemate in regional and multilateral negotiating fora could lead to potentially large gains from policy reform.

The paper is organised as follows: Section 2 describes policy barriers to trade and investment in the liner shipping sector. Section 3 presents the data and estimation methodology. In Section 4 we estimate the effect of policy measures in a maritime transport cost equation, and in Section 5 we use those results to estimate the impact of transport costs on trade flows in a gravity framework. Section 6 concludes and offers policy recommendations.

2. Policy Barriers to Trade in Maritime Shipping Services

We consider four types of potentially cost-increasing policy measures: cargo reservations and the operation of liner conferences, both of which affect cross-border shipping services; port and terminal usage fees on both ends of a route; and policy restrictions on establishing commercial presence. Taking a comprehensive view on policy measures allows us to gauge the relative importance of each type of measure, whereas previous papers have mostly studied some of these types of measures in isolation. While port usage costs are measured in dollar terms and are readily available from the World Bank's Doing Business database, the nature of other policy measures is less straightforward. This section therefore provides a brief background on such measures and how they interact.

The General Agreement on Trade in Services (GATS) defines trade as taking place through different modes of supply, two of which are most relevant to maritime trade. Cross-border

trade (or mode 1) takes place when a maritime transport company from country A provides a service to a consumer resident in country B. Mode 1 is the key mode of supply for shipping services and has received greatest attention in previous research. The other relevant mode is the supply of a service through the establishment of commercial presence (or mode 3). A full commitment in mode 3 means that a country allows foreign firms to invest and establish local subsidiaries, branches or representative offices and imposes no restriction on their operation.[3]

Government barriers in mode 1: Cargo reservations

The main restrictions on cross-border trade (mode 1) take the form of cargo reservations or cargo preferences. These restrictions specify that some types of cargo can only be transported by some types of vessels, in general by vessels flying the country's flag or by vessels operated by national or domestic shipping lines. Over the past decades, most cargo reservations have disappeared (Fink *et al.* 2002) so that nowadays cargo reservations are likely to affect only a small part of world seaborne trade. For instance, in the US the volume of cargo transported under preference schemes represented around 1.5 percent of the total seaborne trade in 2005-07 (Bertho, 2011). In Brazil, 0.18 percent of total seaborne import tonnage was reserved for Brazilian flagged-vessels in 2009.

Private anti-competitive practices in mode 1

[3] Since today most international cargo can be transported irrespective of the vessel's flag, and since "deflagging" has spread, the establishment of a registered company for the purpose of operating a fleet under the national flag is less and less relevant (UNCTAD, 2011). This paper instead focuses on "the ability of international maritime transport service suppliers to undertake all activities which are necessary for the supply of a partially or fully integrated transport service, within which maritime transport constitutes a substantial element" (Draft Schedule on Maritime Transport Services mode 3b).

Historically, on many maritime routes liner shipping companies were allowed to cooperate on prices, capacities or schedules ("liner conferences"). Conferences thus are a particular form of institutionalised cartels and owe their existence to the fact that some countries exempt shipping lines from competition law. Since the 1990s, however, the influence of price-fixing agreements has decreased sharply: whilst 150 conferences operated in the world in 2001 less than 30 survived in 2010 (CI Online, 2010; OECD, 2002), mainly as a result of legislative changes such as the Ocean Shipping Reform Act (OSRA) in the US and the repeal of the block exemption for liner shipping conferences by European countries (Regulation 4056/86). A carrier agreement is active on about 30 percent, i.e. on 67 out of the 226 routes in our sample (detailed list provided in Appendix Table A.4).

Barriers to trade in mode 3: commercial presence

The impact of investment restrictions in the shipping sector has not been studied in the literature. Data unavailability may have been the main reason but it also seems the case that the complementarity between cross-border trade in shipping services and commercial presence has not been fully appreciated. In tramp shipping, tankers or dry bulk carriers are chartered by a single customer and so the transaction can easily be arranged by phone or via internet. In contrast, in liner shipping, a company needs hundreds or even thousands of customers to fill a container ship or a general cargo vessel (Bertho, 2013). It is much more difficult to manage ten thousand boxes pertaining to ten thousand customers than ten thousand tonnes of crude oil pertaining to one customer. The development of a network of offices by establishing a commercial presence can greatly facilitate the administration and organization of vessels' calls as well as the management of cargo. Second, international transport increasingly takes the form of "door-to-door" or multimodal delivery. It is therefore

important for maritime companies to establish a commercial presence abroad in order to have their own inland transport facilities or to develop partnerships with local transportation firms to facilitate the hinterland leg from the port to the final delivery point.

Table 1: Policy measures in the maritime shipping sector affecting foreign investment

	(1)	(2)	(3)	(4)	(5)	(6)
Continuous Variables	Mean	StdDev	Incidence	Min	Max	Obs
a. Equity limit private sector	84.38	25.58		0	100	65
b. Equity limit public sector	70.58	39.20		0	100	65
c. Equity limit JVs	84.31	24.02		30	100	65
d. Equity limit subsidiaries	83.60	27.28		0	100	65
e. Nationality employees	36.79	42.59		0	100	42
f. Nationality BoD	5.89	17.28		0	66	56
Binary Variables						
g. Branch entry not allowed	0.40	0.49	26	0	1	65
h. Subsidiary not allowed	0.03	0.17	2	0	1	65
i. Licence required	0.89	0.32	40	0	1	45
j. Licence criteria not publ avail	0.05	0.21	3	0	1	65
k. Licence not autom if crit fulfilled	0.18	0.39	12	0	1	65
l. Regulator not independent	0.55	0.50	36	0	1	65
m. No right of appeal	0.20	0.40	13	0	1	65
n. No prior notice of regul changes	0.58	0.50	38	0	1	65
o. Repatriation of earnings restricted	0.08	0.27	5	0	1	63

Source: World Bank Services Trade Restrictions Database.
Notes: Continuous variables measure the maximum percentage shares allowed to be held by foreigners and thus are bounded between 0 and 100. Binary variables measure the existence of a certain restriction; as such the mean (col. 1) represents the proportion of countries in which a given measure is applied. For convenience, col. 3 displays the same piece of information as the total number of countries which apply that restriction. A number of observations smaller than 65 in col. 6 indicates missing information for a given variable for some countries. Precise definitions of the variables are provided in Footnote 4.[4]

[4] The data for continuous variables were obtained for each country as a numerical response to the following questions: (a.) "What is the maximum aggregate foreign investment permitted in a single local firm" if the local firm is private (%); (b.) if the local firm is state-owned (%); (c.) in a joint venture (%); (d.) in a subsidiary? (e./f.) "If there are requirements that a certain number or percentage of employees or the board of directors be nationals, please specify the percentage or number required?"
The data for binary variables were obtained for each country as a 'yes' or 'no' response to the following questions: (g.) "Are foreign firms permitted to enter as a branch primary form of establishment?" (h.) "Are foreign firms permitted to enter as a locally incorporated subsidiary?" (i.) "Is a license or a permit required to establish a commercial presence in the domestic market?" (j.) "Are the criteria that a firm must fulfill to obtain a license publicly available?" (k.) "Does the fulfillment of publicly available criteria ensure that a license is granted?" (l.) "Is the regulatory authority established by statute as a body independent from the sector ministry?" (m.) "Are there procedures in place that allow foreign investors to appeal regulatory decisions?" (n.) "Are there procedures that give foreign investors prior notice of, and allow them to comment on, proposed regulatory changes?" (o.) "Are there restrictions on the repatriation of earnings by foreign firms?"

To obtain data on such mode 3 restrictions, we draw on the Services Trade Restrictions Database (Borchert, Gootiiz and Mattoo, 2014) which provides detailed information on the incidence of policy measures in a number of services sectors, including maritime shipping. Table 1 provides an overview of individual policy measures applied to liner shipping. These measures affect market entry, post-entry operations, or the regulatory environment. The summary statistics indicate that (i) limits on foreign ownership or equity tend to be more stringent on average in public incumbent firms than in private sector firms; (ii) tighter limits exist the presence of foreign nationals on the board of directors than as employees of firms; (iii) opening a branch, possibly a less costly alternative to a subsidiary or an acquisition, is not permitted in a number of countries; and (iv) in many countries licenses are required to enter the market, regulators are not independent of the ministry and the incumbent, and regulatory changes can be implemented without prior notice, implying the existence of a fair amount of regulatory discretion, and hence uncertainty for investors.

3. Data and Empirical Strategy

We first describe the construction of the Services Trade Restrictiveness Index (STRI) for liner shipping, and then our estimation strategy.

3.1 Liner Shipping STRI: Data and Methodology

In order to incorporate multiple policy barriers to commercial presence as shown in Table 1, we construct a country-pair specific quantitative score (the liner shipping STRI) that reflects the restrictiveness of policy regimes applied at both ends of a given journey. The approach adopted in this paper builds on a relatively long tradition in the literature of quantifying policy barriers (Deardorff and Stern, 2008) of scoring the relative restrictiveness of specific policy

measures and then constructing a weighted average of underlying scores. The scoring approach to quantification was first developed by the Australian Productivity Commission and used widely in work undertaken by the OECD[5]; recent applications to the maritime transport sector were developed by McGuire *et al.* (2000), Kimura *et al.* (2004), Achy *et al.* (2005) and Li and Cheng (2007). We combine the established methodology with the latest and most comprehensive information on applied service trade policies in the maritime shipping sector.

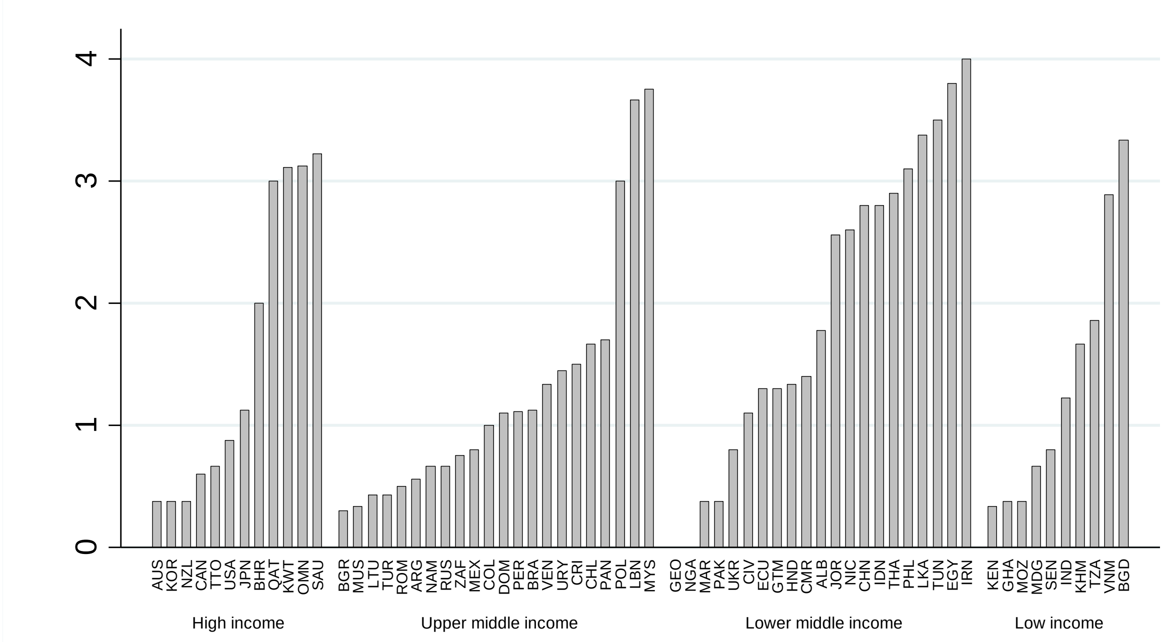
The construction of a liner shipping STRI proceeds in two principal steps: first individual policy measures relevant to the maritime shipping sector are selected, scored and aggregated for each country. Further details are provided in Annex 5. Figure 1 displays the liner shipping STRI by country and income group. As suggested in the literature, the liner shipping sector is relatively open to foreign trade in comparison to other services sectors (Borchert *et al.*, 2011; Kumar and Hoffmann, 2002), yet there is considerable variation across countries, which bodes well for identifying the impact of regulatory regimes. At the same time the index exhibits plausible correlations with some geographical characteristics; for instance, island countries for which international shipping is crucial tend to exhibit a low STRI (Australia, New Zealand, Mauritius and Trinidad and Tobago, one of the Caribbean's main maritime transport hubs).

Second, country scores are combined—or 'bilateralised'—so as to obtain an indicator of restrictiveness that varies at the route level. Recall that activities specifically tied to having a commercial presence are administration and organization of vessels' calls, management of cargoes in ports of origin and destination, and administration and organization of hinterland

[5] See Conway *et al.* (2005), Conway and Nicoletti (2006) and OECD (2008, 2009).

transportation, all of which needs to work efficiently at both ends of a journey. Considering that potential policy barriers on either end of a journey jointly affect route-specific maritime transport costs, we obtain the bilateral STRI as the product of origin and destination countries' indices.[6]

Figure 1: Liner Shipping STRI, Mode 3, across per-capita income group



Sources: Author's calculation. Note: Level of development according to World Bank classification.

3.2 Estimation Strategy and Related Data

Our approach is first to estimate the impact of liner shipping policies on bilateral MTCs, controlling for other determinants. In the second stage, we estimate the impact of transport costs on seaborne trade flows, again including relevant covariates.

[6] Alternatively, constructing the bilateral STRI as the sum of origin and destination country indices yields qualitatively similar results.

In the first stage, we follow the model of liner shipping prices developed by Fink *et al.* (2002) and used in a number of subsequent papers.[7] In this model, the MTC for a product k on a maritime route between an origin country o and a destination d are assumed to be equal to the marginal cost of the service multiplied by a mark-up term.[8] The principal determinants of marginal costs and mark-ups in maritime shipping are distance, scale economies and policy barriers. Distance between the origin and destination has a straightforward effect on the marginal costs of transport through fuel, labour and other costs. At the same time, many maritime journeys between two countries are not direct and involve the "hub and spoke model" – i.e. long journeys between main ports performed by large vessels and cargo distribution within regions delegated to feeders after transhipment. We account for this feature of maritime shipping by including a transhipment variable in the MTC equation. The empirical relevance of doing so is illustrated by the fact that in our sample a direct service exists on 91 routes (or 40 percent) whereas transhipment is needed on 135 routes. Since maritime shipping is also understood to operate under increasing economies of scale, overall trade volume on a given route may affect transport costs. We address this issue by accounting for the aggregate bilateral country-pair volume of trade as well as for route-specific trade imbalances.[9]

We assume that distance, scale economies and policy barriers jointly determine costs for shipping good k between country-pair o and d by affecting marginal costs or mark-ups. This gives rise to the following reduced form equation, which incorporates all principal determinants previously discussed:

---

[7] See Micco and Pérez (2002), Clark *et al.* (2004) and Wilmsmeier and Martinez-Zarzoso (2010).

[8] The term 'MTC' is used in the literature even if it corresponds to the price paid by consumer of the service. Here we follow this convention.

[9] Maritime transport costs are directional and we wish to allow for the fact that a low 'backhaul' is cross-subsidised by charging a higher price on one leg of the journey.

$$\ln(\text{mtc}_{odk}) = \beta_1 \ln(\text{dist}_{od}) + \beta_2 \text{tranship}_{od} + \beta_3 \ln(\text{tv}_{od}) + \beta_4 \ln(\text{tra\_imb}_{od}) + \beta_5 \text{carriers}_{od}$$
$$+ \sum_{q=2}^{4} \beta_{6,2} \text{STRI}_{od,q} + \beta_7 \text{CR}_{od} + \beta_8 \text{LC}_{od} + \beta_9 \text{TermCost}_{od} \quad (1)$$
$$+ \theta_o + \lambda_d + \delta_k + \varepsilon_{odk}$$

The dependent variable mtc_{odk} represents the per-unit cost (in dollars per tonne) paid by the service's consumers, including the price of the transport, insurance costs and cargo handling but excluding customs charges. The product index *k* corresponds to containerisable goods disaggregated at the 2-digit level of the Harmonized System (HS) classification.[10] In order to obtain the most precise price data, we restrict the sample to four importing countries (and all their trade partners) which report import values in CIF *as well as* "value for duty," thereby allowing us to compute 'true' MTCs and sidestepping the problems afflicting CIF-FOB ratios (Hummels and Lugovskyy, 2006).[11] We use the data computed by Korinek (2011) who uses Hummels' (1999) methodology to compute transport costs. The $dist_{od}$ variable measures maritime distance between the two main container ports of trading partners, corresponding to the shortest way by capes, straits or canals expressed in nautical miles (AXS Marine, 2010). The variable $carriers_{od}$ represents the number of carriers serving a particular route and is provided by UNCTAD.[12]

In terms of policy barriers potentially raising maritime trade costs, we control for the presence of cargo reservations (CR_{od}) and liner conferences (LC_{od}) on a particular route as well as the terminal fees ($TermCosts_{od}$) at origin and destination ports, respectively. Our main interest,

[10] Following the OECD Maritime Transport Costs Database, we assume that containerisable cargo corresponds to all lines except 10, 12, 15, 25-29, 31, 72, and 99 in the Harmonized System (HS) disaggregated at 2-digits.
[11] "Value for duty" is defined by Statistics New Zealand as the value of imports before the addition of insurance and freight costs. The equivalent statistical concept in the United States is "Customs value" which is defined as the price actually paid or payable for merchandise when sold for exportation to the United States, excluding U.S. import duties, freight, insurance, and other charges incurred in bringing the merchandise to the United States. In contrast, the CIF value of imports is the actual cost paid by importers, so that the difference of both valuations yields a measure of 'true' maritime transport costs.
[12] We include this variable because it reflects the extent of competition on a particular route; however, the results are not sensitive to its presence. The endogeneity concerns raised by this variable are discussed below.

though, lies in the policy measure $STRI_{od,q}$ which represent dummy variables corresponding to quartiles of the bilateral liner shipping STRI score.

We include full sets of origin, destination, and commodity fixed effects (θ_o, λ_d and δ_k). It is important to emphasise that the coefficients of interest in equation (1) are identified off country-pair variation, while the exporter and importer fixed effects absorb any unobserved country heterogeneity such as port infrastructure or the quality of institutions.[13] One may also expect unobserved product heterogeneity to affect maritime transport costs. For instance, there is evidence that in the presence of market power, shipping prices depend on the (demand) characteristics of the products to be shipped (Calvo Pardo and Lazarou 2013; Hummels, Lugovskyy and Skiba 2009). Likewise perishable goods may command a premium for timely delivery. All these effects are absorbed by the full set of commodity fixed effects.

The sample includes four importers (Brazil, Chile, New Zealand and the United States; destination countries) and 65 exporters (origin countries) representing a total of 18,664 observations.[14] Among exporters, 12 are high income countries, 43 are middle income and 10 are low income countries. Container shipments on liner routes—the focus of this paper—account for a sizable share of countries' overall seaborne imports; for instance, our sample accounts for 69 percent of US total seaborne imports and 52 percent of New Zealand's total seaborne imports, respectively. We estimate equation (1) on a cross-section of product-country-pairs for the year 2006, for which transhipment data are available from UNCTAD.

[13] One such institution is a country's stance on exempting liner conference from domestic competition law. In our particular sample the incidence of this institution is collinear with the country fixed effects and thus cannot be identified separately.

[14] The number of origin countries is in the first instance constrained by the total number of countries in the Services Trade Restrictions Database (103), of which 22 are landlocked and thus drop out. In addition, for 13 EU member states, for which policy information is in principle available, trade flows cannot be tracked back to the port of entry through which they entered EU territory (typically Rotterdam), so they drop out as well. We end up with 65 exporters; the country sample is detailed in Annex 2.

Before proceeding to estimate the transport cost equation, we address the problem of 'incidental truncation' afflicting the dependant variable mtc_{odk}. The issue arises because maritime trade costs are only observed in the presence of positive trade flows and are missing otherwise, which is the case for about 59 percent of observations. Selection into zero trade flows is driven by cost shocks that are part of the error term ε_{odk}, thus giving rise to a sample selection problem. We address this issue by specifying a Heckman selection model to estimate partly unobserved trade costs. For unbiased estimates we require an instrumental variable that is associated with the selection into trading but is excludable from the second-stage equation that models trade costs (equation 1). We use worldwide exports of origin country *o* in product *k* to all countries other than destination *d* as an additional explanatory variable in a first-stage Probit selection equation for bilateral flows between countries *o* and *d* in product *k*.[15] The exclusion restriction appears plausible as the exports of a particular country, say, Japan to all countries other than, say, Brazil are unrelated to the level of trade costs facing shipments from Japan to Brazil in a given product. At the same time this variable is ideal for capturing country-product specific cost shocks, and accordingly turns out to have good explanatory power in the Heckman estimator's first stage.

4. First Stage: Estimating Maritime Transport Costs

4.1 Estimation results

Results from estimating equation (1), i.e. the determinants of maritime transport costs, are presented in Table 2.[16] Model 1 first considers the "natural" determinants of maritime

[15] We thank an anonymous referee for suggesting this instrument.
[16] Estimation results for the Heckman selection equation are contained in Annex Table A.6. Empirical estimates of the selection equation are well behaved, i.e. all coefficients are correctly signed and many are significant. In

shipping (including the degree of competition) whereas subsequent models add policy barriers to the specification. The effects of distance, transhipment, total seaborne import volume and the number of carriers operating on a route are all significant and correctly signed. As we would expect, longer routes as well as the need for transhipment are cost-inflating whereas a higher total trade volume allows scale economies to be exploited, thereby lowering shipping costs. Tougher competition on a given route also works towards reducing shipping rates.[17] The coefficient of route-specific trade volume imbalances is the only unexpected effect; the negative effect could be due to the difficulty of identifying the relevant regional trade routes for a given country-pair[18] and may partly capture cost-reducing economy of scale effects.

In models 2-5, we consider the four principal types of potentially cost-increasing measures that have been observed: cargo reservations on cross-border shipping services (col.2), liner conferences on particular routes (col.3), fees and other terminal costs in the ports at both ends of the journey (col.4), and policy restrictions on establishing commercial presence in the countries involved (col.5). We find evidence that investment restrictions exert a strong influence. Liner conferences appear to be weakly cost-inflating, and no significant effects are found for cargo reservations and port terminal costs. There is stronger evidence for the detrimental effect of anti-competitive practices and port terminal costs when minuscule trade flows are discarded (col.7), an issue we will return to below.

particular, the estimated coefficient on the log value of worldwide exports (excluding the destination country) is positive and highly significant, consistent with a strong positive correlation between rest-of-world exports and the probability of positive shipments to a particular destination country as both flows are driven by common origin-product specific cost shocks. We interpret this result as evidence for a strong and relevant excluded instrument.

[17] As noted above, the number of carriers may not be a strictly independent variable and could be affected by costs on a particular route. However, the negative sign of the coefficient suggests that the direction of causality is from the number of carriers to costs.

[18] The pronounced 'hub-and-spoke' network structure of maritime trade would imply that the inter-regional seaborne trade volume (e.g. between 'Australasia' and the Far East) is more relevant for shipping costs between Auckland and Shenzhen than the inter-country trade volume between New Zealand and China. A ship need not necessarily return empty on the same route but could be deployed elsewhere, in which case the trade volume imbalance variable would again partly capture cost-reducing economy of scale effects.

Our main results for the first stage of the inquiry are contained in column 6 where all potential determinants of maritime transport costs are jointly considered. We include indicator variables for quartiles of the STRI distribution and so do not restrict the effect of investment restrictions to be linear in our measure of restrictiveness. The coefficients associated with cargo reservations, liner conferences and port terminal costs are now insignificant but those associated with the liner shipping STRI are positive and significant at the 1 percent level. The latter coefficients increase monotonically but the cost-inflating effect of policy barriers is not linear. The marginal effects of policy restrictiveness on expected observed trade costs implied by the STRI coefficients in column 6 range from 26 to 68 percent. The impact thus is economically quite significant. We provide a comprehensive discussion of the marginal effects of policy further below.

Table 2: Estimation results -- the MTC equation

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Log Distance	0.1153**	0.1123**	0.1143**	0.0980*	0.1064**	0.0986*	0.0882*
Transhipment	0.1043*	0.1049*	0.1019*	0.1600***	0.0847	0.1327**	0.0938*
Log Total Import Vol	-0.0664***	-0.0663***	-0.0650***	-0.0564***	-0.0702***	-0.0573***	-0.0538***
Log Import Imbalance	-0.0573***	-0.0573***	-0.0576***	-0.0573***	-0.0549***	-0.0560***	-0.0578***
Carriers	-0.0109**	-0.0112**	-0.0113**	-0.0125***	-0.0136***	-0.0160***	-0.0160***
Cargo Reservations		0.0278				-0.0688	-0.1175
Liner Conference			0.0754*			0.0628	0.0924**
Port Terminal Costs				0.0003		-0.0004	0.0031***
STRI 2nd quartile					0.1895***	0.2319***	0.2227***
STRI 3rd quartile					0.2471**	0.3031***	0.2670**
STRI 4th quartile					0.4140***	0.5199***	0.5203***
Observations	18664	18664	18664	16298	18664	16298	15475
Censored obs	11148	11148	11148	9710	11148	9710	9710
Log L	-14050	-14050	-14050	-12350	-14030	-12320	-9804
Rho(u1, u2)	-0.0011	-0.0019	0.0003	-0.0108	-0.0042	-0.0156	-0.0465

Source: Authors' calculation.
Notes: significance levels: * 10% level, ** 5% level, *** 1% level. The dependant variable is the log of per-unit maritime transport cost expressed in dollars per kilogram. Heckit coefficients reported for all models, marginal effects discussed in the text. Maximum likelihood estimation with standard errors clustered at the country-pair level. The number of observations is lower in Models (4) and (6) due to unavailability of information on port terminal costs in 9 countries (Bahrain, Egypt, India, Korea, Lebanon, Madagascar, Qatar, Saudi Arabia, Turkey). The number of observations is again reduced slightly in Model (7) as we drop 823 observations for which the reported physical weight is less than one metric tonne. Origin, destination and commodity fixed-effects as well as intercepts are included in all models but not reported.

We subject the results from the main specification to two further robustness checks. To begin with, we observe in our sample a number of minuscule trade flows that arise from the shipment of tiny physical quantities. The concern here is that the distribution of per-unit transport costs is artificially inflated by these observations (Baldwin and Harrigan, 2007; Harrigan 2010). Thus, we re-estimate model 6 after dropping all observations for which the physical weight reported is less than one metric tonne.[19] The results with respect to baseline covariates remain virtually unchanged, whereas the impact of policy barriers is estimated more precisely and is quantitatively larger. In particular, liner conferences and terminal costs are now significantly cost-inflating, and the coefficients on the STRI variables are larger than in model 6.

Second, while the commodity fixed effects in principle control for alternative modes of transportation at the product level, we check whether the option of road transport is affecting the results. Trade between neighbouring countries in particular is more likely to be carried by road trucking (Hummels, 2007). However, omitting contiguous country pair observations leaves the results quantitatively unchanged.[20]

4.2 Policy Impact

We now discuss in detail the implied marginal effects of policy.[21] The main finding is that more restrictive policies are associated with appreciably higher costs. Specifically, the expected observed value of maritime transport costs is on average 25.9 percent higher on

[19] This affects 823 observations, or about five percent of the sample. Observed average trade costs in this (potentially abnormal) subsample exceed the average in the rest of the sample by a manifold.

[20] This exercise affects 626 observations across eight country pairs (USA-Mexico; Chile-Argentina/Peru; Brazil-Argentina/Colombia/Peru/Uruguay/Venezuela).

[21] Notice that the object of interest in the subsequent discussion of marginal effects is the effect on the level of expected maritime transport costs, $E\{\mathrm{MTC}|x\}$, whereas the dependent variable in the econometric specification is log transformed. Since $E\{\ln(\mathrm{MTC})|x\}$ is not equal to $\ln(E\{\mathrm{MTC}|x\})$, the retransformation problem must be confronted. Details about the computation of marginal effects are available upon request.

routes in the second quartile of the liner shipping STRI as compared to ‘open’ routes (the first quartile serves as reference category). MTCs are 35.4 percent and 67.9 percent higher on routes classified in the third and the fourth quartile, respectively, compared to open routes.

These marginal cost increments refer to the expected value of transport costs for those observations for which trade flows—and therefore transport costs—are actually observed (conditional expected value). At the same time, policy restrictiveness also manifests along the ‘extensive margin’ in the sense that policy restrictions affect the selection probability in the Heckman model. Specifically, higher policy barriers increase the likelihood of choking off bilateral trade flows or, put differently, of lowering the probability of observing trade flows and transport costs.[22]

We find that the likelihood of observing a positive trade flow in the first place, i.e. the ‘extensive margin,’ tends to fall with distance (for any given level of restrictiveness). This is what one would expect and confirms an analysis of maritime trade and transport cost for Latin America by Martinez-Zarzoso and Wilmsmeier (2010) who find that distance reduces trade mainly by trimming the number of shipments. In our case, the decrease in censoring probability for country pairs at the 95th distance percentile is about 20 percent higher than the corresponding change in the censoring probability for nearby countries (at the 5th percentile of bilateral distance).

[22] We focus our discussion on the marginal effects with respect to the conditional mean as this appears to be the more policy relevant quantity. We note in passing, though, that the marginal effect of policy restrictions on the unconditional expected value of transport costs tends to be lower because the marginal effect on the conditional expected value is reduced by the (negatively signed) marginal effect on the selection probability, as explained above. To see this point—and abstracting from the retransformation problem for the moment—notice that $E(y|x) = E(y|x, y = obs) \times \Pr(y = obs)$. Recognising that $(\partial E(y \big| x, y = obs))/\partial \text{ STRI} > 0$ and $(\partial \Pr(y = obs))/\partial \text{ STRI} < 0$, it follows that the impact on unconditional expected MTCs of policy restrictiveness is lower than the one on the conditional expectation. We find that overall expected transport costs are 30.5 percent higher on the most restrictive routes, respectively, relative to ‘open’ routes, compared to the 68 percent rise in conditional expected MTCs. The reduction in the probability of trade taking place effectively amplifies the cost-inflating effect on those trade flows that are being observed.

4.3 Distance and other covariates

In addition to influencing maritime transport costs through the effect of policy, distance also has a direct effect on costs. In the main specification, observed per-unit trade cost increase by 0.82 percent if bilateral distance between country pairs increased by 10 percent, which corresponds to about 780km in our sample. The need for transhipment in order to connect two countries raises per-unit MTCs by 14.1 percent, which constitutes a fairly substantial premium.

Regarding the marginal effects of other covariates, a 10 percent increase in economies of scale as measured by the total volume of seaborne imports reduces maritime transport costs by 0.5 percent. Tougher competition by the same margin—measured by the number of carriers serving a particular route—lowers transport charges by 0.9 percent.

5. Second Stage: Estimating Seaborne Trade Flows

In the second stage of our analysis, we use a standard gravity framework to assess the impact of maritime transport costs on seaborne trade flows. Compared to earlier studies that have looked at the effect of MTCs on seaborne trade flows,[23] the sequenced approach that follows Limao and Venables (2001) allows us to address the endogeneity of transport costs by using predicted values of MTCs from the Heckman model, which are not afflicted by reverse causality.[24] An additional benefit of this setup is that we can obtain more detailed impact

[23] See Bensassi *et al.* (2014), Marquez-Ramos *et al.* (2011), Korinek and Sourdin (2009), Martinez-Zarzoso *et al.* (2008), Martinez-Zarzoso and Nowak-Lehmann (2007), Martinez-Zarzoso and Suarez-Burguet (2005), Limao and Venables (2001), and Radelet and Sachs (1998).

[24] Few studies acknowledge the endogeneity of MTCs, and those that apply IV techniques use the unit value of goods as an instrument for MTCs, see Martinez-Zarzoso and Suarez-Burguet (2005), Marquez-Ramos *et al.* (2011), and Korinek and Sourdin (2009). This approach raises doubts about the exclusion restriction because the value of trade (price times quantity) is likely to be correlated with the unit value of goods. Martinez-Zarzoso and

effects of conventional gravity variables, in particular with regard to distance, the effect of which has been debated extensively in the literature.

5.1 Data and Estimation

We base our estimation on the structural gravity model as developed by Anderson and van Wincoop (2003) in which imports are a function of sectoral output, expenditure, and a trade cost function that comprises of bilateral trade barriers as well as inward and outward multilateral resistance terms. A key property of this framework is trade separability, which defines this structural relationship for each product category *k*.

$$M_{od}^{k} = \frac{Y_d^k E_o^k}{Y}\left(\frac{\tau_{od}^k}{\Pi_d^k \mathrm{P}_o^k}\right)^{1-\sigma^k} \quad (2)$$

We specify the trade cost function $\tau(\cdot)$ to include distance, contiguity, common language, membership in a preferential trade agreement (PTA), tariff rates, and maritime transport costs. As is standard in the literature, we add an error term and estimate equation (2) with Poisson Pseudo Maximum Likelihood (PPML), assuming the conditional mean of imports can be modelled as described:

$$E[M_{odk}] = exp\left\{\begin{matrix}\gamma_1 \ln(dist_{od}) + \gamma_2 contig_{od} + \gamma_3 lang_{od} + \gamma_4 PTA_{od} + \gamma_5 tar_{od} \\ +\gamma_6 \ln(MTC_{odk}) + \theta_o + \lambda_d + \delta_k\end{matrix}\right\} \quad (3)$$

The gravity-type variables are self-explanatory (further details can again be found in Annex Table A.3). *PTA* is a dummy variable indicating whether a bilateral route is covered by any of the main preferential agreements to which Brazil, Chile, New Zealand and the US are party. We use the average applied tariff between country-pairs for product *k*. *MTC* denotes

Nowak-Lehmann (2007) estimate transport costs and trade simultaneously but this approach, too, is problematic since it is not the amount of individual products (or HS-2/4 lines) that creates economies of scale in liner shipping but rather the total amount of bilateral trade.

predicted values of maritime transport costs per country-pair and product, obtained from the previous section's Heckman estimation (Table 2, model 6).

5.2 Results

We obtain a rich set of results that illustrate how natural and policy barriers affect seaborne trade flows. By leveraging the earlier Heckman estimates of maritime transport costs for a gravity estimation of trade flows, we are able to disentangle direct and indirect distance effects and can quantify the indirect impact of policy restrictions that inflate maritime transport costs on trade flows. We obtain three main results: quantitatively, maritime transport costs are the most important determinant of seaborne trade flows by a wide margin. Second, the effect on the value of trade of maritime transport costs has a discernible destination-specific component. Thirdly, the impact of conventional gravity variables such as distance is substantially altered once transport costs are properly controlled for, and we quantify the relative size of direct and indirect distance effects, respectively.

As a point of reference, we start by estimating equation (3) without a MTC variable (Table 3, col. 1), as in some conventional gravity specifications. All variables exhibit the correct sign and distance, which captures the effect of all frictions to seaborne trade flows in this specification, is significant at the 1 percent level. Notice that the coefficient on contiguity is not significant but correctly signed for the specific sample of exclusively seaborne imports, since surface transport (road trucking) is arguably the most efficient transport mode for countries sharing a land border. This result confirms a pattern often identified in the literature, namely that the importance of maritime transport decreases significantly when two trading partners share a common border (Hummels, 2007).

When predicted MTCs estimated in Section 4.1 are included in the specification (Table 3, col. 2), the variable turns out to be highly significant and quantitatively the most important factor in explaining variation seaborne trade flows. The distance elasticity in this specification is significant but its magnitude is only half the size of the estimate in column 1, suggesting that part of the impact of distance in standard gravity models is due to its effect on transport costs. In elasticity terms, the impact on the value of trade of maritime transport costs is about four times as large as the direct effect of distance.[25] Overall MTCs turn out to be by far the most important determinant of seaborne trade flows. In this specification, as well as most others in Table 3, the coefficients of other gravity variables, such as contiguity, the existence of PTAs and a common language, are also significant and have the expected signs.[26]

Table 3: PPML estimation results of the gravity equation

	(1)	(2)	(3)	(4)	(5)	(6)
Distance	-1.4031***	-0.7230***	-0.7173***	-0.8944***	-0.6107***	-0.6064***
Contiguity	-0.9388	-1.1961**	-1.1988**	-1.3038**	-1.1455***	-1.1454***
PTA	0.4697	0.5543**	0.5422**	0.4219	0.6176**	0.6031**
Common language	0.3115	0.3543*	0.3710*	0.4040*	0.3131	0.3095
Avg applied tariff	-0.0074	-0.0079	-0.0084	-0.0077	-0.0061	-0.0063
MTC predicted		-2.8301***	-3.0338***	-2.9711***		
MTC (> median)			-0.2762			
Distance (> median)				0.0405		
MTC pred (USA)					-2.2961***	-2.3090***
MTC pred (BRA)					-3.1628***	-3.1448***
MTC pred (CHL)					-3.0971***	-3.0938***
MTC pred (NZL)					-3.4311***	-3.4240***
Observations	18499	16150	16150	16150	16150	15327
Log L	-350730	-321778	-320050	-321577	-318785	-317833
R-squared	0.6068	0.6113	0.6384	0.6115	0.6139	0.6139

Notes: The dependant variable is seaborne imports expressed in dollars. *MTC* denotes 'Maritime Trade Costs', *PTA* denotes existence of a 'Preferential Trade Agreement.' Variables *MTC* and *Distance* are in logarithms. Coefficient significance levels: * 10% level, ** 5 % level and *** 1 % level. All models estimated by Poisson

[25] Predicted values of MTCs partly embody a distance effect too, which will be discussed below.

[26] The coefficient on the PTA variable could potentially be biased downwards in a cross-section of countries (see Baier and Bergstrand, 2007) but we include this variable to avoid a potential omitted variable bias with respect to distance and MTCs, the coefficients of main interest.

Pseudo Maximum Likelihood (PPML) with robust standard errors clustered at the country-pair level. Full sets of origin, destination and commodity fixed-effects included in all specifications but not reported.

We also check for any non-linear effect of MTC (Table 3, col. 3) or distance (Table 3, col. 4) on trade flows by allowing the effects to vary depending on whether values of distance and MTCs are below or above their respective median. We fail to detect any sign of non-linear effects; the results, including the coefficient of MTC, are virtually unchanged.[27]

Lastly, we allow the average effect of MTC in model 2 to differ by destination country (Table 3, col. 5). Whilst MTCs continue to exert a strong impact on trade flows in each case, the cost elasticities differ markedly across the four destination countries. The effect is relatively lower for journeys to the United States and relatively higher on routes to New Zealand, the most remote of the four destinations. Lastly, we also carried out a robustness check (Table 3, col. 6) that excludes minuscule trade flows below one metric ton (as was done in the Heckman estimations) but results do not change.

Of particular interest is a quantification of the effect of investment restrictions on seaborne trade as these kinds of frictions have not been studied before. The marginal effects of policy barriers and distance can be calculated based upon estimated coefficients presented in col.2 of Table 3. The effect of policy restrictiveness is felt through its (sizable) impact on maritime transport costs. The 26 percent increase in MTCs associated with 'intermediate' STRI values in the second quartile corresponds to a decrease in the value of seaborne imports by 48 percent. On the most restrictive routes, which are associated with a cost increment of about 68 percent, trade flows are predicted to be lower by 77 percent which, put differently, is

[27] We also estimated alternative specifications with squared terms of both MTC and distance but these terms were not significant and the results did not change (results not shown to conserve space).

equivalent of going from the median of (predicted) maritime transport costs to the 75th percentile.

Distance has a direct and an indirect effect.[28] A 10 percent longer route is associated with 7.2 percent lower trade as the direct effect, and with 2.3 percent lower trade indirectly. The latter effect is obtained by taking the product of the impact of higher distance on MTC (approximately 0.82 percent), and the impact of higher MTC on trade (2.83, the MTC coefficient in the PPML estimation).[29] Hence, the combined effect on seaborne trade flows of distance is roughly one-for-one, about one quarter of which is manifested indirectly through higher maritime trade costs.

5.3 Robustness Tests

Following Head and Mayer (2014), we re-estimated the gravity model using a series of alternative statistical models as a robustness check (results available in the supplementary material). Specifically, the trade flow equation was re-estimated using a two-part model (Table A.7), by OLS (Tables A.8 and A.9), and using a negative binomial (negbin) ML estimator (Tables A.10).[30] The results remained qualitatively unchanged.[31]

[28] The direct effect of distance may be felt through specialisation. Harrigan (2010) has shown that in the presence of alternative transport modes which differ in their cost/speed trade-off, and consumers valuing timeliness of delivery, distance will play a role in determining comparative advantage. Using US import data, Harrigan shows that distant exporters have a relatively high market share in goods which are transported by air (as opposed to surface), implying that in a sample restricted to seaborne trade flows and controlling for contiguity, distance exerts a negative effect via comparative advantage specialization.

[29] When computing the marginal effect on expected overall trade costs with respect to distance from the Heckman model, we take care of the retransformation problem on both sides of the selection equation, for what is needed is the elasticity of *MTCs* with respect to *distance* even though the estimable equation is framed in terms of *log(MTC)* on *log(distance)*.

[30] The negbin model is a natural candidate to estimate as it is more flexible (one additional parameter) and nests the Poisson model if the conditional mean in fact equals the conditional variance. It is worth recalling that the negbin estimator may potentially be more efficient if the distributional assumption holds but is inconsistent if it fails. In contrast, the Poisson PML does not require such a distributional assumption for consistency and is therefore generally preferred to the negbin model. We report negbin results purely for robustness purposes and, despite the unsurprising evidence for overdispersion, find nothing that would call into question the main PPML results.

The two-part model (Table A.7), a natural extension to the PPML estimator, offers some interesting ancillary results. It allows the covariates to have a different effect on the probability of observing a non-zero trade flow, and conditional on that, on the value of trade. For instance, once MTCs are explicitly accounted for (Table A.7, col.2), distance is no longer a determinant of whether or not trade takes place, but still lowers the value of trade conditional on shipments taking place. Higher maritime transport costs also seem to have a slightly less adverse effect on the probability of observing shipments whereas the cost effect is uniform for positive trade flows.

6. Conclusion and recommendations

Contrary to popular belief, international trade in liner shipping services is still restricted by policy. In particular, the impact of widespread investment restrictions in the shipping sector has not been studied in the literature. This paper demonstrates that such policy measures have a significant effect in terms of raising maritime transport costs and, hence, lowering seaborne trade flows. Since the bulk of global merchandise goods trade is seaborne, the magnitude of frictions identified in this paper and their spatial distribution have important ramifications for connectivity and market integration.

Trade policy restrictions in mode 3 raise maritime transport costs by 26 to 68 percent. We also find transhipment requirements and total import volume to be significant determinants of

[31] Head and Mayer (2014) also advocate estimating a Gamma PML. With the dataset and model specification at hand, this estimator encounters convergence problems, which are known to afflict models with large sets of fixed effects.

maritime transport costs but the magnitude of these effects is secondary compared to the effects of policy barriers and distance. The elasticity of seaborne trade flows with respect to distance is nearly unity, with three-quarters of the impact attributable to a direct effect, and the rest to a smaller indirect effect operating through higher maritime transport costs.

In a second step, we examine the effect of maritime transport costs on seaborne imports. Using predicted values from the previous transport cost equation to address the reverse causality induced by scale economies in liner shipping, we estimate that policy restrictiveness lowers trade flows by 48 to 77 percent. The two-step approach turns out to be crucial for obtaining correct impact effects not only with respect to policy barriers but also with regard to conventional gravity variables such as distance.

Our finding that protection persists and matters in maritime transport is relevant for both national policy and international trade negotiations. In a wide range of both developing and industrial countries, from China to Germany, restrictions on foreign ownership in shipping are unquestioningly accepted. In the Uruguay Round negotiations at the World Trade Organization, efforts to open up maritime services were a notable failure, and hardly any progress has been made in the more recent Doha negotiations. Even regional trade negotiations in services have tended to exclude maritime transport because of the unwillingness of major countries to accept international disciplines. Perhaps a greater awareness of the high cost of protection may bolster efforts to challenge the political status quo.

References

Achy, Lahcen, Mongi Boughzala, Hanaa Kheir-El-Din and Sübidey Togan. 2005. "*Impact of Liberalization of Trade in Services: Banking, Telecommunications and Maritime Transport in Egypt, Morocco, Tunisia and Turkey*", Femise project, FEM22-02.

Anderson, James E. and Eric Van Wincoop. 2003. "Gravity with Gravitas: A Solution to the Border Puzzle." *American Economic Review*, 93(1): 170-192.

AXS Marine. 2010. "AXS Marine Distance Table" AXS Marine website. http://www.axsmarine.com/distance/.

Baier, Scott L. and Jeffrey H. Bergstrand. 2007. "Do free trade agreements actually increase members' international trade?" *Journal of International Economics* 71(1): 72–95.

Baldwin, Richard and James Harrigan. 2007. "*Zeros, Quality and Space: Trade Theory and Trade Evidence*" National Bureau of Economic Research Working Paper 13214.

Bensassi, Sami, Inmaculada Martínez-Zarzoso, and Celestino Suarez-Burguet. 2014. "The effect of maritime transport costs on the extensive and intensive margins: Evidence from the Europe-Asia trade" *Maritime Economics & Logistics* 16(3): 276-297.

Bertho, Fabien. 2013. "*The Impact of Liner Shipping Trade and Competition Regulations on the Market Structure, Maritime Transport Costs and Seaborne Trade Flows*". Doctoral dissertation, Sciences Po Paris, Paris, France.

Bertho, Fabien. 2011. "*Maritime Transport in Australia and in the United States*" in: The Impacts and Benefits of Structural Reforms in the Transport, Energy and Telecommunications Sectors in APEC Economies, APEC Policy Support Unit Report, Singapore: Asia-Pacific Economic Cooperation Secretariat, pp. 290-333.

Borchert, Ingo, Batshur Gootiiz and Aaditya Mattoo. 2014. "Policy Barriers To International Trade In Services: Evidence from a New Database", *World Bank Economic Review* 28 (1), pp. 162-188.

Borchert, Ingo, Batshur Gootiiz and Aaditya Mattoo. 2011. "Services in Doha: What's on the Table?", Chap. 5 in: Will Martin and Aaditya Mattoo (eds.), "*Unfinished Business? The WTO's Doha Agenda*", London: CEPR and World Bank, pp. 115-143.

Calvo Pardo, Hector F. and Nicholas-Joseph Lazarou. 2013. "Firm heterogeneity and asymmetric trade with a transport sector - Implications of trade liberalisation", University of Southampton, mimeo.

Clark, Ximena, David Dollar and Alejandro Micco. 2004. "Port Efficiency, Maritime Transport Costs and Bilateral Trade." *Journal of Development Economics*, 75: 417-450.

Containerization International Online. 2010. "Fleet Deployment Statistics" http://www.ci-online.co.uk/

Conway, Paul, Véronique Janod and Giuseppe Nicoletti. 2005. "*Product Market Regulation in OECD Countries: 1998 to 2003*" OECD Economics Department Working Papers 419.

Conway, Paul and Giuseppe Nicoletti. 2006. "*Product Market Regulation in the Non-Manufacturing Sectors of OECD Countries: Measurement and Highlights*" Organization for Economic Cooperation and Development Economics Department Working 530.

Deardorff, Alan V. and Robert M. Stern. 2008. "Empirical Analysis of Barriers to International Services Transactions and the Consequences of Liberalization," in Aaditya Mattoo, Robert M. Stern, and Gianni Zanini, eds, *A Handbook of International Trade in Services*, New York: Oxford University Press, pp. 169-220.

Egger, Peter. 2008. "On the Role of Distance for Bilateral Trade" *The World Economy* 31(5): 653-662.

Fink, Carsten, Aaditya Mattoo and Ileana C. Neagu. 2002. "Trade in International Maritime Services: How Much Does Policy Matter?" *The World Bank Economic Review*, 16(1): 81-108.

Harrigan, James. 2010. "Airplanes and comparative advantage" *Journal of International Economics* 82(2), pp. 181-194.

Head, Keith and Thierry Mayer. 2014. "*Gravity Equations: Workhorse, Toolkit, and Cookbook*," Chapter 3 in: Handbook of International Economics, Volume 4: 131–195.

Hummels, David. 2007. "Transportation Costs and International Trade in the Second Era of Globalization", *Journal of Economic Perspectives*, vol. 21, n° 3 Summer 2007

Hummels, David. 1999. "*Toward a Geography of Trade Costs*" Global Trade Analysis Project Working Paper 17.

Hummels, David and Volodymyr Lugovskyy. 2006. "Are Matched Partner Trade Statistics a Usable Measure of Transportation Costs?" *Review of International Economics*, 14(1): 69-86.

Hummels, David, Volodymyr Lugovskyy and Alexandre Skiba. 2009. "The trade reducing effects of market power in international shipping" *Journal of Development Economics* 89: 84–97.

Kimura, Fukunari, Mitsuyo Ando and Takamune Fujii. 2004. "Estimating the Ad Valorem Equivalent of Barriers to Foreign Direct Investment in the Maritime and Air Transportation Services sector in Russia." Available at: http://siteresources.worldbank.org/INTRANETTRADE/Resources/Topics/kimura-Ando-Fujii-RussiaTransport.pdf

Korinek, Jane. 2011. "*Clarifying Trade Costs in Maritime Transport*", Document No. TAD/TC/WP(2008)10/FINAL of 29 March 2011, OECD: Paris.

Korinek, Jane and Patricia Sourdin. 2009. "*Maritime Transport Costs and Their Impact on Trade*" available at: http://www.etsg.org/ETSG2009/papers/korinek.pdf

Kumar, Shashi and Jan Hoffmann, "Globalization: the Maritime Nexus," in Costas T. Grammenos, ed, *Handbook of Maritime Economics and Business*, London: Lloyds List Press, 2002, pp. 35-62.

Li, Kevin X. and Jin Cheng. 2007. "The Determinants of Maritime Policy." *Maritime Policy and Management*, 34(6): 521-533.

Limao, Nuno and Anthony J. Venables. 2001. "Infrastructure, Geographical Disadvantages, Transport Costs and Trade." *The World Bank Economic Review*, 15(3): 451-479.

Márquez-Ramos, Laura, Inmaculada Martínez-Zarzoso, Eva Pérez-García and Gordon Wilmsmeier. 2011. "Maritime Networks, Services Structure and Maritime Trade" *Networks and Spatial Economics* 11(3): 555-576.

Martínez-Zarzoso, Inmaculada and Felicitas Nowak-Lehmann. 2007. "Is Distance a Good Proxy for Transport Costs? The Case of Competing Transport Modes." *Journal of International Trade and Economic Development*, 16(3): 411-434.

Martínez-Zarzoso, Inmaculada, Eva Pérez-García and Celestino Suarez-Burguet. 2008. "Do Transport Costs Have a Differential effect on Trade at the Sectoral Level?" *Applied Economics*, 40: 3145-3157.

Martínez-Zarzoso, Inmaculada and Celestino Suarez-Burguet. 2005. "Transport Costs and Trade: Empirical Evidence for Latin American Imports from the European Union." *Journal of International Trade and Economic Development*, 14(3): 353-371.

Martínez-Zarzoso, Inmaculada and Gordon Wilmsmeier. 2010. "International Transport Costs and the Margins of Intra-Latin American Maritime Trade" *Aussenwirtschaft* 65(1): 49-71.

McGuire, Greg, Michael Schuele and Tina Smith. 2000. "*Restrictiveness of International Trade in Maritime Services*" in: Christopher Findlay and Tony Warren, eds, *Impediments to Trade in Services: Measurement and Policy Implications*, London: Routledge, pp. 189-200.

Micco, Alejandro and Natalia Pérez. 2002. "*Determinants of Maritime Transport Costs*" Inter-American Development Bank Research Department working paper 441.

Organisation for Economic Co-operation and Development (OECD). 2009. "*Methodology for Deriving the Services Trade Restrictiveness Index*" Presentation at the OECD Experts Meeting on the Services Trade Restrictiveness Index, Paris 2-3 July 2009.

Organisation for Economic Co-operation and Development (OECD). 2008. "*Handbook on Construction Composite Indicators: Methodology and User Guide.*" Paris: OECD Publications.

Organisation for Economic Co-operation and Development (OECD). 2007. "*The Maritime Transport Costs (MTC) database*" series: Ad Valorem and Unitary Maritime Transport Costs, available at: http://stats.oecd.org/Index.aspx?datasetcode=MTC.

Organisation for Economic Co-operation and Development (OECD). 2002. "*Competition Policy in Liner Shipping – Final Report*," Doc. No. DSTI/DOT(2002)2, 16-Apr-2002, Paris: OECD.

Radelet, Steven and Jeffrey Sachs. 1998. "*Shipping Costs, Manufactured Exports and Economic Growth*," available at: http://admin.earth.columbia.edu/sitefiles/file/about/director/pubs/shipcost.pdf

Sanchez, Ricardo J., Jan Hoffmann, Alejandro Micco, Georgina V. Pizzolitto, Martin Sgut and Gordon Wilmsmeier. 2003. "Port Efficiency and International Trade, Maritime: Port Efficiency as a Determinant of Maritime Transport Costs." *Maritime Economics and Logistics*, 5: 199-218

United Nations Conference on Trade and Development (UNCTAD). 2011. "*Review of Maritime Transport 2011, Chapter 2: Structure, Ownership, and Registration of the World Fleet,"* New York and Geneva: United Nations.

Wilmsmeier, Gordon and Jan Hoffmann. 2008. "Liner Shipping Connectivity and Port Infrastructure as Determinants of Freight Rates in the Caribbean." *Maritime Economics and Logistics*, 10: 130-151.

Wilmsmeier, Gordon, Jan Hoffmann and Ricardo J. Sanchez. 2006. "The Impact of Port Characteristics on International Maritime Transport Costs", *Port Economics*, 16: 117-140.

Wilmsmeier, Gordon and Inmaculada Martinez-Zarzoso. 2010, "Determinants of Maritime Transport Costs -- A Panel Data Analysis for Latin American Trade." *Transportation Planning and Technology*, 33(1): 105-121.

World Integrated Trade Solution (WITS). 2007. "*Most Favoured Nation and Applied Tariffs: HS2 Chapter by Country of Origin and Destination*" Tariffs and Trade Analysis.