BULLETIN

FACILITATION OF TRADE AND TRANSPORT IN LATIN AMERICA AND THE CARIBBEAN

FAL

UNITED NATIONS

CEPAL
ECLAC

www.eclac.cl

THE COST OF INTERNATIONAL TRANSPORT, AND INTEGRATION AND COMPETITIVENESS IN LATIN AMERICA AND THE CARIBBEAN

1) International Trade and Transport Profiles of Latin American Countries, by Jan Hoffmann, Gabriel Pérez, and Gordon Wilmsmeier, ECLAC, Serie 19 Manuales www.eclac.cl/transporte/perfil/bti.asp;

2) Globalization – the Maritime Nexus, by Jan Hoffmann and Shashi Kumar, in *Handbook of Maritime Economics*, London, LLP, due to be published in October 2002; and

3) Port Efficiency and International Trade, by Ricardo J. Sánchez, Jan Hoffmann, Alejandro Micco, Georgina Pizzolitto, Martín Sgut, and Gordon Wilmsmeier, to be submitted at the "IAME Panama 2002" Conference, November 2002.

For further information, please contact Mr Jan Hoffmann, maritime transport and ports specialist with the Transport Unit, Natural Resources and Infrastructure Division, ECLAC, JHoffmann@ECLAC.cl.

Improvements in international transport services are one of the main features of economic globalization. Together with progress in telematics, standardization and trade liberalization, faster, more reliable and cheaper transport services are contributing to the integration of production processes at the global level. This article seeks to examine the causal links between trade and the cost of international transport services.

The impact of the cost of transport on foreign trade and economic development

International freight has an impact on trade equivalent to customs tariffs or the exchange rate: a reduction in the cost of transport directly stimulates exports and imports, just as an increase in the exchange rate (the rate at which the national currency may be exchanged against another) makes

exports more competitive, and a reduction in national customs tariffs lowers the cost of imports. Spurred by trade liberalization, customs tariffs have dropped to levels where in many cases any additional reduction would now no longer have a significant impact. It is perhaps for that reason that new and interesting studies have been produced in recent years analysing the impact of transport costs on trade patterns and globalized production.

The impact on trade: the price of the vast majority of traded goods is exogenous for developing countries. If the shipping of imports becomes more expensive, higher inflation ensues as a result of the increased cost of imported goods; in the case of intermediate and capital goods, this also increases the costs of local production. If exports become dearer to ship, the result is a drop in earnings for the exporting country or simply the loss of a market, depending on the elasticity of demand and the availability of substitutes. Econometric estimates suggest that the doubling of an individual country's transport costs leads to a drop in its trade of 80% or even more (N. Limao and A. J. Venables, *Infrastructure, Geographical Disadvantage, and Transport Costs*, World Bank Economic Review 15, 2001. David Hummels, *Toward a Geography of Trade Costs*, University of Chicago, 1999).

The impact on economic growth: empirical studies have concluded that greater transport costs lead to lower levels of foreign investment, a lower savings ratio, reduced exports of services, reduced access to technology and knowledge, and a decline in employment. It is estimated that a doubling of transport costs leads to a drop in the rate of economic growth of more than half a percentage point (S. Radelet and J. Sachs, "Shipping Costs, Manufactured Exports, and Economic Growth", Harvard, 1998). This impact may appear low, but it should be noted that lower growth over the long term results in sizeable variation in per capita income. Geographical variables related to transport costs may account for 70% of the statistical variation in per capita income between countries (S. Redding and A. J. Venables, *Economic Geography and International Inequality*, London, 2001).

The impact of transport costs is increasing

On average, 7.94% of the value of merchandise imported by the countries of Latin America and the Caribbean is spent on freight and insurance costs relating to their international carriage; this figure is almost 50% more than the world average. Major differences persist within the region, with the Caribbean economies recording the highest indices.

Table 1: Freight and insurance costs as a percentage of imports (c.i.f.)

(all modes of transport)

	1980	1990	1999
Latin America and the Caribbean	8.85	8.17	7.94
World	6.64	5.22	5.39
Developing Countries	10.44	8.6	8.21

Source: UNCTAD, *Review of Maritime Transport*, Geneva, 2001

Growing relative importance: Compared to tariffs, transport costs have been increasing in relative importance for export competitiveness. For example, on average, exports from Latin America and the Caribbean to the United States attract customs duties of 1.86%, compared to the 4.45% share of their value accounted for by international transport costs. (A. Micco and N. Pérez, *Maritime Transport Costs and Port Efficiency*, IDB, Washington, 2001; data from 1999).

Increasing component of GDP: The freight and insurance costs of international transport are also

tending to increase as a percentage of Gross Domestic Product (GDP). The reason for this is that, both globally and in Latin America and the Caribbean, trade is growing at a faster pace than GDP. In the 1990s, the rate of growth of world exports was more than double that of GDP, and was triple in Latin America and the Caribbean (ECLAC, Globalization and development, April 2002). Therefore, though transport costs have fallen as a percentage of the value of trade, trade itself has expanded, and with it international freight's share of GDP.

Increasing component of the cost of logistics: spending on transport is also increasing because improved quality of service is sought, especially greater dependability and "just in time" delivery. As a result, the inventory component within the overall cost of logistics declines, while the transport component rises. In the case of the United States, for instance, it is estimated that during the 1990s spending on transport rose from 9.5% to 10% of GDP, while spending on inventories slipped from 4.3% to 3.5% (M. Gorman, http://www.ascet.com/documents.asp?d_ID=995; includes domestic transport).

Increasing importance in the value of traded goods: lastly, even as a percentage of the value of imported goods, the incidence of the cost of international transport is increasing in many cases. Whereas in the past exports consisted primarily of raw materials and manufactured goods, today trade is increasingly in intermediate goods. For example, the import price of a Mexican-made car imported into Peru includes not only the cost of transporting the vehicle from Veracruz, Mexico, to Callao, Peru, but also the transport cost of importing a number of inputs sourced from a wide range of countries that supply Mexico.

Transport costs: causes and effects

Analysis and reduction of transport costs is a quite complex issue. Demand for transport services is dependent on trade, which is itself influenced by a number of variables that also have an impact on the cost of transport.

Supply versus demand: The cost of transport is essentially the price of a service, and is determined by the supply and demand for that service. In the above-mentioned studies of the impact of transport costs on trade, the cost of transport is always included as an exogenous variable; in other words, the causal relationship is considered as operating in one direction - from transport onto trade. However, an expanding volume of trade reduces the unit costs of transport, allowing for greater differentiation between different services in terms of speed, frequency, reliability and security.

Quality versus cost: As with goods, the production of transport services is also subject to the impact of technological advances. With the use of new information and communication technologies, improvements in infrastructure, and by taking advantage of the growing rate of containerization, today the same freight and insurance per tonne of cargo can buy a quicker, more reliable service with less variation in delivery time than a decade ago. In addition, it is worth noting that greater commercial demands as regards speed have at the same time given rise to an increase in the share of air transport as compared to maritime transport, and may entail an increase in the average cost of transport.

Direct impacts versus indirect impacts: the distance separating countries impacts on trade between them in different ways. The main models used to explain international trade flows can be described as "gravitational": countries trade with one another depending on their patterns of production, income, and whether they belong to economic blocs, with the distance between them also having some bearing. That gives an advantage to countries located in the "centre of gravity", and hence the name of the model. There is an assumption of a close link between distance and transport costs, which would explain why countries closer to one another trade more than with countries further away. In practice, distance may also have a bearing on other characteristics of countries, which leads them to trade more. For instance, countries located nearer to one another tend to have more similar histories, cultures and languages. Lastly, geographical closeness provides scope for alternative modes of transport to sea and air, thereby boosting competition and reducing prices for services. In other words, shorter distances entail lower costs and more trade. Increased trade in turn makes for economies of scale, leading to even further reductions in transport costs. In the case of intra-Latin American sea-borne trade, a partial correlation coefficient of -0.463 is estimated between distance and the volume of bilateral trade, with a coefficient of +0.178 between distance and the cost of transport per tonne.

Choice of the mode of transport

The fact that the average cost of freight and insurance rose worldwide in the 1990s (see Table 1) should not be interpreted as a worsening of the international transport system, but rather as a reflection of greater use of air transport and improvements in other transport services.

Table 2: Foreign trade of seven Latin American countries, 2000

Total volume of trade: thousands of metric tonnes				
	Sea	Air	Land and other	% sea	% air
Argentina	93,957	682	20,111	81.9%	0.6%
Brazil	324,991	694	12,138	96.2%	0.2%
Chile	88,924	514	9,690	89.7%	0.5%
Colombia	76,028	431	2,985	95.7%	0.5%
Mexico	198,857	1,031	885,890	18.3%	0.1%
Peru	25,376	153	699	96.8%	0.6%
Uruguay	6,121	20	2,330	72.2%	0.2%
Total value of trade: millions USD				
	Sea	Air	Land and other	% sea	% air
Argentina	30,803	6,610	12,847	61.3%	13.2%
Brazil	77,131	20,737	13,279	69.4%	18.7%
Chile	25,121	4,060	4,407	74.8%	12.1%
Colombia	16,320	5,004	2,573	68.3%	20.9%
Mexico	53,293	27,744	259,642	15.6%	8.1%
Peru	10,567	2,731	409	77.1%	19.9%
Uruguay	2,980	636	1,954	53.5%	11.4%
Value of cargo: USD per tonne			
	Sea	Air	Land and other	

Latin America's foreign trade: In terms of volume (tonnes), trade using air transport accounts for barely 0.1-0.6% of the foreign trade conducted by the countries of Latin America; in terms of value (USD), however, this mode represents anywhere between 8 and 21% (Table 2). The table also indicates that sea-borne and air transport are used particularly in foreign trade conducted by Argentina, Brazil, Chile, Colombia and Peru, while in Mexico (significant trade with the United States) and Uruguay (significant trade with Brazil and Argentina), the overland mode plays a relatively greater role.

Air transport's share is higher in long-distance trade; accordingly, although total trade decreases with distance, there is virtually zero correlation (-0.001) between distance and the volume of trade using air links

Argentina	328	9,687	639
Brazil	237	29,869	1,094
Chile	283	7,891	455
Colombia	215	11,608	862
México	268	26,889	293
Peru	416	17,837	586
Uruguay	487	30,343	839

Source: ECLAC, Maritime Profile, www.eclac.cl/transporte/perfil

(estimate for intra-Latin American trade).

Transport costs of intra-Latin American trade

Table 3: Intra-Latin American transport costs as a percentage of the value of imports, c.i.f., 2000

Origin:

Destination:	Argentina	Brazil	Chile	Colombia	Ecuador	Mexico	Paraguay	Peru	Uruguay	Venezuela	Average
Argentina		4.3	13.2	6.3	20.9	7.7	10.3	6.9	3.8	8.4	9.1
Brazil	4.1		5.9	6.0	7.5	6.2	4.1	5.6	9.0	9.2	6.4
Chile	10.2	7.9		6.0	15.8	6.9	8.7	6.7	9.4	9.9	9.1
Colombia	10.7	6.5	8.4		4.5	6.0	11.9	4.7	8.6	6.2	7.5
Ecuador	11.6	7.1	7.5	4.8		7.9	25.4	5.9	9.6	7.6	9.7
Mexico	5.4	5.7	6.9	4.7	9.6		5.2	8.6	7.0	7.6	6.7
Paraguay	6.3	14.0	10.5	6.5	7.6	10.2		15.6	3.4	9.2	9.3
Peru	13.2	8.2	5.6	5.6	3.9	6.3	11.0		9.4	8.1	7.9
Uruguay	4.9	7.3	38.8	5.2	31.3	13.1	2.1	7.8		7.5	13.1
Average (non-weighted)	8.3	7.6	12.1	5.6	12.6	8.0	9.8	7.7	7.5	8.2	

Source: ECLAC, based on data extracted from the International Transport Database (BTI) www.eclac.cl/transporte/perfil/bti.asp. Excludes oil and coal.

For the 10 countries included in Table 3, Chilean exports to Uruguay have the highest transport costs as a percentage of the value of trade, followed by Ecuador's exports to Uruguay and Paraguay's to Ecuador. On average, the country with the highest transport costs for its imports from other Latin American countries is Ecuador, followed by Chile. Trade between Paraguay and Uruguay has the cheapest transport costs, followed by that between Argentina and Uruguay, and Argentina and Brazil

(Table 3). It is not possible, using these figures, to reach hasty conclusions about the efficiency of the respective transport services, nor to conclude that transport in one country is more "expensive" than in another. It should be noted that these figures are averages that cover all modes of transport and many different types of goods. Some initial conclusions –confirmed by more detailed analysis– point to low density of regular shipping services (liner services), together with the natural barrier of the Andes, as part of the reason why transport between countries on the west and east coasts of South America tends to more expensive than transport along the same coast.

What factors determine transport costs?

An analysis of multiple variables: Using statistics available from the International Transport Database (BTI) maintained by ECLAC, an analysis has been conducted of the freight and insurance components of imports transported by sea and air originating from 15 exporting countries in Latin America and destined for a subgroup of 8 importing countries (Table 4).

Table 4: Regressions concerning the transport costs of intra-Latin American trade

(Freight and insurance per tonne, 2000)

Mode of transport:	Regression 1	Regression 2	Regression 3	Regression 4
	Seaborne (only potentially containerizable cargo)			Air
Adjusted R^2 (No. of observations)	0.566 (70492)	0.562 (70492)	0.561 (71656)	0.422 (77366)
Variable (logarithm)	estimated parameter (t value)			
Constant	.997 (20.9)	.956 (16.5)	.755 (14.9)	3.537 (76.6)
Value per tonne of merchandise (USD) of the transaction	.358 (163.8)	.355 (161.2)	.357 (162.3)	.256 (139.9)
Volume of the transaction (kg)	-.122 (-114.2)	-.123 (-115.0)	-.123 (-115.7)	-.163 (-123.8)
Maritime distance (km) between main ports; direct distance by air between capitals for Regression 4	.221 (46.6)	.282 (68.7)	.267 (66.9)	.245 (52.9)
Liner services per month	-.096 (-28.4)			
Total volume of bilateral trade per annum of the same mode of transport (kg)		-.025 (-13.2)	-.025 (-13.3)	-.039 (-23.7)
There exists (1) or there doesn't exist (0) a paved overland link	-.088 (-12.6)	-.159 (-24.8)	-.131 (-21.2)	-.282 (-32.4)
Progress toward port privatization in country of origin (between 1-10)	-.159 (-14.3)	-.200 (-18.1)		
Bilateral trade balance of the same mode of transport (exports/imports)	-.027 (-17.5)	-.030 (-19.2)	-.039 (-27.6)	-.034 (-17.2)
Maximum speed of	.084 (16.3)	0.015 (3.1)		

**regular services
(km/day)**
Note: Analysis relates to individual trade transactions, at the five-digit level of SITC, between countries. All estimated parameters are significant to 95%. See text for further information on variables.

- As is to be expected, the greater the value of the merchandise (USD per tonne), the greater the cost of transporting it. There is a need for greater insurance cover, and the shippers is prepared to pay more for better packaging or speed of delivery. In the case of shipping, a 1% increase in the value of merchandise entails an increase in the cost of transport of around 0.358% (estimated elasticity in Regression 1).

- Economies of scale reduce the transport cost per tonne. Shipping in one individual transaction 10,000 tonnes instead of 100 tonnes reduces transport costs per tonne by 43% (calculation: estimated elasticity is -0.123. 10,000 tonnes are 10,000% if 100 tonnes ar\e 100%; the difference in the transport cost is $1-((10\,000/100)^{(-0.123)})$).

- Distance, obviously, entails an increase in cost. Doubling the distance results in an increase in cost of 16.5% (example Regression 1).

- Having a larger number of liner services between two countries is closely linked to the total volume of bilateral trade. Economies of scale come into play, and as well (all things being equal) there are more options for the user. Having 20 instead of five services per month, for instance, results in a drop in freight and insurance costs of 12% (Source for liner services: www.ci-online.co.uk. Direct services are included, as well as transhipment where this is offered by the shipping line).

- The total annual volume of bilateral trade (sea-borne and potentially containerizable) also has a bearing on economies of scale and, as a result, reduced transport costs. If, for instance, the volume of trade increases from one million to 10 million tonnes, the saving on international transport costs (per tonne) is approximately 6%.

- Where sea-borne transport faces competition from the overland option, average costs also show a tendency to decrease. The likely reason is heightened competition; in addition, it is more likely that the overland option will be favoured in the case of products that require speedier carriage and which would normally be sent by less expensive ocean freight. It is estimated that having available an overland transport link leads to a reduction in ocean freight rates per tonne of between around 8.8-15.9%.

- The information analysed looks at countries as a whole, but most containerized cargo is usually handled in one of the main state-owned ports. As would be expected, an expanded role for the

private sector in these ports also translates into savings in transport. This is because port tariffs may drop, but more importantly there is generally a drop in the cost for the ship operator due to faster delivery, better security and more certainty that the itinerary will be adhered to. Experts have estimated that the transport cost associated with El Salvador's exports would be 25% less had that country made as much progress as Panama in privatizing ports (see www.eclac.cl/transporte/perfil/Latinamericanports.pdf for information on progress noted toward private-sector participation in 16 Latin American countries).

- Trade imbalances also influence the cost of transport. By way of example, if the volume of sea-borne exports of containerizable cargo to a given country is twice that of imports from that same country, it is estimated that the transport cost related to importing is around 19% less (Regression 2).

- The speed of the fastest existing regular service was used as an indicator of service quality (km/day of travel, calculated using km of maritime distance according to "Fairplay Ports Guide", divided by the minimum number of days of travel as per www.ci-online.co.uk). Higher speed, and perhaps also a limited number of ports of call between origin and destination, are associated with slightly greater costs.

- In the case of air transport (Regression 4), the same main criteria are applied as in maritime transport, though with different elasticities. Using a far greater constant as a starting point, the impact of the value of merchandise on the transport cost is somewhat lower, and economies of scale and the impact of competition from overland transport are greater, while the effect of distance and imbalances seems to be similar to that seen in sea-borne transport.

Conclusions

Firstly, it can be concluded that the cost and quality of transport services is of increasing importance for the competitiveness, development and economic integration of Latin America and the Caribbean. Analysis of the connection between geographical location, volumes of trade, and transport services points to the growing impact of gravitational forces in line with the trade models described above. In this way, economies of scale in transport foster the trend toward concentration , and it is likely that trade within economic blocs will continue to expand at a faster rate than trade between blocs.

Secondly, it is worth noting that simple differences in average transport costs should not be used to draw hasty conclusions about the efficiency of the system. Having said that, there are areas where governments can contribute to reducing costs and improving the transport system. In order to gain maximum advantage from economies of scale, for example, it would be necessary to allow intermodal transport services to operate at the national, regional and international levels, this being currently prohibited in the case of coastal shipping (see FAL Bulletin No. 183, November 2001). There is also a need for regional cooperation and specialization and integration of port operations, for example by promoting the use of foreign ports through investments in overland infrastructure and simplification of customs procedures. There is evidence that promoting competition and providing incentives for it reduces transport costs; in addition, private-sector involvement in port investments and operations has a significant downward impact on transport costs.

Together, these two findings mean that the governments of Latin America and the Caribbean have an opportunity to implement reforms in the transport sector with a direct and more or less well immediate impact on future prospects for the region's development and integration. Major headway has already been made in liberalizing trade and reducing tariffs; the transport sector is now shaping up as a major area for initiatives by governments and organizations in Latin America and the Caribbean that wish to promote integration and competitiveness in the region.