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*Logistics, Transport and Food Prices in LAC:
Policy Guidance for Improving
Efficiency and Reducing Costs*

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POLICY DISCUSSION PAPER

*Logistics, Transport and Food Prices in
LAC: Policy Guidance for Improving
Efficiency and Reducing Costs*

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Abbreviations and Acronyms

BTI	International Trade Database
CARICOM	Caribbean Community
CIF	Cost, Insurance and Freight
ECLAC	Economic Commission for Latin America and the Caribbean
FAS	Free Alongside
FOB	Free on Board
GDP	Gross Domestic Product
LAC	Latin America and the Caribbean
LPI	Logistics Perceptions Index
OECD	Organization of Economic Cooperation and Development
OECS	Organization of Eastern Caribbean States
TEU	Twenty-foot Equivalent Unit
UN	United Nations
WDI	World Development Indicators

Definition of Terms

Logistics: For the purposes of this paper, the term “Logistics” refers to the infrastructure, services and procedures required to physically move a product from place of origin to destination.

Food Cargo Types: In the analysis of the impact of transport and logistics costs, the types of shipment that are required for each type of food cargo are defining characteristics of the sector. The primary types of cargo transport types are:

- **Bulk grains:** wheat, rice, maize, oats, soy, sorghum. These products are shipped in bulk carriers and trucks. Liquid foods such as edible oils, frozen concentrated orange juice and wine are shipped in specialized liquid bulk carriers.
- **Containerized foods:** processed foods, coffee, cacao, sugar. These products are shipped in general cargo or specialized container (cellular) ships as well as by truck or rail. Products may be stripped at port and distributed by smaller vehicles
- **Perishable foods and produce:** meat, fish, dairy, fresh fruits and vegetables. These products are shipped by refrigerated or “reefer” container in container ships, truck and rail chassis which need energy supply to keep units refrigerated.

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Introduction

This introductory section explains the rationale for the Guidance Note, reflecting on the relevance of food prices in Latin America and the Caribbean (LAC), their impact on the poor and the effect that logistics and transport costs have on those prices. Based upon that framework, the note provides an overview of the logistics and transport hurdles faced by importers and consumers in the region as food products move through the logistics chain. The final section of the report provides some policy guidance that could improve the efficiency of logistics systems in LAC and reduce the price of delivered foods.

1.1 Summary of Findings

Despite its image as a self-sustaining region in agricultural production, about one-third of the population of LAC lives in net food importing countries, and most of the region's net food exporting countries import a large and growing segment of their food as well. This trend is driven by trade liberalization, greater concentration in production, the “supermarketization” of food retail, and the globalization of consumption habits. The more food products travel, change modes of transportation and cross borders, the higher the impact of logistics costs on the final price of food. An analysis of the breakdown in food types suggests that, for net importers of food, refrigerated cargo capacity and services are the critical bottlenecks. For imports going to LAC countries that are net exporters of food, bulk storage, handling and transporting are the primary concerns.

Transport and logistics costs make up a large part of the delivered cost of food products in LAC. The international maritime and road haulage components alone can total about 20 percent of the FOB value of goods if combined, while national average logistics costs represent a share of product value of between 18 and 32 percent, compared with OECD benchmarks of around 9 percent.¹ On a macro-level, the World Bank has estimated LAC logistics costs as a percent of GDP as between 16 and 26 percent with the OECD benchmark again being about 9 percent.

There is large heterogeneity in logistics burdens among LAC's sub-regions, different types of food products and different trading modalities. Nonetheless, a reduction of logistics costs from port efficiency gains, road haulage improvements, the expediting of customs clearance and border crossings, better inventory practices and increased capacity and competition in storage and warehousing could reduce logistics costs by 20 to 50 percent. This would mean a permanent reduction in the baseline cost of food products ranging from about 5 to 25 percent.

The cost burden of moving food into and around LAC has been largely unaffected by the rise and decline of commodity prices. While commodity prices rose sharply over the last two years, freight rates (both ocean and road) as a share of the value of food products hardly changed. That is, the cost of logistics rises along with international price changes for major food indexes. While there is some endogeneity associated with transport and food prices, countries that can shift to more efficient forms of transport and logistics will lock in benefits regardless of commodity price trends and spot market fluctuations.

While the cost of logistics services seems to lie in the hands of the private sector, LAC government actions and inactions have an important influence on

¹/Guasch & Kogan (2006); Guasch (2004).

the logistics burden. This influence is often indirect, but they can impact every step in the logistic change, from ocean shipping to domestic trucking to transfers, storage and warehousing.

- Ocean shipping costs of food are impacted by port efficiencies, port capacity cargo agglomeration and the level of connectivity and competition in the global liner shipping network.² Countries which have coherent port development strategies that link to inland networks, allow for cargo agglomeration, provide for fast turnaround of large vessels, and utilize anti-trust regulations to assure competition among carriers can benefit from faster services, economies of scale and lower prices in the shipping of their food products.
- Customs clearance and border crossings also play an important role in facilitating or hampering the efficient and timely movement of food products. Delays are particularly costly to consumers of food products that are perishable and time sensitive.
- Both the cost of international road transport, rising as a share of FOB prices of imported food, and domestic trucking movements are driven more by infrastructure quality and service competition than by distance. The prioritization of governments in maintaining their roads and encouraging competition in warehousing, transfer stations and in trucking services likewise has a significant impact on the prices of delivered foods.

1.2 Dependence on Food Imports in an Exporting Region

As a whole, the LAC region is a net food exporter and has the largest surplus in food trade across all regions of the world.³ This fact, however, does not mean that LAC is free from concerns about the cost of food. Indeed, no country in the region eats everything it produces and, more importantly, no country produces everything it eats.

In 2006, more than 71 million tons of food products with a value of over \$US21 billion were imported into the countries of South America and Mexico. Of this sum, a little over a third was comprised of intra-regional trade.⁴ The remainder, well over 50 million tons of food products, is imported per year into LAC from outside of the region. The majority of those food products arrives by ocean shipping and is thus subjected to every step of a logistics chain, including maritime transport, port transfers, customs clearance and inspection, warehousing, modal transfers, domestic rail, trucking and/or barge shipping and final distribution. These steps typically add 30 to 100 percent onto the price of delivered goods, and in exceptional cases—such as fruit imports to the Caribbean islands—may triple the cost of a product from the time it leaves its home of origin to the time it arrives at market.

The blend of products imported depends upon the consuming habits of the local population and the range of locally produced staples. For the region's net importers of food—the Caribbean islands, Mexico, Venezuela and El Salvador—meat, fish, and dairy represent the largest share of all food imports by value (26 percent). These perishable foods are followed by dry and liquid bulk products: cereals (22 percent) and fats and oils (14 percent). Fruits and vegetables make up 11 percent of import by value while sugar and beverages represent 4 percent.

² /This refers to containerised cargoes that are transport by regular liner services.

³ /World Bank (2008) Rising Food Prices Latin America and Caribbean Position Paper

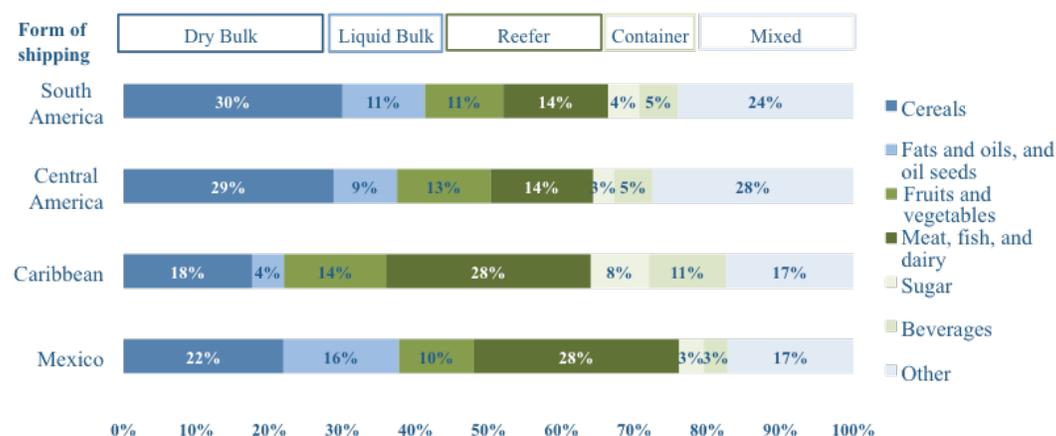
⁴ /Figures based on BTI (2007) for Argentina, Brazil, Chile, Colombia, Ecuador, Mexico, Paraguay, Peru, Uruguay, and Venezuela

The remaining food imports (19 percent) fall into the category of “other,” which includes live animals other than fish, coffee, tea, cocoa, spices, and manufactured foods as well as feeding stuff for animals.⁵

The region’s net food exporters also depend on imports for an important part of their food supply although the types of food they import are, on the whole, different than those of LAC’s net importers. On a weighted-average basis, the dry bulk items constitute by far the biggest share of net exporters’ food imports at 31 percent by value, followed by meat, fish, and dairy (14 percent), fats and oils (11 percent), fruits and vegetables (11 percent), beverages (5 percent), and sugar (4 percent). The primary difference between net importers and net exporters is that the net exporters are supplying themselves with a higher share of perishable goods—meat, fish and dairy—while almost all countries are dependent upon grain imports. For instance, while meat/fish/dairy and fruits/vegetables make up over half of all imports by product value into the island countries of the Eastern Caribbean, those two categories make up only 18 percent of Peru’s imports.

This dispersion of product types in the importing basket provides an indicator for policy makers as to where they should focus their attention when trying to combat the prices of food. The data above suggest that the island countries of the OECS, for example, should work on reducing the cost of refrigerated containerized traffic (herein referred to as “reefer”). Peru, Brazil, Bolivia and Colombia, on the other hand, would benefit from improvements in the importing and distribution process for dry bulk goods. The Diagram below illustrates the relationship at the sub-regional level between types of product and forms of shipping.

Diagram 1.1: Food Imports by Category in Latin America, in value terms in 2006



Source: WDI (2008)

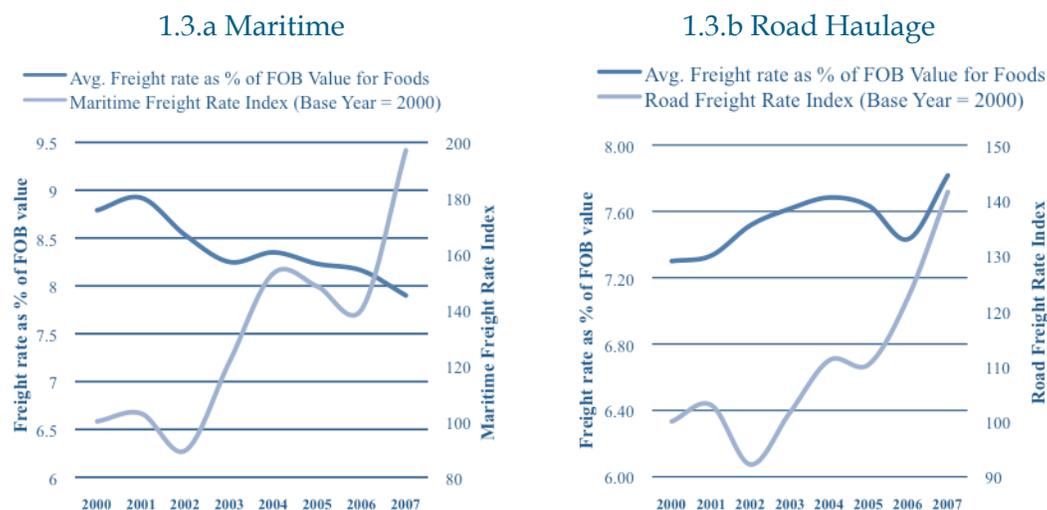
1.3 Coming to Terms with Logistics Costs

Regardless of the shifting prices of staple commodities in global markets, a large portion of foods are low value goods by volume and thus highly sensitive to international and domestic transport, warehousing and transfer costs. In fact,

⁵ /WDI from UN COMTRADE (2006). For a full breakdown of food imports for net food importing and exporting LAC countries, see Annex 2.

in recent years international and domestic shipping costs have risen and fallen along with commodity prices, leaving the impact of logistics costs on food prices relatively constant. As illustrated below, the “burden” (share of freight rates as FOB cost for food) for both maritime and trucking elements of costs remained relatively constant as the delivered price of food rose. As ocean rates doubled from 2002 to 2007, the maritime burden fell only by 1 percent. As trucking rates increased by 50 percent over the same period, the land burden rose by one half of percent.

Diagrams 1.3.a & 1.3.b: Transport Costs as Share of FOB Prices of Imported Foods By Cargo Type, 1999 – 2007



Source: Authors' calculations from International Transport Database (BTI) UNECLAC 2008 data

Notes: Average Freight Rates are unweighted averages of dry and liquid bulk, general cargo, reefer & specialty cargoes for maritime shipments; and dry bulk, general cargo and reefer cargo for road shipments.

The objective of the following sections is to consider the impact of transport and logistics costs on the price of delivered food products in the LAC region in particular, as well as to identify options that will help policymakers address those costs.

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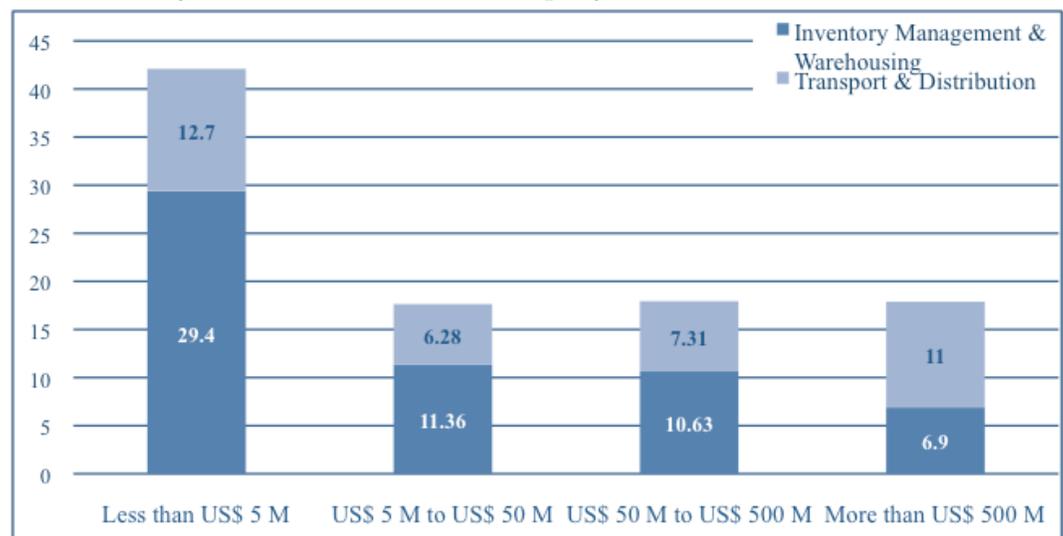
Logistics Costs and Food Prices

2.1 The Elements of Transport and Logistics Costs as they Relate to Food in LAC

Logistics and transport costs are a stubborn, underlying cost element for food in LAC. An analysis of both ocean shipping and road haulage costs as a share of imported food prices across LAC suggests that logistics and transport services remain major contributors to food prices regardless of the overall movements in commodity prices. In fact, according to the International Transport Database (BTI) UNECLAC 2008 data, all forms of shipping costs as they relate specifically to food products saw an increase from 2000 to 2007. For instance, trucking costs rose by 40 percent during that period, while maritime costs doubled and air shipments of high value food products rose even higher.

While food products moving from producer to consumer incur a number of costs outside of the logistics chain – profits, customs duties, processing and taxes, to name a few – the transport and logistics components of the cost of delivered food products can be staggeringly high. From the perspective of a firm, domestic logistics costs in LAC may be the largest single cost element of the final price of a good. While there are important variances by sub-region and type of firm, LAC's logistics costs are most sensitive to the size of the firm. For small mills, markets and retailers of foods in towns and secondary cities around Latin America, domestic logistics costs can total over 42 percent of the price of a firms' sales. By comparison, larger firms spend between 15 and 18 percent of sales on logistics. This is driven by such factors as lack access to warehousing, storage and transfer facilities and the quality of the infrastructure and trucking services that link rural markets, smaller towns and secondary cities to large production and consumption centers.

Diagram 2.2: Latin America: Average Logistics Costs by Component as % of Sales as Affected by the Total Volume of a Company's Sales



Source: Centro Logístico de Latinoamérica, Bogotá, Colombia. Benchmarking 2007: Estado de la Logística en América Latina Anexo, María Rey Logistics Summit 2008

To illustrate the range of costs associated with logistics processes, two supply chains are analyzed below, built around the logistics costs of food imports into

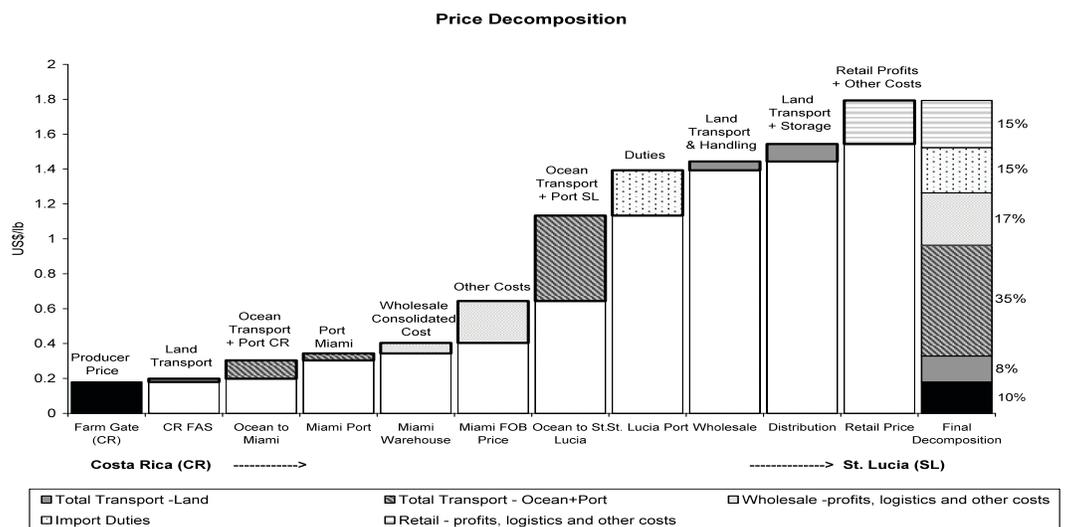
LAC. This exercise describes what happens to a pineapple as it travels from the farm gate in Costa Rica to its destination in the Caribbean; and a kilogram of wheat from the time it leaves the Port of Vancouver, Canada destined for the mills of Ecuador. The two products chosen are indicative of logistics chains for foods across the diverse landscape of Latin America and the Caribbean.

The products chosen are proto-typical of food trade for their respective sub-regions – both in the costs that are borne in their shipment and in the number of modal transfers that define their logistics chains. The island countries of the Eastern Caribbean import the majority of their perishable goods and almost all high value foods are consolidated in Miami and transshipped into the region. Likewise, grains and cereals make up the largest share of food imports to the LAC region as a whole by value – and even larger by volume as bulk goods. The US and Canada are the primary sources for grains, particularly wheat and corn.

Case 1: High value food imports into the Caribbean

The first analysis – that of pineapple imports from Costa Rica to St. Lucia via Miami as a regional consolidation center – shows that, with all of that traveling and handling, the producer price of the pineapple itself represents only about 10 percent of the final delivered price. Transport costs represent the lion’s share: those related to land and ocean transportation and handling account for 43 percent. In addition, storage, warehousing, consolidation and the retail and wholesale profits together represent another 33 percent, half of which is also logistics. Ocean shipping represents a particularly large part of the transport costs: 3.5 times as much as the producer price for the pineapple itself. Yet, this is not a function of distance: the ocean shipping leg from Miami to St. Lucia is an order-of-magnitude more costly than the leg from Costa Rica to Miami, although the trip to St. Lucia is shorter.

Diagram 2.3: Supply Chain Analysis of Pineapples Imported into St. Lucia



Source: Authors, freight forwarder and shipper interviews; and OECS Backward Linkages Study (2008)

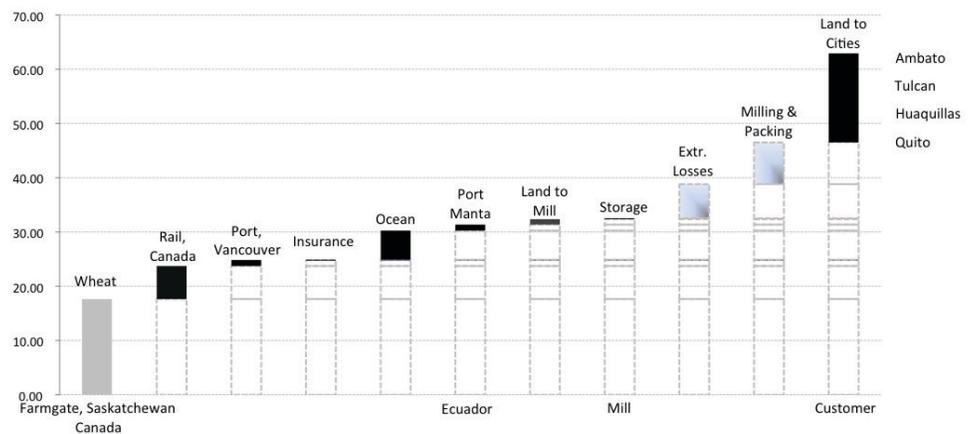
Since the shipping structures of the islands provides for very little direct service, most food stuffs are consolidated in Miami and shipped on small carriers with relatively infrequent services that travel to multiple islands on each voyage. The results are low economies of scale in shipping, infrequent port calls, and large numbers of middlemen buying, repackaging and reselling produce. At 13 percent of FOB value, maritime transport costs to the CARICOM are significantly higher than in other regions in the world which averages 6.6 percent of FOB.⁶

The Caribbean example illustrates the role of a country’s connectivity in the cost structure of its imports, including food. According to regression analysis built around ocean service data for Caribbean countries, there is statistically significant correlation between connectivity and ocean freight rates, confirming the importance of regular and reliable ocean services using the “transshipment connectivity index” which measures the centrality of a country within the global shipping network. If a country can “double” its centrality in the network, which would require significantly increasing its direct liner services to a wider range of countries, transport costs could decrease by over 15 percent. While harder to control in the short-term through direct policy interventions or investments, a country’s connectivity is an important long-term result of port reform, cargo agglomeration and the resulting attractiveness of a country as a major port of call or transshipment center.

Case 2: Wheat into Ecuador

The second supply chain analysis concerns wheat, a basic staple for LAC consumers. According to World Grain Statistics, South America imported 14 million tons of wheat in 2006/2007 and about 1.5 million tons of wheat flour over the same year. This represented a 26 percent increase over the previous year. In Ecuador, wheat is currently the fourth most important food item in terms of per capita daily calorie intake (after sugar, rice and palm oil).⁷

Diagram 2.5: Supply Chain Analysis Wheat Flour Imports to Ecuador



Source: Authors calculations, data from Manifestos, Ec. millers, interviews, Winnipeg Bd. of Wheat
 Note: Wheat cost includes local elevator costs. Vancouver port costs are estimates.

The figure above offers a graphic representation of the cost increases experienced in the process of transporting wheat originating in Vancouver,

⁶ /Developed market-economy countries (5.77% of FOB)

⁷ /FAO Yearbook, (2008) and FAS, USDA Grainfiles

Canada until it is sold as wheat flour to bakeries in Quito, Ecuador. When the grain leaves the Port of Vancouver, the first costs incurred correspond to insurance and ocean freight charges. Once the wheat arrives at the Port of Manta, Ecuador, there are several steps that account for additional costs. Shipping companies generally deliver the wheat FAS or “alongside ship.” Therefore a cost is incurred in receiving the wheat and clearing customs. Next, the wheat is loaded on trucks and transported by road to the mill. At the mill, the grain is first stocked in silos and then milled at an efficiency of between 75 and 78 percent. Next, administrative, marketing and financial costs (about 1.25 percent) and mill’s profit (estimated at 7.2 percent) need to be added. Finally, the flour is transported to the bakeries in Quito, presenting yet additional costs.

The Quito supply chain analysis shows that, by the time the wheat arrives at the mill, logistics costs constitute over 30 percent of the mill’s purchase price. Once the cargo is unloaded in Ecuador, the cost of domestic transportation to Quito is minimal due mainly to the high degree of competition in the Quito market and the availability of good roads linking the coast and the capital city. However, when the price of wheat flour to other cities is assessed, domestic transportation costs are more significant. The delivered cost to a city such as Ambato further adds another 20 to 25 percent onto the cost of the product. The large price difference is mostly explained by the quality of the road infrastructure and the ability of trucks to make a return trip within a day when traveling to and from Quito. According to calculations for 11 cities in Ecuador, domestic transport costs per kg of flour and the price of the flour per kg are perfectly correlated, meaning that higher domestic transport costs per kg in Ambato, for example, explain the flour price difference relative to Quito.

The two supply chains combined illustrate several points about food prices and logistics. Most fundamentally, the product that is being bought at market is only partially “food.” A large piece of the product’s price is derived from moving the product around, storing it, and changing hands and modes of transport, and this realization applies not only to tiny Caribbean countries. In Brazil, too, transport costs are estimated to represent about 80 percent of the challenges facing the Brazilian foodstuffs sector overall.⁸

A second observation is that transport and logistics costs can be punishing on both high value goods—such as pineapples, and low value goods, such as wheat. That is, modern transport movements in refrigerated containers and established intermediary distribution and consolidation arrangement do not insulate a product from exposure to high freight costs.

A final important observation about logistics and food derived from these two cases relate to distance versus scale economies. On one hand, distance appears not to be a central driver of costs, either for ocean transport (note the difference in the price of shipping the pineapple from Costa Rica to Miami versus Miami to St. Lucia) or for trucks (e.g., from the Port at Manta to Quito versus from the port to other cities in Ecuador). This observation is supported by econometric analysis correlating distance and other factors to road freight rates, which confirms that the sensitivity of shipping costs to distance in road transport exists, but is

⁸ /Brazil: How to Decrease Freight Logistics Costs in Brazil (2008) - draft

modest--a doubling of distance increases transport costs by between 8.5 and 18.7 percent, depending upon the cargo type, value and specific connection points (see Table 2 in Annex 1). This increase can be explained by operating costs, such as salaries and fuel costs, which are a function of distance. However, the relevance of distance on transport costs weakens over time, in part because of the growing role of air transport, which tends to be preferred to ocean transport, especially on long-distance shipments.

Scale economies in the form of large markets may affect transport costs, but are not a singular determinant of final food prices. While the two largest cities in the sample, Quito and Guayaquil, do command relatively low prices, the trend line is soft and the exceptions are many. In fact, when the two big cities are excluded, there is almost no correlation between size of the market and final price (or transport cost).

On the other hand, the manner of transport does seem to matter if it can capture scale economies. The distance from Canada to Ecuador is many thousands of nautical kilometers while the distance from the port at Manta to the mill in Quevedo is only 171 kilometers. Yet, somehow, shipping a kilogram of wheat from Vancouver to Manta costs less than half of the cost of trucking that same kilo of grain from Manta to Quevedo. If competing modes of transportation are available, agglomeration of cargo may mean economies of scale. This fact becomes important in discussing competition in domestic shipping.

The analysis suggests that distance and market size are less likely to drive transport costs than infrastructure quality and competition among transport providers. Interviews with local mills suggest that the difference in costs is derived mainly from the turnaround times of the trucks which are determined, in turn, by the quality of the road. In addition, some routes are considered unsafe and thus competition among truck drivers is considerably less.

To conclude, underlying factors of logistics service, scale economies and infrastructure quality seem to be the more important drivers of costs. The following sub-sections will further tease out the policy implications of these observations for each component of the supply chain as they relate to food shipments.

2.2 Maritime Transport

According to econometric modelling carried out for this paper, food prices are sensitive to maritime transport costs. The analysis suggests that ocean shipping rates do seem to affect the price of commodities; specifically corn, soybean and wheat are shown to be affected by maritime shipping costs. For each increase of 10 percent of the bulk shipping index, the estimated impact on commodity prices is in the order of 1.5 percent.⁹

Given the effect that ocean shipping rates can assert on the price of particular delivered goods, it is necessary to explore the determinants of these rates. Since LAC countries eliminated cargo reserves for their state-owned shipping

⁹ /Authors' calculations based on autoregressive distributive lags of maritime freight rates (captured by the Baltic Dry Index or BDI) for 26 major shipping routes and the value of the commodities carried by the specific types of vessels.

companies in the 1980s and 1990s and oversaw the subsequent privatizations and liquidations of the region's national flag carriers, it has generally been assumed that ocean shipping costs are beyond the control of government intervention. In a short-term sense, this is true: governments no longer have the ability to determine freight rates by executive fiat or to influence tariffs by increasing or decreasing capacity in routes that are now controlled by the private sector. In the medium to long-term, however, a series of government actions related to transport network design and port performance has had an indirect but important impact on ocean shipping rates.

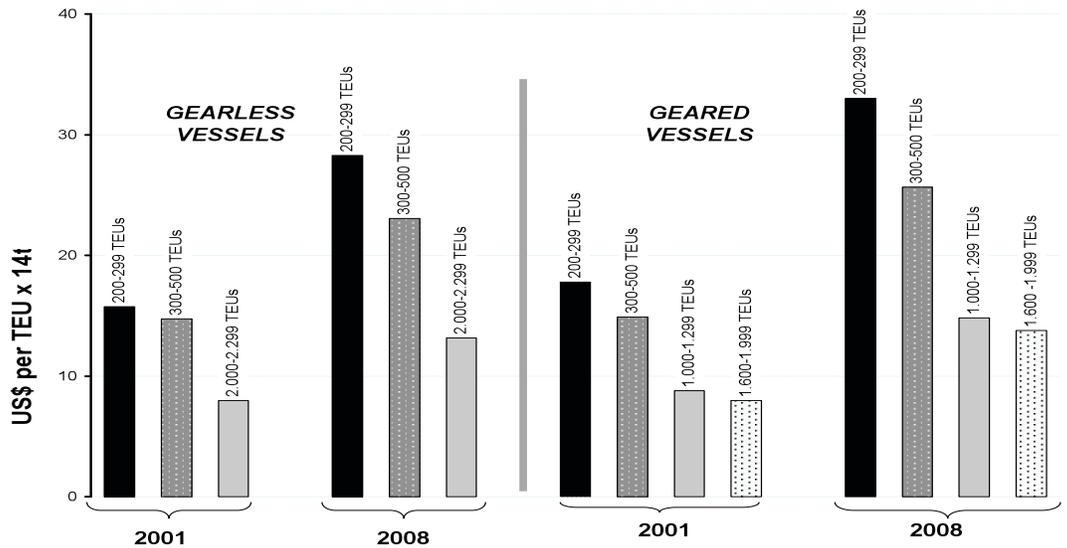
Port reform, investment and efficiency gains have turned out to be a significant driver of ocean shipping costs. This, in turn, affects the costs of delivered goods, particularly food products. Since Mexico first reformed the Port of Veracruz and Colombia concessioned its four main general cargo ports in the early 1990s, most, although not all, LAC ports have undergone a tremendous growth in productivity. This has been achieved through decentralization and concessioning programs that incentivized major private sector investments and increased inter-port and inter-terminal competition as well as through more modest improvements to port-inland connections and harbor deepening projects.

For those ports which have been successfully reformed, a positive cycle of effects help to drive down ocean freight rates. These effects include increases in connectivity and agglomeration of cargo, resulting in the achievement of scale economies in shipping as cargo seeks the more efficient terminals. However, increases in port infrastructure endowment and efficiency, too, are important for achieving reductions in ocean freight rates, since they result in faster turnaround times for vessels, faster cargo throughput and quicker amortization of investment costs for port investors.

Significant differences exist between vessels that are equipped to call larger and modern ports and those that are forced to call smaller ports that cannot provide their own equipment. "Gearless Vessels" is the term for ships that do not need to have their own cranes because the ports they call have sufficient equipment to load and unload the vessel efficiently. "Geared Vessels" are those ships which have cranes on board. Not only is there a depreciation of equipment associated with those ships, but they taken up valuable space and use fuel and other costs (such as maintenance and operations) to be transported around the seas. In 2008, the charge per ton of containerized good was about 15 percent higher for the geared vessels, assuming the same sizes.

The size of the vessels calling each port, however, has an even greater impact on the cost per containerized ton of cargo being shipped. As shown in the following graph, in 2008, containerized cargo traveling on a 200-299 TEU capacity geared vessel, on average, paid more than twice as much as cargo traveling on a geared vessel of 1000 to 1299 TEUs. The difference has grown since 2001 as larger and more efficient vessels have entered the market.

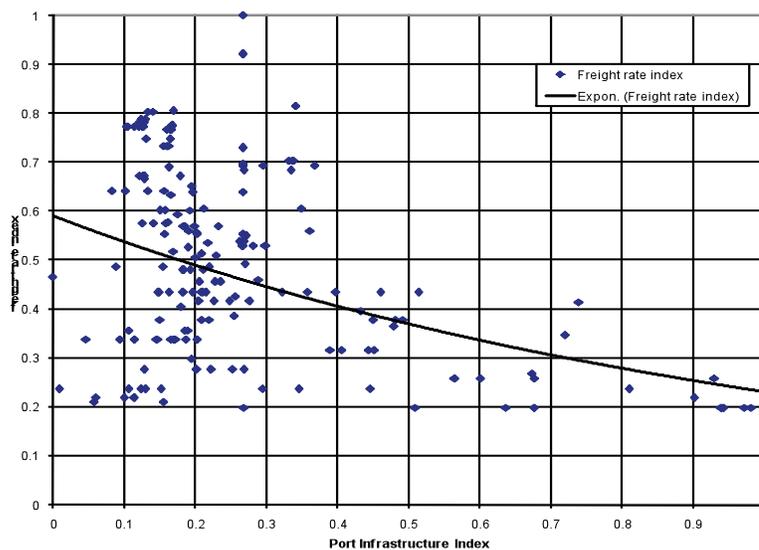
Diagram 2.10: Hamburg Index Freight Rates for Containerized Cargo Gearless and Geared Ships, 2001 and 2008



Source: Hamburg Index, Authors' Calculations

According to the results of a regression analysis of maritime costs for food imports to South America (Annex 1), port infrastructure endowment affects ocean shipping freight rates and, in turn, the delivered price of commodities. The figure below visually illustrates this causal relationship for the Caribbean region, specifically. The ranking of port infrastructure values such variables such as draught, length of berth, storage areas and lack of bottlenecks to cargo throughput. Actual ocean freight rates were uncovered and applied to ports according to the physical endowment of each facility, ranked on an index of 0 to 1.

Diagram 2.11: Port Infrastructure Endowment and Freight Rates in the Caribbean



Source: Wilmsmeier (2008)

Port efficiency not only affects the cost of ocean shipping, but also the costs incurred by cargo-owners and consignees. A poorly run or otherwise inefficient port will serve as a tax on cargo because storage, warehousing, inventory and demurrage charges are accrued when ports hold up cargo and delay delivery. A comparison of total ship costs for a port stay of a similar ship between Limon-Moín, Costa Rica, and Cartagena, Colombia, reveals the relevance of the value of time. The Port of Limon-Moín posts a US\$28/TEU cost advantage of Cartagena based solely on port charges to cargo and vessel. However, this advantage disappears when the value of time is included in the cost equation, leaving Limon-Moín with a cost per TEU that is US\$111 higher than that for Cartagena.¹⁰ Since so many food products are perishable, the value of time is even more important for food than for dry containers carrying other types of consumer goods.

Based on an analysis of maritime trade transactions in containerized goods on most intra-Latin American trade routes, it was found that port efficiency has the greatest influence on international maritime transport costs, although port infrastructure, degree of private sector participation, and inter-port connectivity are also important. The regression analysis found that increasing the indicator for port efficiency by 1 percent reduces freight rates by 0.38 percent. Moreover, if an importing country with the lowest index of the sample were to improve its port infrastructure to the level of the best index of the sample, maritime transport costs for imports would decline by 7.4 percent.¹¹

As relative efficiency declines at a port, cargo is chased away to other ports, sending a port into a negative spiral, affecting agglomeration of cargo, and, in turn, connectivity or regularity of ocean service. In 2005, about 60,000 containers that were origin or destination Costa Rica—equaling 100,000 TEUs or 15 percent of the country’s container cargo—traveled an extra 200 kilometers over poor conditioned roads to avoid the congestion and inefficiency of the Port of Limon and to seek better services through Panama’s ports. This represented about \$1500 of extra road haulage fees per container for Costa Rican importers and exporters for a yearly total of US\$70 to US\$100 million in additional trucking costs. For Limon specifically, firms surveyed for a Logistics Survey carried out as part of the Country Economic Memorandum blamed deterioration of access roads and delays in the loading process caused by the availability of only one crane as serious bottlenecks. Costa Rica’s liner shipping connectivity is below what it should be for the country’s income level which is both a cause and a result of the Tico cargo slipping away to Panama.¹²

This example illustrates the insidious ways in which port inefficiency affects cargo prices. The estimated impact of port efficiency on international maritime transport costs is significant. If the two countries in the LAC sample of ports with the lowest port efficiency rankings improved their efficiency to the level of the two countries of the sample with the highest rankings, the freight rates on the route between them would decrease by almost 26 percent.¹³

A related factor driving shipping costs is the degree of competition among service providers. In a study on ocean shipping rates for a sample 189 routes within the Caribbean basin, Wilmsmeier & Hoffmann (2008) show statistical

¹⁰ /Kent, et al. (2005)

¹¹ /The Impact of Port Characteristics on International Maritime Transport Costs (Wilmsmeier, Hoffman, and Sanchez, 2006)

¹² /Armijos, Schwartz (2006).

¹³ /Wilmsmeier, G., J.Hoffmann, R.Sanchez, “The Impact of Port Characteristics on International Maritime Transport Costs” (2006)

evidence, that around two fifths of the variance of the freight rate can be explained by the number of carriers operating on the given route, and that the number of liner shipping companies providing direct services between pairs of countries has a stronger impact on the freight rate than does distance.

Price setting in transport and logistics markets significantly depends on the level of effective competition, and competition in the transport markets depends on the size of the market and effective market regulation. In the presence of collusive behaviour, atomization and monopolies have potential impacts on price structures. Sanchez and Wilmsmeier (2009) analyse the evolution of competition and contestability on the East Coast of South America (ECSA) and the West Coast of South America (WCSA) between 2000 and 2008. They find that market contestability is “impeded” by collusive behaviour and strong alliances among carriers, thus allowing market entrance only to strong global carriers.

The service structures that use alliances among regional carriers and global shipping lines are partly a consequence of the type of cabotage regulations prevalent in South America, especially on its east coast. The structure of capacity supply for East Coast South America to Asia and Europe trade suggests that leading global carriers are using regional shipping lines to overcome the existing cabotage restrictions. Consequently, companies like Alianca, CSAV Brazil and Maruba face the prospect of being “converted” into regional feeder operators. While capacity supply between 2000 and 2008 has expanded, effective competition has been declining, and high entrance barriers and collusive behaviour among existing players in the market prevail, as evidenced by the almost complete absence of new entries in the market.

2.3 Customs Clearance and Border Crossings

As can be seen from the Ecuadorean wheat supply chain, just because a food product has arrived in port does not mean that it has yet truly arrived at its destination. In fact, the hurdles and costs may only just be beginning to accrue. Regression analysis conducted for this paper reveal that delays in customs clearance in LAC increase transport costs by between 4 and 12 percent. That is, if time for customs clearance could be halved, transport costs could be reduced by that same percentage. This finding is consistent with LAC firm perception surveys from Investment Climate Surveys, Doing Business Surveys and the Logistics Performance Index (LPI): in terms of customs efficiency and organization, the LPI’s first dimension, LAC as a region in the 2007 survey received a score of only 2.5 out of 5.

The regression analysis of border crossing and customs to freight rates illustrates the importance of ease of movement across national borders. The existence of a direct land access of any type reduces transport costs by around 6 percent. Moreover, a doubling of the number of border crossings could reduce transport costs by another 6 percent. These findings underline the importance of infrastructure development along international corridors in the region and specifically the improvement of border crossings and customs procedures.

These border crossing burdens affect food prices given the importance of intra-regional trade in primary staples such as beef and grains. Regression analyses

show that “over” costs from inefficiencies in the logistics chain, particularly at border crossings, represent around 20 percent of the total costs incurred in the import of Paraguayan soy beans into Brazil and beef into Chile. The unnecessary logistics costs related to beef are equivalent to US\$14.01/ton, of which 7 percent (US\$ 0.95) are related to the private sector and 93 percent (US\$13.06/ton) to the public sector. More than half of the over-costs are related to informal payments, inventory costs and profit loss because of delays of 24 hours at the border crossing. Inefficiencies at customs clearance and related activities contribute another 32 percent (US\$4.41/ton).¹⁴

2.4 Inland Transportation: Roads and Trucks

Road transport is responsible for handling 38 percent of all food imports into South America in terms of value.¹⁵ It is also responsible for nearly all domestic movements and for a significant share of inputs to food exports – particularly in Central America and Mexico.

While regression results confirm the relevance of distance in road transport, they also show that the relationship is not a singularly important driver of transport costs. According to the analysis of the relationship between distance and transport costs, a doubling in distance increases transport costs only by between 8.5 and 18.7 percent (see Annex 1). This modest increase can be explained by the role of operating costs (salaries, vehicle wear and tear and fuel costs) in trucking services. Those same variables, however, are impacted by other factors such as trade balance (i.e., the potential for backhauling), degrees of competition, size and efficiency of the service providers and, perhaps most importantly, infrastructure quality.

Road maintenance is emerging as the greatest threat to the affordable and reliable delivery of basic goods in LAC, even for the region’s more advanced economies, such as Brazil and Costa Rica. In Brazil, only 12 percent of the total road network is paved, and, due to the decline in investment in road maintenance since the 1980s, only about 25 percent of the overall road network in 2007 was rated as in good or very good condition.¹⁶ As a result, the operating costs of trucking services in Brazil have increased by 10 to 30 percent, depending on region. This burden on delivered goods is playing out in all sub-regions of LAC.

In Costa Rica, for example, road quality is among the three main impediments affecting businesses in 80 percent of responses. The poor and worsening quality of Costa Rica’s road network also causes direct losses from delays in shipments and breakage of 8 to 12 percent of the sales value of exported goods. The declining road quality can be partly explained by the fact that public investment in transportation infrastructure in the country has been on a decline (decreasing from between 1.5 and 2.1 percent of GDP in the mid-1980s to less than 0.5 percent in 2003).

Overall, the impact of transport interruptions seems to be particularly significant for firms whose main market is within Central America - a loss of about 5.3 percent of their consignment value. Slightly higher than the average for the country overall are also the losses experienced by non-exporting firms, since they rely on road transport relatively more.¹⁷

¹⁴ /Carana (2006)

¹⁵ /BTI (2007)

¹⁶ /Brazil’s National Federation of Transport (CNT) Road Survey (2007).

¹⁷ /Guatemala ICA (2005)

Where railroads are prevalent in LAC, however, shippers have been unable to utilize their full potential. The share of railroad use for domestic freight transport in Argentina is relatively low, in the range of 5 to 8 percent, depending on the method of measurement. Of all containers entering or leaving Argentina's port terminals, 95 percent do so by truck, the railroad container transportation being limited by lack of access, a shortage of container bays, and the low level of coordination with metropolitan passenger services. In the case of cereals and oilseed transport to Rosario, more specifically, the railroad's relative share fell from 20 percent in 1998 to 15 percent in 2004. It has been estimated that in the case of this particular traffic alone, rail participation could be increased from 30 percent, with a consequent saving in freight costs per ton.¹⁸ Also in Brazil, the railroad network presents a significant infrastructure related challenge, notwithstanding the improvements made since the start of the concessions. In effect, despite carrying 22 to 26 percent of the total freight volume and 25 percent of all cargo, the railroad network remains insufficient in size, has different gauges that make connectivity difficult, offers low geographic coverage particularly from the main grain belt areas, and lacks inter-modality with roads and waterways.

Finally, the efficiency of a country's trucking sector plays a role in its overall import cost structure. Trucking regulation, in particular, presents a paradoxical problem for many governments: costly if they do, costly if they don't. Shippers argue that tougher rules and enforcement related to weight restrictions, overloading, truck quality and safety will immediately increase transport costs which will be passed on to consumers. While it is true that transport regulations lead to costs which can be estimated, it is also true that the lack of regulation and/or enforcement of trucking regulations creates costs, although these are indirect and take time to manifest themselves. Typically, smaller producers and local agriculture traders are the most heavily affected by dilapidated roads and failures in trucking regulation, while large shippers using the main highways and trade corridors between large cities and ports are less affected.

- As reported in Chile's Investment Climate Assessment (2007), transport for products shipped to international market is generally better than for products destined for the national market: while about 17 percent of firms report breakages in deliveries to international destinations, 25 percent report breakages in the case of national deliveries.
- In Honduras, about 37 percent of local firms incur losses while merchandise is in transport either because of spoilage or breakage due to poor road quality, and lack of enforcement of trucking regulations. Among the other countries in LAC, the percentage of sales lost due to transport ranges from 1.5 in Brazil to 2.2 in Nicaragua.¹⁹
- In Guatemala, as a result of the aged fleet of the local trucking industry, discrimination against foreign trucks, and a lack of adequate regulations for vehicle and driver operations, about 30 percent of firms experience transport interruptions and, as a result, incur losses of an average of 1.6 percent of sales.

2.5 Warehousing, Storage and Inventory Costs

High inventory costs are an important logistics bottleneck for the region, in turn, driving up the cost of delivered products. For LAC businesses, the World

¹⁸ /Serebrisky, Barbero (2007)

¹⁹ /Honduras ICA (2004)

Bank calculates that inventory costs equal 35 percent of GDP, compared to only 15 percent of GDP for businesses in the United States.²⁰ This can be explained by the fact that, beyond the roads themselves, the storage networks of many of the region's countries are sub-standard, warehouses lack competition and effective instruments for financing inventories, and the rates of storage space rental are higher in LAC compared to other regions.

For agricultural interests, the lack of sufficient warehousing capacity is a common complaint and is particularly costly for small shippers. As with Colombia and Brazil, storage capacity along the value chain in Argentina is particularly inadequate in the agricultural sector, largely due to the growing harvest volume and the rising shortage of vessel holds available to logistics operators. Small holders which export predominantly food products do not usually have a set aside logistics area, and therefore often outsource storage functions and customs clearance, among other parts of the supply process.

The need for additional storage capacity is also a consequence of the shortage of efficient intermodal transfer terminals. According to estimates, Brazil's warehousing shortage alone is currently about 40 million tons per year. If Brazil were to double its number of intermodal transfer terminals from the current 250, the total inventory and warehousing costs could be reduced by as much as US\$1 billion per year.²¹

²⁰ /Guasch and Kogan (2004).

²¹ /Macroligistica, Brazil (2008)

3

Policy Guidance

3.1 Policy Guidance for Maritime Service/Port Reform

The greater goal of port services reform in LAC should be that of providing a foundation for better connectivity in terms of ocean borne transport. Typical port charges – wharfage, dockage, warehousing, cargo handling fees and provisioning – are in fact far less significant to the price of food imports or other cargoes than the costs that ports may be unintentionally levying on consumers because of inefficient practices and insufficient infrastructure. Reforms thus need to focus on investments, operational efficiency and landside linkages that will help turnaround times for large vessels and the efficient loading and unloading of cargo.

The Governments of LAC have had considerable experience with concessioning ports operation, primarily through landlord models. In Colombia, the government concessioned the port authorities themselves, which then were allowed to bring in private stevedoring and terminal operators. Unfortunately, the countries most dependent on food imports have, for the most part, not undertaken the necessary reforms and thus benefited from the lessons learned elsewhere in the region.

- *Introduce modern port operating practices:*
Today, the ports of the region can be found in a heterogeneous state of evolution. At the most problematic levels, many of the Central American ports remain mired in the practices of the 1980s. They are yet to introduce private terminal operators who bring with them the modern practices of electronic tracking of containers, links to global shipping networks and investments in labor-reducing and time-saving gantry cranes, transtainers and other modern cargo handling equipment. The vessels that call those ports generally carry their own “gear” or cranes, are old, small and inefficient. The cost of poor shipping services that are willing to call these inefficient port conditions is passed on to consumers and local producers.
- *Anticipate growth and invest in landside and waterside capacity:*
In concessioning and decentralizing the ports of the region, many LAC countries washed their hands of all port-related investments. While private operators made quick gains in efficiency and turnaround with “superstructure” investments such as cranes, handling equipment and refrigerated storage, larger investments in greater yard capacity, deeper channels, wider turning basins, on-dock railroads and better landside access for roads was beyond the capacity and contractual commitments of individual private operators. Moreover, ports with multiple private operators face a Prisoner’s Dilemma when individually considering their competition and the incentives for port-wide investments, warranting a public commitment and regulatory function to coordinate the shared commitment and benefits.
- *Introduce spatial planning into the notion of port location expansion:*
Several ports in Central America and the Caribbean remain unplanned, congested and stuck within cities. This is also a growing concern of ports in Argentina, Colombia and Brazil. Efficient cargo flows are hampered

by congestion, foot traffic, land use constraints and bridge clearance restrictions. In moving ports outside of cities and residential areas, the economic knock-on effects in terms of productivity, job creation and consumer prices are likely to outweigh the short-term dislocations of local stevedoring and warehousing jobs.

- *Encourage consolidation or coordination of small private operators:*
While decentralization and competition have been helpful to many of the regions' ports, atomization is a regressive curve of problems for port operations. Given the importance of cargo agglomeration, planned development, competition in carrier services and access of third party cargo to port facilities, governments may benefit from strengthening the regulatory oversight of these facilities and, in some cases, encouraging their consolidation.

3.2 Policy Guidance for Customs and Border Reform

Several areas of custom and border crossing inefficiencies could be addressed that would speed up processing times and decrease transport costs. Specifically, the region's countries should:

- *Eliminate fines for minor documentation errors that lead to "misdeclaration:"*
Customs in many Latin American countries still impose heavy fines for minor errors. In Argentina, for example, a simple documentation error results in a "misdeclaration" which incurs a fine that could be double the value of the goods.
- *Clearances and Inspections could be greatly improved through better cross-border collaboration and greater coordination between phytosanitary and customs services:*
In Central America, across Mercosur and across the US-Mexico borders, for instance, customs harmonization to facilitate the transport of goods and to reduce costs of clearance could be addressed as an issue of regional integration and trade facilitation.²² For countries that are partners in trade agreements, the duplication of phytosanitary inspections can be avoided through the initiation of a common set of testing procedures. These may be applied only once on one side of a border crossing, using officials from both countries. This could save considerable time and costs, particularly for perishable goods.
- *Improve customs coordination with phytosanitary services during the hours in which both agencies are operating:*
The above is a common complaint among agricultural importers in the region. Customs clerks are often not available when phytosanitary inspectors are available and vice versa, making import approvals doubly complicated and time-consuming. Addressing this frustration may require extending the operating hours of both agencies, co-locating offices or even hiring additional staff.

- *Establish export clearance times as the standard for import clearance times:*
In most LAC countries, exports clear faster than imports, probably due to the effective scrutiny of export promotion agencies and pressure from large shippers. The average days to clear import customs in the region varies widely, however, ranging from 5 in Honduras to 14 in Brazil. By contrast, to clear exports, less than 2 days are required in El Salvador and Honduras, 5 in Chile and 8 in Brazil.
- *Simplify customs declarations forms, procedures and clearance:*
Importing goods into an OECS takes on average 19 days and requires seven documents, while exporting goods takes an average of 17 days. All OECS countries require that a bill of lading, invoice, certificate of origin, and customs declaration be completed to import goods. Colombia and the Dominican Republic recently implemented several reforms, including the creation of a single online customs declaration and a decrease in the tax burden on companies, thus facilitating export and import procedures.
- *Use of risk-based selectivity process for inspections:*
This will help assure fair selection of inspections, minimize opportunities for corruption and should reduce the need for high percentage inspections. Haiti managed to reduce export time by one day by introducing risk-based inspections.²³
- *Harmonize customs standards for sub-regions:*
Particular logistics-related challenges to imports can best be addressed at the regional or sub-regional level. In Central America, for instance, customs harmonization to facilitate the transport of goods and to reduce the costs of doing so is an inherently regional issue.

3.3 Policy Guidance for In-land Transport and Distribution

The significant cost burden on food prices described in this section related to domestic in-land shipping is due, in large part, to road conditions throughout the region; lack of competition among modes of transport; poorly regulated trucking services; and inadequate transfer and storage facilities. The specific needs include:

- *Improved road quality:*
Governments around LAC are well versed in the arguments for better road maintenance: lower vehicle operating costs, fewer losses, less damage and greater producer and consumer surplus. In addition, it is widely recognized that the present value of maintaining a road regularly is an order of magnitude less than rehabilitating it once every ten years. As LAC enters a period of fiscal constraint, it may be worth reiterating the importance of road quality and the effects on food prices. The road funds of Central America and Haiti, which are derived in large part from gasoline taxes, are likely to come under pressure during periods of fiscal crisis. Yet LAC's fiscal gaps of the past have been rebalanced primarily out of lowered infrastructure investments and the results have been lower growth and a contribution to greater inequality.²⁴ These lessons should

²³ /Increasing Linkages of Tourism with the Agriculture, Manufacturing and Service Sectors, OECS, The World Bank (2008)

²⁴ /Calderón, Serve (2005)

demonstrate the importance of maintaining networks and connectivity between communities, markets and the goods they depend upon.

- *Strengthened trucking regulations and enforcements:*
While new regulations and stricter enforcements always entice fears of consumer pass-throughs and political backlash, the dearth of trucking standards around the region is taxing food logistics and transport movements in general dearly. Better weight controls, inspections and standards for truck safety will reduce costly losses from damage.
- *Facilitation of the development of ample storage, warehousing and transfer facilities:*
Several countries across the region have instituted policies to restrict the development of storage facilities in order to protect existing service providers or allow for easier regulatory control of importing and transfer facilities. Simple reforms related to permitting and licensing can reduce the cost of the facilities and increase their availability.²⁵
- *Strengthened logistics planning based upon more sophisticated freight flow modeling:*
The value and importance of multi-modal transport and intra-modal competition may not be fully appreciated in LAC because of the infrequent use of freight flow modeling and the general lack of data to help simulate the costs and benefits of alternative investments. Many countries in LAC have the potential to make fuller use of customs, manifest and commercial shipment data and to simulate alternative regulatory and investment decisions as OECD countries do. This requires a stronger public commitment to collection and use of freight flow data. (See Annex 2 for a more detailed discussion of the topic.)

²⁵ /As a result of simplifications in municipal licensing procedures in Honduras, the time required to build a warehouse has been reduced by 32 percent.

Annex 1: Regression Analysis for Maritime Imports

TABLE 1: REGRESSION RESULTS – IMPORTS TO SOUTH AMERICAN COUNTRIES BY MARITIME TRANSPORT 2006, SITC 3 DIGIT LEVEL

	A	B	C	D	E	F
Constant	-24.194	39.867	20.076	20.277	-26.041	-18.013
Product unitary value (ln)	0.764 197.556	0.77 202.799	0.758 202.46	0.76 201.999	0.768 212.463	0.77 211.505
Reefer Dummy	-0.039 -10.101	-0.037 -9.939	-0.041 -11.09	-0.04 -10.978	-0.037 -10.36	-0.037 -10.169
Distance (ln)	0.115 30.494	0.136 36.396	0.135 36.6	0.136 36.833	0.11 31.189	0.113 31.658
Transshipment connectivity index (ln)		-0.154 -40.853				
Frequency of shipments reaching the consignee within schedule (ln)		-0.058 -14.974				
Competence of the logistics industry (ln)			-0.098 -24.779	-0.093 -22.913		-0.021 -5.526
Size of the Informal Market (ln)				-0.028 -5.368		
Port Infrastructure Endowment					-0.051 -14.461	-0.045 -12.396
R Square	0.626	0.649	0.659	0.659	0.629	0.629
Adjusted R Square	0.626	0.649	0.659	0.659	0.629	0.629
Std. Error of the Estimate	0.757	0.733	0.723	0.723	0.752	0.752
R Square Change	0.626	0.023	0.033	0	0.003	0
N	26366	26364	26364	26363	30003	30002

Source: Authors

Notes: significant at 1 per cent, 5 per cent and 10 per cent. T-statistics are given in brackets. The dependent variable is the freight rate per ton of transporting good k from the exporting country i to the importing country j in natural logarithms. All explanatory variables, excluding dummies, are also in natural logarithms. Models A-E were estimated by OLS. The estimation uses White's heteroscedasticity-consistent standard errors. Data are for the year 2006.

TABLE 2: REGRESSION: IMPORTS TO SOUTH AMERICAN COUNTRIES BY ROAD TRANSPORT 2006, SITC 3 DIGIT LEVEL

	A	B	C	D	E	F	G
(Constant)	(159.825)	(41.4648)	(-14.9825)	(-14.4957)	(1.4313)	(1.0495)	(-0.0878)
Truck border crossings	-0.1109 (-8.997)	-0.128 (-10.7309)	-0.0834 (-9.2606)	-0.0823 (-9.1777)	-0.0857 (-9.6824)	-0.0862 (-9.7457)	-0.0821 (-9.2305)
Customs clearance (ln)		0.2163 (18.1322)	0.2285 (25.4119)	0.2286 (25.5605)	0.2335 (26.4276)	0.232 (26.2663)	0.2463 (25.8836)
Public Corruption (ln)		0.1358 (11.3926)	0.1393 (15.5093)	0.1362 (15.2345)	0.1243 (14.0103)	0.1218 (13.705)	0.1435 (13.7929)
Unitary product value (ln)			0.6326 (70.3404)	0.6343 (70.887)	0.5716 (56.9974)	0.5824 (55.9541)	0.5812 (55.8842)
Dummy Reefer				-0.075 (-8.3964)	-0.0653 (-7.3886)	-0.0596 (-6.6545)	-0.0632 (-7.0254)
Volume of products shipment (SITC 5 digit)					-0.1328 (-13.196)	-0.1359 (-13.4722)	-0.1395 (-13.7866)
Dummy Bulk						0.0366 (3.8332)	0.0363 (3.8045)
Dummy Brazil							0.0448 (4.0011)
R	0.110919	0.282323	0.691111	0.695158	0.704799	0.705605	0.706479
R Square	0.012303	0.079706	0.477635	0.483245	0.496741	0.497878	0.499113
Adjusted R Square	0.012151	0.079281	0.477313	0.482847	0.496276	0.497337	0.498496
Std. Error of the Estimate	1.173449	1.132876	0.853571	0.849041	0.837944	0.837062	0.836096
R Square Change	0.012303	0.067403	0.397928	0.00561	0.013497	0.001136	0.001235
F Change	80.94058	237.8875	4947.771	70.49956	174.1355	14.69329	16.00887

Source: Authors

Notes: significant at 1 per cent, 5 per cent and 10 per cent. T-statistics are given in brackets. The dependent variable is the freight rate per ton of transporting good k from the exporting country i to the importing country j in natural logarithms. All explanatory variables, excluding dummies, are also in natural logarithms. Models A-E were estimated by OLS. The estimation uses White's heteroscedasticity-consistent standard errors. Data are for the year 2006.

Annex 2: Logistics Modeling – Using Data to Plan and Invest

This Annex examines the data and modeling potential of Latin America and the Caribbean Region in the context of freight flow, or logistics, planning. Throughout the OECD, Planning Ministries and Transport Agencies rely on data from a variety of sources to simulate the decisions of shippers and travelers. They undertake these exercises to better understand the economic, financial, demographic and environmental implications of policy options related to investment in transport infrastructure and regulations that would drive logistics decisions and land use.

In OECD countries, national data collection programs are often created in response to legislative mandates. The intent is often to reduce the need for patchwork, overlapping or contradictory data collection by regional and local jurisdictions, and to allow national or regional planning and investment agencies to use the data. Common data collection efforts and sources include (i) statistics on values and volumes of external trade, often disaggregated by transportation mode, along with data on the flow of commodities; (ii) comprehensive sources of general macro-level logistics data collected by other OECD countries (e.g. *The Port Import Export Reporting Service (PIERS) Database, EuroStat, International Trade by Commodity Statistics (ITCS), Vehicle Inventory and Use Surveys*); (iii) Railroad Carload Waybills with information on origin/ destination points, type of commodity, number of cars, tons, revenue, length of haul, participating railroads, interchange locations, and cost, and (iv) Waterborne Commerce Statistics, collected to analyze and forecast foreign and domestic waterborne cargo movements at principal commercial ports and jurisdictions, including inland waterways.

In LAC, on the other hand, most countries do not have a systematic approach to collecting, organizing and analyzing existing freight transportation data, and the region in general lacks a freight database with origin-destination matrices that could facilitate the orderly analysis of commodity flows. Government-funded freight data analyses in the region are few and far between, and have mostly been undertaken either by international agencies or academics. At the individual country level, detailed freight data collection is not universal and systematic partly because the countries' various governmental agencies involved in transportation and its data analysis are oftentimes not highly coordinated. Likewise, they often lack resources for managing and manipulating large datasets and for engaging in periodic releases of information to the public. In contrast to the progress in processing trade data that the region's countries have made, manifest data – with the exception of data on levies, assessed for fiduciary reasons – are rarely retained. Although private firms in charge of consolidating and digitizing data often times provide this additional information in files that they deliver to the governments, it is not uncommon for this information to languish.

Comprehensive freight data is being reported mainly by a handful of regional and sub-regional organizations. For instance, the only comprehensive overview on modal split and international trade in South America in terms of volumes (tons, and value) and expenditures on trade has been published by the United Nations Economic Commission for Latin America and the Caribbean (UNECLAC),¹ whose statistical information sources are derived from the International Transport Database (BTI) which contains data for the period 2000-2007, consolidated and digitized by each country's national customs service.

The Foreign Trade Data Bank for Latin America and the Caribbean (BADECEL)—also a regional organization—provides detailed trade and freight-related information. For instance, freight data, transportation costs, and trip length, among other relevant variables, for many of the region’s countries are reported through the Latin American Association of Foreign Trade (ALADI). Due to limited resources, however, ALADI currently neither analyzes these data nor produces any reports. Instead, the United Nations Economic Commission for Latin America and the Caribbean (UNECLAC) uses the ALADI data to produce a series of reports. In Central America, regional data, specifically for maritime transport, is collected and analyzed by Comisión Centroamericana de Transporte Marítimo (COCATRAM). As in the other sub-regions of LAC, however, empirical research based on this data is limited.

Aside from the international organizations that maintain and take occasional use of the data, there are also sporadic interventions at the country level to collect trade, shipment and freight data. For example, public institutions in El Salvador have started to collect and analyze customs data, recognizing that such data allow depicting and differentiating international cargo flows at border crossings, and can be used for modeling flows on international routes, thus improving the planning of installations of border crossings. In Argentina, simple tools like the logistics costs index published by Cámara Empresaria de Operadores Logísticos (CEDOL) have proven applicable to research relevant to the transportation industry. In addition, Argentina’s Statistics Unit of the Transportation Secretariat, housed in the Ministry of Federal Planning, Public Investment and services, collects and disseminates transportation statistics for passengers and freight, which - in terms of the level of detail - is comparable to that available in OECD countries. Freight cost data, however, are missing, and the quality of the statistics could be questioned.

Likewise, while information on freight rates, transportation mode, and shipments destinations at the country level is not being processed comprehensively, countries do collect this type of data at different levels of detail, and a few publish some of the data on their national statistics institutions website. For example, Bolivia publishes data on modal split, transport flows through border crossings and multimodal transport chains for imports and exports. Likewise, Brazil has begun developing programs to collect and disseminate different types of freight data. As with government agencies in other countries, Secretaria de Indústria e Comércio Exterior, part of the Ministry of Indústria e Comércio Exterior, is in charge of processing trade data. In addition, the Secretaria de Transportes do Governo do Estado de São Paulo has undertaken the Origin Destination Survey on a sporadic basis, while the Instituto Brasileiro de Geografia e Estatística is in charge of an Annual Industrial Survey.

Similarly, a number of private companies in the region are involved in collecting data from bills of lading and ship manifests from international transport (e.g. Manifestos in Ecuador) and are selling the data to interested private and public parties. In some cases, governments buy this information, although interest is often mainly shown by the private sector. Specifically, shipping lines use the data for capacity planning. Yet, while private companies in the transport and logistics sector have an incentive to engage in--and push for--the collection and

analysis of better and more comprehensive data, it is also common, worldwide, to keep such data secret or to limit its distribution and availability. This runs counter to the public good nature of the data and its importance for rational policy making. Therefore, there is a need for public institutions to take on the responsibility of leveraging market forces by releasing information on freight rates, volumes, values, network links, and other aspects relevant to logistics planning and by assuring that, when collection and data management are outsourced, the data can be readily purchased or obtained on request.

Modeling of Freight Flows: Putting the Data to Use

In OECD countries, a wide range of modeling techniques are effectively being used for freight and logistics planning, differing in their data requirements, level of sophistication, and specific focus. In the LAC region, on the other hand, there are relatively few examples of individual countries (their public agencies, private companies, or academic institutions) modeling freight movements to inform policy decision. While some of the models – namely, the Generalized Cost Analyses, the Logit model, Origin–Destination Tables, Spatial Interaction Models, supply chain analyses, and elasticity studies – have indeed been used for transport and logistics modeling in the LAC region, these have predominantly been initiatives undertaken by international and regional organizations as opposed to domestic governments.

There are only a few examples of official research carried out by LAC countries themselves, mostly limited to data collection exercises and general infrastructure studies and data analyses of intermodal transport networks from the perspective of competitiveness, and is mostly carried out ad hoc by Competitiveness Councils, Ministries or Departments of Planning and sometimes Ministries of Economy, Finance or Commerce.

- In 2006, the Government of Chile appropriated US\$780 million to develop an infrastructure investment program (the National Plan of Infrastructure for Competitiveness) for 2007-2012, targeted to improve the competitiveness of the productive sectors nationwide. This program involves the Ministries of Public Works, Transportation and Telecommunications, and Energy and Mining, and part of it has focused on identifying the specific industries that would most benefit from investments in infrastructure. This effort is meant to be followed by attempts to prioritize these investments in: (1) logistics investments in zones that are links to international markets, such as ports, airports, border crossings, and multimodal terminals; (2) investments in geographic sectors that concentrate the productive attitudes of the country, such as dynamic regions and macro-zones; and (3) logistics and infrastructure issues specific to forestry, mining, dairy and livestock, fisheries and aquaculture, fruit trees, and tourism.
- To underpin that effort, the Ministry of Planning outsourced the development of a series of in-depth supply chain analyses of key export products for competitiveness and logistics planning purposes. Data for the initiative is derived from a combination of national figures collected by line ministries on commodity flows and industry surveying.

- Colombia's National Logistics Plan involves the process of undertaking an assessment of the issues relevant to the country's logistics and transportation sector, including the funding needs of logistics infrastructure and the measures that would be necessary for increasing the country's competitiveness through the adoption of best practices for transport and logistics. The first step in this process was made in 2008 with the design and implementation of the 2008 National Logistics Survey,² administered by the Latin America Logistics Center and coordinated with Colombia's Ministry of Transportation, Ministry of Commerce, Industry and Tourism, and the High Council for Competitiveness and Productivity. As input to developing the National Logistics Plan, another study in Colombia has been commissioned to identify the productive chains that contribute significantly to the country's export performance and freight movements.
- Peru and Panama are presently undertaking their National Logistics Surveys, aimed at identifying the logistics issues in the respective countries' productive sectors, providing a baseline for the public and private sectors to make critical decisions about public policy and private practice, and recommending an action plan for the future.
- In Argentina, the initiative in creating a National Logistics Council has predominantly been taken by the Argentinean Association of Business Logistics (ARLOG) and the Business Chamber of Logistics Operators (CEDOL), organizations that aim to increase the official engagement of the private sector in logistics planning, and to recommend and assist the government in prioritizing new infrastructure works. At the level of the Government itself, however, the capacity to understand logistics issues is still weak.

More freight-focused planning exercises are carried out by government institutions in Costa Rica, the Dominican Republic, and Brazil:

- The National Transportation Plan currently developed by the Sector Planning Directorate of Costa Rica, for instance, includes a forecast of freight flows for the next 25 years and using cutting-edge simulation and forecasting models that can be easily updated using modern technologies. In the Dominican Republic, the National Council of Competitiveness is leading a series of studies aimed at identifying constraints to the movement of freight in the country's transportation system. These studies include a SWOT analysis of the port system and a characterization of the freight transportation system with a focus on trucking, as well as describe the general characteristics of the truck fleet in an effort to fill the gap in the national statistics of this type of data. It uses a survey of public and private entities to gather this information, and provides statistical information on the volume and other characteristics of imported and exported freight through the main ports, as well as information on container flows.
- In an attempt to map future commodity flows and the associated investment needs, an important planning tool - *Plano Nacional de Logística* (PNLT) - has

recently been prepared in Brazil (World Bank, 2008a). Lacking a dedicated planning or implementation unit, however, the PNLT cannot be considered a complete strategy since it is not able to assess logistics-related projects in a systematic manner, as with a number of previous logistics-planning initiatives, including *Estudos dos Eixos and Brazil em Ação*.

To conclude, most LAC countries still lack reliable and extensive public and private logistics data that is regularly updated, and therefore find it difficult to undertake systematic analysis not only of existing costs and bottlenecks, but also of potential efficiency gains that could be achieved through proposed large investments, such as regional logistics corridors. There is a need for data on all of the inputs that are required for the proper functioning of the logistics system, such as commodity origin and destination, costs of transport, infrastructure availability, operations indicators, and registry of users, among others.

The need for these data as well as their reliability must be validated with input from all stakeholders, including cross-support from the private sector. While international and regional organizations like UNECLAC and BADECEL do produce reports on trade and freight-related variables, the complexity of domestic and international transportation networks continues to diverge in different directions for the countries in the region, and individual countries would therefore benefit from more clearly defining their specific data needs and tools of analysis. While sophisticated modeling of that data may turn out to be prohibitively costly for some of LAC's smaller countries due to human and technical capacity constraints, the sophistication of the academic institutions, planning and economics ministries of the region suggest that a deeper and broader application of modeling for decision-making in logistics could be considered at this time.

¹ /International Trade and Transport Profiles (2000); Modal Split in Latin American International Transport (2006)

² /Detailed information about the survey is available at <http://www.encuestanacionallogistica.com>

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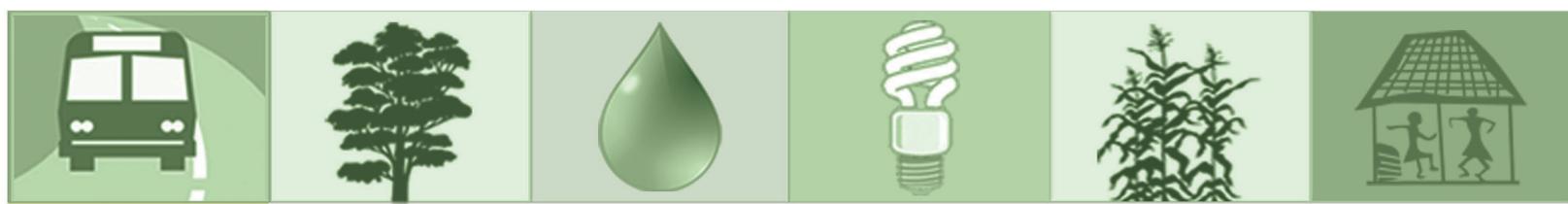
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