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The Role of Geography and Size

David Hummels

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THE ROLE OF GEOGRAPHY AND SIZE

David Hummels [*]

I. INTRODUCTION

This report focuses on issues for Latin America and the Caribbean (henceforth LAC) from China's expanding presence in the world economy, with a particular interest in questions related to China's size and proximity to markets.

We begin with a basic overview of facts, including a characterization of trade and trade growth for China and LAC. The emphasis here is not just on the quantity of trade growth, but whether Chinese export expansion has taken place in the same product categories in which LAC countries also export. The numbers here are quite startling. By 2002, China was exporting to the US in 94% of the product categories that South American nations export to the US, 90% of the categories Central American nations export, and 93% of the categories Mexico exports.

Next we address issues related to the relative proximity of China and LAC countries to major markets. We know from scores of empirical studies that distance matters in trade. Section III describes some reasons why distance might be important, including the role of shipping costs and timeliness.

Section IV presents extremely detailed data on shipping costs. The emphasis here is two-fold. First we address the size of the import wedge, the price of goods at the exporter's departure port relative to the importing destination. This wedge describes how much higher are the prices of imports as a consequence of having to pay shipping costs. Alternatively, one can think of this wedge as a protective barrier behind which less efficient domestic firms hide from the encroach of foreign competition. This wedge helps determine how much a country imports, and the size of its gains from trade. We show that LAC importers pay very high shipping costs compared to more developed nations.

Our second focus is on the size of the sourcing wedge and its determinants. The sourcing wedge compares two different foreign sources of supply, for example, the price of steel originating in China relative to steel originating in Brazil when sold in a third market such as the US. This wedge determines from whom the importer buys (or to whom an exporter sells). For our analysis of the sourcing wedge, we focus primarily on US data. This is justified both by the large role played by the US as an importer from both LAC and China, and the lack of high quality data from other major importers. We show that Chinese shipping costs, measured per kilogram shipped,

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[*] David Hummels, Purdue University. Study on The Rising of China in the World Economy: Competitiveness Advantages and Disadvantages, background paper for the Inter-American Development Bank; resulting on Devlin, Robert; Antoni Estevadeordal and Andrés Rodríguez. *The Emergence of China. Opportunities and Challenges for Latin America and the Caribbean.* Cambridge: Harvard University Press. 2006.

are much higher than LAC shipping costs to the US. This is explained by the greater distance goods must travel from China, along with higher congestion costs in crowded Chinese ports.

However, when measured in per value terms, Chinese costs are only slightly higher for air and actually lower for ocean transport. The reason is that Chinese exports to the US are much lighter than LAC exports per value shipped. Chinese exports avoid the penalty of distance, and negate LAC's proximity advantage, via a compositional shift to higher value goods. When measuring a comparable set of goods, LAC countries enjoy a cost advantage of approximately 5% on air shipping, but no advantage in ocean shipping.

Section VI argues that LAC's proximity to the US market provides it an important advantage in timeliness, which can be overcome by Chinese exporters only via expensive air shipment. It describes the recent literature on timeliness, and discusses whether this is likely to be a sustainable advantage, that is, how easy Chinese exporters will find the shift to air shipping.

This report does not cover the flip side of the geographic equation. While LAC nations are closer to the US than is China, they are also farther from Asia. Ideally one would like to redo for the Japanese import market the US sourcing wedge calculations presented here. Or to calculate the costs LAC vs. Chinese importers face when buying from Asian exporters of industrial supplies. Unfortunately, these data are not available, and so when can only presume the distance relationship holds in reverse.

Apart from their relative geographic position, an important distinction between LAC nations and China is their relative size. Section VII overviews the literature discussing why size might matter. These include the role played by size in determining host Foreing Direct Investment (FDI) patterns, and home market effects in trade. China's size makes it more likely that firms who want to enter the Chinese market do so via FDI rather than via exporting, but there is no clear evidence to suggest that FDI into China crowds out FDI into LAC. The home market effects literature would suggest that China's size would push it in the direction of exporting high scale, high transport cost manufactures. But the data in the previous sections suggest quite the opposite - China exports low transport cost manufactures. Ultimately, it is not clear that either channel is especially relevant to LAC.

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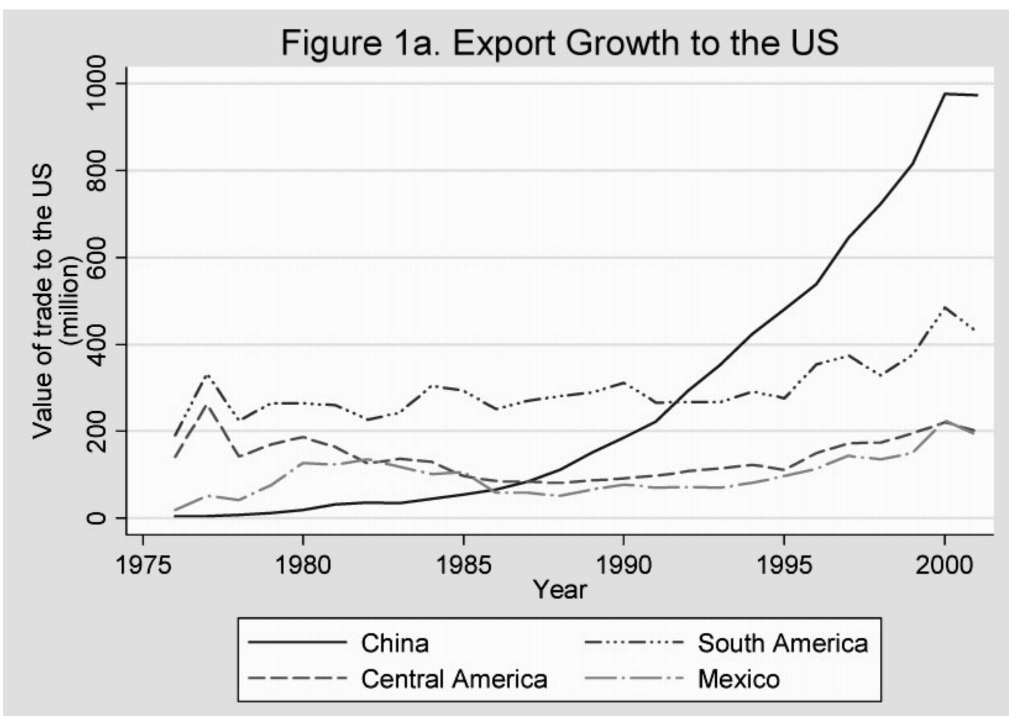
II. EXPORT EXPANSION

In 2001, Latin America had 41% of China's population, but gross product 79% greater. However, China's output has been growing at an unprecedented pace, increasing 157% in real terms in the last decade. Export growth has been even more rapid. While China's exports to the world were half of Latin America's in 1991, they were almost exactly equal by 2001.

	Latin America & Caribbean		China	
	1991	2001	1991	2001
GDP (billions of constant 1995 US$)	1,496.30	2,000.80	434.20	1,117.20
Exports (billions of constant 1995 US$)	217.50	456.80	99.00	457.40
Population (millions)	446.30	523.60	1,150.10	1,271.90
GDP per capita (constant 1995 US$)	3,352.60	3,821.20	377.32	878.43

Source: World Development Indicators, 2003.

Figures 1a and 1b show the growth in exports for China, South America and Central America plus the Caribbean (henceforth, Central America) and Mexico to the United States, and to the world as a whole. China has exhibited much more rapid export growth than either South or Central America to the world as a whole. However, growth in exports to the US has been more rapid for the Americas. (Table 1 provides additional detail, with export values to the US and the World in 2001 for China and each LAC nation).



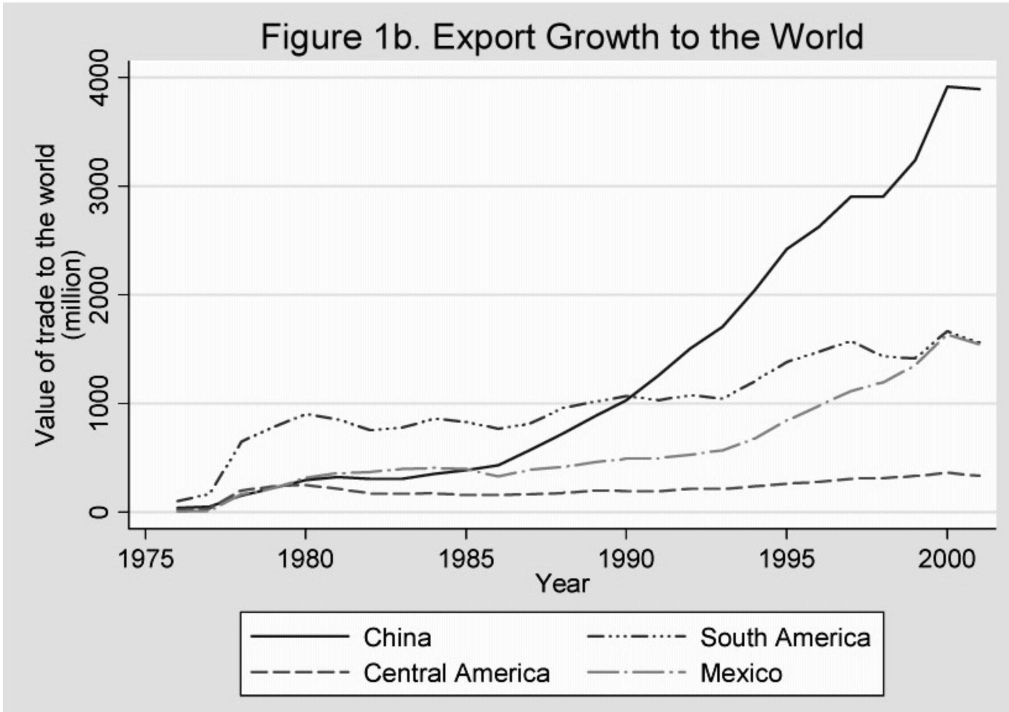


TABLE 1
EXPORT VALUES TO THE US AND THE WORLD IN 2001 FOR CHINA AND EACH LAC NATION

Importer	US (million US$)	World (million US$)
China	99,671.36	398,301.91
South America	43,961.90	159,784.50
Falkland Islands/Islas Malvinas	6.84	
Argentina	2,941.11	26,002.80
Uruguay	225.64	2,304.83
Paraguay	32.40	1,223.26
Brazil	12,435.38	59,159.21
Chile	3,528.46	18,535.48
Bolivia	162.25	1,114.24
Peru	1,828.71	6,147.72
Ecuador	1,989.99	6,110.07
French Guiana	0.35	0.00
Suriname	142.59	520.69
Guyana	129.03	520.31
Venezuela	15,210.67	24,848.10
Colombia	5,328.48	13,297.80
Central America	20,521.36	34,473.44
Martinique	0.50	
Guadeloupe	10.17	

TABLE 1 (continued)

Importer	US (million US$)	World (million US$)
Aruba	1,041.61	
Netherlands Antilles	401.35	
Trinidad & Tobago	2,372.06	3,657.84
Barbados	38.25	234.82
Grenada	21.51	56.08
St. Vincent	19.74	137.80
St. Lucia	26.79	70.01
Dominica	3.96	57.66
Montserrat	0.18	
Antigua	2.56	213.69
St. Kitts-Nevis	40.18	62.25
British Virgin Islands	11.16	
Anguilla	1.81	
Dominican Republic	4,106.74	4,836.70
Haiti	261.40	304.92
Cayman Islands	6.25	
Turks & Caicos Islands	8.05	
Jamaica	449.61	1,507.48
Cuba	0.01	
Bahamas	309.22	1,023.46
Bermuda	49.99	359.20
Panama	279.94	2,531.38
Costa Rica	2,827.82	6,166.89
Nicaragua	600.75	1,099.22
Honduras	3,116.11	4,122.23
El Salvador	1,876.06	3,039.45
Belize	82.53	256.13
Guatemala	2,555.06	4,736.23
Mexico	19,562.63	157,990.53

Note: Exports to World here refer to all importers in the WITS database for 2001.

Table 2 shows the export destinations, by continent, for China, South America, and Central America plus the Caribbean. Central American exports are the most geographically specialized, with 84 percent destined for North America. South American exports are spread more uniformly, with the Americas receiving 60 percent, Europe almost a quarter, and Asia approximately 14 percent. China is primarily focused on its neighbors, with Asian and Australasian destinations constituting almost half of its exports. The remainder goes to North America (30 percent) and Europe (19). Note that North America is the one market that is a major destination for all three sources.

TABLE 2
EXPORT DESTINATIONS, 2001

Origin	China	South America	Central America
Destination			
North America	0.295	0.333	0.840
Central America	0.012	0.055	0.036
South America	0.014	0.225	0.023
Europe	0.190	0.236	0.066
Asia	0.468	0.139	0.032
Australasia	0.016	0.003	0.002
Africa	0.006	0.009	0.001

Another way to characterize the competition between China and LAC is to examine in which particular products and markets they compete. To do this we provide some initial evidence based first on detailed US imports data. We are interested in identifying the degree of overlap between China and LAC, and how that has changed in the last decade as China has expanded its exports more than 4-fold.

The columns in Table 3 display the breadth of product coverage for China's exports to the US market. First we calculate the (weighted) number of product categories in which China ships to the US relative to the total number of import categories in US data, where categories are defined at the 6, and 10 digit levels of aggregation of the Harmonized System. We weight each category by its value share in US imports. This assigns greater importance to exporting in, for example, automobiles as opposed to exporting wind up toys. These numbers are reported in the first two columns of Table 3, and show clear evidence of China's expansion. In 1976, China shipped in 21% of the 6 digit categories in US imports. This number grew to 77% in 1991, and 95% in 2002. Similarly, China's participation in US imports measured at the 10 digit level exhibits an increase from 20-86% of weighted categories.

TABLE 3
BREADTH OF PRODUCT COVERAGE FOR CHINA'S EXPORTS TO THE US MARKET
(Percentage)

Partner	All US		South America		Central America		Mexico	
Year	**6 digits**	**10 dig**	**6 digits**	**10 dig**	**6 digits**	**10 dig**	**6 digits**	**10 dig**
1976	21	20	25	24	22	21	25	24
1977	15	15	15	14	16	15	16	15
1978	19	17	22	21	21	21	24	21
1979	49	48	67	66	56	57	63	64
1980	53	51	69	68	59	58	72	71
1981	31	29	33	32	31	29	31	29
1982	58	55	74	73	63	63	76	75
1983	54	51	68	66	58	56	64	64

TABLE 3 (continued)

Partner	All US		South America		Central America		Mexico	
Year	6 digits	10 dig	6 digits	10 dig	6 digits	10 dig	6 digits	10 dig
1984	61	57	76	73	65	63	72	71
1985	56	53	73	72	60	58	62	63
1986	61	57	79	76	65	62	65	64
1987	78	65	86	83	84	70	89	74
1988	67	63	82	80	69	67	73	73
1989	84	67	95	80	88	72	93	78
1990	77	63	83	81	82	73	84	76
1991	77	65	83	82	83	76	82	79
1992	80	68	88	84	86	79	88	81
1993	83	71	94	87	87	80	89	85
1994	91	77	95	90	94	83	97	88
1995	92	80	95	91	93	87	96	91
1996	85	77	91	88	87	82	89	85
1997	91	80	97	92	93	86	95	90
1998	91	80	97	93	93	87	95	89
1999	95	86	97	94	96	91	97	93
2000	95	86	97	93	97	89	98	93
2001	95	83	98	93	96	87	98	92
2002	95	86	97	94	97	90	98	93

Notes: 1. Percentages are the (weighted) number of product categories in which both China and that LAC region export to the US, with categories measured at both 6 and 10 digits.

2. Weights are given by the share of each category in the LAC region's exports to the US.

To directly compare China's expansion to LAC's market position, we repeat the exercise but change the comparison set. Rather than examine all US product categories, we examine the share of product categories in which South America, then Central America, then Mexico, ship to the US. Weights here are given by the share of each category in exports to the US by that LAC region. (That means that China shipping in a category like auto parts will have different weights for Mexico and Central America due to the greater importance of auto parts in Mexico's exports).

By 2002, China ships in 97% of South and Central America's export categories to the US, and 98% of Mexico's export categories (in each case referring to the weighted count of 6 digit categories). All increased from less than one-quarter in 1976, and all have increased roughly 15 percentage points since 1991. In other words, in almost every product LAC ships to the US, China is a direct competitor.

We provide two final exercises along these lines. In Table 4 we reverse the perspective of Table 3, looking at the expansion of LAC exports to the US (this is comparable to the first two columns of Table 3). In contrast to China, South and Central America export expansions have been relatively

small. Only Mexico shows a pronounced expansion. In Table 5, we show the overlap between LAC and China's exports to the US, using China's trade weights. In contrast to the previous table, LAC exporters were participating in most of China's categories throughout the period.

TABLE 4
EXPANSION OF LAC EXPORTS TO THE US

Year	South America		Central America		Mexico	
	6 digits	10 digits	6 digits	10 digits	6 digits	10 digits
1976	67	65	81	80	56	55
1977	77	76	87	87	70	68
1978	65	63	81	73	57	55
1979	67	66	84	81	68	65
1980	69	67	85	83	62	60
1981	75	72	84	80	62	60
1982	66	64	84	80	59	57
1983	67	65	86	83	70	65
1984	68	66	89	84	69	64
1985	66	63	86	83	63	58
1986	64	60	87	79	69	62
1987	62	58	84	77	69	62
1988	62	58	87	82	68	62
1989	77	56	90	79	75	60
1990	76	55	88	73	73	57
1991	76	56	85	72	78	58
1992	75	57	85	72	77	60
1993	70	57	87	72	80	62
1994	72	57	90	75	82	64
1995	75	58	92	76	84	67
1996	79	62	92	78	86	72
1997	82	63	92	77	86	72
1998	79	62	92	78	86	72
1999	83	64	93	81	88	76
2000	80	66	95	83	88	76
2001	85	64	94	81	87	71
2002	85	71	95	86	90	71

Notes . 1. Percentages are the (weighted) number of product categories in which that LAC region exports to the US

2. Weights are given by the share of each category in total US imports

TABLE 5
OVERLAP BETWEEN LAC AND CHINA'S EXPORTS TO THE US

	South America		Central America		Mexico	
Year	**6 digits**	**10 digits**	**6 digits**	**10 digits**	**6 digits**	**10 digits**
1976	79	78	85	86	67	66
1977	76	75	92	91	74	70
1978	78	76	91	89	72	68
1979	92	92	96	96	87	87
1980	90	90	95	94	84	84
1981	79	78	82	80	62	60
1982	84	85	92	91	77	77
1983	85	84	93	91	82	80
1984	85	84	95	93	81	80
1985	86	85	92	91	70	69
1986	83	81	92	87	73	70
1987	69	74	91	83	79	70
1988	77	73	90	88	74	72
1989	86	68	94	86	83	70
1990	82	71	93	85	79	68
1991	82	70	92	85	83	71
1992	82	70	92	83	85	71
1993	80	69	91	82	86	75
1994	76	66	92	81	87	74
1995	78	67	94	83	88	76
1996	85	71	93	83	89	81
1997	87	73	94	83	90	82
1998	85	72	93	84	89	80
1999	85	69	95	85	90	81
2000	82	72	96	87	91	83
2001	88	72	96	85	91	80
2002	87	78	97	90	92	83

Notes: 1. Percentages are the (weighted) number of product categories in which both China and that LAC region export to the US, with categories measured at both 6 and 10 digits.

2. Weights are given by the share of each category in China's exports to the US.

Lastly, in Tables 6 we provide the same overlap calculations as Tables 3 and 5, but breaking them out for every LAC country in 2002. Using LAC trade weights, China overlaps the trade of every single LAC country almost completely. Using China's trade weights, we see the reverse is not true. With the exception of the larger LAC exporters, the LAC countries overlap China in relatively few categories.

TABLE 6
OVERLAP CALCULATIONS, FOR EVERY LAC COUNTRY IN 2002
(Percentages)

	LAC Trade Weights		China Trade Weights	
	6 dig	**10 dig**	**6 dig**	**10 dig**
US	95	86		
South America	97	94	87	78
Falkland Islands/Islas Malvinas	100	100	19	21
Argentina	98	97	79	64
Uruguay	99	98	45	33
Paraguay	100	100	29	27
Brazil	97	92	91	81
Chile	99	96	61	45
Bolivia	99	100	34	32
Peru	99	97	61	48
Ecuador	99	98	58	49
French Guiana	100	100	21	22
Suriname	100	100	24	23
Guyana	99	99	31	28
Venezuela	99	95	75	58
Colombia	99	97	72	60
Central America	97	90	97	90
Martinique	100	100	23	23
Guadeloupe	100	100	30	26
Aruba	100	96	27	26
Netherlands Antilles	99	97	41	32
Trinidad & Tobago	99	97	44	38
Barbados	100	100	32	30
Grenada	100	100	23	23
St. Vincent	100	100	23	24
St. Lucia	100	100	29	26
Dominica	98	98	23	24
Montserrat	100	100	21	22
Antigua	100	100	25	24
St. Kitts-Nevis	100	100	30	28
British Virgin Islands	100	97	39	30
Anguilla	100	100	24	23
Dominican Republic	99	98	54	47
Haiti	100	100	31	30

TABLE 6 (continued)

	LAC Trade Weights		China Trade Weights	
	6 dig	**10 dig**	**6 dig**	**10 dig**
Cayman Islands	100	100	27	25
Turks And Caicos Islands	100	100	21	23
Jamaica	99	97	39	33
Cuba	100	100	21	22
Bahamas	100	97	34	31
Bermuda	99	99	30	29
Panama	99	96	52	42
Costa Rica	99	98	56	48
Nicaragua	98	98	34	30
Honduras	98	98	42	36
El Salvador	99	99	48	36
Belize	99	99	26	25
Guatemala	99	98	61	49
Mexico	98	93	92	83

III. OVERVIEW OF GEOGRAPHY AND PROXIMITY ISSUES

The US is a major export market for both China and LAC. The distance from Los Angeles, California (the major west coast entry port) to Guongdong China (a major export source) is roughly 11,700 km. This compares to a distance of 8,790 from Miami, Florida to the southern tip of South America. Does being more proximate to the US help LAC, that is, "protect" it in any way from China's growth? Similarly, we could ask whether China's proximity to Asia and its vast industrial supplies provides it with significant cost advantages on the production side.

A. What We Know

Distance impedes trade to a surprising extent. Roughly half of world trade takes place between countries located within 3000 km of each other. Countless gravity regressions affirm that the trade-distance relationship is robust to the inclusion of a wide variety of partial correlates, with typical estimates suggesting that doubling distances halves trade. Further, despite substantial growth in the level of trade, dramatic changes in the commodity composition of trade, and significant advances in transportation and communication technology, the grip of geography remains. Distance matters as much, or more, today as it did forty years ago.

B. What We Don't Know

Why does distance pose such an obstacle to trade? Possible explanations can be grouped into two broad categories: trade costs, and general equilibrium effects. Possible trade costs that may be correlated with distance and impede trade include costs of transportation, some forms of communication (personal travel and phone calls), preferential trade agreements (i.e. tariff barriers are lower for close neighbors), and search costs,[1] among others. To the extent that distance diminishes trade because of real costs, LAC's export sales to the US really are protected from Chinese growth, at least up to the differential implied by the trade costs. If trade costs are 10% higher for China, then its ex factory prices must be 10% lower to compete.

However, an alternative explanation suggests distance provides less of a protective shield. Suppose it is only slightly less expensive to ship manufactures from Mexico to the US than to ship from China. This provides no great proximity advantage for Mexico, but if production costs are similar, why not locate the manufacturer in Mexico and minimize those small trade costs? In this case distance from markets could greatly diminish trade even though actual distance costs are small. However, in this case, the trade-distance effect does not imply that proximity is a real barrier to China's expansion. Small cuts in production costs for China would undermine Mexico's small proximity advantage.

Several researchers are working to better understand these general equilibrium effects. We know that they are very strong within a country and a primary source of industrial agglomerations

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[1] Rauch argues that trade in differentiated products requires costly search: identification of partners, negotiation, enforcement, etc. that may be much more difficult at a distance.

(Hilberry and Hummels [2002]). Whether they also operate at the level of international trade is not well understood. Nor do we fully understand the degree to which comparative advantage is persistent, that is, whether an initial proximity advantage creates lasting production cost advantages that persist long after the proximity advantage is gone.

Given the uncertainty about what causes the trade-distance relationship, the best we can do for current purposes is to show the real cost differentials between LAC and China for known trade costs. We do that next for two costs that have been discussed in the literature: shipping costs and time costs.

A third distance cost one could examine is the cost of search. While potentially promising, the literature on search has not moved much beyond claiming that search costs are a potential reason for trade diminishing with distance. The most interesting evidence to that effect involves China. Rauch and Trindade show that ethnic Chinese spread throughout the world facilitate trade by providing a conduit through which information about foreign markets can move (Rauch and Trindade [2002]). This is intriguing but doesn't provide direct evidence of the size of the underlying costs.

Contents

IV. SHIPPING COSTS

First we address the size of the import wedge, the price of goods at the exporter's departure port relative to the importing destination. That is, this wedge describes how much higher are the prices of imports as a consequence of having to pay shipping costs. Alternatively, one can think of this wedge as a protective barrier behind which less efficient domestic firms hide from the encroach of foreign competition. This wedge helps determine how much a country imports, and the size of its gains from trade.

We begin by examining the size of ad-valorem transportation costs in imports for the US and several Latin American countries. The data we examine come from customs declarations forms in which the importing country requires the shipping firm to report the value of the shipment measured fob (free on board, or exclusive of shipping costs) and cif. To simplify the reporting, we aggregate over multiple shipments and exporters to calculate the ad-valorem freight bill as the total freight bill paid divided by total value shipped. Equivalently, this can be thought of as a trade-weighted average of shipping costs for each individual shipment.

Table 7 reports ad-valorem shipping costs, i.e. shipping costs expressed as a percentage of the value of goods shipped, in 1994 and 2000 in aggregate and by 1 digit SITC goods classification. Shipping costs create a substantial wedge between home and foreign prices for all countries except the US (this is primarily because US imports are dominated by North American goods with very low shipping rates). Small and land-locked countries pay higher costs than large countries with ocean access. Rates differ substantially across products, with ad-valorem costs being much higher for bulk commodities than for manufactures.

Total ad-valorem costs are actually larger than these data suggest. These customs data typically cover only the international leg of transport, omitting inland charges. For shipments to and from coastal locations this will be accurate, but shipments inland will be more expensive. Case study evidence shows that international ocean freight comprises only a third of total door-to-door shipping charges. Also, the Table 7 numbers are trade-weighted averages of shipping costs. When importers choose export sources so as to minimize freight costs, the Table 7 numbers attach a large weight to unusually small costs and small weights to unusually large costs, i.e. the trade-weighted average understates true rates. Simple average freight rates for these countries are roughly double those reported in the table.

Next we address the size of shipping costs in creating a sourcing wedge. The sourcing wedge compares two different foreign sources of supply, for example, the price of steel originating in China relative to steel originating in Brazil when sold in a third market such as the US. This wedge determines from whom the importer buys (or to whom an exporter sells). For our analysis of the sourcing wedge, we focus primarily on US data. This is justified both by the large role played by the US as an importer from both LAC and China, and the lack of high quality data from other major importers.

TABLE 7
AD-VALOREM SHIPPING COSTS

1994	USA	Argentina	Brazil	Chile	Paraguay	Uruguay	N Zealand
All goods	*3.8*	*7.5*	*7.3*	*8.8*	*13.3*	*4.6*	*8.30*
Food and Live Animals	8.2	9.9	10.4	12.7	12.0	3.6	14.5
Beverages & Tobacco	6.9	11.3	9.0	8.4	10.4	4.8	9.40
Crude Materials	8.2	15.2	7.7	12.0	10.2	3.7	16.3
Mineral fuels, lubricants	6.6	14.7	10.7	11.8	20.9	4.7	9.90
Animal & Veg Oils, Fats	7.1	10.8	5.4	9.3	12.5	2.6	10.6
Chemicals & Related Prod	4.5	7.6	6.8	10.2	10.4	3.0	9.00
Manuf. Goods (by material)	5.3	9.4	8.5	10.9	11.2	4.7	10.0
Machinery & Transp Equip	2.0	5.6	5.1	6.3	13.8	4.1	6.30
Misc Manufact.	4.7	9.3	8.1	9.1	15.2	5.8	6.60
All other goods, NES	1.0	4.5	0.8	7.6	6.80	2.5	0.60

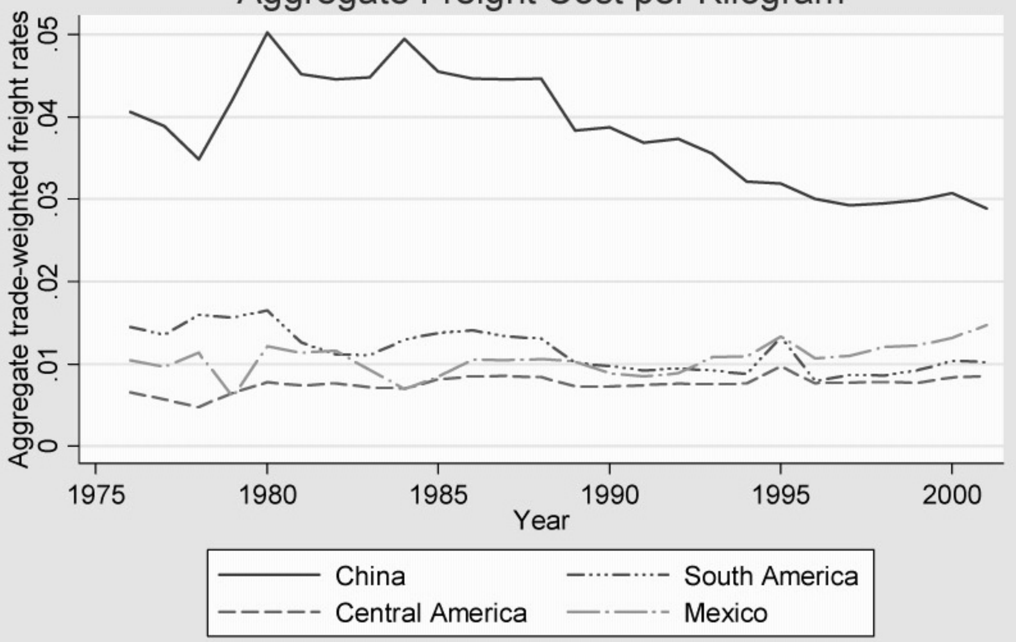
2000	USA	Argentina	Brazil	Chile	Paraguay	Uruguay	N Zealand	Bolivia	Colombia	Ecuador	Mexico	Peru
All goods	*3.3*	*8.3*	*10.6*	*15.5*	*9.6*	*7.0*		*8.4*	*8.1*	*19.2*	*3.6*	*13.4*
Food and Live Animals	7.7	9.4	9.2	12.5	10.8	8.0		16.1	12.9	13.8	6.0	13.5
Beverages & Tobacco	5.2	7.1	5.5	7.0	6.3	4.9		7.5	6.3	8.5	7.3	5.5
Crude Materials	7.5	12.3	7.2	13.2	16.5	13.8		10.6	11.7	14.2	5.5	12.8
Mineral fuels, lubricants	4.1	29.7	15.7	28.9	23.9	12.3		16.2	22.7	25.9	6.9	23.4
Animal & Veg Oils, Fats	6.6	7.8	6.2	12.1	6.7	5.1		8.4	11.8	11.4	7.3	16.0
Chemicals & Related Prod	3.0	6.4	5.3	8.8	9.0	5.0		9.2	7.2	9.2	6.6	9.0
Manuf. Goods (by material)	5.1	7.1	6.8	9.8	8.5	6.2		9.7	7.8	10.5	13.2	9.9
Machinery & Transp Equip	1.9	4.2	4.1	6.8	9.4	4.9		5.4	4.1	5.8	7.6	6.4
Misc Manufact.	4.9	6.4	5.7	6.5	16.0	7.0		7.9	6.8	9.0	19.5	7.0
All other goods, NES	1.0	11.4	8.7	6.4	…	5.2		7.9	12.0	49.7	1.7	6.4

Note: 1. Table reports shipping charges paid as a percentage of goods value shipped, aggregating over all exporters for each importer and commodity.

Sources: US Census, Statistics New Zealand, ALADI Secretariat, ECLAC BTI Database.

Figures 2a, 2b, 2c and 2d report time series for air and ocean shipping costs from China, South America, and Central America, and Mexico taken from US imports data from 1976-2001. In Figures 2a and 2b, the aggregate in each year is a trade-weighted average of shipping costs per kg for all shipments from that exporter (or exporter group) to the US in that year. In Figures 2c and 2d, the aggregate in each year is a trade-weighted average of ad-valorem shipping costs, that is, expressing the total shipping bill relative to the value of the product. Table 8 reports the same data, for 2001 only, for China and each of the LAC countries in their exports to the US. (For the same data calculated at the 2 digit Harmonized System (HS) level for each exporter and exporter group, see *growth_ind_table.xls*).

Figure 2a. Air Shipments
Aggregate Freight Cost per Kilogram



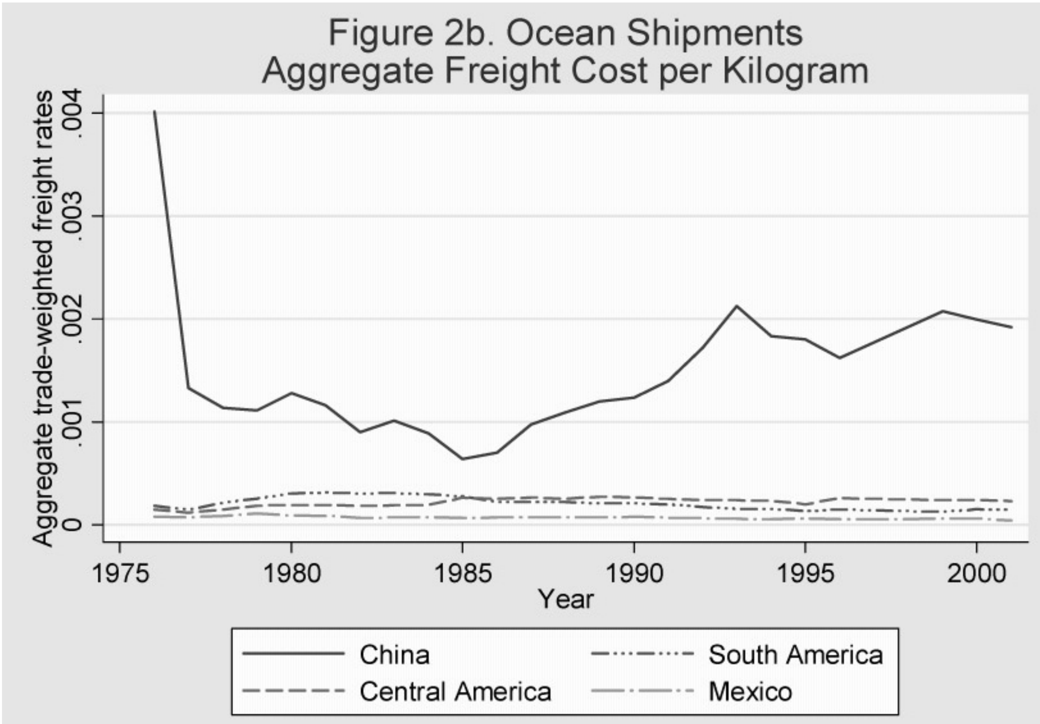


Figure 2b. Ocean Shipments
Aggregate Freight Cost per Kilogram
Aggregate trade-weighted freight rates
0
.001
.002
.003
.004
1975
1980
1985
1990
1995
2000
Year
China
South America
Central America
Mexico

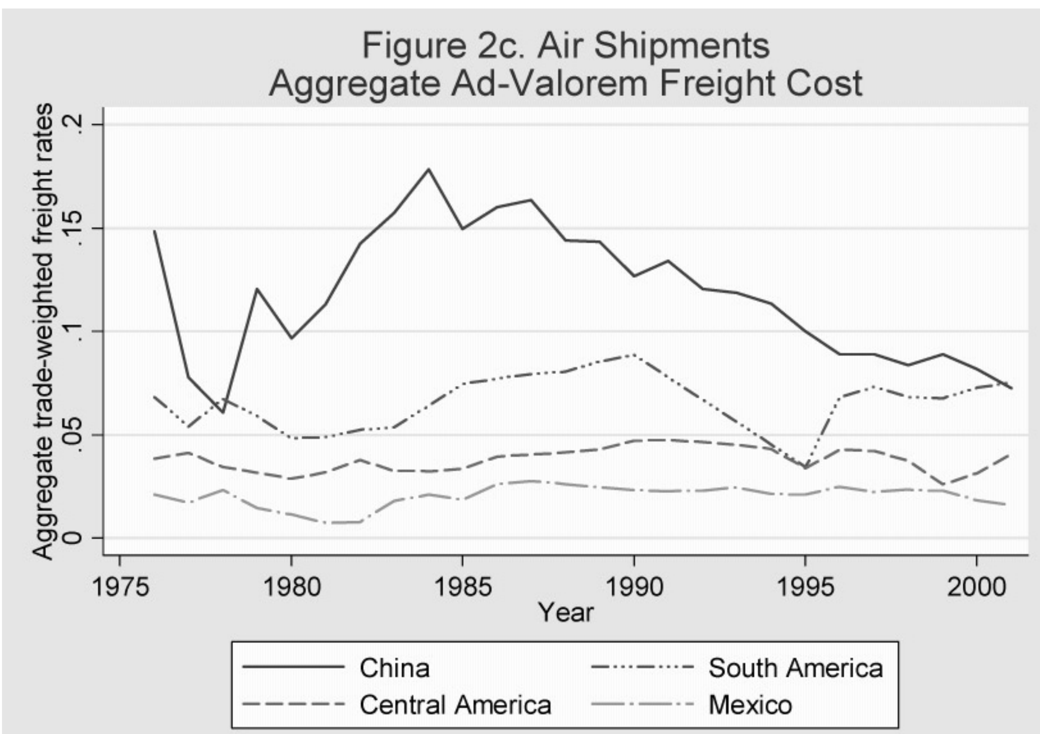


Figure 2c. Air Shipments
Aggregate Ad-Valorem Freight Cost
Aggregate trade-weighted freight rates
0
.05
.1
.15
.2
1975
1980
1985
1990
1995
2000
Year
China
South America
Central America
Mexico

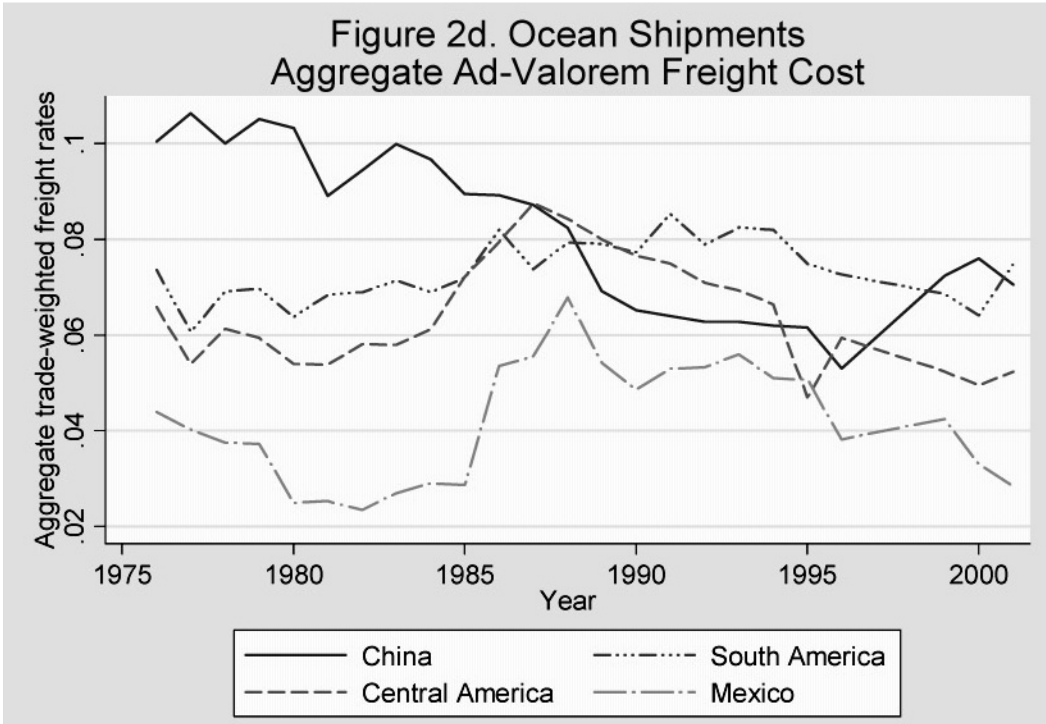


TABLE 8
AD-VALOREM SHIPPING COSTS FOR CHINA AND EACH OF THE LAC COUNTRIES IN THEIR EXPORTS TO THE US, FOR 2001 ONLY

	Total Freight Charges		Ocean Freight Charges		Air Freight Charges	
	per kg	per value	per kg	per value	per kg	per value
China	0.22	0.07	0.20	0.07	2.95	0.07
South America	0.02	0.07	0.02	0.07	1.05	0.08
Falkland Islands/Islas Malvinas	0.13	0.06	0.12	0.06	3.28	0.43
Argentina	0.03	0.08	0.03	0.09	1.06	0.04
Uruguay	0.17	0.06	0.12	0.06	1.11	0.04
Paraguay	0.11	0.12	0.10	0.12	1.73	0.10
Brazil	0.03	0.06	0.03	0.07	1.12	0.03
Chile	0.06	0.15	0.05	0.14	1.13	0.22
Bolivia	0.09	0.04	0.06	0.05	1.31	0.03
Peru	0.04	0.07	0.03	0.06	1.06	0.12
Ecuador	0.03	0.14	0.03	0.12	1.16	0.25
French Guiana	0.76	0.04	0.78	0.06	0.64	0.01
Suriname	0.01	0.04	0.01	0.03	0.73	0.20
Guyana	0.01	0.16	0.01	0.16	0.72	0.10
Venezuela	0.01	0.06	0.01	0.06	0.86	0.03
Colombia	0.01	0.07	0.01	0.06	0.85	0.10

TABLE 8 (continued)

	Total Freight Charges		Ocean Freight Charges		Air Freight Charges	
	per kg	**per value**	**per kg**	**per value**	**per kg**	**per value**
Central America	0.03	0.05	0.02	0.05	0.88	0.04
Martinique	0.17	0.08	0.07	0.11	1.02	0.07
Guadeloupe	0.04	0.03	0.04	0.04	1.26	0.03
Aruba	0.01	0.05	0.01	0.05	1.03	0.01
Netherlands Antilles	0.01	0.07	0.01	0.08	3.36	0.03
Trinidad &Tobago	0.01	0.09	0.01	0.09	0.64	0.09
Barbados	0.13	0.03	0.08	0.06	1.08	0.02
Grenada	0.63	0.04	0.36	0.04	0.79	0.04
St. Vincent	0.02	0.01	0.01	0.01	0.81	0.06
St. Lucia	0.02	0.06	0.01	0.05	1.75	0.06
Dominica	0.02	0.09	0.01	0.18	1.59	0.01
Montserrat	0.01	0.02	0.01	0.03	0.76	0.02
Antigua	0.00	0.07	0.00	0.08	0.78	0.06
St. Kitts-Nevis	0.89	0.03	0.37	0.04	1.00	0.03
British Virgin Islands	0.22	0.04	0.20	0.05	2.04	0.02
Anguilla	0.20	0.03	0.16	0.03	3.72	0.03
Dominican Republic	0.08	0.03	0.06	0.02	1.04	0.03
Haiti	0.23	0.03	0.19	0.03	0.58	0.10
Cayman Islands	0.05	0.06	0.05	0.07	0.89	0.02
Turks & Caicos Islands	0.23	0.02	0.21	0.03	0.57	0.01
Jamaica	0.01	0.08	0.01	0.08	0.54	0.08
Cuba	3.01	0.04			3.01	0.04
Bahamas	0.00	0.05	0.00	0.05	1.36	0.01
Bermuda	0.07	0.03	0.06	0.15	2.85	0.00
Panama	0.05	0.07	0.04	0.06	0.59	0.08
Costa Rica	0.09	0.07	0.08	0.09	0.82	0.03
Nicaragua	0.15	0.04	0.14	0.04	0.73	0.05
Honduras	0.11	0.04	0.11	0.04	1.02	0.05
El Salvador	0.14	0.03	0.12	0.03	0.97	0.05
Belize	0.04	0.06	0.04	0.06	0.68	0.16
Guatemala	0.06	0.06	0.05	0.06	1.11	0.08
Mexico	0.01	0.03	0.00	0.03	1.51	0.02

When expressed in shipping costs per kg, Chinese exports to the US are much more expensive in the aggregate than either South or Central America. The difference is on the order of 10-fold higher ocean shipping costs for China in 2002, with this number rising steadily after 1985.[2] Looking at air shipping costs per kg, Chinese costs are 3 times higher in 2002, having declined somewhat since 1980.

However, when expressed in shipping costs per value of the traded good, we see a very different story. Air shipments from China were more than twice as expensive in 1983, but these costs decline both absolutely and relative to costs for Latin America. By 2001 costs for China are comparable to South America. For ocean shipments, costs for Chinese exports to the US are actually lower than those from Latin America, but have risen toward the end of the period. This may reflect growing congestion in Chinese ports, as well as a growing east-west trade imbalance. Both are discussed in greater detail below.

We noted above that China is expanding trade into product categories it had not previously exported. Since shipping costs differ considerably across commodities, shifting composition can drive aggregate movements, but not inform us as to the relative costs for substitute goods. To deal with this compositional effect, we next restrict our attention only to those commodity categories that China has in common with South and Central America, respectively. First, we calculate the relative cost of China's shipping compared to South America in each common (6 digit HS) commodity, then aggregate over commodities using the value share of that commodity in US imports. We then repeat the procedure for a set of commodities common to China and Central America, and then again for China and Mexico.

Formally, we calculate the following statistic for each year, transport mode, and comparison group.

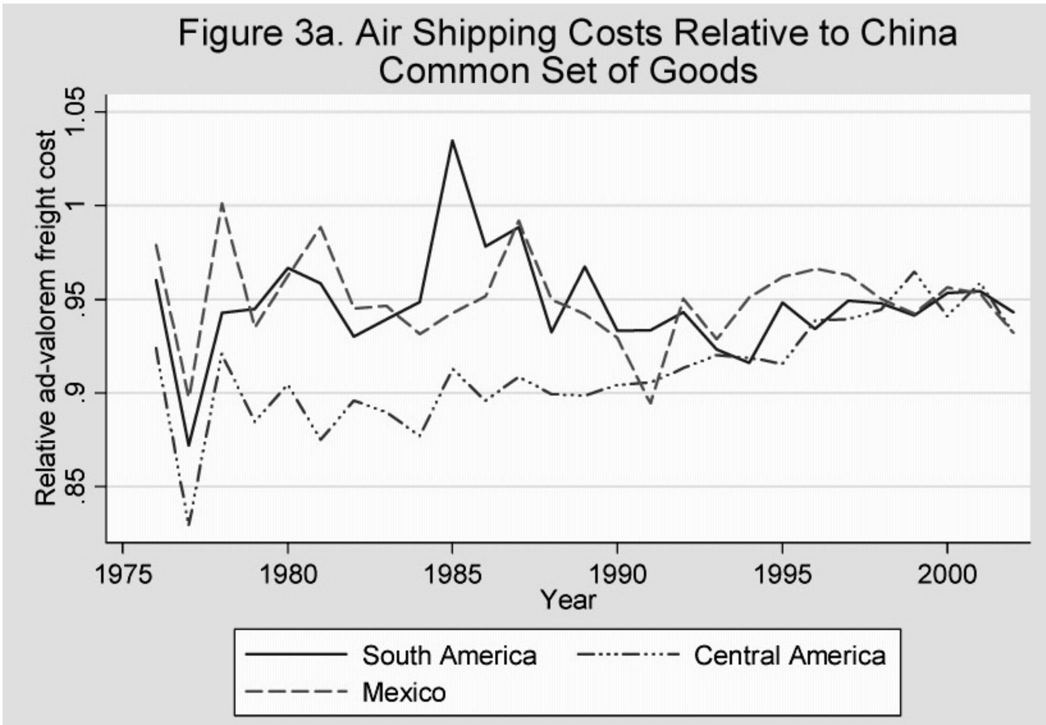
$$r_{F,MODE}^{REG} = \sum_{k \in HS6} \frac{f_{REG,MODE}^{k}}{f_{\text{China},MODE}^{k}} s_k$$

where
REG - region: South America, Central America, Mexico;
f - percentage impact of shipping cost on price: $f = p_{cif} / p_{fob}$;
MODE - mode of transportation: air, ocean;
s_{HS6} - share of HS 6 digit industry in total US imports for that year.

Figures 3a and 3b describe the results for air and ocean shipping over time for broad LAC regions, while Table 9 provides the results for 2002 only, for all LAC nations individually. Note that we are using the percentage impact of shipping cost on price, rather than the freight bill itself. If costs are the same for China and South America, the statistic evaluates to 1. A value of 0.91 (Central America relative to China in 1991) means that air transportation costs lower the delivered price of Central American goods by 9% relative to Chinese goods. In other words, if the

2 The very high value for China in 1975 is some kind of data error, I think.

goods had the same price at the factory gate in China and Central America, Central American goods would be 9% cheaper when they arrived in the US.



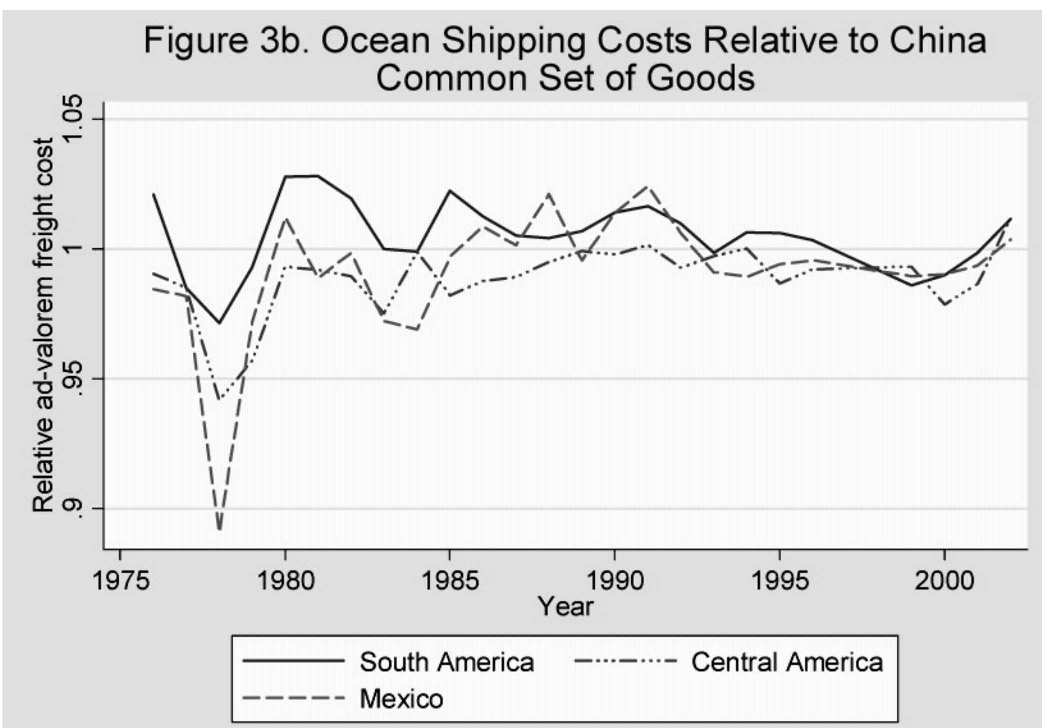


TABLE 9
AIR AND OCEAN COSTS SHIPPING OVER TIME FOR ALL LAC NATIONS INDIVIDUALLY

2002 only

	Ocean freight (ad-valorem)	Air freight (ad-valorem)	Total freight (ad-valorem)
South America	1.01	0.94	1.00
Argentina	1.01	0.95	1.01
Uruguay	0.99	0.95	0.99
Paraguay	1.01	1.03	1.03
Brazil	1.02	0.96	1.01
Chile	0.99	0.97	1.00
Bolivia	0.99	1.01	1.02
Peru	1.00	0.95	1.01
Ecuador	1.01	1.01	1.02
Suriname	0.97	1.05	0.99
Guyana	1.01	1.02	1.02
Venezuela	0.98	0.96	0.99
Colombia	0.99	0.91	1.00
Central America	1.01	0.93	0.99
Martinique	0.99	1.00	1.01
Guadeloupe	1.01	0.99	1.01
Aruba	0.98	1.00	1.00
Netherlands Antilles	0.99	0.99	1.00
Trinidad & Tobago	0.98	0.98	0.99
Barbados	1.02	1.00	1.03
St. Vincent	0.96	1.05	1.00
St. Lucia	1.01	0.99	1.01
Dominica	0.98	0.97	0.95
Antigua	0.99	1.00	1.01
St. Kitts-Nevis	1.06	1.02	1.03
British Virgin Islands	0.99	0.99	1.00
Dominican Republic	0.98	0.94	0.98
Haiti	0.98	0.95	0.98
Cayman Islands	0.99	0.99	1.00
Jamaica	1.02	0.96	1.00
Bahamas	0.99	1.02	1.01
Bermuda	0.98	1.00	0.99
Panama	1.01	0.95	1.01
Costa Rica	0.98	0.95	0.98
Nicaragua	1.01	0.96	1.00
Honduras	0.99	0.96	0.98
El Salvador	0.99	0.94	0.98
Belize	0.97	1.01	1.00
Guatemala	1.06	0.96	1.02
Mexico	1.00	0.93	0.99

Figure 3a shows that Latin America's cost advantage in air shipping has declined substantially by the end of the period (with South America only enjoying about a 2% cost savings relative to China in 2002). Figure 3b shows that ocean shipping costs increase the price of South American goods relative to China until 1997, dip below China's prices from 1998-2001, then rise above them again in 2002. While Central America ocean shipping costs lie below China's, and are falling over time, the advantage they provide in terms of delivered prices is small - 2% or less in each year. Looking at the individual countries in Table 9, we see that the ocean cost differential is within a few percentage points for every country, while the air cost differential favors LAC countries by around 5 percentage points on average.

V. EXPLAINING SHIPPING COST DIFFERENCES, AND LOOKING FORWARD

Shipping costs can be broken into three main stages: inland movement from the origin and loading, international transit, and unloading plus inland movement at the destination. A rough rule of thumb suggests that these three stages each represent about one-third of the total bill.

A. Inland Shipping

Inland movements depend on the quality of the road and rail infrastructure, and the distance goods must travel overland. Limao and Venables (Limao and Venables [2001]) estimate that differences in the quality of infrastructure explain 40 percent of international transportation costs for coastal countries, and 60 percent for land-locked countries. They further estimate that the cost per mile shipped overland is 6-7 times more expensive than the cost per mile for ocean transit. High quality inland linkages reduce this problem, essentially bringing inland regions closer to the port. Quality in this sense has several dimensions, including reliability, cost, modal interoperability (the ability to move containers from truck to rail to ocean liner and back again), and capillarity (infrastructure that reaches all parts of a region, not just a central transport hub).

Costs for loading and unloading primarily depend on the degree of port congestion, and the ability to "unitize" cargo, that is, load cargo into a single storage container that can be packed once and then moved intact from one mode to the next. Containerization is thought by many to be the single most important technological advance in shipping in the last 50 years. This is because it saves considerably on loading/unloading expenses as well as easing the movement of cargo between modes. There are clear differences in container use between China and LAC. In 2001, 95% of Chinese waterborne exports by value to the US were containerized (up from 51% in 1991). In contrast 47.6% of Central American and 38.5% of South American waterborne exports to the US were containerized in 2001 (up from 30.1 and 23.7% respectively).[3]

The implication for LAC v. China are these. Most of the population in LAC is near to coastal areas but in China the same is not true. Currently China's active export regions are on the coasts, not the interior.[4] This suggests three possibilities if China's expansion into international markets is to continue:

(1) China could bring the inland regions "closer" to world markets by improving infrastructure, though this would be a monumental task. Most efforts now focus on using China's inland waterways, dredging rivers to allow ocean going vessels to travel further inland, or expanding barge traffic;

(2) China could bring more resources into the coastal regions. This choice reduces inland shipping costs but leads ultimately to congestion, and incurs higher land and labor costs than would be enjoyed further from the coast. One possible reason for the sharp rise in ocean shipping costs for China shown in Figure 2d is that port congestion is starting to push up costs in China. Whether port congestion is a long run phenomenon, or only a short run problem that can be allayed through

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[3] Source: US Waterborne Trade Statistics, CD-Roms, 1990-2001.

[4] Wei and Yi (NBER 8611) show that trade levels, trade growth, and income growth all drop as one goes further inland within China.

adding additional ports in alternative locations, is not clear. Certainly it is not trivial to create new port facilities, as dedicated road and rail infrastructure must be created, along with ancillary industries such as finance, logistics, and warehousing.

(3) an expanded use of air shipping, especially for items with a high value to weight ratio, may be the best solution. Rather than transiting a congested ocean port, braving snarled intermodal linkages, and then waiting days for a rail or truck shipment to arrive, shippers may prefer to via air. As Figure 3a indicates, the cost disadvantage for air transport from China relative to Latin America has declined substantially in the last decade. However, the success of this strategy turns on whether it is easier to move technical capabilities for manufacturing than it is to move the goods themselves. To explain, the interior regions of China are backward not only with respect to market access, but likely also with respect to their level of manufacturing sophistication. And the goods likely to be suitable for airlift are high value manufactures (especially electronics).

DETERMINANTS OF PORT TO PORT SHIPPING COSTS

Transit expenses depend on the distance goods travel, and the weight and bulk of the goods being moved in relation to their value, and demand considerations including the scale of operations, fluctuations in demand, and unbalanced demand. We discuss each in turn, and its implications for China vs. LAC.

A. Distance Costs

Each mile cargo moves translates into fuel expenses, depreciation, and time costs, which include manning expenses and the implicit rental rate of the ship or plane. Using the US imports data it is possible to estimate the elasticity of shipping costs with respect to distance. For ocean shipping the elasticity is 0.2, for air shipping, 0.4 (Hummels [2001]). That is, doubling distance (e.g. from Los Angeles to Shanghai China is roughly double the sea lane distance from Los Angeles to Panama City) increases transportation costs by 20% to 40%. These costs rise and fall with fuel prices, but the elasticity of costs with respect to distance has remained fairly flat for 15 years. The difference between the elasticity of costs with respect to distance helps explain why air cost advantages for Latin America are greater than those for ocean costs. The marginal cost per mile traveled is higher for airplanes than ships; this means that the advantage of proximity will be greater for air than for ocean.

B. The Weight/Value Ratio

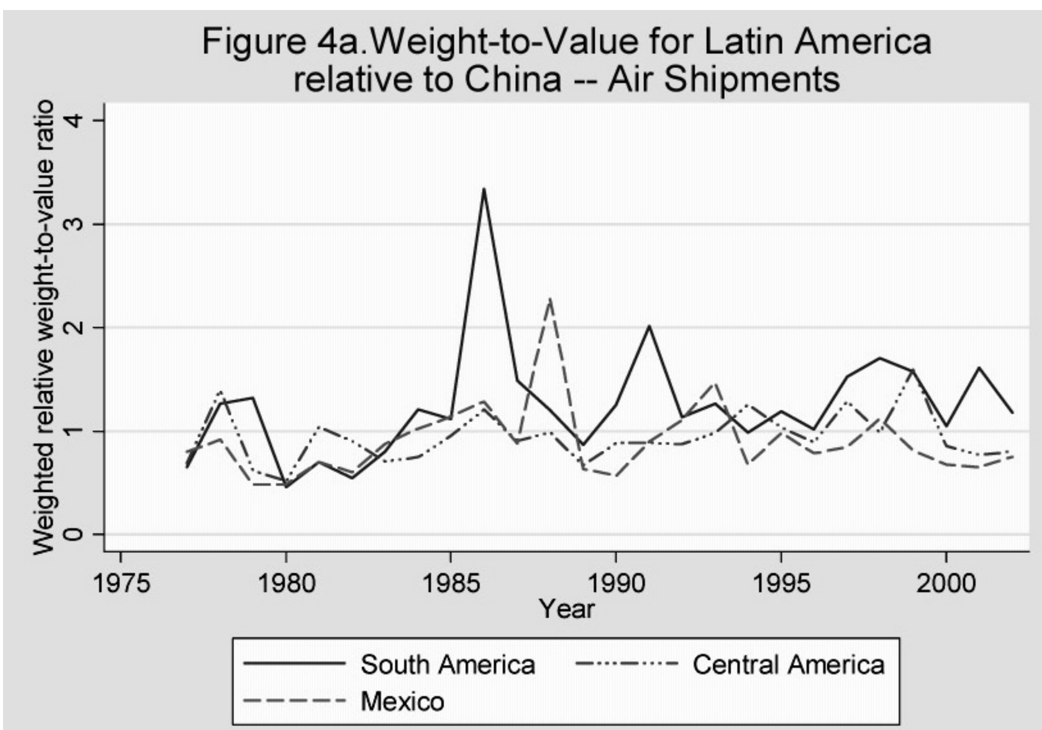
Shipping costs, measured in ad-valorem terms, are an increasing function of the weight/value ratio of the shipment. The reason is that the total freight cost for a shipment is primarily a function of the quantity shipped, not the value shipped.[5] Heavier goods require greater fuel expenditures, and bulkier goods fill cargo spaces. However, the impact of transportation costs on trade volumes

[5] Hummels and Skiba [2004] show that the elasticity of transport costs per kg with respect to goods price is about 0.12. In other words, higher priced goods require more costly shipping but the relationship is weak. In contrast, the total freight bill is close to linear in quantity.

depends on their magnitude relative to value, not quantity. Consider a simple example. I want to import a $16 bottle of wine from Chile. Air shipping costs per bottle are $8, which increase the delivered price by 50%. Now suppose my tastes improve and I want to import a $160 bottle of wine from Chile. The shipping costs are the same, but now the shipping cost represents just a 5 percent increase in the delivered price. The broader point is that transportation demand is derived from import and export demand. No one values transportation directly, they value it only as part of a process of getting internationally traded goods to their final consumers. And those consumers are sensitive to changes in the delivered price, not to changes in the transportation price.

In Figures 2a and 2b we showed that China's shipping costs per kg were many times higher than Latin America's. Unfortunately for LAC, Chinas' ad-valorem cost (shipment cost per value) were comparable to or even lower than Latin America. The reason is the weight/value ratio for the goods. In the aggregate, goods coming from China are 10 times lighter per dollar shipped than Central American goods, and 20 times lighter per dollar shipped than South American goods. In other words, whatever proximity advantage Latin America enjoys for shipping costs is completely lost as a result of specializing in heavy, low value products.

This is primarily true when considering cross-commodity specialization, but also helps explain differences in costs for the same commodities. In Figure 4a and 4b we construct weight/value ratios for Latin America relative to China for a common set of commodities, using the same basic technique as in Figures 3a and 3b. (A value greater than 1 means that, on average, Latin American goods are heavier per dollar shipped than Chinese goods). The figures show the evolution in the numbers for broad LAC regions. Table 10 shows the same numbers, in 2002 only, for each LAC nation.



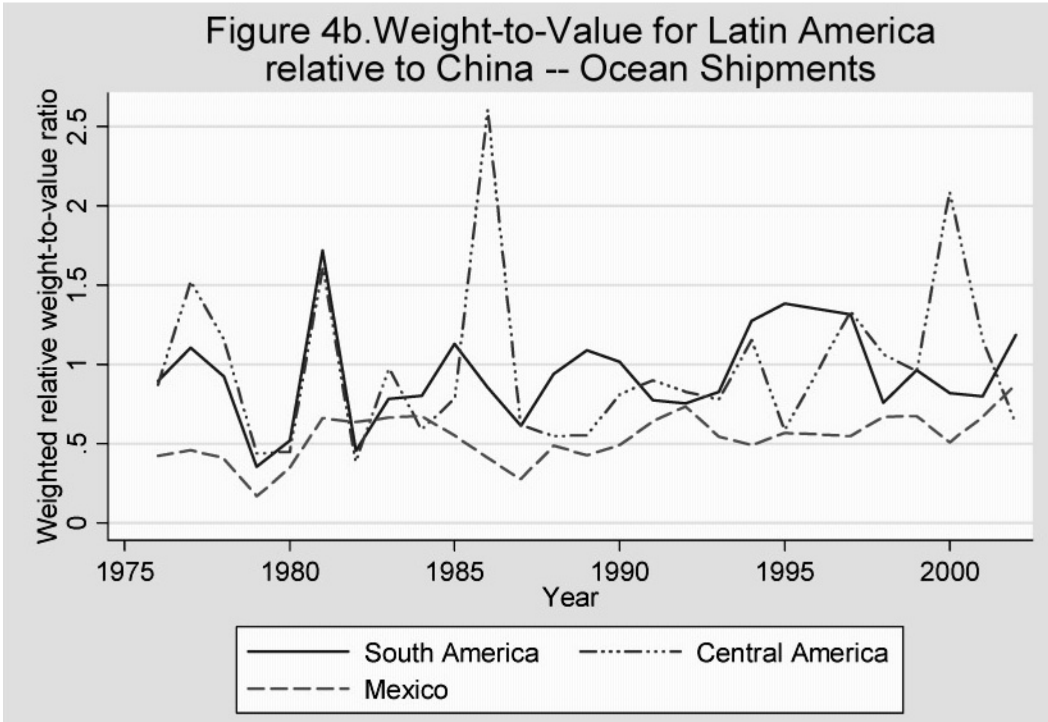


TABLE 10
EVOLUTION IN THE NUMBERS FOR BROAD LAC REGIONS
2002 ONLY, FOR EACH LAC NATION

	Vessel Shipments (Weight/value)	Air shipments (Weight/value)
South America	1.19	1.18
Falkland Islands/Islas Malvinas	0.39	0.00
Argentina	0.54	0.88
Uruguay	0.59	0.92
Paraguay	1.20	2.11
Brazil	1.20	1.08
Chile	0.58	1.06
Bolivia	0.95	1.31
Peru	0.55	0.92
Ecuador	0.58	1.01
French Guiana	0.08	0.13
Suriname	1.33	1.70
Guyana	0.74	1.16
Venezuela	1.11	1.07
Colombia	0.88	1.41
Central America	0.63	0.80
Martinique	0.56	1.06
Guadeloupe	0.50	0.59

TABLE 10 (continued)

	Vessel Shipments (Weight/value)	Air shipments (Weight/value)
Aruba	2.65	4.18
Netherlands Antilles	1.52	0.66
Trinidad & Tobago	1.61	0.35
Barbados	0.59	0.63
Grenada	0.06	1.89
St. Vincent	0.54	2.56
St. Lucia	0.41	1.03
Dominica	2.07	1.01
Montserrat	1.18	0.12
Antigua	0.10	1.25
St. Kitts-Nevis	0.11	1.70
British Virgin Islands	0.50	1.17
Anguilla	0.53	0.62
Dominican Republic	0.59	1.30
Haiti	1.16	2.46
Cayman Islands	0.11	1.26
Turks And Caicos Islands	0.59	1.08
Jamaica	1.68	2.71
Cuba	3.23	0.01
Bahamas	3.12	0.97
Bermuda	1.54	0.65
Panama	0.41	1.05
Costa Rica	0.53	0.82
Nicaragua	0.66	1.57
Honduras	0.63	1.53
El Salvador	0.98	0.73
Belize	0.71	0.88
Guatemala	0.94	2.36
Mexico	0.87	0.75

The broad point to take away from these numbers is that the very large aggregate difference between China and the LAC countries is driven primarily by cross-commodity composition. In the aggregate, China has much lighter exports than LAC countries. Within commodities the evidence is much more mixed. Air shipments from South America are heavier throughout the last 20 years, but air shipments from Central America and Mexico are lighter. Within each commodity ocean shipments for most of the LAC countries are also lighter.

C. Shipping Scale

Unlike port costs, transit costs for shipping are typically estimated to be decreasing in the scale of operations.[6] Using US imports data it is possible to calculate the effect of increased demand for shipping on the transportation price.[7] The estimated elasticity is in the range of -.05 to -.12, implying that doubling the quantities traded reduces shipping costs from 5 to 12 percent. (To be clear about units, starting from ad-valorem shipping costs of 10%, this scale effect would reduce the ad-valorem barrier to somewhere been 8.8 and 9.5%).

As trade quantities increase it is possible to more effectively realize gains from three sources. First, a densely traded route allows for effective use of hub and spoke shipping economies - small container vessels move quantities into a hub where containers are aggregated into much larger and faster containerships for longer hauls. Second, the movement of some goods requires specialized vessels. Examples include ships specialized to move bulk commodities, petroleum products, refrigerated produce, and automobiles. Increased quantities allow introduction of these specialized ships along a route. Similarly, larger ships will be introduced on heavily traded routes, and these ships enjoy substantial cost savings relative to older smaller models still in use. (One source of scale advantage is in crew costs, which are roughly independent of ship size).

D. Liner Conferences

A third source of scale benefits lies in pro-competitive effects on pricing. Many trade routes are serviced by a small number of liner companies that have traditionally been organized in formal cartels called "liner conferences". But supposing that freight prices do include significant monopoly markups, it is possible that increasing trade quantities would lead to entry, and a pro-competitive effect on prices.

A related issue is whether these conferences restrain competition and lead to higher shipping prices. The policy debate centers on two questions: (1) do liner conferences exercise market power and (2) are they necessary for provision of transportation services. If the answers are yes, and no, this suggests an important role for regulatory policy at the international level. Unfortunately, the answers from the literature are not especially clear. While there is some evidence that conferences exert market power, the evidence is not very robust, and is subject to serious criticisms. There is also a very interesting argument to suggest that these conferences are necessary coordination devices, and without them, the provision of shipping services would be far less efficient. (A discussion of the relevant literature on this point is captured in an Appendix to this paper).

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[6] Once some minimum efficient scale has been reached, port costs rise rapidly as traffic rises because land around the port, and road/rail access to it, is in very limited supply. In contrast, the number, size, and technological sophistication of the vessels committed to a particular route depend on the volume of trade that moves along that route. If trans-Pacific trade is growing while trans-Atlantic trade is shrinking, ocean lines will simply divert vessels from the Atlantic to the Pacific. This prevents strong congestion effects in the long run. However, sudden surges in demand will result in sharply rising prices.

[7] See Hummels and Skiba [2003] and Skiba [2004] for examples of these estimates.

E. Unbalanced Demand

Even if the total cargo moved along a route remains constant, freight costs can be strongly affected by unbalanced demand. Liner vessels move in endless circles, carrying cargo from Asia to the United States and back again. When eastbound cargo holds are full and westbound holds are empty, the marginal cost to the shipper of adding westbound cargo is close to zero, while the marginal cost of adding eastbound cargo is extremely high. In essence, the eastbound cargo payments reflect both competition for scarce space and the cost of returning the nearly empty vessel westbound again.

Demand can become unbalanced as a result of bilateral trade deficits and surpluses. In 2001, the United States had a "cargo deficit" (imports exceeding exports) of 4.45 million containers and 17 million metric tons. Along the Pacific Coast alone, these deficits were 3.4 million containers and 10.5 million metric tons (Haveman and Hummels [2004]). The large and rising cargo deficit that the United States runs with Asia means that inbound cargo is becoming increasingly more expensive than outbound cargo.

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VI. TIME COSTS

To this point we have focused on the cost of shipping a good, measured either in quantity or value terms, taking as fixed the quality of the transportation service. However, there have been pronounced changes in the quality of international transport over the past 30 years, the most notable being transportation time. Ocean shipments from Central America and the Caribbean require, on average, 6.4 days to reach the US. Shipments from South America and China require, on average, 21 and 24 days, respectively. In contrast, air shipping requires only a day or less to most destinations.

How valuable is timeliness? Two recent empirical papers shed light on this point. Evans and Harrigan [2003] show that timeliness in the apparel industry has a pronounced effect on sourcing patterns, with a specific emphasis on the question of whether LAC's proximity to the US provides it with a sustainable or even growing comparative advantage relative to China. They use retail data on the "replenishment rate" for products, i.e. how often within a season retailers re-order from foreign suppliers. They show that clothing lines that have high restocking rates within a given buying season are much more likely to be sourced locally than those in which orders are taken once per season. That is, in those products with a very high replenishment rate, sourcing of apparel from LAC has grown much more rapidly than sourcing of apparel from China. In other words, the temporal proximity of LAC provides it with a comparative advantage relative to China that in those goods that require frequent re-orders.

Hummels [2001] estimates a demand for timeliness by examining the premium that shippers are willing to pay for speedy air shipping relative to slow ocean shipping. He shows two effects. First, for every day in ocean travel time that a country is distant from the importer the probability of sourcing manufactured goods from that country drops by 1%. Second, conditional on exporting manufactures, firms are willing to pay just under 1% of the value of the good per day to avoid travel delays associated with ocean shipping.

Why are these effects so large? The per day time cost of the good is a function of two factors. The first is the per day interest rate on the good in transit, otherwise known as pipeline inventory. The second factor is a "depreciation rate" for the good. The depreciation rate encompasses any reason that a newly produced good might be preferable to an older good.

Obvious examples include spoilage that is literal and predictable such as fresh produce or cut flowers. Depreciation may also reflect the immediate need for the good, and lost profitability/ utility from the good if it is not available. More generally, with long lags between production ordering and final sales, firms may face a mismatch between what consumers want and what the firm has available to sell. Consumers will pay a premium to purchase goods containing "ideal" characteristics, but firms may not be able to predict long in advance what constitutes the ideal. Firms that can wait longer to produce are better able to match the ideal characteristics and capture that premium. This can be accomplished either by producing locally, or by producing at a distance and air shipping.

Specific examples of goods with this property may be useful here. Toy manufactures generally do not know in advance which toys will emerge from among hundreds of competitors to capture the

hearts and minds of children during the holiday gift-giving season. The "ideal" types command price premia over the non-ideal types. As firms near the holidays, they receive market signals (product reviews, early sales) about the ideal type, and can adjust accordingly. As Evans and Harrigan [2003] demonstrate, apparel is another example where ideal characteristics are difficult to discern well in advance, and firms must produce (and ship) much closer to sales dates, or restock mid-season. Finally, personal computers exhibit extreme time sensitivity of this sort. Standardized packages do not appeal to many consumers who are willing to pay more for a customized computer that is manufactured to particular specifications (CPU speed, screen size, amount of RAM). So manufacturers simply do not build the computer until they know the precise ideal characteristics.

In addition to costs associated with lengthy shipping times, shippers may also be concerned with costs due to variability in arrival times. Arrival time variability is a potentially serious cost when production is fragmented across locations. The absence of key components can idle an entire assembly plant, which increases the optimal inventory on-hand necessary to accommodate arrival time variation. The costs of defects in component quality are also magnified, as sizable inventories (at the plant, in transit) may be built up before defects are detected. The defect problem motivates "just-in-time" inventory techniques, which aim to minimize both the inventory on-hand and in the pipeline. Studies of JIT indicate some plants hold only a few hours of component inventory. Clearly, the ability to implement a "just-in-time" strategy is limited when parts suppliers are a month of ocean transit time removed from the assembly plant.

A. Implication for Specialization Patterns in China and LAC

Harrigan and Evans dismiss the possibility that LAC’s temporary proximity could be overcome by air shipping. However, while China is 18 days further away than LAC by ocean liner, the difference for air shipping is a matter of hours. As the cost of air shipping declines relative to ocean shipping, this will tend to erode LAC’s competitive position. Under what circumstances is this likely to be important?

The answer to this question is complex, and varies considerably over different products, locations, and over time. But a few empirical regularities stand out, and these help us to understand why air shipping has become so much more important for trade.

- Air shipment is more likely to be used in commodities that evolve rapidly over time, such as computing equipment or high fashion clothing, or where costs of delay have broader consequences for production processes, as with intermediate components. As cycle times for production have declined, and international outsourcing increased, air shipments have risen.

- Air shipment is more likely to be used when time lags from ocean shipping are especially large, as with very distant shippers. If an ocean voyage will take only 2 days, time savings from air shipping are small. If the voyage takes 20 days, they become more substantial.

- Air shipment is more likely to be used when the price differential between the two modes is small. This occurs primarily in goods with very low weight-value ratios, like computer chips.

In this case, air shipping's higher marginal cost per kilogram matters much less. Goods with this characteristic have become far more important in trade overall.

- Air shipment is more likely to be used when ad-valorem freight costs are small, that is, the freight bill is a small fraction of the value of the good. Return to our example from above with Chilean wine. I want to import a $16 bottle of wine from Chile. Air shipping costs of $8 are twice ocean shipping costs of $4. Going from ocean to air increases the delivered cost by $4 or 25 percent. Now suppose my tastes improve and I want to import a $160 bottle of wine from Chile. The shipping costs are the same, but now $4 increment represents just a 2.5 percent increase in the delivered price. The consumer is much more likely to use the more expensive shipping option when the effect on delivered price is smaller. Again since consumers are only sensitive to changes in the delivered price, not to changes in the transportation price. If the cost of transportation substantially affects the delivered price, as in the first example, modal choice will be driven by cost considerations. But if the transportation price is but a small fraction of the delivered price, it will likely be trumped by other factors such as timeliness or reliability. The same lesson is true of all cost differentials related to transportation. When shippers are deciding which modes to use, or which ports to use, they look at cost differentials. But if these cost differentials have a minor effect on the delivered price, other factors will get greater weight.

To get an idea of how the use of air shipping varies across exporters, Table 11 reports the air share of export value (to the US), along with the ad-valorem freight charges and weight/value ratios for air and ocean shipping for each exporter. More directly, we can relate growth in air shipping (by exporter and commodity) to the relative price and relative weight of the shipments. From 1976-2002, the air share of shipping is (strongly) negatively related to the relative price of air shipping, and to the weight/value ratio being moved. (This is true in cross-section, in panel, and in panel exploring only variation within each exporter and commodity). After controlling for these effects, China actually has a lower air share of shipments than do LAC countries.

TABLE 11
AIR SHARE OF EXPORT VALUE (TO THE US)

		Vessel Shipments		Air Shipments	
	Air Share of Value	Ad-valorem freight charges	kg/$	Ad-valorem freight charges	kg/$
China	0.153	0.066	0.3340	0.078	0.025
South America	0.125	0.069	4.4860	0.082	0.077
Falkland Islands/Islas Malvinas	0.001	0.033	0.5070	0.092	0.014
Argentina	0.143	0.084	3.3310	0.045	0.039
Uruguay	0.461	0.056	0.5050	0.045	0.038
Paraguay	0.243	0.127	1.4320	0.113	0.079
Brazil	0.209	0.074	2.4730	0.035	0.030
Chile	0.158	0.136	2.2150	0.234	0.197
Bolivia	0.478	0.053	0.5660	0.029	0.022
Peru	0.261	0.060	2.1370	0.120	0.115

TABLE 11 (continued)

		Vessel Shipments		Air Shipments	
	Air Share of Value	**Ad-valorem freight charges**	**kg/$**	**Ad-valorem freight charges**	**kg/$**
Ecuador	0.091	0.105	4.1900	0.235	0.223
French Guiana	0.013	0.004	0.0480	0.038	0.006
Suriname	0.044	0.044	5.6340	0.195	0.257
Guyana	0.053	0.184	16.779	0.105	0.121
Venezuela	0.006	0.048	6.3770	0.043	0.049
Colombia	0.154	0.055	6.1120	0.108	0.128
Central America	0.127	0.052	2.2860	0.039	0.044
Martinique	0.496	0.150	1.7230	0.015	0.005
Guadeloupe	0.065	0.022	0.7830	0.018	0.024
Aruba	0.004	0.042	5.5920	0.014	0.010
Netherlands Antilles	0.078	0.072	7.0290	0.015	0.010
Trinidad & Tobago	0.023	0.094	6.9640	0.082	0.107
Barbados	0.557	0.061	1.5720	0.022	0.023
Grenada	0.656	0.030	0.2220	0.085	0.105
St. Vincent	0.112	0.014	0.5190	0.005	0.003
St. Lucia	0.756	0.060	0.0920	0.061	0.028
Dominica	0.459	0.195	15.408	0.030	0.017
Montserrat	0.305	0.031	0.2230	0.012	0.004
Antigua	0.284	0.086	27.168	0.046	0.032
St. Kitts-Nevis	0.962	0.090	4.2580	0.026	0.028
British Virgin Islands	0.342	0.043	3.0370	0.009	0.005
Anguilla	0.229	0.028	0.1660	0.010	0.005
Dominican Republic	0.149	0.025	0.2880	0.028	0.030
Haiti	0.107	0.026	0.1640	0.103	0.190
Cayman Islands	0.315	0.024	0.9710	0.012	0.012
Turks & Caicos Islands	0.140	0.036	0.1460	0.024	0.030
Jamaica	0.066	0.078	14.151	0.073	0.149
Cuba	0.286	0.028	0.7060	0.012	0.002
Bahamas	0.019	0.044	11.676	0.013	0.010
Bermuda	0.491	0.046	1.2390	0.011	0.005
Panama	0.296	0.057	1.4090	0.080	0.112
Costa Rica	0.320	0.081	1.0450	0.030	0.032
Nicaragua	0.135	0.040	0.2870	0.050	0.062
Honduras	0.057	0.040	0.3760	0.050	0.051
El Salvador	0.104	0.027	0.2400	0.037	0.040
Belize	0.007	0.075	1.4290	0.116	0.143
Guatemala	0.091	0.063	1.3510	0.070	0.064
Mexico	0.159	0.027	5.4720	0.024	0.017

B. The Policy Implications of Timeliness

If timeliness matters, is there anything policymakers can do about it? Three suggestions come to mind (though, these are offered very tentatively and with no direct consideration of the cost involved).

1. Build Airports.

2. Build Scale.

Shipping times are determined partly by the distance a ship must travel, and partly by the scale of operations. Because volumes moving between the US and any one country in South America or Central America are fairly small, ships do not move directly between the exporter and importer. Instead, a liner vessel may stop in a dozen ports in many different countries. This tends to lengthen shipping times, especially in South and Central American trade. Table 12 displays typical port-of-call itineraries for liner vessels between North and South America[8] Each route involves five or more countries, and multiple stops within each. Considering all exporting routes to the United States, the median number of countries visited by each ocean liner on a single route is ten. In contrast, because trade between China and the US is so large, shipments are much more direct, typically involving a small number of stops.

How does one build scale? The answer suggested by Hummels and Skiba is tariff liberalization. By reducing tariffs, one increases trade volumes, which leads to the scale benefits described in the preceding section in addition to increasing the frequency of shipping visits. More speculatively, it might be sensible to liberalize tariffs regionally. By reducing tariffs only with select regional partners, this raises regional trade both through trade creation and trade diversion. While the latter is generally thought to be unequivocally bad, it can be beneficial if it raises the scale of regional operations.

3. Speed up Customs Procedures

Apart from time in transit, shippers must also be concerned with customs clearance at points of departure and arrival. Speeding up customs clearance times is one of the key points of emphasis in the recent Asia-Pacific Economic Cooperation (APEC) trade negotiations on trade facilitation. There is some cost to achieving higher speed - it may involve infrastructure investments in more efficient shipping yards, or more simply by hiring more customs officials - but it is decidedly within the control of individual nations.

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[8] Vessel itineraries taken from *http://www.shipguide.com*.

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VII. DOES SIZE MATTER?

The concern in many quarters regarding China's expanding role in the world economy stems primarily from its size. In what way does size matter? The international economics literature has identified three distinct ways that size is potentially important. They are: size as a determining factor in which countries receive FDI; size of home market in determining comparative advantage; and finally, size and the nature of production differentiation. Each is considered in turn.

A. Size and Foreign Direct Investment (FDI)

One branch of the FDI literature emphasizes the idea that major exporters such as the US, Europe, Japan, and now Korea, and Taiwan, face a scale/proximity tradeoff in deciding whether to export or serve a market with FDI. The argument is that entering a market via FDI comes at a high fixed cost as firms invest in new plant and equipment, establish distribution networks, and pay learning and adaptation costs in the new market. The benefit of paying these high fixed costs is the ability to avoid marginal costs of serving the market via exporting (transportation costs, tariffs, exchange rate uncertainty, etc.). Given this tradeoff, firms will be more likely to use FDI to enter larger markets than when entering small markets. And they will be more likely to use FDI when costs of exporting are especially high. For both reasons theory would predict that China is a more likely host of FDI from Europe and the US than LAC.[9]

But from LAC's perspective, does this matter? Put another way, this literature asks whether exports or FDI are the best entry method into China, conditional on wanting to sell in China in the first place. This is very different from FDI for the purpose of production and export back to the source country. Export-oriented FDI (or more broadly, outsourcing) does potentially involve direct competition between China and LAC as western firms ask in which region goods can be produced better and more cheaply. But the size of the Chinese market provides no particular advantage to these firms because the ultimate customers are not in China but rather in the US, Europe or Japan. All that matters are factor prices and productivity, neither of which are obviously connected to market size.[10]

For FDI targeted at sales inside China to affect LAC, it seems that two things must occur. First, suppose that FDI resources are scarce, that is, multinational firms have limited resources of capital or managerial attention. As a result, these firms choose to enter one market at a time via FDI, and choose China over LAC because of its size and proximity characteristics. Thus, even if China and LAC markets are independent of one another from the perspective of sales, they become linked because of shortages on the input side for multinational firms.

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9 For a clear theoretical and empirical exposition of these points, see Brainard [1997].

10 One could argue that a defining feature of the Chinese labor market is the sheer number of workers willing to supply labor into the export sector at the market wage, a kind of reserve army of the under-employed. In other words, China's size may be attractive to export-oriented firms because it implies that China can absorb tremendous increases in investment and exports without driving up marginal costs. However, this notion is belied by the rapid rise in wages and land prices within coastal regions in China in the past decade. Even with 1 billion plus people, supply curves still appear to slope upward.

Second, a recent literature emphasizes the technology spillover effects of FDI (cites) Regions that receive FDI tend to experience faster economic growth. There is some question about the exact channel through which the spillover takes place (connections between up and down-stream firms that facilitate learning about production, the development of managerial expertise, awareness of or even direct theft of intellectual property, and learning about foreign markets and how to access them have all been suggested). Supposing these spillovers exist, higher rates of FDI in China could then potentially lead to a more rapid rate of technological growth than in LAC. But its not clear that this matters to LAC unless we imagine them in competition for strategic, rent-generating industries.

B. Home Market Effects

The "new" (now 25 year old) trade literature has an important implication for market size. When cost curves slope up, as in neoclassical models, higher domestic demand pushes prices up, making a country less competitive on world markets. However, if average cost curves slope down, as they might with scale or learning economies, large domestic demand pushes prices down. This makes countries more competitive on world markets. This logic would seem to imply a dominant market position for all of China's firms, so a quick look at theory is helpful.

The implications for home market effects appear clearest in monopolistic or oligopolistic market structures, that is, when entry barriers related to innovation or perhaps product standards are substantial. But these models don't tell us what happens in general equilibrium, which turns out to be key to understanding how these effects might work in China. This requires models with scale economies plus free entry (i.e. monopolistic competition models) in which home market effects can lead to a growing market share. For example, Krugman supposes Home and Foreign are identical in all respects except the share of expenditures they devote to two goods produced under increasing returns to scale in a monopolistically competitive market structure. Home spends $a>1/2$ of its income on good 1 (and $1-a$ on good 2), while Foreign does the reverse. Krugman shows that in equilibrium Home will produce a share of world demand for the product greater than "a"; that is, production responds more than proportionally to idiosyncratic demand, and Home becomes a net exporter.

What if a country commands a large share of world demand for all goods, as China must given its size? Weder [1995] shows that what matters for home market effects is not the absolute size of demand, but rather relative demand. That is, the fact that China buys more than other countries of every good does not necessarily lead to production expansion in all goods. It is only those goods in which demand is especially large (relative to rest to other demands within China) in which production will expand.[11] Finally, Davis shows that all these home market effects turn on rather strong assumptions (in particular, the existence of a costlessly traded numeraire sector) and so it is not clear empirically how seriously one should take these predictions.

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[11] The logic is simple. Having more demand in a sector draws resources into that sector on the supply side. But if resources are fixed, it is not possible to simultaneously expand production in all sectors. It is only those sectors with relatively strong demand that command greater resources in production

Since the theory is somewhat ambiguous, it is useful to turn to empirical work. Davis and Weinstein [1999 and 2003] find that industry production increases more than one-for-one with local demand for a good.[12] Hanson and Xiang [2002] show theoretically, and then demonstrate empirically, the conditions under which home market effects should exist. They show that industries with high transport costs and low substitution elasticities (i.e., more product differentiation) tend to concentrate in the larger country and industries with low transport costs and high substitution elasticities (i.e., less product differentiation) tend to concentrate in the smaller country.

What do these results imply for the nature of China's export expansion? First, given China's size it will be a large exporter of many products. Second, its exports will be relatively concentrated in high transport cost, highly differentiated activities. In contrast, the small countries of LAC would be expected to specialize in the opposite manner: in industries with low transport costs and low degrees of product differentiation. Of course, the evidence supporting these theories should be thought of as an ex-post statistical relationship in which the authors have taken care to hold all else constant. Whether the theory will apply precisely to China and LAC looking forward, or whether other factors will trump these predictions, is not known.

C. Growth and Terms of Trade under Product Differentiation

In order to directly evaluate the impact of China's growing trade on LAC, we need to examine *how* China's trade is growing. Put another way, the normative and positive implications for LAC depend on exactly why countries are trading, and the channels through which growing countries expand. Since the answers differ depending on the model of trade one has in mind, this section employs a framework that is particularly well-suited to decomposing the channels of trade growth.

A useful tool for analysis is provided in Hummels and Klenow [2002]. They note that large countries trade more than small countries, both in the cross-section and in time-series. This is not surprising, and would be predicted by nearly any model of trade. Where trade models differ is in precisely how large and small differ. When a country accumulates more resources (or in China's case, that country brings resources out of autarky and into trade) it can do essentially three things with those resources: produce more of the same set of goods (the intensive margin); produce a larger set of goods (the extensive margin); or improve the quality of its set of goods (quality margin).

The implications of the three channels can be quite different. If expansion is along the intensive margin (as assumed by models of Armington national product differentiation), as countries grow, they just produce a higher quantity of the same varieties. As a consequence, growth implies strong terms of trade declines as the country works its way down a single demand curve in each product. If expansion is along the extensive margin (as assumed by Krugman style models of monopolistic competition), countries expand the set of varieties and avoid terms of trade declines. Essentially exporters carve out new markets to avoid competing with themselves.

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[12] The two papers use two distinct datasets. One employs regional data from Japan, the other nationwide data for the OECD as a whole. Head and Ries [2001] find evidence of similar patterns of industry production and consumption in Canada and the United States. Hanson and Xiang [2002] note that these estimates are inconsistent and misleading if industry demand and supply shocks are correlated. Another approach, useful only on highly aggregated data, is to examine whether the income elasticity of exports is higher for differentiated than commodity goods.

Cross-sectional evidence suggests the world is somewhere in between Armington and Krugman. Large countries produce more varieties than small countries, but variety grows at a rate less than proportional to output growth. This should mean each firm is working its way down the demand curve and lowering product prices, but we don't see those price effects empirically. This suggests that some of those resources are used up via quality differentiation. Rather than producing more stuff, growing countries produce better stuff.

What are the implications for China v. LAC? In short, the kind of competitive pressures that LAC will feel from China depend on the nature of China's export expansion. Were China to simply expand exports along the intensive margin we expect substantial terms of trade declines for China, and for any country in the same set of products. The spillover effect onto other exporters depends on how substitutable the goods are within each category. For example, raw industrial supplies might be much more substitutable than industrial machinery. (The degree of substitutability could be estimated using the US and World Integrated Trade Solution (WITS) data described above, along with a substantial investment of time).

We have seen in Table 3 that China's export expansion also involves an extensive margin expansion in product categories. Expanding product coverage alleviates some of the downward pressure on the terms of trade for China (and its product market competitors). That is not all good news for LAC, however. While extensive margin expansion prevents a collapse in the terms of trade for common products, it also means that more and more products are now in competition with China. The final possibility is that China will run out of new product categories and new markets in which to expand, and be forced to use resources to upgrade quality. Without a clear idea of where China sits relative to LAC in product space it is difficult to assess what these means for LAC. It could be that LAC now has much higher quality and China's continued growth will mean a convergence in quality. Or they could be similar now and China's continued growth will push it past LAC to the point where they are producing fundamentally different (and better products).

The net effect of this is very hard to evaluate without detailed study. We believe an adaptation of the Hummels, Klenow methodology joined to WITS trade data that includes information on product coverage, quantities and prices would be helpful.

A brief aside on neoclassical models

Neoclassical models of trade in homogeneous goods incorporate growth through one of two channels. Suppose growth occurs in a factor-neutral manner (i.e. growth adds to the supplies of capital and labor in a way that preserves the pre-growth K/L ratio). This is identical to the intensive margin discussed above, with the exception of how directly Chinese growth affects LAC's terms of trade. If goods are homogeneous (perfect substitutes) Chinese expansion has a very strong direct effect on LAC. Suppose instead that growth is not factor neutral (i.e. the K/L ratio rises), then China would switch specialization toward more capital-intensive products over time. The effect on LAC would depend on whether China was entering or leaving LAC's specialization set ("cone of diversification" in the trade lingo). The relevance of this model to the China and LAC seems limited for two reasons: one, a priori disbelief that goods from China and LAC are perfect substitutes; two, the data we provide above shows that China is expanding its set of traded goods, not merely shedding one set in favor of another. For both reasons differentiated products models seem better suited for the analysis.

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APPENDIX: THE LITERATURE ON COLLUSION IN SHIPPING - LINER CONFERENCES

Do Conferences Affect Prices?

1. Why Might We Expect it

The shipping industry is characterized by extremely high fixed costs and nearly constant average variable costs. In order to recover fixed costs, a profitable provision of transportation services must rely on pricing above marginal costs. This need to prevent competitive forces from driving the prices below the long run average total costs is used to justify the existence of liner conferences. However, liner conferences are criticized for their alleged practices of price discrimination and anticompetitive behavior. Therefore, the policy debate centers on two questions: (a) do liner conferences exercise market power and (b) are they necessary for provision of transportation services.

2. Evidence of Conference Market Power

- (a) Market Power and Freight Rates -

One strand of empirical literature looked for correlation between monopoly power and freight rates. Clyde and Rietzes [1995] fail to connect higher freight rates with the share of the conference shipments on a given route. They, however, find some evidence that a measure of industry concentration affects freight rates for very high-valued goods.

Using a more indirect approach Fink *et al.* [2002] conclude that "restrictive trade policies and private anticompetitive practices" contribute to higher transportation costs in some countries.

- (b) Price Discrimination -

Another strand of literature explores the relation of freight rates to the cost and demand characteristics of the shipment. The degree of market power is determined by the extent to which the freight rates are affected by the demand characteristics of a shipment. The most prominent among the demand variables is value of the shipped commodity, which is supposed to serve as a proxy for the elasticity of demand for shipping services. The overwhelming evidence reports positive correlation between the value of the shipped commodities and the freight rates. See Sjostrom [1992] for an excellent literature review. Sjostrom [1992] also points to a major flaw in such an approach. He suggests that the value of the shipping goods is not a good proxy for the elasticity of demand because it likely affects both the cost of and the demand for shipping. In line with Sjostrom's critique a careful study by Zerby and Conlon [1983] makes a serious attempt to control for different cost and demand characteristics in hedonic freight regression. Their results do not support the ability of shipping lines to exercises monopoly power.

- (c) Miscellaneous Evidence -

Fung *et al*. [2003] provide some evidence of price discrimination by conferences. They argue that all-in-one freight rates can be hard to enforce. Therefore, separation of the rates into an easily observable terminal portion and a port-to-port portion allows conferences to exercise monopoly power over the terminal part of the shipping cost. They find that after the shipping charges were split into two parts, Hong Kong terminal handling charges increased dramatically leading to a hike in overall shipping charges despite a decrease in port-to-port portion of the freight rates.

Martian and Sicotte [2003] looked at the relation between stock value of shipping companies and events in the legal battle for legalization of exclusive contracts practiced by liner conferences. These events caused changes in the market value of the shippers stock reflecting the probability of receiving higher profits due to restricting competition.

3. What can Explain Seeming Lack of Evidence?

- (a) Theory of Contestability -

A literature on the liner conferences suggests that liner conferences can fail to exercise monopoly power if the markets are contestable. Well-cited references in this literature are Frank, Bunel [1991] and Davies [1986a], which is based on more extensive discussion presented in Davies [1986b]. Davies argues that the *a priori* assumptions of a contestable industry are satisfied. Empirically, he interprets frequent entry and exit as evidence of contestability. Jankowski [1989] challenges this view by pointing out that it is the threat of entry, not the entry itself that drives frequent entry and exit. Frank and Bunel [1991] also note that presence of large non-conference competitors largely diminishes the ability of conferences to price discriminate.

- (b) Monopoly and Empty Core Theory-

The premise of the empty core argument is the observation that the liner shipping conferences are too stable and too long-lasting to be regular cartels. As an alternative explanation, the literature on empty core suggests that conferences may form to avoid the problem of empty core rather than to exercise monopoly power. This literature suggests that "cartelization may be an efficient response to the cost and demand conditions that preclude the existence of a competitive equilibrium" (Pirrong [1992]). In industries with avoidable fixed costs there could be a situation when the entrant will find it profitable to enter by undercutting the incumbent firm(s) with monopoly power. But once the entrant enters all firms cannot profitable coexist and some of them are forced to exit. Sjostrom [1989] finds that empirical evidence from shipping industry is consistent with the empty core theory and much less so with the theory of cartels.

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