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TRADE AND AGRICULTURE DIRECTORATE
TRADE COMMITTEE

Working Party of the Trade Committee

CLARIFYING TRADE COSTS IN MARITIME TRANSPORT

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- The cost of shipping grains is large for all countries in the dataset. On average, maritime transport costs equal 10-20 percent ad valorem for bulk agricultural products. For some countries, transport of these products reaches 23 percent. This may be compounded by an additional overland cost of transport which is not included in the dataset. In addition, since many of these products are already subject to significant tariffs, the transport cost of these products further increases potential barriers to trade.

- One reason for the high cost of shipping grains and other bulk agricultural commodities is the increase in demand for bulk carriers to transport industrial raw materials to China and South-East Asia. Smaller bulk ships traditionally used to transport grains have been reserved to haul ores, coal and other industrial products for which there is a constantly growing demand in Asia.

- One of the most unusual aspects of the shipping industry is the importance of trade cost asymmetries. Particularly for the container market, the cost of eastbound vs. westbound routes or northbound vs. southbound legs of routes differ on average by 100 percent. It is therefore twice as expensive to ship a container one-way on any given route compared to the return trip. Part of the asymmetry in transport costs can be attributed to differences in the volume of goods transported in containers. This phenomenon is not likely to disappear as the freight rate imbalances between eastbound and westbound legs of shipping routes have increased in 2007 over 2006 on almost all routes, sometimes very significantly.

- Although the above would suggest that distance is of limited importance as a component of transport costs, it may become more significant in future. With the rising price of oil, one of the important variable components of transport costs is increasing. Since the fuel cost component of transport costs is directly correlated with distance, maritime transport costs may in turn become more closely correlated with distance in future.

The findings of this paper will be used in the next stage to ascertain more fully the impact of maritime transport costs on tral to rith9i( )Tj/T9i( )Teon trat.8(thesi(9.9(s)8.2(9.7(027 Tc0.2272 Tw00.002n)1310(rific)2.8(etwee

Tramp: A ship operating with no fixed route or published schedule**.**

Transshipment: The unloading of cargo at a port or point where it is then reloaded, sometimes into another mode of transportation, for transfer to a final destination.

Twenty Foot Equivalent Unit (TEU): A unit of measurement equal to the space occupied by a standard twenty foot container. Used in stating the capacity of container vessel or storage area.

I. Introduction

1. The economic consequences of increasing globalisation of the world economy, that is, closer integration of production and markets, have been discussed intensively over the last decade. The growing interdependence of countries around the world has often been largely attributed to lower trade barriers and

in distance on a given vessel. Some elements have a non-linear effect – size of ship, for example, as seen in Figure 1 above. Some elements have a mixed effect: the cost of ship location for example, which is a function of the number of days spent at sea and at portside, which is somewhat related to distance between ports, but also depends on a number of other factors such as port infrastructure and the speed of loading and unloading. Some costs are fixed and somewhat related to distance – the cost of using Panama and Suez Canal services, for example, which is generally only an element of cost on long haul trips. Some elements of transport costs however are fixed and unrelated to distance at all such as the cost of loading and unloading at portside. The cost of loading and unloading is in turn a function of port infrastructure and determines the size of ship that will transport the cargo. The size of ship in turn determines (in a non-linear fashion) the effect of distance on transport costs. ***The aggregate effect of distance on transport costs is, to say the least, complex.***

15. Indeed, the use of distance as a proxy for transport costs is the subject of two recent articles, both of which come to the same conclusion. In an article entitled "Is Distance a Good Proxy for Transport Costs?", Martinez-Zarzoso and Nowak-Lehmann (Sept. 2007) find that it is not, and that it is a particularly poor proxy for maritime transport costs.[5] Clark (Sept. 2007) states clearly that "Theorists should re-evaluate the role of distance in trade models and refrain from using distance as a proxy for transport costs."

Time

16. It has been suggested that the time it takes for goods to get to markets is a better proxy for transport costs than is distance. "Trade costs have both a financial and a time dimension and the latter has become increasingly important. This is best understood at the firm level where non-core activities are increasingly outsourced to outside suppliers who are expected to deliver their inputs just in time" (Nordas et al, 2006).

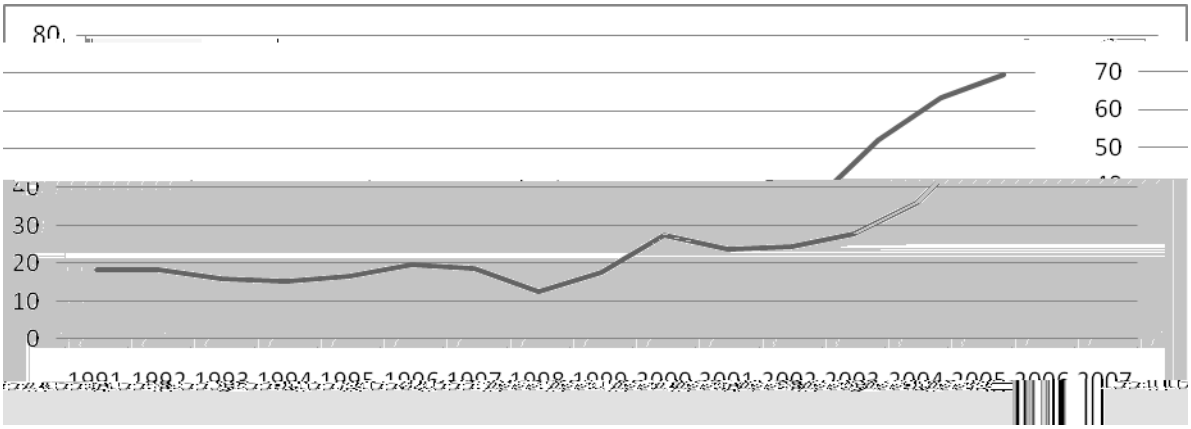
17. Hummels (2001, 20062.4(fort tak)13(e)0.3b 0.4(He59(ei)8.1ed "I)1d(3u(6th)12.6(9(ei)8.5(a)0.7x .8(r64(t

thousands of islets, and is an outlet for many rivers, making it an ideal location for pirates to hide and evade capture.[9]

35. The International Maritime Bureau (IMB) reports worldwide pirate attacks on ships at sea in 2006 fell to 239 vessels, down from 276 in 2005. The

their contracts months or even a year or two in advance of their shipments, shippers cover increased fuel costs in times of high price volatility by adding a fuel surcharge.

Figure 2. Price of oil, US$/barrel



Note: Oil prices refer to simple monthly averages of Brent and Fatah-Dubai.

Source: International Energy Agency, Oil Outlook 2007.

III. Data collection

39. Transport costs are calculated in a variety of ways in the literature. Some early studies use export values (CIF) minus import values (FOB), i.e., mirror trade data, and assume the difference represents transport and insurance costs.[15] This approach is erroneous due to many statistical errors, and problems of mismatched mirror data. Indeed, the IMF suspended publishing these data in a readily accessible fashion so as to avoid this particular error.[16] More recent studies have attempted to use better estimates for transport costs. Hummels and Lugovskyy (2006) compare these mirror data with actual transport costs for US and New Zealand and find that the CIF/FOB ratios are "badly error-ridden in levels, and contain no useful information for time-series or cross-commodity variation."

40. Limao and Venables (2001) use transport data obtained from the moving company that re-locates World Bank employees. The firm in question provided the authors with the cost of moving one container (TEU) from Baltimore, United States to destinations to which Bank employees may be re-located. Although this is an inventive solution, its drawback is that the data does not exist for other countries of the world (which the authors then estimate econometrically).

41. Some more recent studies (e.g., Hummels, various years, and Bradford, 2006) use detailed data compiled by the US Census from customs records. These data indicate at the product level which products are imported by sea, rail or air, the transport costs, the quantity imported and its value by country of origin and by customs district of entry.

42. The cornerstone of this OECD project is an extensive data collection exercise that unites maritime transport cost data from a variety of different sources. The data base created here includes original customs data where available. These data provide full information – transport costs at the most detailed product level from all destinations. Product-level transport cost data is used for only those items that have arrived by sea. These data are available, however, only for a limited number of countries (Australia, New Zealand, and United States). The comprehensive data are then combined with shipping rates actually charged that are available at a more aggregated level (i.e., not for specific products) to estimate actual transport costs at the product level for imports into a number of other countries. These data have been compiled using the methodology outlined below to provide estimates at the detailed product level for ad valorem transport costs to and from as many countries of the world as possible. The data set includes 2.9 million data points for products at the HS-6 digit level for 20 importing countries in total (including all EU countries as a customs union[17]) from all 218 countries of the world from 1991 to 2006.

43. The challenges in compiling these data are numerous. They have been collected at a very detailed level – by country of origin and destination, by product and year: the dataset quickly becomes very large. More importantly, the most desirable form of the data is in ad valorem equivalents (i.e., transport costs divided by total import value). Data can therefore8(e)11.-1.7(t)im c0 Tl3(n463.3(n 11.04 l1h69)10.9(11

was to use these valuable data and transform them into a harmonized form that can be readily utilized for analysis of trade flows and costs.

44. This study makes use of detailed customs data for Australia, New Zealand and the United States (see Appendix II.A). These datasets record the export (FOB) value of goods, the cost of freight and insurance and the corresponding import (CIF) data for all imports from all destinations at the product level by mode of entry (ship, air or rail). In this way, the transport and insurance costs of only those imports that

also no known substitution effect of tankers with the other segments of the maritime transport industry (containers, “clean bulk” or “dirty bulk”).

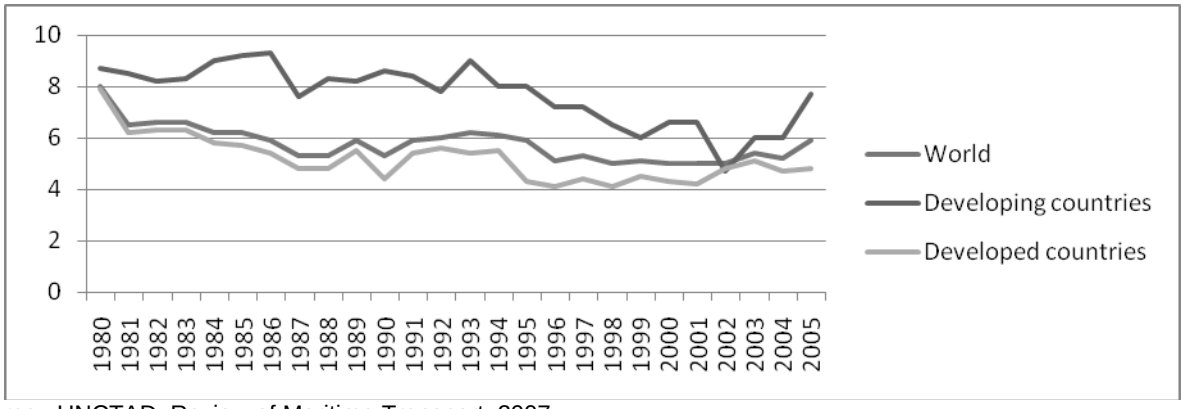
IV. Evolution in maritime transport costs

50. A number of factors have been contributing to the evolution of maritime transport costs. There have been significant technological advances in the shipping industry, not least of which the advent of containerisation and increasing automatization. Economies of scale due to the phenomenal growth in ships’ size are evident over the past decades. These changes however mean that transport costs are more differentiated between hubs -- deep ports that host large ships and are fully automated -- and small out-of-the-way ports that are far from markets and have not benefitted from investments in infrastructure.

51. These evolutions also imply that the effect of distance on trade has changed in a variety of ways. Larger, faster ships are capable of transporting large volumes of merchandise long distances. Yet the possibility of larger ships may require different sea routes to avoid the Panama and Suez canals that restrict access based on ships’ size. Since the greatest economies of scale will be ret.9(utes(ie)11(e) on)rou12.8(t -2.9(es o

under 6 percent in 2005 (Figure 3). Corresponding figures for developed countries are 8 percent to 4.8 percent; developing countries saw their cost of maritime transport fall from 8.5 to 7.7 percent of the price of goods.

Figure 3. Maritime transport costs in the long term, ad valorem equivalent

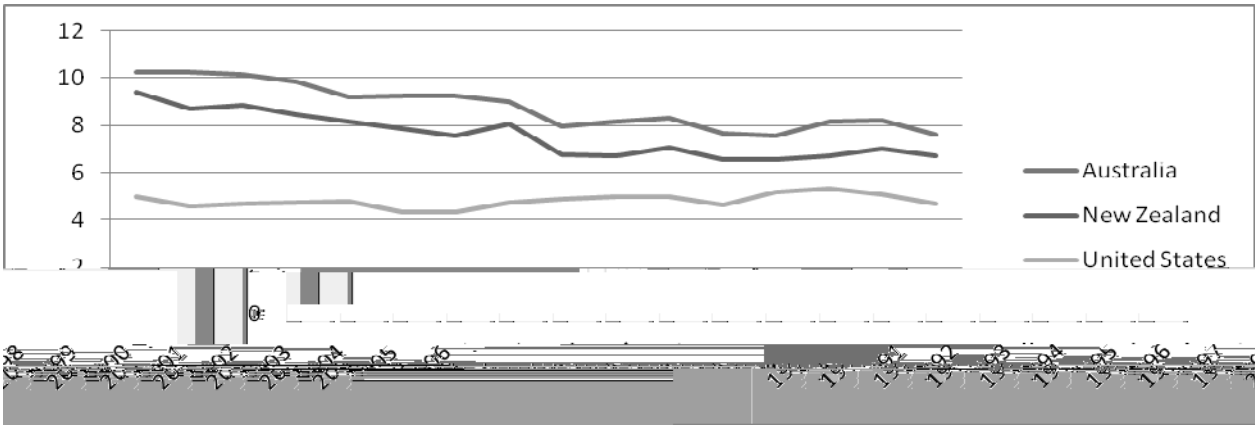


Source: UNCTAD, Review of Maritime Transport, 2007.

56. Hummels (2007) suggests that the answer to the question "have maritime transport rates fallen?" depends largely on the time period analysed. He maintains that both tramp and liner shipping prices have fallen very little since the early 1970s, deflated using a GDP deflator, a commodity price deflator, or a traded-goods price deflator.

57. Comparing the dataset compiled for this study for the three countries for which comprehensive data is available (since 1991 for all products on an ad valorem basis), overall shipping rates have fallen somewhat for Australia and New Zealand but very little for the United States. Over the fifteen year period from 1991 to 2006, the cost of freight entering Australia fell from 10.2 percent to 7.6 percent. Comparable figures for New Zealand were 9.4 percent to 6.7 percent; for the United States, rates overall from all destinations fell from 5 percent to 4.7 percent (Figure 4).

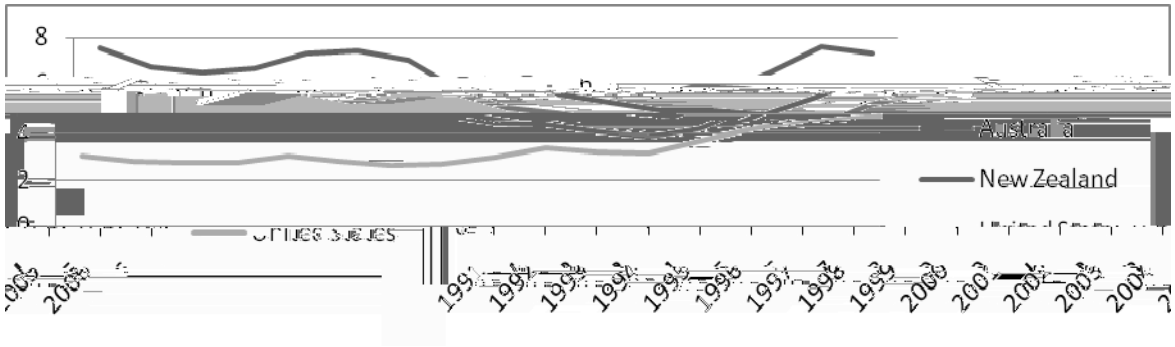
Figure 4. Cost of freight entering Australia, New Zealand and the United States, ad valorem equivalent



Source: OECD Maritime Transport Cost Database from original customs data. See Appendix II.A for data sources.

58. Considering the overall freight rates for the three countries in terms of transport costs per tonne of merchandise, the evolution is not overwhelmingly clear either. Over the 15 year period under review, the nominal cost of shipping a tonne of merchandise has increased for the United States from 3 to 4.7 dollars per tonne, has increased slightly for Australia from 5.3 to 5.7 dollars per tonne and has fallen slightly for New Zealand from 7.5 to 7.3 US dollars per tonne (Figure 5).

Figure 5. Cost of freight entering Australia, New Zealand and the United States, $/tonne of merchandise



Source: OECD Maritime Transport Cost Database from original customs data. See Appendix II.A for data sources.

59. It seems therefore in the period under review in this study that there is no overwhelming evidence of a large drop in maritime transport costs that might have been the result of the significant technological advances in the industry, or the important changes in the competitive environment. On aggregate, the evolution of transport costs is a more nuanced picture, with costs rising for some destinations, for some products, and for some types of transport (bulk, container, etc.), and falling for others. A more detailed analysis of transport costs needed to shed light on the question follows.

How do transport costs differ between countries and goods shipped?

60. There is a large difference in the level and evolution of the different "markets" within maritime transport: containers, carrying manufactures and processed food products; "clean bulk" carrying grains; and "dirty bulk" carrying industrial raw materials. Supply and demand for different types of carriers to and from different destinations have evolved over time.

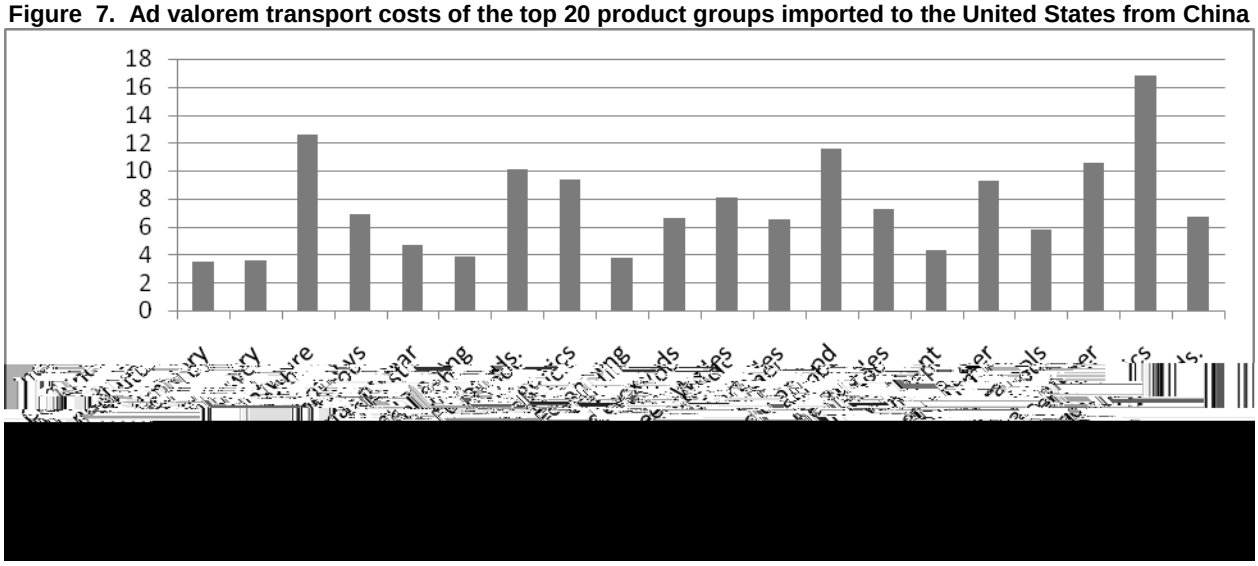
61. Container traffic, hauling manufactures and processed agricultural products, has increased most of the three market segments during the 15 years analysed in this study. Although the cost of transporting goods in containers has generally decreased, the evolution varies according to importitral(0tedeiuIspor)9or most l(0t)7.7(ri)7.7(es fo)12.5(r which da)10.7(ta h)12.5(a)-0.2(s been ca)10.7(lcu)12.5(l)-3.2(a)10.7(t)-3.2(ed or es)10.3(tin Japan, Korea, Singapore and ThailandorThe cost of sending a container to China has dropped mst rapidly – on average a 9 percent drop per yearoriner costs have risen slightly in ad valorem terms to the United States – by two percent on average; and have risen mre strongly to Hong Kong and Malaysiaorhe latter can be explained by sharp drops in prices in the early 2000s, and a subsequent rectification (see Appendixable III.A.1).

62. In 2006, the cost of shipping goods by container as a percent of their total import value was between 0.5 and 7 percent for all the co 0tries for which data is available. Not surprisingly, it is mst expensive to import manufactures and processed agricultural products to Australia and New Zealand: transport costs of all goods hauled by container are between 6 and 7 percent of the total value of imports

(Figure 6). For these countries, maritime transport is

footwear – and for higher value added goods such as machinery and equipment. The overall figures therefore hide large differences and can represent much higher rates on some goods, even those that are exported in large volumes.

Figure 7. Ad valorem transport costs of the top 20 product groups imported to the United States from China



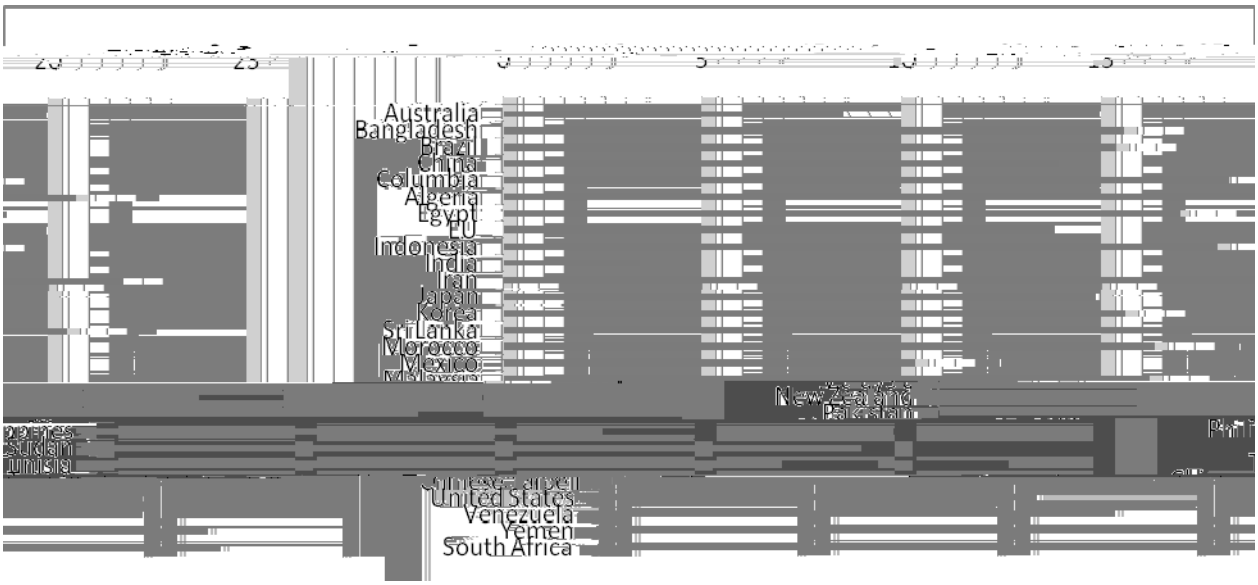
Note : These are the top 10 imported product groups at HS2 level to the United States from China in 2006.

Source: OECD Maritime Transport Cost Database.

65. In contrast to container-shipped goods, grains and oilseeds are generally shipped on small bulk carriers and the cost of shipping these goods is very high as a percent of their value. There are a number of reasons for this: smaller ships used do not offer the same economies of scale, for example, and there is less automation for bulk carriers in some ports. For most countries in the study, the cost of shipping grain is between 10 and 20 percent of the total import cost. For some countries – Algeria, Iran, Sri Lanka, Yemen and South Africa – the transport cost is greater than 20 percent ad valorem (Figure 8). These countries, almost without exception, are not large importers generally, although they are large grain importers. Their ports thereby do not generally represent regional hubs of any size. The one exception is South Africa which has major ports (Richard's Bay, Durban) but which is far from grain exporting countries.

66. For most countries in this survey, transport of grains represents a significant cost. Transport costs of grains and oilseeds are over 10 percent of the total import value for: Bangladesh, Brazil, China, Columbia, Egypt, the European Union, Indonesia, Japan, Korea, Morocco, Mexico, Malaysia, New Zealand, Pakistan, Philippines, Sudan, Tunisia, Chinese Taipei, the United States and Venezuela (Figure 8).

Figure 8. Transport costs of grains, 2006, ad valorem equivalent by importer



Note: Estimates for total maritime freight costs have been calculated and divided by the total CIF value of imports.

high, and put these countries at a severe disadvantage if one considers the cost of transport as a form of tax on inputs – the cost of producing semi-processed manufactures or finished goods for which the raw materials are imported will be correspondingly higher. The effective cost on finished goods is therefore very high. Similar figures for the imports of raw materials to Australia, New Zealand, Japan and the United States are smaller but not insignificant: 11, 8, 4.3 and 4.4 percent ad valorem respectively (Figure 9).

Figure 9. Transport costs of industrial raw mate

72. The analysis in this section suggests large differences in the ad valorem maritime transport cost of different goods in a given country. In Australia, for example, manufactures and processed agricultural products face transport costs of about 6 percent, grain imports are at 8.5 percent and industrial raw materials face 11 percent ad valorem costs. Nowhere are these differences more evident than in China where the transport costs of imported manufactures are 1.3 percent ad valorem, grains are 14 percent and industrial raw materials are 28 percent (Appendix Tables III.A.1, III.A.2 and III.A.3).

Do maritime transport costs represent insurmountable barriers to trade in some cases ?

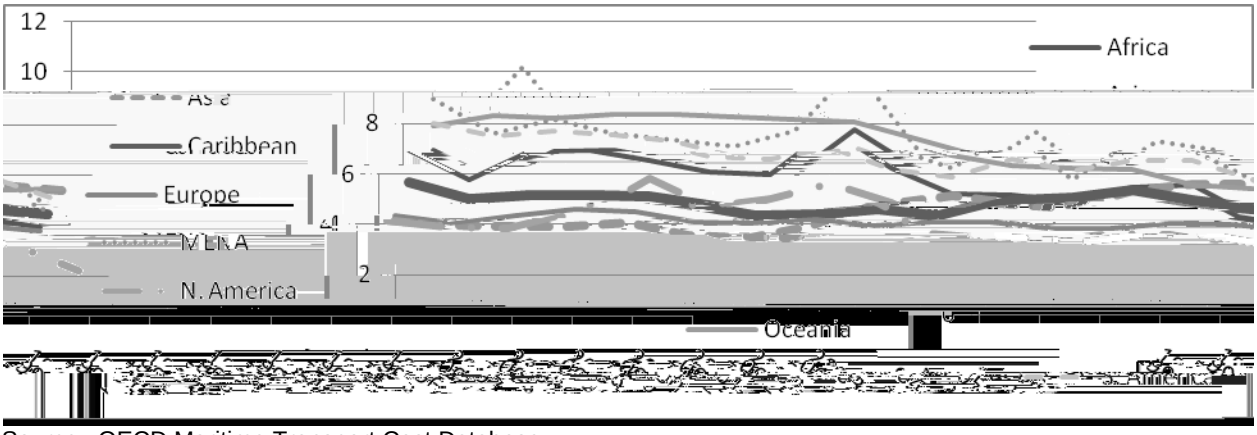
73. The answer to this question is "yes" for a small number of countries.[23] Given the available data in this study, eight countries, mostly remote nations with very small markets, face such high transport costs that they represent a significant drag on most exports (Appendix Table III.B). These countries are: Christmas Islands (maritime transport costs of exports to all countries in this study equal 43 percent ad valorem on average in 2006), Andorra (38 percent), Montserrat (37 percent), Togo (36 percent), Guinea (23 percent), American Samoa (21 percent), Sierra Leone (21 percent) and Tonga (17 percent). The average for developing countries overall is 8 percent. Given these extremely high transport costs, these countries would need to specialize in export goods with very high value to weight ratios where transport costs play a smaller role.

74. A significant group of other exporters face high but potentially not insurmountable barriers to trade in the form of transport costs. These include some large exporters. Brazil and Argentina, for example, show export costs of 11 percent ad valorem on average, Australia 12 percent and Morocccg10.8(e)]TJT*0.

at sea, which can vary due to different factors on the route (passage through Canals, etc.) as well as the size and speed of vessels. For example, although Sri Lanka is about twice as far from Europe as Sudan, the cost of exporting a tonne of grain there was only two dollars more in 2007 (59$ as opposed to 57$) and was slightly cheaper in 2006 (37$ to ship a tonne of grain to Sri Lanka and 38$ to ship a tonne to Sudan).

78. It seems that the relationship of transport cost to distance is not linear on a destination by destination basis.[26] This is indeed the implication of the information on the relationship between distance and the size of ship as expressed in Figure 1. The prices of transporting a tonne of goods to closer destinations (e.g., Western Europe to North America) are similar; once ships travel a certain distance, however, they are at a higher level. In this way, the transport prices per tonne of merchandise are clustered on two distinct plateaux. A case in point can be found in the grains market. There seem to be two types of major freight markets for grains – Europe and North America where grains are exported for about 35-40

Figure 11. Ad valorem transport cost by region, imports into the United States



Source: OECD Maritime Transport Cost Database.

82. Another way to ascertain the role of distance on maritime transport costs is by comparing the cost of shipping each way (eastbound vs. westbound) on a single shipping route. The asymmetry in the freight costs of shipping containers is enormous: in 2006, if one compares the cost of shipping a container on eastbound vs. westbound legs of scheduled routes, they differed on average by 100 percent! That means that on average of the approximately fifty routes covered in the data set it is twice as costly to ship containers from e.g. Singapore to the United States as from the United States to Singapore. The percentage was even higher in the first ten months of 2007 – on average one way was 120 percent more than the return trip.

83. The averages above mask even large differences in eastbound vs. westbound rates on some routes. Some routes show as much as a 300 percent difference, i.e., freight rates going one way are 4 times those returning. The routes showing the highest asymmetry are: EU-Singapore, EU-Hong Kong, US-China, EU-China, Brazil-US, Dubai-Singapore, Singapore-India. The routes showing the least asymmetry are : Brazil-India, EU-India and EU-Dubai.

84. Part of the asymmetry in transport costs can be attributed to differences in the amount of goods transported in containers. Transporters that load large ships going, e.g. from China to the United States return almost empty and therefore charge very little on the United States to China route.[27] However, this cannot fully explain the differences in transport costs between eastbound and westbound routes. Indeed, the routes where there is the greatest imbalance in the freight rates are not necessarily those where there is the greatest trade imbalance of container-transported goods. Two examples are the EU-Singapore and EU-Hong Kong which, while an imbalance exists (18 vs 24 bln$ for EU-Singapore and 17 vs. 24 bln$ for EU-Hong Kong), it is not at all like that facing some other routes (US-China 52 vs 295 bln$ or EU-China 85 vs 247 bln$).

85. This phenomenon is not likely to disappear any time soon as the freight rate imbalances between eastbound and westbound legs of shipping routes have increased in 2007 over 2006 on almost all routes, sometimes very significantly. It is hard to ascertain why this is – it could be due to the large fuel surcharge in 2007 that is pushed more onto paying customers (e.g. Chinese exporters on the China – United States route) as opposed to containers returning empty or returning at low rates due to lack of demand. Similarly,

27

it could reflect the greater fuel costs of bringing full containers on the competitive route as opposed to the smaller amount of fuel used on the “half-empty” return trip.

86. Although the above analysis of freight rate imbalances suggests that distance is of limited importance as a component of transport costs, it may become more important in future. With the rise in the price of oil, one of the important variable components

- ***For some countries that are major world grain importers but small traders overall, transport costs of grain imports can be greater than 20 percent*** – these include Algeria, Iran, South Africa, Sri Lanka and Yemen.
- ***The cost of transporting industrial raw materials has risen sharply to most destinations*** in the dataset. Transport costs of importing raw materials into China and the European Union are 28 and 24 percent ad valorem respectively. Although one would expect transport rates of industrial raw materials to be high because they are heavy and are generally low value added goods, transport costs over 20 percent represent significant barriers to imports.
- ***Some products are subject to particularly high transport costs***: jewellery, artificial teeth, aircraft parts and rugs are expensive to ship on a cost per weight basis perhaps due to high insurance costs.

Selected determinants of transport costs

- ***Transport costs differ vastly between a shipping route and its return trip***. Eastbound routes vs. westbound or northbound vs. southbound routes differ in cost on average by 100 percent. In some cases, cost of transporting a container one way is four times the cost of transporting a container on the return trip. The large cost imbalances mirror, although not perfectly, imbalances in trade in containerized goods in bilateral country pairs. Routes showing the highest asymmetry are the European Union and the United States with South East Asia; Brazil with the United States; and Singapore with India and Dubai. ***The importance of directional imbalances is one of the specificities of the shipping industry.***
- ***The rise in the price of oil in the last years has undoubtedly had a strong effect on transport costs*** and increased the relative cost of long haul trips compared to short-haul ones.

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Hummels, David (2006), , 17th International Symposium on Theory and Practice in Transport Economics and Policy, Berlin, 25-27 O1304 T6ir24O35 0 TDnaO35 Twic, 17T

Redding, S. and Venables, A.J.,

in turn driven demand for container transport.[31] The revolution in the shipping industry brought on by

The middle-sized bulk carriers are of Panamax size. These refer to ships that are up to the dimensions

Table I.A.1. Leading operators of containerships, 2006

Rank	Operator	Country/territory	No. of ships in 2006	TEU capacity in 2006

the goods from a trans-shipment hub such as Colombo, Sri Lanka or Salalah in Oman. These strategies are put into place to try to improve reliability of service but add cost in terms of extra handling.

Since 2001, there have been new security measures put into place regarding control of merchandise. Regulation which is imposed by a major importer (in this case, often the United States) often becomes the norm for shippers and freight forwarders, in order not to have duplicate processes and documentation. The extra cost of scanning and documenting container contents is estimated by one transporter to equal 50 to 100 dollars per TEU.[43] Delays due to new or upgraded security procedures may hold up cargo by 1 to 2

APPENDIX II. TRANSPORT COSTS DATA

A. Transport cost data obtained from customs declarations.

Transport cost data is obtained from customs declarations for three OECD Member countries: Australia, New Zealand and the United States. These data have been graciously made available to the Secretariat for the purposes of this project. Details on the coverage and scope of these data can be found below.

Australia

Source: Australian Bureau of Statistics

Import data is supplied at HS 6-digit level for all goods transported via sea freight. Data is available by commodity and by country of origin and is valued FOB, customs value (a market price FOB) and CIF. Import quantities are also available. Total insurance and freight costs can be derived by deducting Customs value from CIF.

The Australian Customs Service obtains the import data using Import Declaration N10. Data is also available by other modes of transport (air, post, etc.) Import data are generally collected at the HS 10-digit level and are aggregated to produce estimates at the 6-digit level.

The transaction value of goods is the price actually paid (or payable) for the imported goods.

New Zealand

Source: Statistics New Zealand.

Data is supplied at HS 6-digit level for all goods transported via sea freight. Data is available by commodity and country of origin and are valued CIF (i.e., including insurance and freight to New Zealand) and VFD (value for duty, i.e., the value of imports before insurance and freight costs are added). The difference in values CIF and VFD is therefore the cost of freight and insurance. Weight imported is also available for the vast majority of commodities. The data is measured in current New Zealand dollars. Values are then converted to US dollars for the purposes of this project.

The data is obtained from import entry documents lodged with the New Zealand Customs Service (NZCS). Import values are converted from foreign currencies when import documentation is processed by NZCS.

United States

US import statistics include shipments of merchandise into the US Customs Territory (50 states, District of Columbia and Puerto Rico), US Foreign Trade Zones and the US Virgin Islands from foreign countries. Import data includes net quantity, value data, value and shipping weight data for vessel and air shipments by commodity, by country of origin, by customs district of entry, by customs district of unlading and by rate provision. Import data is valued both FOB (customs value) and CIF (including cost, insurance and freight).

The import charges represent the aggregate cost of all freight, insurance and other charges (excluding

Rates from the Black Sea ports were assumed to be shipments of grain from Russia and Ukraine. In practice, in the last few years (data are available for exports from the Black Sea starting in 2005), grains have been shipped either from Ukraine or from Russia due to uncertain weather and resulting difficult harvests.

As the IGC ocean freight rates are expressed in US dollars per tonne of merchandise, the percentage ad valorem of freight cost is a straightforward calculation. (See Appendix Table II.1 for data availability of transport costs of grains).

The Baltic Dry Index

The Baltic Dry Index (BDI) is a daily index of bulk freight rates issued by the London-based Baltic Exchange which traces its roots to the Virginia and Baltick coffeehouse in London's financial district in 1744. Since then, the Baltic Exchange has been published as a leading indicator of real freight rates. The Baltic combines information from freight brokers on the cost of booking different sizes of ships on different routes carrying specific types of cargo. These are blended into the general Baltic Dry Index which gives an overall idea of the changes in bulk shipping rates.

For the purposes of this study, specific routes and sizes of ship were used (i.e., the data underlying the BDI). In particular, 13 routes carrying coal and/or iron ore were extracted for this study. Exporting countries include Australia, Brazil, China, Ecuador, European Union, Japan, South Africa and United States. Importing nations include China, European Union, Japan and United States. (See Appendix Table II.1 for data availability.) Data series are available on a daily basis in terms of the cost of renting a given

Appendix Table II.1 Information included in the dataset

	Importers	**Exporters**
Full information for all products (customs data)	Australia, New Zealand, United States	All destinations.
of which:		
Data covering manufactures and non-bulk agricultural products shipped in containers (estimates)	Brazil	EU, India, United States
	China	

	Sri Lanka	Australia, Canada, United States
	Sudan	EU
	Tunisia	Argentina, Canada, EU, Russia, United States
	Chinese Taipei	Australia, Canada
	Venezuela	Argentina, Canada, United States
	Yemen	EU
Industrial raw materials (bulk)		
	China	Australia, Brazil, EU
	EU	Australia, Brazil, China, Ecuador, Japan, South Africa, United States
	Japan	EU

APPENDIX III.

Containers (manufactures, processed food products, etc.)

Importer	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
AUS	9.22	9.12	9.04	8.49	7.9	7.97	7.87	7.69	6.86	6.83	6.89	6.25	6.22	6.69	6.86	6.42
BGD																
BRA																3.28
CHN			13.75	6.13	7.73	6.76	5.23	5.06	3.21	2.17	1.68	3.53	1.75	1.49	2.18	1.26
COL																
DZA																
EGY																
EU15			1.98	1.98	2.1	2.28	1.91	2.17	1.61	1.65	1.8	1.5	1.71	1.57	1.2	1.13
HKG			4.99	5.32	7.49	6.82	7.26	6.14	5.64	5.97	4.04	1.66	2.43	1.85	1.72	3.79
IDN			1.12	1.41	1.73	4.1	2.96	2.77	7.67	4.24	4.58	10.17	1.63	2.05	2.38	1.81
IND																1.62
IRN																
JPN			4.14	4.13	4.19	3.92	3.8	1.57	1.26	1.33	2.31	3.11	1.39	2.49	1.52	0.8
KOR			1.26	1.21	1.03	1.11	1.26	1.75	2.03	0.89	0.81	0.9	0.78	1.1	0.75	0.61
LKA																
MAR																

Appendix Table III.A.2. **Ad valorem transport costs by type of shipment: grains**

Grains ("clean bulk")

Importer	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
AUS		12.77	12.23	11.85	13.49	14.55	9.02	8.98	9.1	9.21	9.17	8.09	7.07	12.06	9.6	11.92	8.52
BGD																28.23	15.53
BRA							6.08	3.52	1.56	10.27				12.31	15.4	17.02	15.36
CHN	9.46	11.81	10.16	14.97	15.28	11.56	6.17	8.24	8.85	7.86	8.81	5.54		5.12	14.93	13.16	13.91
COL																19.51	18.18
DZA	14.75	12.8	9.96	14.05	10.8	11.84	8.96	9.8	8.04	9.28				10.61	18.94	26.88	20.68
EGY	13.74	17.63	11.87	11.33	13.02	13.67	7.07	9.66	9.82	11.91	13.75	13.29	12.44	15.96	22.25	22.12	16.95
EU15		8.54	7.06	8.79	6.16	9.03	6.89	7.37	5.89	4.29	8.92	8.59	5.31	8.64	18.74	19.16	13.79
HKG																	
IDN																9.17	17.9
IND		19.08	24.93	22.14	21.34	14.53	11.31	13.08	3.42								
IRN	14.84	25.93		17.57	17.96	12.84	8.62	10.66			13.5			15.31	20.96		21.84
JPN							5.68		7.06	7.06		8.29	6.18	12.02	17.79	14.43	14.82
KOR	10.38	13.04		9.31	10.79	10.51	5.85	6.75	6.52	8.23	10.5	8		10.24	18.66	14.98	15.58
LKA																24.07	20.46
MAR	3.59	18.41	13.53	14.48	11.42	13.45	8.5	10.41	7.72	13.72	14	17.76		12.62	20.44	18.41	16.3
MEX		8.91	9.54	9.13		9.38	5.74	6.51	6.76	8.43		8.91		11.56	16.68	13.67	10.31
MYS																16.32	16.19
NZL		18.29	17.03	17.71	18.34	16.14	12.77	13.25	12.5	13.51	13.42	13.6	10.94	10.19	12.91	12.48	12.83
PAK																21.25	18.35
PHL			12.55	17.48	10.47			10.76	16.74	21.43				7.89	19.57	7.39	12.23
SDN																25.82	19.16
TUN																26.02	16.73
TWN																11.35	13.48
USA		11.71	10.14	9.82	9.72	9.37	8.02	7.88	8.81	9.3	9.75	10.62	10.37	9.95	11.7	11.32	10.12
VEN		12.8	13.52	12.44	12.42	12.57	8.09	7.93	8.56	12.34	11.75	11.79	10.54	9.22	13.42	13.09	12.11
VNM																	
YEM																25.51	20.77
ZAF			19.7		18.51	17.23	9.7	10.65	13.33					12.05	22.53	23.58	21.12

Note: data refer to weighted averages across all products and countries of origin for which data are available in the OECD Maritime Transport Cost Database. See Appendix II for data availability.

Appendix Table III.A.3. **Ad valorem transport costs by type of shipment: industrial raw materials**

Industrial raw materials ("dirty bulk")

Importer	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
AUS	12.84	13.31	13.19	13.18	12.28	12.47	12.49	12.1	10.77	11.75	12.2	11.69	11.32	12.02	11.28	10.76
BGD																
BRA																
CHN								18.21	19.6	30.5	22.16	24.62	45.96	45.37	29.67	28.02
COL																
DZA																
EGY																
EU15	17.75	10.79	13.86	16.8	18.47	13.24	15.45	11.25	14.56	26.16	16.96	14.91	37.8	39.87	26.16	24.02
HKG																
IDN																
IND																
IRN																
JPN									0.5	1.57	1.24	1.08	8.23	10.16	5.23	4.3
KOR																
LKA																
MAR																
MEX																
MYS																
NZL	11.84	11.54	12.32	11.8	11.58	10.64	10.59	11.96	9.34	8.29	9.77	8.63	9.6	9.85	9.2	8.21
PAK																
PHL																
RUS																
SAU																
SDN																
SGP																
THA																
TUN																
TWN																
USA	7.41	6.56	7.26	7.49	7.28	6.53	6.94	8.49	6.73	5.8	6.63	5.46	6.18	6.22	5.18	4.42

Note: data refer to weighted averages across all products and countries of origin for which data are available in the OECD Mar

Appendix Table III.B. Transport costs by exporting country, ad valorem equivalents

		1993	2000	2006
CXR	Christmas Isl.	21.13	26.43	43.1
AND	Andorra	0.58	2.73	37.5
MSR	Montserrat	22.96	3.93	36.97
TGO	Togo	14.27	8.56	35.53
GIN	Guinea	21.02	20.56	22.47
ASM	American Samoa	47.1	54.04	21.09
SLE	Sierra Leone	14.37	15.51	20.66
TON	Tonga	24.24	19.8	17.21
MAR	Morocco	11.87	11.72	15.32
PRY	Paraguay	7.87	11.29	15.24
ZAF	South Africa	8.39	14.82	14.23
SLB	Solomon Islands	9.86	16.23	13.33
BEN	Benin	6.75	9.03	13.3
NIU	Niue	12.87	10.14	13.29
PLW	Palau	5.59	4.23	13.03
MOZ	Mozambique	6.11	6.31	12.36
FJI	Fiji	6.73	5.5	12.32
AUS	Australia	8.01	10.88	12.11
GUY	Guyana	18.74	15.59	12

UKR	Ukraine	15.32	10.85	7.38
CRI	Costa Rica	9.21	8.71	7.37
CIV	Cote d'Ivoire	11.01	9.03	7.32
ROM	Romania	8.36	6.67	7.09
DMA	Dominica	5.88	8.04	6.99
WLF	Wallis and Futuna	11.45	7.76	6.93
SYR	Syria	10.34	7.23	6.92
CYP	Cyprus	12.15	6.83	6.91
LTU	Lithuania	12.8	10.03	6.87
CAF	Central African Rep.	3.07	2.15	6.79
EGY	Egypt	7.63	5.48	6.79
ARM	Armenia	5.31	6.73	6.77
GTM	Guatemala	8.46	5.78	6.75
YEM	Yemen	11.59	6.99	6.73
ATG	Antigua	10.24	10.04	6.66
PAN	Panama	10.65	6.71	6.65
FRO	Faroe Isl.	4.64	3.55	6.62
EST	Estonia	7.69	7.79	6.59
MKD	Macedonia	4.84	4.94	6.5
PYF	French Polynesia	4.11	8.89	6.49
BDI	Burundi	4.58	5.53	6.46
URY	Uruguay	5.91	5.64	6.46
CHL	Chile	15.6	11.56	6.43
MWI	Malawi	10.37	5.24	6.43
NRU	Nauru	18.4	19.32	6.39
PAK	Pakistan	5.78	6.19	6.38
CMR	Cameroon	8.83	6.49	6.36
NZL	New Zealand	9.41	7.44	6.29
IDN	Indonesia	6.54	6.75	6.23
ETH	Ethiopia	6.73	7.25	6.2
BTN	Bhutan	8.45	7.7	6.14
OMN	Oman	8.76	7.86	6.06
REU	Reunion	5.4	2.55	6.04
IRN	Iran	10.86	3.91	6.03
STP	Sao Tome and Principe	0.86	4.39	6.03
MCO	Monaco	21.17	3.87	6.02
TKM	Turkmenistan	12.85	5.78	6.02
LVA	Latvia	14.35	6.74	6
MDA	Moldova	8.39	8.36	5.99
MHL	Marshall Isl.	11.69	4.19	5.9
LIE	Liechtenstein	y	L-4004d59KIs7(z)4(ete)-12.1(in486.8(	7)-1414

CPV	Cape Verdi	5.36	
DJI	Djibouti	4	5.52
ERI	Eritrea	3.92	6.91
GLP	Guadeloupe	18.61	
GNB	Guinea Bissau	4.49	5.59
GUF	French Guyana	12.52	
IRQ	Iraq	6.25	5.58
LBY	Libya	4.78	
MNP	Northern Mariana Isl.	15.55	10.95
MTQ	Martinique	16.44	
MYT	Mayotte	22.23	
PCN	Pitcairn Isl.	18.93	12.2
PRK	Korea, Dem. Rep.	1.65	
SPM	St. Pierre and Miquelon	2.35	3.77
TMP	East Timor	6.52	3.03
VAT	Vatican City State	1.24	
VIR	Virgin Isl.	3.48	8.97
ZAR	Zaire	12.54	

Note: these calculations are made using mirror statistics, i.e., imports to all markets included in the dataset.

Source: OECD Maritime Transport Dataset.

APPENDIX IV. DEFINITIONS OF GOODS SHIPPED BY DIFFERENT MEANS

Harmonized System (HS) codes used for bulk shipping
Dry or "clean" bulk
Generally:
10 Cereals (light)
1201-1207 Oilseeds (heavy)
IGC data are for wheat, rye, oats, maize and sorghum (barley is separate)

"Dirty" bulk
26 Ores
28 Inorganic chemicals
29 Organic chemicals
31 Fertilisers
72 Iron and steel

Harmonized System (HS) codes used for tankers
27 Petroleum products

All goods not shipped in bulk or in tankers are assumed to be transported in containers.

Definitions of product groups used in this study

HS codes referring to agriculture
01-24

Raw materials
25-27, 72

Manufacturing
28-97 except 72