Consulta de San José 2007

"Latin America: Addressing High Logistics Costs and Poor Infrastructure for Merchandise Transportation and Trade Facilitation"

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Contents

LIST OF FIGURES

LIST OF TABLES

1. Introduction

Access to basic infrastructure services – roads, electricity, water, sanitation - still remains as a key challenge in the fight against poverty in Latin America and in the elusive search for sustainable growth. These services provide not only direct and fundamental benefits but also have important indirect effects on the living conditions of the population and are key ingredients for productive development and to enhance competitiveness.

Infrastructure services are central to personal productivity and the opportunity for advancement. While this is intuitive for electricity and telecommunication services which bring with them the promise of connectivity and higher productivity, it is also true for roads and transport services. Access to markets, jobs, health care and education, the extreme poor in rural communities in Latin America live on average 5 kilometers or more from the nearest paved road, which is almost twice as far as non-poor rural households.

Over the past 15 years, infrastructure coverage and quality have increased in most Latin American and Caribbean sectors and countries. There have been major improvements in access to water, sanitation, electricity, telecommunications, ports, and airports. Only in roads has coverage not changed much, but still efforts and resources have been invested to improve the quality of trunk networks.

This solution paper focuses on the main determinants of logistics costs and, whenever possible, provides evidence on the effects of these determinants on competitiveness and growth of Latin American economies. In preparation of the Consulta de San José 2007, this paper provides recommendations/solutions that encompass a series of policies to reduce the prevalent high logistics costs in Latin America. The recommendations rely on the available applied economic analysis on logistics and trade facilitation (areas where very scarce studies can be found). All the recommendations were elaborated having as a main premise the feasibility of implementation; that is, all of them can be realistically implemented.

Although it is difficult to do justice to the tremendous diversity of the Latin American region - which is home to both Caribbean islands with fewer than 100,000 inhabitants as well as Brazil with close to 180 million, and with annual per capita income ranging from $ 467 in Haiti to more than $ 6,000 in Mexico – the recommendations emanated form this solution paper apply to most countries, though the best ways to implement them may vary.

This paper is organized as follows: Section 2 provides a brief overview of the recent literature on the effects of infrastructure on productivity and growth. Section 3 presents the challenge understood as the need to reduce high logistics cost in Latin America (with its direct impact on improving competitiveness). Section 4 aims at identifying the impact of the quantity of infrastructure on growth. Section 5 present an assessment of the levels and determinants of inventory costs and their impact on competitiveness. Section 6 evaluates the potential benefits of trade facilitation on competitiveness. Section 7 presents a set of solutions/recommendation to meet the challenge.

2. Brief Literature Review on the Impact of Infrastructure on Growth and Logistics Costs

This section provides a quick overview of the recent empirical literature on the effects of infrastructure on productivity and growth. For the sake of brevity, the discussion is selective rather than exhaustive.

A number of empirical studies have found that infrastructure has a positive effect on output, especially in developing countries. Returns on infrastructure investments are generally highest during the early stages of development, when infrastructure is scarce and basic networks have not been completed. However, returns tend to fall with development, sometimes sharply. Indeed, some studies of the United States have found that infrastructure investment has negative effects on total output [Briceño-Garmendia, Estache and Shafik, 2004].

In his paper *Is public expenditure productive?* Aschauer [1989] found that the stock of public infrastructure is a significant determinant of aggregate total factor productivity (TFP). However, the economic significance of these results was found to be implausibly large and not robust when more sophisticated econometric techniques are used [Holtz-Eakin, 1994; Cashin, 1995; Baltagi and Pinnoi, 1995]. Gramlich [1994] provides an overview of this literature.

The more recent empirical literature, relying on cross-country panel data, confirms that infrastructure makes a significant contribution to output. Such analysis relies on increasingly sophisticated econometric techniques to address reverse causation; infrastructure may cause growth, but growth may lead to a higher demand of infrastructure. Failure to take this endogeneity problem into account would result in an overestimation of infrastructure's contribution to growth. Notable papers on this line include Canning [1999], which uses panel data for a large number of countries, and Demetriades and Mamuneas [2000], which uses data for OECD countries. Röller and Waverman [2001], using a framework that controls for the possible endogeneity of infrastructure accumulation, find that telecommunications infrastructure has large output effects. Similar results for roads are reported by Fernald [1999] using data on U.S. industry. Calderon and Serven [2003a] present a similar empirical analysis focused on Latin America. They find positive and significant output contributions from three types of infrastructure: telecommunications, transport and energy.

A few papers go beyond measures of infrastructure spending and stock and consider infrastructure efficiency or quality. Hulten [1996] finds that differences in effective use of infrastructure explain 25 percent of the growth difference between Africa and East Asia, and more than 40 percent of the difference between low- and high-growth countries. Using a large panel data set, Esfahani and Ramirez [2002] report that infrastructure has significant growth effects, but that its contribution is affected by institutional factors. Finally, Calderon and Serven [2004b] find that infrastructure quantity and quality both have a robust impact on economic growth and income distribution. The authors use a large panel data set covering more than 100 countries and spanning the period 1960-2000, and conduct a variety of specification tests to ensure that the results capture the causal impacts of infrastructure quantity and quality on growth and inequality.

The relevance of infrastructure as determinant of logistics costs is enormous. Logistics costs, being defined as the costs incurred to take a given good from the producer to the consumer, are heavily determined by the availability and quality of infrastructure. Infrastructure influences directly transport costs and indirectly the level of inventories and consequently financial costs, the main components of logistics costs. A variety of studies [World Bank 2006] emphasize the fact that infrastructure stock and quality, by lowering logistics costs, has a significant impact on countries' competitiveness.

It has been widely shown that poor infrastructure contributes to Latin America's low rankings on competitiveness indexes. Several indexes, aggregating infrastructure variables, have been developed. These include the World Economic Forum's Growth and Business Competitiveness index and the International Institute for Management Development's World Competitiveness Yearbook[2]. These indexes use data and firm surveys to rank countries' ability to create and maintain an environment that sustains enterprise competitiveness. The World Bank's investment climate assessments survey firms about the environments in which they operate, including the performance of infrastructure. More than half of the respondents in Latin America consider infrastructure to be a major or severe obstacle to the operation and growth of their business.

FIGURE 1: BUSINESSES THAT CONSIDER INFRASTRUCTURE A SERIOUS PROBLEM, BY REGION

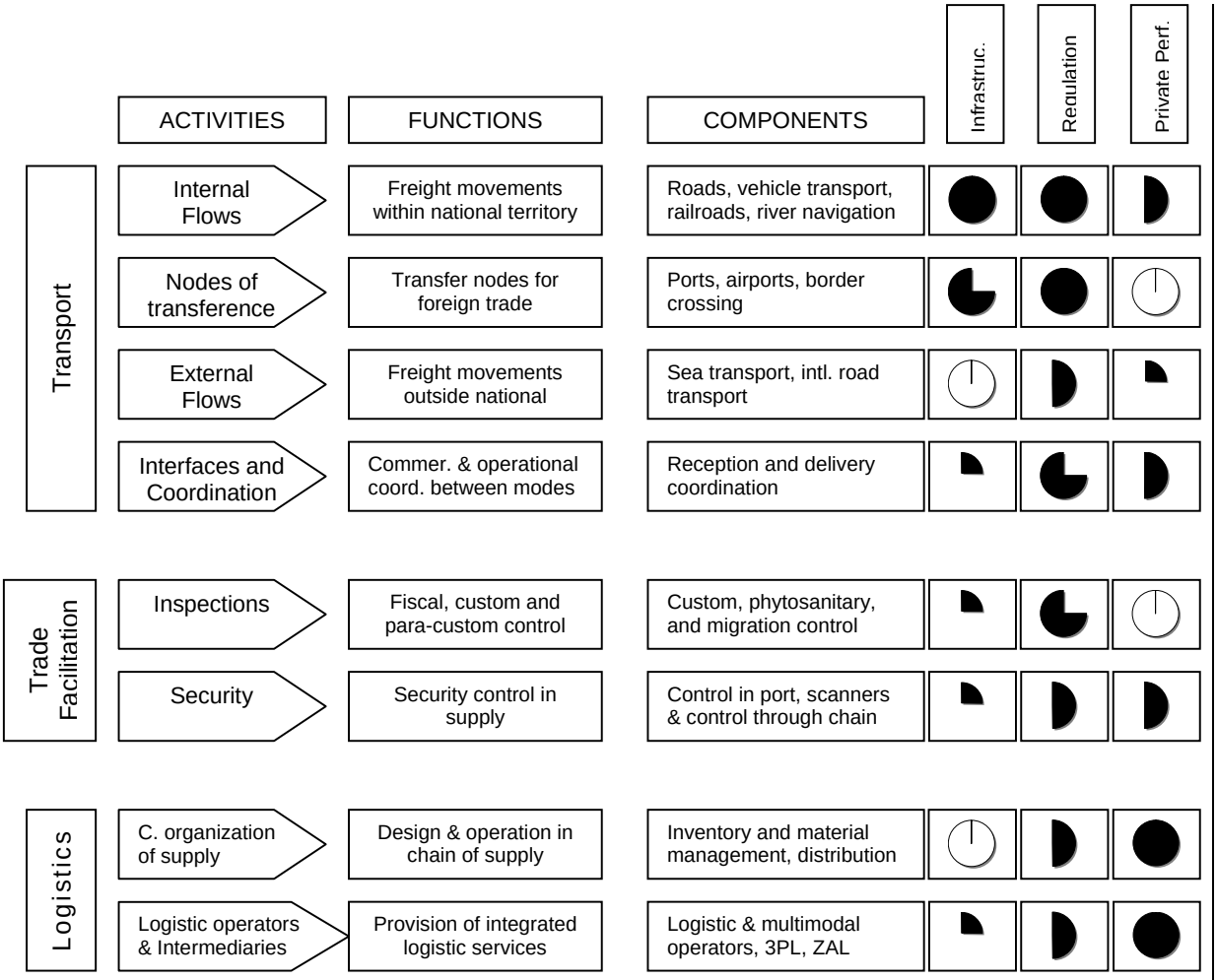
Source: World Bank, World Development Report 2005.

[2] See http://www.webforum.org/ for the World Economic Forum's indices and http://www02.imd.ch/wcc/yearbook/ for the World Competitiveness Yearbook.

3. The Challenge: Reducing Current High Logistics Costs in Latin America

A complex logistics system, composed of transport infrastructure and services, business logistics practices and trade facilitation procedures, is responsible for the physical flows**.** Several studies analyzed the link between competitiveness and the physical flow of goods [World Bank 2005, 2006, 2007], concluding that three major areas have to be dealt with in order to optimize the flow of goods throughout the logistics chains: (a) transportation, (b) business logistics, and (c) trade facilitation. This conceptualization of the factors involved in the flow of goods makes clear that the analysis and policy options should not be limited exclusively to infrastructure bottlenecks (infrastructure being considered the hard component of logistics) but should also consider the rules and procedures regulating the services (soft component). Thus, the performance of a country's logistics system depends on the activities of both the public and the private sectors. Figure 2 shows the impact that the supply of infrastructure, rules and regulations, and the performance of the private sector have on each of the activities defined. It also makes possible to appreciate the diversity of instruments, both public and private, that converge to define the efficiency of the logistics system.

FIGURE 2: ACTIVITIES CONDITIONING THE MOVEMENT OF FOREIGN TRADE FREIGHT



Source: Banco Mundial, 2006: Argentina: El Desafío de Reducir los Costos Logísticos ante el Crecimiento del Comercio Exterior.

3.1 Relevance of the physical movement of goods and available measures of logistics costs

In recent decades there has been a profound change in the way companies organize their physical flow of goods, with the development of modern business logistics that integrate movements over distance (transport) and time (storage), from supply to distribution. The process of change in the organization of physical flows of goods began in the more developed economies, and has been extending gradually into the rest of the world. Until the 80s, companies managed the transport of their inputs, distribution of final products, and storage systems in a relatively independent manner. In recent years, companies began to integrate processes, considering logistics to be the complete cycle of materials, documentation and information, from purchase to final delivery to the consumer, covering transport, storage, inventory management and packaging processes, and the administration and control of these flows.

For most countries, logistics costs are a more important component of total trade costs than tariff barriers[3]. The gradual unilateral tariff reduction implemented in recent years by a large number of countries, together with free trade agreements, brought about an increase in the relative share of logistics costs in total trade costs. This motivated several public policy initiatives aimed at improving the performance of the components making up logistics costs. One example is the trend towards the signing of open skies agreements. Empirical evidence [Micco and Serebrisky, 2006] indicates that import-related transport costs fall by up to 9 percent five years after the signing of an open skies agreement.

3.2 Definition and Estimation of Logistics Costs

There is no agreement on a precise definition of logistics costs. A review of the literature shows significant discrepancies regarding the activities that should be included in the definition of logistics costs. In this paper, we consider logistics costs to include: transaction costs (those related to transport and trade -processing of permits, customs, standards), financial costs (inventory, storage, security), and non-financial costs (insurance).

Lacking a uniform definition, international logistics cost comparisons tend not to be precise. In addition to the difficulties common to any survey carried out across countries the lack of a precise definition of logistics costs on the components and how to measure them. For this reason, much care is necessary when concluding that one country has higher or lower logistics costs than another based on international comparisons that use different methodologies, heterogeneous databases, and were conducted in different years for each country that is part of the comparison.

In recent years various studies have been carried out with the aim of making international comparisons of logistics costs. Taking into account the limitations detailed in the previous paragraph, estimates and international comparisons can provide valuable information. The added value of international comparisons lies basically in the relative ranking of the countries (or regions, if that is the way the grouping has been made) and not so much in the percentage difference of the cost indicator used. Below are the results of the principal studies that include the Latin American countries within their sample.

- **World Bank. Doing Business, Analysis of regulations**. The Doing Business database provides measurements of trade regulations and their application. Doing Business indicators make it possible to compare 155 economies, and can be used to analyze concrete regulations that favor or restrict investment, productivity and growth. The data base contains a category denominated “Trade Among Borders” that provides information on aspects of trade facilitation that have a direct impact on transaction costs, one of the components of logistics costs.

TABLE 1 : DOING BUSINESS REPORT: TRADING AMONG BORDERS

Region or	Documents	Time for	Cost to	Documents	Time for	Cost to

[3] For example, in Latin America, average tariffs were lowered from 40% in the 80s to 10% in the present decade.

Economy	for export (number)	export (days)	export (US $ per container)	for import (Number)	import (days)	Import (US $ per container)
East Asia and Pacific	6.9	23.9	884.8	9.3	25.9	1,037.1
Europe and Central Asia	7.4	29.2	1,450.2	10.0	37.1	1,589.3
Latin America and Caribbean	7.3	22.2	1,067.5	9.5	27.9	1,225.5
Middle East and North Africa	7.1	27.1	923.9	10.3	35.4	1,182.8
OECD	4.8	10.5	811.0	5.9	12.2	882.6
South Asia	8.1	34.4	1,236.0	12.5	41.5	1,494.9
Sub-Sahara Africa	8.2	40.0	1,561.1	12.2	51.5	1,946.9
USA	6	9	625	5	9	625
Argentina	6	16	1,470	7	21	1,750
Brazil	7	18	895	6	24	1,145
Chile	7	20	510	9	24	510
Colombia	6	34	1,745	11	35	1,773
Costa Rica	7	36	660	13	42	660
Mexico	6	17	1,049	8	26	2,152
Peru	7	24	800	13	31	820
Uruguay	9	22	552	9	25	666

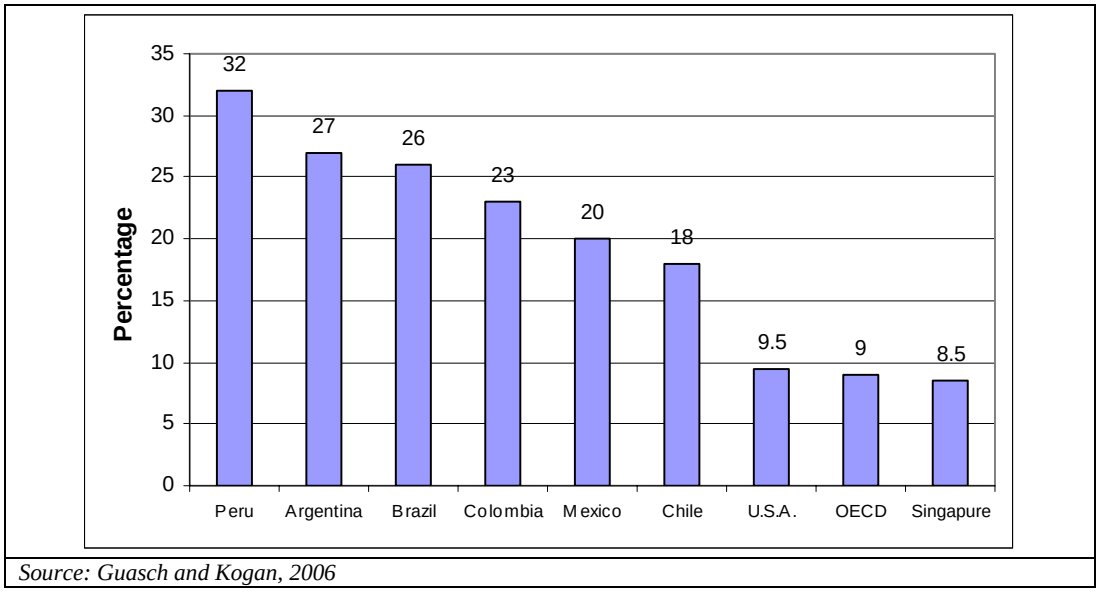
Source: Doing Business Report 2007, The World Bank.

Compared with other regions in the world, Latin America (LAC) shows an acceptable performance of the indicators of official procedures and time necessary for foreign trade (Table 1). Nevertheless, if its performance is compared with that achieved by OECD countries, it can be seen that LAC has much room for improvement. As the time taken for customs and fiscal processing has a direct financial impact on the economic agents participating in the tradable sector of the economy, the "extra" days that the goods are delayed in LAC have a negative effect on its competitiveness. By calculating an average for the indicator, a ranking can be made of the various economies. It can be seen that although Argentina, Chile and Mexico have much improving to do, other countries in the region, such as Brazil (in 107th place in the ranking) and Peru (93rd) need to make reforms far more urgently.

- **World Bank, estimate of logistics costs as a proportion of GDP** [World Bank, 2002]. In an estimate made for various countries in Latin America in 2001, logistics costs were calculated as a percentage of the sale value of the products. The results show that all Latin American countries faces logistics costs that are significantly higher than those in the OECD and the United States[4].

FIGURE 3: LOGISTIC COST AS PERCENTAGE OF PRODUCT VALUE, 2004.

[4] The estimation of logistics costs for Argentina was updated in a recent World Bank report (2006). Logistics costs, in part as a result of the devaluation of the domestic currency and the improvement in the terms of trade account for 16% of product value.



Source: Guasch and Kogan, 2006

- **World Bank, Logistics Perception Index**. The World Bank is developing an innovative questionnaire to be distributed to shippers and logistics operators with the aim of identifying the areas that require immediate intervention if logistics costs are to be lowered. Those receiving the questionnaire have to assign points to each question, on topics that include: effectiveness and efficiency of the cargo shipment process, available infrastructure for logistics operations, and the quality of infrastructure in use for logistics operations. In a preliminary round of this questionnaire[5], the first place corresponded to the Netherlands, the United States was in 19th place, South Korea was 25th, while in the LAC region Chile was 29th, Argentina ranked 40th, followed by Mexico in 45th place. Ecuador was in 46th, Brazil ranked 51st and Peru in 55th, among 70 countries included in the sample.

3.3 Role of Inventories and Other Determinants of Logistics Costs

Inventory levels are usually studied to assess the reliability of infrastructure services, in particular transport. When a country has poor transport infrastructure, firms need to have high levels of inventories, to account for contingencies. Maintaining such levels is expensive because it ties up capital, which has a high cost in the region. This significantly increases unit costs, lowering competitiveness and productivity. Estimates show that, assuming an interest rate of 15 to 20 percent, additional inventory holdings made necessary by poor logistics systems cost Latin American economies more than 2 percent of GDP [Guasch and Kogan, 2001, 2006]

Whereas U.S. businesses hold inventories equal to about 15 percent of GDP, inventories in Latin America and other developing regions are often twice that amount [Guasch and Kogan, 2006]

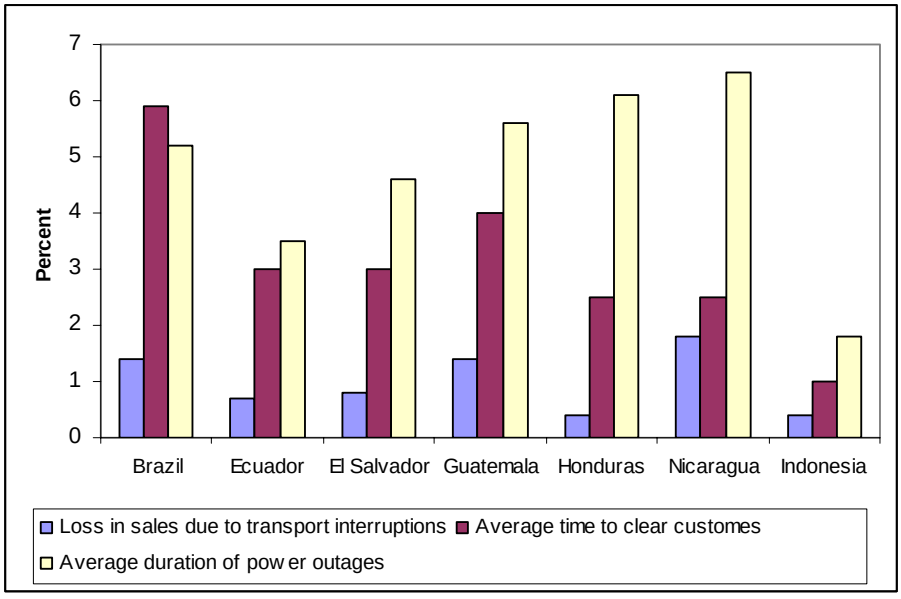
TABLE 2: LATIN AMERICA RATIOS TO U.S. INVENTORIES (ALL INDUSTRIES)

[5] http://www.gfptt.org/uploadedEditorImages/00000325.pdf

Raw Material Inventory Level Ratios: Ratio to U.S. Level by Industry (average of all available data for 1990s)								
	Chile	**Venezuela**	**Peru**	**Bolivia**	**Colombia**	**Ecuador**	**Mexico**	**Brazil**
Mean	2.17	2.82	4.19	4.20	2.22	5.06	1.58	2.98
Minimum	0.00	0.30	0.10	0.11	0.52	0.86	0.42	0.8
1st Quartile	0.36	1.87	1.25	1.39	1.45	2.55	1.06	1.6
Median	1.28	2.61	2.30	2.90	1.80	3.80	1.36	2.00
3rd Quartile	2.66	3.12	3.90	4.49	2.52	5.64	2.06	3.1
Maximum	68.92	7.21	31.1	34.97	13.59	20.61	3.26	7.1
Final Goods Inventory Levels: Ratio to U.S. Level by Industry (average of all available data for 1990s)								
	Chile	**Venezuela**	**Peru**	**Bolivia**	**Colombia**	**Ecuador**	**Mexico**	**Brazil**
Mean	1.76	1.63	1.65	2.74	1.38	2.57	1.46	1.98
Minimum	0.01	0.10	0.39	0.11	0.19	0.67	0.35	0.75
1st Quartile	0.17	0.87	1.17	1.13	1.05	1.67	0.82	1.1
Median	0.72	1.60	1.54	2.02	1.28	1.98	1.36	1.60
3rd Quartile	1.38	2.14	2.11	3.18	1.63	2.86	2.14	2.00
Maximum	31.61	5.29	3.87	21.31	5.31	7.94	4.91	5.2
Source: Guasch and Kogan, 2001.								

Other determinants of logistics costs, like loss in sales due to transport interruptions or average time to clear customs, have a direct impact on productivity in Latin America. Investment climate surveys in Brazil, Ecuador, El Salvador, Guatemala, Honduras, and Nicaragua confirm that most entrepreneurs consider inadequate infrastructure a serious issue. An analysis of these surveys plus Indonesia, conducted for the publication by Fay and Morrison [2007], supports this finding.

FIGURE 4: PRODUCTIVITY GAINS FROM A 20 PERCENT IMPROVEMENT IN SELECTED INVESTMENT CLIMATE VARIABLES IN VARIOUS LATIN AMERICAN COUNTRIES AND INDONESIA



Source: Escribano et al. 2005 and Fay and Morrison, 2007.

In the following section, we will expand the analysis of the three areas that have the largest impact on logistics costs: (i) infrastructure and transport services, (ii) company logistics organization, and (iii) the organization of the public sector in trade facilitation in the flow of foreign trade. Correspondingly, for each of the areas, we will present empirical evaluations of the impact of (i) infrastructure quantity and quality on growth, (ii) the impact of inventory levels on logistics costs, and (iii) improvements in trade facilitation and their impact on growth.

4. Analysis (i): The Impact of Infrastructure on Growth.

This section, that relies heavily on Calderon and Serven (2004b), aims at identifying the impact of the quantity of infrastructure on growth. To assess the impact of infrastructure on growth, Calderon and Serven use a large panel data set comprising 121 countries and spanning the years 1960- 2000. Using this data set, they estimate empirical growth equations including a standard set of control variables augmented by infrastructure quantity measures, and controlling for the potential endogeneity of infrastructure indicators.

4.1 Econometric Methodology

Assessing empirically the impact of infrastructure on growth in the panel data set poses some econometric issues that can be illustrated in the context of a simple dynamic equation:

$$\begin{aligned} y_{it} - y_{it-1} &= \alpha y_{it-1} + \phi' K_{it} + \gamma' Z_{it} + \mu_t + \eta_i + \varepsilon_{it} \\ &= \alpha y_{it-1} + \beta' X_{it} + \mu_t + \eta_i + \varepsilon_{it} \end{aligned} \qquad (1)$$

In equation (1) *K* is a set of standard growth determinants, and *Z* is a vector of infrastructure-related measures. The terms μ_t and η_i respectively denote an unobserved common factor affecting all countries, and a country effect capturing unobserved country characteristics. The second equality follows from defining $X_{it} = (K'_{it}, Z'_{it})'$ and $\beta = (\phi', \gamma')'$. y denotes (log) per capita GDP.

Estimation of (1) faces the potential problem of endogeneity of the regressors. In principle, this affects both the standard determinants of growth in *K* (e.g., variables such as inflation, financial depth and so on, commonly included in growth regressions) as well as the infrastructure measures in *Z*, since it can be argued that these are jointly determined with the rest of the economy's endogenous variables. Furthermore, in the growth equation the lagged dependent variable y_{it} is also endogenous due to the presence of the country-specific effect.

Therefore, suitable instruments are needed to deal with endogeneity. However, apart from the terms of trade, which shall be assumed strictly exogenous, there are no obviously exogenous variables at hand to construct them, and therefore it shall rely primarily on internal instruments. These instruments are provided by taking first differences.

4.2 Empirical Results

As noted, the strategy involves estimation of an infrastructure-augmented growth regression. The analysis includes the following standard (i.e., non- infrastructure) growth determinants: indicators of human capital, financial depth, trade openness, government burden, governance, inflation and real exchange rate overvaluation, and terms of trade shocks. In addition, the set of explanatory variables includes indices of infrastructure quantity. The empirical experiments use an unbalanced panel data set of 5-year averages over the 1960-2000 period, with a total number of observations exceeding 400.

- **Growth and Infrastructure Stock**

TABLE 3 presents the results. According to the best estimate --column [6], which is the specification that includes the best possible instruments --the coefficient of infrastructure stock is positive and significant, pointing to a positive contribution of infrastructure to growth. To contextualize the important of this effect, let us consider a one-standard deviation increase in the aggregate index of infrastructure; this amounts to an increase of 1.3 in the global index, which represents an improvement of the aggregate infrastructure stock from 0.4 (the level exhibited by Ecuador and Colombia in the 1996-2000 period) to 1.7 (the level displayed by Korea and New Zealand in the same period)[6]. The coefficient estimate in column [6] implies that, other things equal, such increase in the index of infrastructure stocks would raise the growth rate of the economy by 3 percentage points a fairly substantial effect.

Among Latin American countries, we find that if the infrastructure levels in Peru (located in the 25th percentile of the region) were to rise to the levels of Chile (75th percentile of the region) during the 1996-2000 period, Peru's growth rate would rise by 1.7 percentage points. Note that these growth benefits imply a very significant expansion of the infrastructure network. According to the figures for the 1996-2000 period, an improvement in the infrastructure of Peru to the levels exhibited by Costa Rica (leader in Latin America) implies an increase in: (a) main lines (per 1000 workers) from 164 to 457, (b) electricity generating capacity (per 1000 workers) from 0.5 to 0.9, and (c) roads (in km. per sq.km.) from 0.06 to 0.70

TABLE 3: INFRASTRUCTURE STOCKS AND ECONOMIC GROWTH: PANEL REGRESSION ANALYSIS USING DIFFERENT ESTIMATION TECHNIQUES

Dependent Variable: Growth in GDP per Capita
Sample of 121 countries, 1960 - 2000 (5 year averaged rate)

					GMM-IV System Estimator 1/	
Variable	**Pooled OLS (1)**	**Country-Effects (2)**	**Time-Effects (3)**	**GMM-IV (D) (4)**	**(5)**	**(6)**
Constant	0.1527** (0.03)		0.1712** (0.03)	0.2214** (0.02)	0.2956** (0.04)	0.3064** (0.06)
Output per capital (in logs)	-0.0147** (0.00)	-0.0663** (0.01)	-0.0145** (0.00)	-0.0143** (0.00)	-0.325** (0.01)	-0.0381** (0.01)
Human Capital	0.0020 (0.00)	-0.0045 (0.00)	0.0059** (0.00)	0.0079** (0.00)	0.0081* (0.00)	0.0059 (0.01)

[6] Such increase in infrastructure stocks has in fact been achieved between 1976-80 and 1996-2000 by countries such as China, Indonesia, Turkey, Korea and Malaysia.

Financial Depth	0.0024* (0.00)	0.0057** (0.00)	0.030** (0.00)	0.0036** (0.00)	0.0026** (0.00)	0.0020* (0.00)
Government Burden	-0.0102** (0.00)	-0.0190** (0.01)	-0.0091** (0.00)	0.0016 (0.00)	-0.0128** (0.00)	-0.0172** (0.01)
Trade Openness	-0.0051 (0.00)	0.0276** (0.01)	0.0007 (0.00)	-0.0046* (0.00)	0.0267** (0.01)	0.0215** (0.01)
Governance	0.0038** (0.00)	0.011 (0.00)	0.0030** (0.00)	0.0005 (0.00)	0.0027** (0.00)	0.0039** (0.00)
Inflation	-0.0190** (0.00)	-0.0177** (0.00)	-0.0166** (0.00)	-0.0204** (0.00)	-0.0236** (0.00)	-0.0214** (0.00)
RER Overvaluation	-0.0053* (0.00)	0.0035 (0.00)	-0.0064** (0.00)	-0.0131** (0.00)	-0.0046** (0.00)	0.0017 (0.00)
Terms of Trade Shocks	0.0251 (0.03)	0.0221 (0.02)	0.0140 (0.03)	0.0733** (0.01)	0.0391** (0.02)	0.0464** (0.02)
Infrastructure Stock	0.0072** (0.00)	0.0195** 90.010	0.0059** (0.00)	0.0043** (0.00)	0.0207** (0.01)	0.0226** (0.01)
Observation	399	331	399	331	331	331
R2**	0.199	0.346	0.0274	0.0219	0.409	0.407
Specification Test (p-value)						
-Sargan Test				(0.52	(0.71	(0.81)
-Second Order Correlation	(0.01)	(0.84)	(0.11)	(0.9)	0.78)	(0.81)

Number in parenthesis below the coefficient estimates are standard errors *(**) implies that the variable is significant at the 10(5) percent level. 1/The GMM-IV System estimations presented in columns {5} and {6} differ in the set of instruments used. In {5} the analysis used only internal instruments (lagged levels and lagged differences of all the explanatory variables in the regression. In {6} we use internal instruments for the growth determinants except for the infrastructure variable. For the variable of interest (infrastructure) actual and lagged levels are used as well as lagged differences of demographic variables such as the urban population, the size of the labor force and population, the size of the labor force and population density. 2/The aggregate infrastructure stock is the first principal component of the following normalized variables: main telephone lines per 1000 workers, energy generating capacity (in GW per worker), and roads (in km per sq.km)

Source: Calderon and Serven, 2004b

- **The Impact of Different Categories of Infrastructure**

TABLE 4 presents the estimates of the growth regression using the different categories of infrastructure --telecommunications, power, and transportation-- individually or jointly.

In columns [1]-[5] of TABLE 4, one infrastructure indicator at a time is used. The analysis evaluates the impact on growth of main telephone lines, main lines and cellular phones, power generating capacity, length of the road network, and length of the road and railways network. Results show that two indicators of telecommunications --that is, main telephone lines and total lines per 1000 workers-- have a positive and significant coefficient, and the latter measure has a larger effect on growth than the former. Power generating capacity also has a positive and significant coefficient, but smaller than the growth effects of an expansion in telecommunications. Finally, an expansion in the transportation network -- measured by either the length of the road network or the length of the road and railways system-- has a positive and

statistically significant effect. It is important to note that the impact of roads and rails is slightly larger than the impact of roads alone.

From these point estimates, the following can be deduced:

- A one standard deviation increase in either main telephone lines (1.65) or total lines (1.69) raises the growth rate of the economy between 2.6 and 3.1 percentage points. Such increase implies a surge in the number of lines from the levels of Indonesia (located in the bottom quintile of the distribution with 51 main lines per 1,000 workers) to the levels of Japan (in the top quintile of the distribution with 977 main lines per workers) in the 1996-2000 period.
- An increase of one standard deviation in power generating capacity (1.43) --that is, from the levels exhibited in India (with 0.7 GW per 1,000 workers at the bottom quintile of the distribution) to the levels in Israel and Hong Kong (with 2.8-2.9 GW per 1,000 workers at the top quintile of the distribution) during the 1996-2000 period -- will enhance the growth rate of income per capita by 1.7 percentage points.
- Finally, if the road and railways system expands by one standard deviation (1.88) -- which implies an increase from the levels displayed in Argentina (with 0.6 km. per sq.km. of area at the bottom quintile of the distribution) to levels in Korea and Taiwan (with 3 km per sq.km. of surface area at the top quintile of the distribution) -- growth will be higher by 1.4 percentage points.

TABLE 4: INFRASTRUCTURE STOCKS AND ECONOMIC GROWTH: PANEL REGRESSION ANALYSIS USING DIFFERENT CATEGORIES OF INFRASTRUCTURE.

Dependent Variable: Growth in GDP per Capita
Estimation Technique: GMM-IV System Estimator
Sample of 121 countries, 1960 - 2000 (5 year averaged rate)

Variable	{1}	{2}	{3}	{4}	{5}	{6}	{7}	{8}	{9}
Constant	0.2000** (0.06)	0.2291** (0.07)	0.1844** (0.05)	0.1430** (0.06)	0.1854** (0.06)	0.2905** (0.06)	0.2767** (0.07)	0.3278** (0.07)	0.3326** (0.07)
Output per capita (in logs)	-0.0300** (0.01)	-0.0355** (0.01)	-0.0232** (0.01)	-0.0194** (0.01)	-0.0203** (0.01)	-0.04121** (0.01)	-0.0405** (0.01)	-0.441** (0.01)	-0.0460** (0.01)
Human Capital	0.0111* (0.01)	0.0093* (0.01)	0.0098* (0.01)	0.0124** (0.00)	0.0118** (0.01)	0.0083 (0.01)	0.0062 (0.01)	0.0050 (0.01)	0.0019 (0.01)
Financial Depth	0.0040* (0.00)	0.0046* (0.00)	0.0032* (0.00)	0.0004 (0.00)	0.0001 (0.00)	0.0026* (0.00)	0.0029* (0.00)	0.0023 (0.00)	0.0020 (0.00)
Government Burden	-0.0221** (0.01)	-0.0208* (0.01)	-0.0262** (0.01)	-0.0205** (0.01)	-0.0218** (0.01)	-0.0231** (0.01)	-0.0257** (0.01)	-0.0199** (0.01)	-0.0219** (0.01)
Trade Openness	0.0170 (0.01)	0.0135 (0.01)	0.0137 (0.01)	0.0240** (0.01)	0.0269** (0.01)	0.0187* (0.01)	0.0192 (0.01)	0.0279** (0.01)	0.0262* (0.01)
Governance	0.0035** (0.00)	0.0041** (0.00)	0.0040** (0.00)	0.0041 (0.00)	0.0028** (0.00)	0.0044** (0.00)	0.0041** (0.00)	0.0023** (0.00)	0.0028** (0.00)
Inflation	-0.0232** (0.00)	-0.0240** (0.00)	-0.0250** (0.00)	-0.0229** (0.00)	-0.0192** (0.00)	-0.0242** (0.00)	-0.0271** (0.01)	-0.0207** (0.00)	-0.0234** (0.00)

RER Overvaluation	-0.0013* (0.00)	0.0008 (0.00)	-0.0010** (0.00)	0.0031 (0.00)	0.0030 (0.00)	-0.0033 (0.00)	0.0033 (0.00)	-0.0014 90.00)	-0.0413** (0.02)
Terms of Trade Shocks	0.0219 (0.02)	0.0229 (0.02)	0.0428** (0.02)	0.0353** (0.02)	0.0424** (0.02)	0.0457** (0.02)	0.0429** (0.02)	0.0497** (0.01)	
Main Lines	0.0157** (0.01)					0.0130** (0.00)			0.0164** (0.01)
Main Lines +Cell		0.0187** (0.01)					0.0153** (0.01)	0.0095 (0.00)	0.0082 (0.01)
Power			0.0120* (0.01)			0.0102 (0.01)	0.0129* (0.01)		
Roads				0.0070** (0.00)		0.0084** (0.00)	0.0093** (0.00)	0.0072** (0.00)	0.0077** (0.00)
Roads + Rails					0.0077** (0.00)				
Observation	338	332	334	335	326	331	325	322	316
R2**	0.417	0.411	0.415	0.393	0.396	0.387	0.39	0.413	0.411
Specification Test (p-value)									
-Sargan Test	{0.45}	{0.33}	{0.49}	{0.72}	{0.73}	{0.63}	{0.44}	{0.62}	{0.62}
- 2nd Order Correlation	{0.50}	{0.38}	{0.54}	{0.78}	{0.83}	{0.79}	{0.63}	{0.66}	{0.72}

Number in parenthesis below the coefficient estimates are standard errors *(**) implies that the variable is significant at the 10(5) percent level.

Source: Calderon and Serven, 2004b

4.3 Conclusions (i)

The main results of the work done by Calderon and Serven [2004b] indicate that the volume of infrastructure stocks has a significant positive effect on long-run economic growth. This conclusion is robust to changes in the infrastructure measure used as well as the estimation technique applied. Illustrative experiments show that the empirical findings are significant not only statistically but also economically. For example, if all Latin American countries were to catch up with the region's leader in terms of infrastructure quantity, their long-term per capita growth gains would range between 1.1 and 4.8 percent per annum. Catching up with the East Asian median country would involve even larger gains ranging from 3.2 to 6.3 percent extra growth. It is important to note, however, that these catch-up scenarios implicitly assume potentially very large investment efforts in the transition toward the increased levels of infrastructure development.

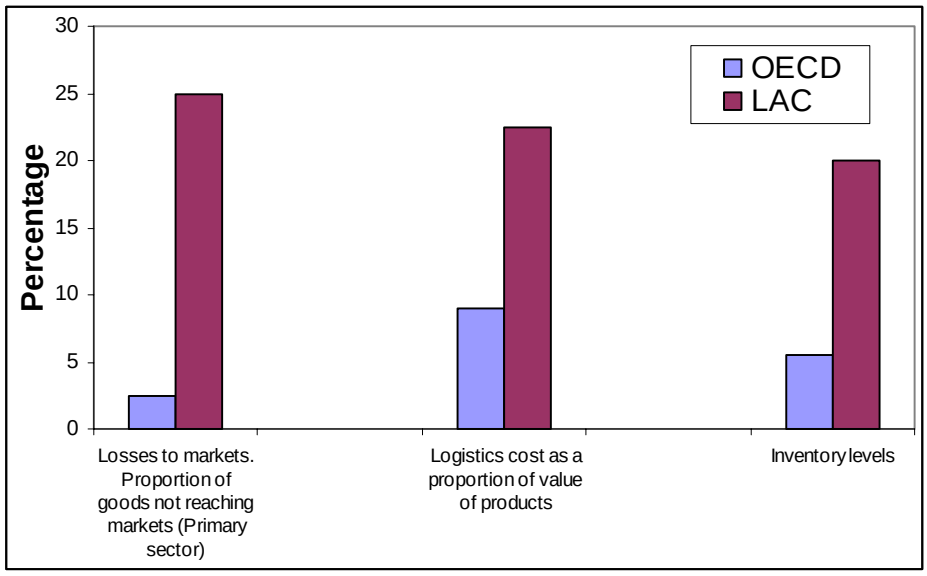
Finally, and perhaps most importantly, the conclusion that infrastructure raises growth implies that infrastructure development may be a key win-win ingredient for poverty reduction. In addition to raising society's overall level of income, it would help raise the income of the poor more than proportionately. This suggests that infrastructure development should rank at the top of the poverty reduction agenda.

5. Analysis (ii): Logistics Costs, Inventories and Their Influence on Competitiveness and Growth

As mentioned in section 3 (3.3), the second of the three major groups that condition the physical movement of goods, and consequently have a significant effect on logistics costs, refers to the logistics organization of firms. In particular we consider the role of inventories, a key aspect of how firms organize their production and distribution processes. Large inventories are, in general, the consequence of unreliable infrastructure and logistics services. By measuring them we can obtain an estimate of avoidable logistics costs and their overall impact on growth. To asses the potential benefits of reducing the cost inventories on growth and competitiveness, we will draw on the work done by Guasch and Kogan [2001, 2003 and 2006].

Figure 5 provides a comparison of average inventory levels in Latin America and the OECD. If we consider inventories have an associated financial cost, the fact that inventory levels in Latin America are three times higher than in the OECD translate into a significant competitive disadvantage. The need to have more inventories is in part explained in the first column of Figure 5. The proportion of goods not reaching markets, due to poor infrastructure and business logistics, forces firms to hold more inventories.

FIGURE 5: DETERIORATING AND INSUFFICIENT INFRASTRUCTURE CONTRIBUTES TO UNCOMPETITIVE INDUSTRIES, 2004



Source: Guasch and Kogan, 2006

In this section we present an assessment of the levels and determinants of inventory costs so as to facilitate appropriate government interventions to reduce them and, in doing so, improve competitiveness.

5.1 Inventories

At present, the logistics industry is a global hub-and-spoke network designed to link hundreds of towns and cities with an overnight communication infrastructure that keeps the world's 'just-in-

time' supply chain taut. In developed markets such as the US, the ability to guarantee overnight shipment of parts and finished goods has allowed companies to reduce average inventory levels by a fifth over the last decade and is thought to have played a significant role in improving productivity across the economy.

In developing markets, however, the evidence shows large inventory holdings. While it is well known from anecdotal evidence that inventories are higher in developing countries, there are no systematic studies that attempt to explain this phenomenon or even to quantify the difference. In their 2001 paper, Guasch and Kogan assembled data for 52 countries from the 1970s and 1980s to draw out some stylized facts about the pattern of inventory holdings. Recent data in Latin American countries, for the 1990s, shows that the problem persists.

US business typically hold inventories equal to 15 percent of GDP while inventory levels in many developing countries are often twice as large, and for raw materials three times as large. If the private sector interest rate for financing inventory holdings is 15 to 20 percent, a conservative estimate in most developing countries, then the cost to the economy of the additional inventory holdings is greater than 2 percent of GDP.

Suppose that firms in developing countries keep high levels of inventories in response to poor infrastructure and logistic services. Then, as an example, consider that the total transport infrastructure stock in Bangladesh is about 2 percent of GDP[7] [Guasch and Kogan, 2001] while this figure is above 12 percent in the US[8]. One year worth of savings in inventory holding costs would be enough to double Bangladesh's infrastructure stock; infrastructure improvement could pay for itself. At the firm's level, the impact of these high levels of inventories is also enormous. Given the high cost of capital in many developing countries, cutting inventory levels in half could reduce unit costs by over 20 percent with a significant impact on competitiveness, aggregate demand, and employment.

These calculations are merely a lower bound on the cost of additional inventories. First, there are certain transactions that would have been worthwhile were it not for the high level of inventory holdings necessary to complete them effectively. It is difficult to estimate the size of these lost transactions. Second, firms in developing countries will take costly steps to mitigate the institutional or structural factors creating a need for high inventories. Suppose that for a particular firm, 30 days of inventory are sufficient when transportation networks are well developed but 90 days of inventory are required when transportation networks are poor. The firm might choose to reduce these 90 days to 60 days by requiring suppliers to locate nearby. Additional costs due to poor infrastructure as measured by increased inventory levels would be 30 days while the actual costs are higher. Third, high inventories can obscure efficiency problems. Current thinking in the manufacturing and operations research fields suggests that low inventories make it easier to trace problems in the production processes.

The direct impact of inventory costs is quite large as Table 5 shows. Given the high levels of cost of capital, on average they can reach about 19 percent of product value. If countries could rely in

[7] Rough calculation, based on graphs of infrastructure stock per capita and composition of Infrastructure. See World Bank, *World Development Report* [1994], figures 1 and 2.
[8] Non-military, non-residential net public stocks of highways and streets.

near just-in-time strategies, those costs could be cut in half, with significant impact on competitiveness and export growth.

TABLE 5: INVENTORY CARRYING COSTS AS A PERCENTAGE OF PRODUCT VALUE

Element	Average (%)	Ranges (%)
Capital Cost	15.00	8 – 40
Taxes	1.00	0.35 – 1.52
Insurance	0.05	0.01 – 0.25
Obsolescence	1.20	0.5 – 3
Storage	2.00	0 – 4
TOTALS	19.25	9 – 50

Source: Guasch and Kogan, 2006. From various studies.

The analysis carried out by Guasch and Kogan [2001] explains the magnitude and the determinants of the inventory holdings and the potential cost to the economy and the benefits on competitiveness. The following regression is estimated to explain the determinants of inventory levels:

$$\text{Inventory Level}_{I,C} = \sum_i \beta_i \cdot \text{Industry Dummy}_i + \sum_x \lambda_x \cdot \text{Country Characteristic}_x + \varepsilon_{I,C}$$

It is difficult to obtain consistent time series data on inventory holdings for developing countries. The aggregate data reported in the national accounts is the change in inventories rather than the stock of inventories; often this data is based not on an inventory survey but on the difference between production and sales which leads to highly inaccurate data[9].Most national statistics agencies do have inventory stock data but they do not publish it. In order to report the size of the country's industrial production, the statistics agency typically carries out a firm survey or census, which asks about total inventory holdings at the beginning or end of the year. More detailed surveys break down inventories into three or more categories: raw materials inventory, goods-in process inventory, and finished goods inventory.

Regressions (1), (2), and (3) of TABLE 6 present the results of regressing raw materials inventory on infrastructure and the presence of a free market, as well as some control variables. The analysis uses two proxies for infrastructure, telephone mainlines per person and BERI's infrastructure quality index, which, although more comprehensive, is available for fewer countries. These proxies for infrastructure are significant at the 1 percent or 5 percent level; the coefficients suggest that a one-standard deviation worsening in infrastructure increases inventories by 27 percent to 47 percent relative to U.S. levels. The proxy for the lack of a free market is transfers and subsidies to private and public enterprises expressed as a fraction of GDP A one-standard deviation restriction on the free market increases raw materials inventories by 19 to 30 percent.

[9] However, it is worth pointing out that the initials results of the research, using the aggregate inventory levels computed from the National Accounts data, were not inconsistent with the stylized observation that developing countries hold more inventory than developed countries.

TABLE 6 : REGRESSIONS								
	{1}	{2}	{3}	{4}	{5}	{6}	{7}	{8}
…Dependent Variable	*Raw Materials*	*Raw Materials*	*Raw Materials*	*Upstream Inventories*	*Upstream Inventories*	*Upstream Inventories*	*Raw as % of Raw + Upstream*	*Raw as % of Raw + Upstream*
Log real PPP GDP/Capita	-0.0229 (0.0186)	0.0010 (0.0285)	-0.0304* (0.0171)	-0.0328*** (0.0950)	-0.0193** (0.0103)	-0.0320*** (0.0077)	0.0444* (0.0227)	0.0523* (0.0274)
Telephone mainlines per person	-0.2934*** (0.0948)		-0.1968** (0.0928)	0.0950* (0.0539)		-0.0926** (0.0549)	-0.5417*** (0.1695)	
Infrastructure Quality		-0.0300*** (0.0086)			0.00021 (0.0044)			-0.0374*** (0.0076)
Transfers & Subsidies/GPD	0.7427*** (0.2226)	0.4105** (0.1947)	0.6453** (0.3128)	0.2136* (0.1202)	0.3098** (0.1235)	0.6608*** (0.1238)	0.4385 (0.4809)	-0.3475 (0.4063)
Imports/GDP	0.0290* (0.0166)	0.0372*** (0.0124)	0.0449 (0.0296)				-0.1765 (0.1798)	0.1615 (0.1596)
Exports/GDP				-0.0157 (0.0108)	-0.0151 (0.0111)	0.0158* (0.0110)	0.2721 (0.1798)	-0.0767 (0.1856)
Lending interest Rate (real)			-0.0317 (0.0368)			-0.0442*** (0.0149)		
GDP Growth			-0.0113 (0.0073)			-0.0038** (0.0016)		
GPD Growth Standard Deviation			0.0108 (0.0075)			-0.0066** (0.0019)		
(24 industry dummy variables)	Included	Included	Included	Included	Included	Included	Included	Included
# of clusters (countries)	42	29	31	44	30	32	41	29
R-Squared	0.2528	0.2897	0.2846	0.3893	0.4291	0.4549	0.3234	0.3518
# of Observations	2086	1627	1408	1962	1642	1271	1554	1307

Robust standard errors corrected for clustering at the country level are in parenthesis.

*Included significance at the 10% level; **Indicates significant at the 5% level; ***Indicates significant at the 1% level.

Inventories greater than .5 have been dropped for these regressions.
Coefficients in regressions (1)-(6) represent the effect of an absolute change in the explanatory variable on inventory level expressed as fraction of a year, For example, if telephone mainlines per person increased from .5 to .6 in regression (1), inventories would fall by o.2934 of a year or about 11 days.
Coefficients in regressions (7)-(8) represent the effect of an absolute change in the explanatory variable on the percentage of inventories held as raw materials. For example, if telephone increased from .5 to .6 in regression (7), 5417% of inventories more are held as raw materials. In the U.S., the median industry holds 57% of inventories as raw materials so that the .1 in telephone mainlines leads to a 9% change in holdings.

5.2 Conclusions (ii)

The work done by Guasch and Kogan in 2001 introduced a new cross-country dataset on inventories at the industry level into the literature documenting the determinants of inventory levels in developing countries. Given the high costs of capital in developing countries, usually in the 15 percent to 30 percent rate, the impact on unit costs of holding inventories is enormous. The analysis explores some broad causes of high raw materials inventory levels across countries in the 1970s and 1980s and can confirm the validity of two causes, infrastructure and poor markets, which have been suggested in case studies.

Since high inventories are a problem today in many developing countries, this solution paper should be useful in understanding one type of obstacle faced by manufacturing firms in Latin American countries and from a policy standpoint, it indicates the direction to take to address the problem.

The policy implications are clear: improvements in infrastructure (roads, ports and telecommunications) can have a significant impact in reducing inventory levels, particularly when accompanied with appropriate and effective regulation. Likewise, the development and deregulation of associated markets can also have a significant impact on inventory levels and consequently reducing the costs of doing business.

6. Analysis (iii): Potential Benefits of Trade Facilitation and its Impact on Competitiveness and Growth

The last of the three major groups of factors that condition the physical movement of goods is the organization of the public sector in trade facilitation and security. To assess the potential benefits of trade facilitation on competitiveness, we will mainly draw on the work done by Wilson, Mann and Oysuki [2003 and 2004].

The relationship between trade facilitation and trade flows is, complex and empirically challenging to assess. Wilson et al.[2004] measure and estimate the relationship between trade facilitation and trade flows for manufactured goods for the period 2000-2001. Four indicators of trade facilitation are developed: (1) Port efficiency, designed to measure the quality of infrastructure of maritime and air ports. (2) Customs environment, designed to measure direct customs costs as well as administrative transparency of customs and border crossings. (3) Regulatory environment, designed to measure the economy's approach to regulations, and (4) Service sector infrastructure designed to measure the extent to which an economy has the necessary domestic infrastructure (such as telecommunications, financial intermediaries, and logistics firms) and is using networked information to improve efficiency and to transform activities to enhance economic activities). We present the results obtained with a gravity model and those obtained with a simulation exercise that offer more information about what type of trade facilitation efforts might provide the largest gains in terms of increasing trade flows.

There is no standard definition of trade facilitation in public policy discourse. In a narrow sense, trade facilitation efforts simply address the physical and paper (customs related documentation) logistics of cross-border trade [Wilson et al., 2003]. In recent years, the definition has been broadened to include the environment in which trade transactions take place, including transparency and professionalism of customs, regulatory environments, as well as harmonization of standards and conformance to international or regional regulations. In addition, the rapid integration of networked information technology into trade means that modern definitions of trade facilitation need to encompass technological concepts as well [Wilson et al., 2004]. In light of this broadening definition of trade facilitation, the definition of trade facilitation used here incorporates relatively concrete "border" elements (port efficiency and customs administration)

and "inside the border" elements (domestic regulatory environment and the infrastructure to enable e-business usage).

Wilson et al. [2004] rely on three data sources - World Economic Forum Global Competitiveness Report 2001-2002 (GCR), IMD Lausanne, World Competitiveness Yearbook 2002 (WCY), and Kaufmann, Kraay and Zoido-Lobaton [2002] (KKZ). See Wilson et al. [2004] for a more complete description of the sources and each of their methodologies used to estimate the gravity model[10]. In this paper we summarize the main results.

Therefore:

- Port efficiency for each country is the average of two indexed inputs from GCR:
  - o Port facilities and inland waterways
  - o Air transport

- Customs environment for each country is the average of two indexed inputs from GCR:
  - o Hidden import barriers
  - o Irregular extra payments and bribes

- Regulatory environment for each country is constructed as the average of indexed inputs from WCY and KKZ:
  - o Transparency of government policy is satisfactory (WCY)
  - o Control of Corruption (KKZ)

- Service sector infrastructure for each country is from GCR:
  - o Speed and cost of internet access
  - o Effect of internet on business

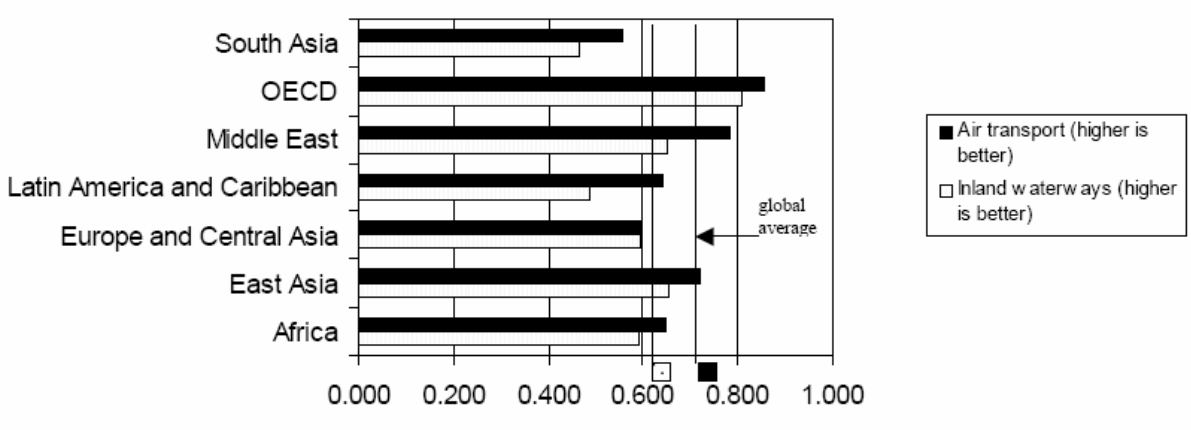
Figure 6 to FIGURE 9 report information about these indicators. The figures show the indexed inputs for regional groups of countries for each specific trade facilitation indicator[11]. Each indexed input is represented by a horizontal bar. The longer the bar extends to the right toward the maximum of 1.0, the higher ranked the region is in the category of trade facilitation. A vertical line is drawn at the average value. If a bar extends beyond the average for the particular trade facilitation measure, that indexed input for that region represents a condition superior to the average for all countries. For example, Figure 6 shows that OECD, Middle East and North Africa (MENA)[12] and East Asia regions are above the global average in terms of the two indexed inputs used for port efficiency.

[10] The gravity model of international trade flows is a common approach to modeling bilateral trade flows. The standard gravity formulation includes various measures of market size (GDP, population, GDP per capita to account for intra-industry trade effects that may be associated with countries of similar incomes but varied tastes), measures of remoteness (distance and adjacency), and measures of kinship (regional trade arrangements, and language/ethnic similarities). To this basic formulation, Wilson et al.[2004] add tariffs as well as the trade facilitation indicators and some additional factors

[11] These regional indicators use simple average of the region. An average weighted by trade or GDP would no doubt yield somewhat different results. There is no clear interpretation of alternative weighted averages. Moreover, these regional indexes are not used in estimation.

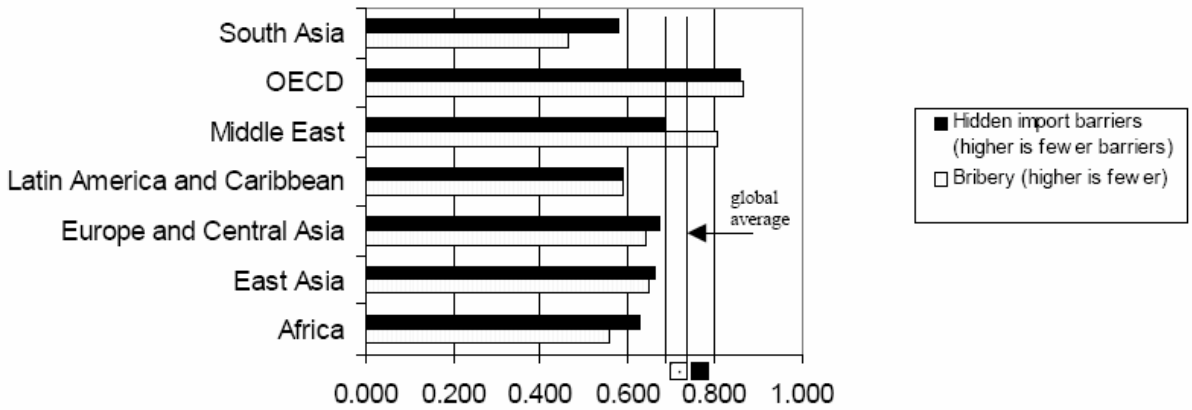
[12] Data are available only for Egypt, Jordan and Israel.

FIGURE 6: TWO INDEXED INPUTS TO PORT EFFICIENCY



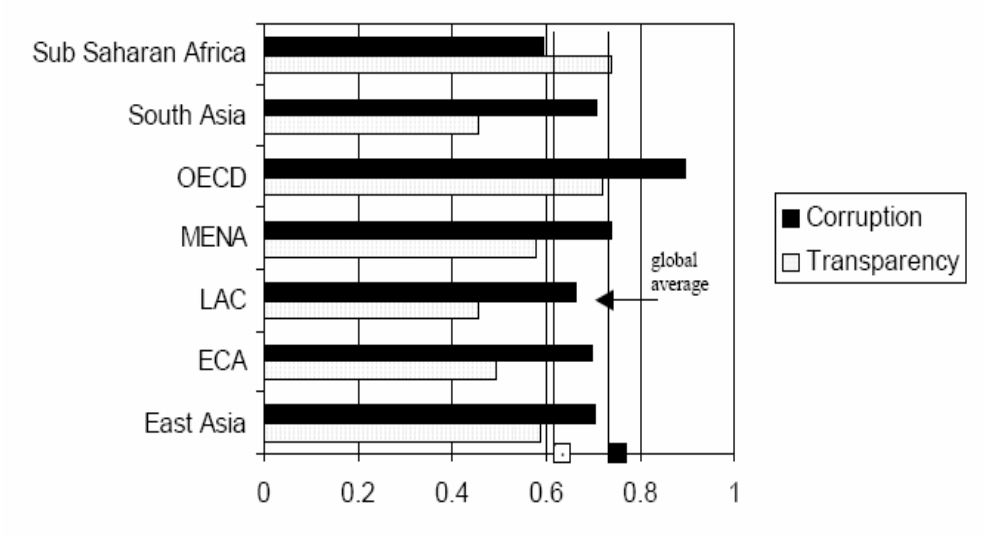
Source: Wilson et al.,2004

FIGURE 7 :TWO INDEXED INPUTS TO CUSTOMS ENVIRONMENTS



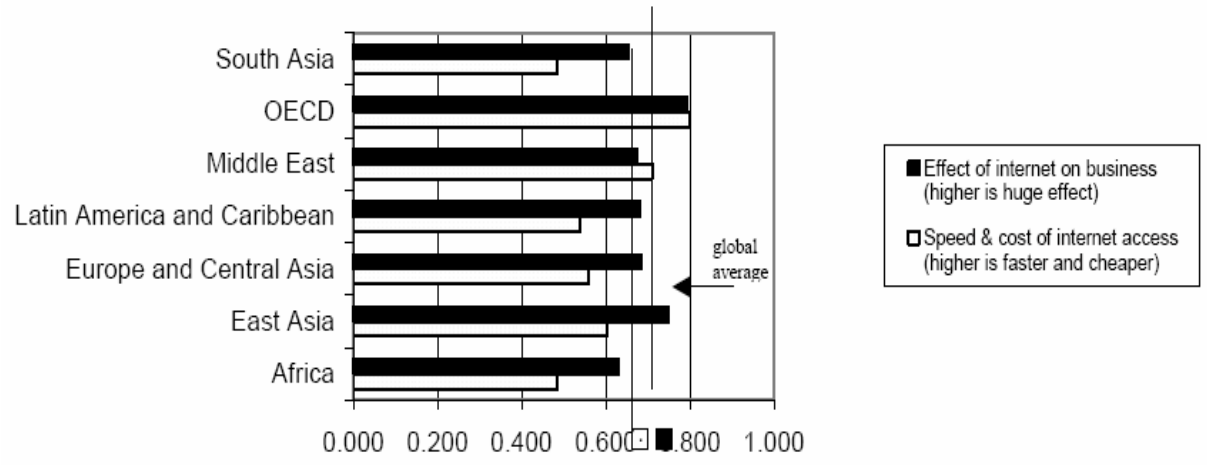
Source: Wilson et al.,2004.

FIGURE 8: TWO INDEXED INPUTS TO REGULATORY ENVIRONMENT



Source: Wilson et al.,2004.

FIGURE 9 : TWO INDEXED INPUTS TO SERVICE-SECTOR INFRASTRUCTURE



Source: Wilson et al.,2004.

6.1 Regression Results

The approach used by Wilson et al.[2004], which constructs a set of distinct trade facilitation indicators and deploys them in a gravity model of trade, is generally successful. TABLE 7 displays regression results. The first column includes the estimated coefficients and standard errors for the basic gravity model specification. The second column includes those for a specification that measures the effect of Free Trade Agreements (FTA) and language dummies (i.e. membership of any FTA, or any common language). The model was run using an ordinary

least squares (OLS). The coefficients for the four trade facilitation measures are statistically significant and the estimated coefficients differ for the different trade facilitation indicators.

Before considering the trade facilitation indicators, it is worthwhile to consider tariffs. Higher tariffs have a significant and the expected negative effect (with -1.2 coefficient) on trade. The coefficient on tariffs is similar to that of distance. In *ad valorem* terms, the elasticity of tariff is -1.1 at the global average level of tariff rates -- i.e. 1 percent reduction in *ad valorem* tariff from the global average (from 8.5 to 7.5 percent) will increase the trade flow by 1.1 percent and a 1 percent reduction in distance (80 kilometers from the global average) would yield a 1.3 percent increase in trade flow. These figures are useful benchmarks against which to compare the coefficients on the trade facilitation indicators.

Port efficiency of both the importer and the exporter is positively associated with trade; that is, an improvement in the indicator toward best practice is associated with an increase in trade flows. Comparing the effect of port efficiency on imports vs. exports, it is noticeable that the coefficient is higher for exporters than importer, which implies that global trade flows get a bigger boost when the exporters' port efficiency improves. So for countries and regions that are well below the global best practice, such as LAC, there is great potential for improvement in terms of port efficiency. Moreover, the range of performance on this measure of trade facilitation is the largest among the trade facilitation indicators.

Customs environment also has a significantly positive effect on trade of the importing country with an elasticity of 0.47, which is smaller than that for tariffs. Trade facilitation is a possible avenue for reducing the cost of imports through customs improvements even as tariffs remain where they are.

Improving the regulatory environment of the importer and exporter has a positive and significant association with trade with coefficients of 0.28 and 0.62, respectively. As with ports, the magnitude of the coefficient is larger for the exporter than for the importer. Regulatory transparency and control of corruption (the two inputs) reduce unnecessary transaction costs of trading and reduce barriers to private business.

Improving indicators of service sector infrastructure are positive and significantly associated with trade among the countries in the sample. Similar to port efficiency and regulatory environment, service sector infrastructure has a more significant positive effect on the exporters than on importers. The elasticity of the exporters' service sector infrastructure is the highest among all trade facilitation measures (1.94).

TABLE 7: REGRESSION RESULTS

	Model 1		**Model 2**	
	Coef.	**Std. Err.**	**Coef.**	**Std. Err.**
Constant	-10.641***	1.558	-10.771***	1.549
Tariff Rates	-1.155***	0.318	-1.163***	0.318
Port Efficiency of Importer	0.307*	0.163	0.338*	0.160
Port Efficiency of Exporter	0.924***	0.148	0.938***	0.146

Customs Environment of Importer	0.472**	0.199	0.486*	0.199
Regulatory Environment of Importer	0.281*	0.144	0.264	0.144
Regulatory Environment of Exporter	0.620***	0.132	0.580***	0.131
Service sector infrastructure of Importer	0.729***	0.224	0.657**	0.224
Service sector infrastructure of Exporter	1.943***	0.216	1.943***	0.217
GNP of Importer	0.915***	0.014	0.915***	0.014
Per capita GNP of Importer	-0.182***	0.037	-0.210***	0.037
GNP of Exporter	1.246***	0.014	1.241***	0.014
Per capita GNP of Exporter	-0.226***	0.029	-0.251***	0.029
Geographical Distance	-1.258***	0.025	-1.225***	0.025
Adjacency dummy	0.336***	0.114	0.426***	0.108
Membership Dummy for any FTA			-0.021	0.078
ASEAN Membership Dummy	0.509***	0.190		
NAFTA Membership Dummy	-0.645	0.501		
LAIA Membership Dummy	0.593***	0.154		
AUNZ Membership Dummy	1.118	0.858		
MERCOSUR Membership Dummy	0.229	0.302		
EU Membership Dummy	-0.515***	0.106		
Dummy for any Common Language			0.823***	0.061
English Language Dummy	0.808***	0.089		
French Language Dummy	-1.413***	0.500		
Spanish Language Dummy	0.598***	0.098		
Arabic Language Dummy	-1.223	0.992		
Chinese Language Dummy	1.747***	0.406		
German Language Dummy	-0.826	0.505		
Portuguese Language Dummy	0.569	0.986		
Russian Language Dummy	2.026***	0.362		
Year 2000 dummy	-0.031	0.039	-0.038	0.039
Adjusted R-squared	0.758		0.755	
Number of the observations	7,904		7,904	
Note: The significance levels at: 10%: "*" 5% : "**" 1% : "***"				
Source: Wilson et al., 2004.				

6.2 Potential Benefits from Trade Facilitation

In this section we present the results of several simulation exercises conducted by Wilson et al.[2003]. These simulations use a formula that brings the below-average countries in the group half-way to the average for the entire set of countries. Special attention is devoted to the below-average country on the grounds that donor attention and capacity building efforts should be extended to this group. An improvement of 'half-way' to the average is chosen because there are limited development resources and improvements take time. Dramatic improvements are possible, but it is not realistic to presume a scenario whereby all countries in the sample are assumed to achieve best practice as measured by the nation with the highest score on a particular measure of trade facilitation.

From the standpoint of a specific country, improvement in port efficiency should increase both its own imports and exports. The same can be expected for regulatory environment, and service sector infrastructure, as well as customs on the import side. But, a country will export more not

only from its own reforms, but also because of reforms undertaken by its trading partners as importers. Thus, export gains are the sum of the simulated effect on exports of unilateral reform and of import reforms undertaken by the country's trading partners. On the import side, a country's imports increase first on account of its unilateral import reforms, and secondarily on account of the reforms undertaken by its trading partners as exporters. Examining the relative gains to trade from unilateral reforms as compared to partner's reforms, and on exports vs. imports, and across trade facilitation indicators offers three dimensions of potential insight to policymakers, donors, and the private sector.

Table 8 summarizes the results for the simulations and presents the results for the 75 countries as a whole. In total, the collection of simulations on the four trade facilitation indicators yields an increase in trade among the 75 countries worth about $377 billion, representing an increase of about 9.7 percent in total trade among these countries. About $107 billion of the total gain comes from the improvement in port efficiency and about $33 billion emanates from the improvement in customs environment. The gain from the improvement in regulatory environment is $83 billion. The largest gain comes from the improvement in service sector infrastructure ($154 billion), which is consistent with the broad concept of services infrastructure that this variable is designed to capture.

TABLE 8: OVERVIEW OF SIMULATION: BRING BELOW-AVERAGE MEMBERS HALF-WAY UP TO THE GLOBAL AVERAGE (CHANGE IN TRADE FLOW IN $ BILLION)

	Importer's change in trade facilitation	Exporter's change in trade facilitation	Total
'Border' Measures			
Port Efficiency	23.40 (0.6%)	84.53 (2.2%)	106.93 (2.8%)
Customs Environment	32.87 (0.8%)		32.87 (0.8%)
'Inside the Border' Measures			
Service Sector infrastructure	36.64 (0.9%)	117.38 (3.0%)	154.02 (4.0%)
Regulatory Environment	24.39 (0.6%)	58.86 (1.5%)	83.25 (2.1%)
Grand Total	117.30 (3.0%)	259.77 (6.7%)	377.06 (9.7%)

Source: Wilson et al., 2004.

TABLE 9 summarizes the change in trade flow by region, by trade facilitation indicators, and by own vs. trading partners' reforms. These results can be combined in several ways to give different perspectives on which regions gain the most and why. One cut, exports by region and by trade facilitation indicator, is shown in Figure 10.

TABLE 9 : DETAILS OF SIMULATION RESULTS

Experience of Exporters

		Port efficiency			Customs Environment	Regulatory Environment			Service sector Infrastructure			Combined effect
Region	Initial Trade	Importer change, percent	Exporter change, percent	Total change, Percent	Total Change, percent	Importer change, percent	Exporter change, percent	Total change, Percent	Importer change, percent	Exporter change, percent	Total change, Percent	Total change, Percent
East Asia	753	0.5	7.0	7.6	0.8	0.6	3.3	3.9	0.9	10.8	11.7	24.0
ECA	139	0.8	8.7	9.5	0.9	0.7	5.5	6.1	1.4	12.1	13.5	30.0
LAC	179	0.6	7.3	7.9	0.9	0.8	3.6	4.4	0.8	6.0	6.8	20.0
MENA	26	0.4	0.2	0.6	0.7	0.5	0.1	0.6	0.7	0.7	1.4	3.3
OECD	2,735	0.6	0.0	0.7	0.8	0.6	0.6	1.3	1.0	0.0	1.0	3.8
South Asia	36	0.4	11.7	12.1	0.8	0.5	6.9	7.4	0.7	19.2	20.0	40.3
SS Africa	12	0.4	1.1	1.4	0.6	0.5	2.8	3.3	0.8	4.8	5.6	10.9
TOTAL	3,879	0.6	2.2	2.8	0.8	0.6	1.5	2.1	0.9	3.0	4.0	9.7

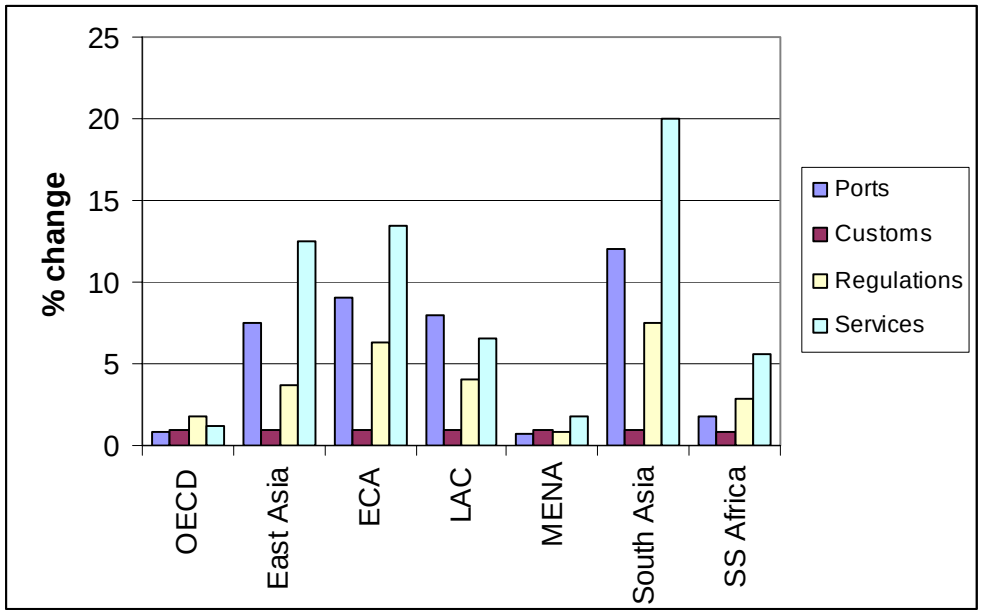
Experience of Importers

		Port efficiency			Customs Environment	Regulatory Environment			Service sector Infrastructure			Combined effect
Region	Initial Trade	Importer change, percent	Exporter change, percent	Total change, Percent	Total Change, percent	Importer change, percent	Exporter change, percent	Total change, Percent	Importer change, percent	Exporter change, percent	Total change, Percent	Total change, Percent
East Asia	620	1.5	2.7	4.2	2.2	1.1	2.1	3.3	2.7	4.4	7.0	16.7
ECA	165	3.1	1.8	4.9	3.2	2.7	1.3	4	5.3	2.4	7.7	19.8
LAC	260	2.9	1.3	4.2	3.4	2.4	1.4	3.8	2.9	1.8	4.7	16.1
MENA	32	0.2	1.0	1.3	1.3	0.1	1.1	1.2	0.7	2.1	2.8	6.6
OECD	2,761	0.0	2.2	2.2	0.1	0.2	1.4	1.6	0.1	2.9	3.0	6.9
South Asia	21	3.1	1.4	4.5	5.8	3.3	1.5	4.8	6.8	2.5	9.3	24.4
SS Africa	20	1.5	1.5	3.0	3.0	1.8	1.3	3.1	3.5	2.6	6.1	15.2
TOTAL	3,879	0.6	2.2	2.8	0.8	0.6	1.5	2.1	0.9	3.0	4.0	9.7

ECA: East Europe and Central Asia
LAC: Latin America and the Caribbean
MENA: Middle East and North Africa
SS Africa: Sub-Sahara Africa

Source: Wilson et al., 2004.

FIGURE 10: CHANGE IN EXPORTS BY REGION



Source: Wilson et al., 2004.

On the whole, as TABLE 9 shows, from improvement in all trade facilitation measures the highest export gain is attained by South Asia (40.3 percent). LAC is in fourth place (20 percent), after ECA (30.0 percent) and East Asia (24 percent). High gains for South Asia emanates from high export gains due to improvement in port efficiency, and service sector infrastructure. Likewise, the LAC region gains in its exports mainly come from reforms in port efficiency and service sector infrastructure. In both cases, the gains are generated from their own improvements, rather than the improvements by trading partners. In the LAC region, Mexico gathers an export gain in the amount of $17.3 billion (i.e. the highest in the region) and Paraguay realizes a gain of 74.8 percent. Mexico and Paraguay's high gains again come from the improvement in ports and service sector infrastructure.

6.3 Conclusions (iii)

In conclusion, the results from this section suggest that the scope and benefit of unilateral trade facilitation reforms are very large and that the gains fall disproportionately on exports. Some of the policies required to improve the four trade facilitation indicators are easier to adopt than others. But the message is clear: there are significant gains to be made from improving the components of trade facilitation, even if the improvements are unilateral.

7. Solutions / Recommendations

In this paper we presented the three areas that have the largest impact on logistics costs and consequently on competitiveness: (i) transport infrastructure, (ii) company logistics organization, and (iii) the organization, rules and regulations that affect trade facilitation.

The recommendations provided follow the sections developed in the paper. Some of the recommendations can be assessed following standard cost/benefit analysis. However, others can not. Such is the case of company logistics organization. A well developed market of business logistics providers can have a tremendous impact on aggregated logistics costs. The problem is that the performance of service logistics providers depends on a wide variety of factors, most of them related to investment climate (taxation, standards and quality regulation, among others). Coming up with a cost/benefit estimate for the measures aimed at improving the productivity of service logistics providers or to facilitate trade is very difficult. This is clearly not the case of infrastructure investments (road, railways, etc) because their costs and benefits can be measured with more accuracy.

Recommendation 1: Latin America needs to spend more and better in infrastructure

- *Latin America needs to spend 'more' in infrastructure*. On average, countries in the region spend less than 2 percent of GDP in infrastructure, while 3 to 6 percent is needed to keep pace with other countries like China or Korea[13]. Regardless of the source of financing, infrastructure investment costs (including operation and maintenance costs) are ultimately borne by users or taxpayers. So, if infrastructure investment is to increase, users must cover a higher share of the costs. This requires changing the payment culture as well as protecting users who cannot afford to pay creating safety nets programs.

- *Latin America needs to spend 'better'*. Resources should be better allocated between investment and maintenance. The temptation to build "white elephants" should be avoided; countries in LAC ought to conduct careful analysis of investment needs, eliminating biases towards investment in operation and maintenance of infrastructure. New investments must focus on increasing productivity and competitiveness, though that does not need to be at the expense of social goals, since universal coverage of water, sanitation, and electricity could be achieved within ten years for less than 0.25 percent of GDP a year. Subsidies must be better targeted to those who need them. The most important concern when it comes to infrastructure investment in Latin America is project selection. The vast majority of countries lack the institutional set up to prioritize investment according to sound processes and cost/benefit criteria. Moreover, few countries have the institutions and technical skills to monitor the achievement of the outcomes sought by infrastructure projects. In summary, in order to increase the quality of their infrastructure, Latin American countries need to set up institutions capable of conducting adequate planning, cost benefit analysis and monitoring and evaluation.

As an illustration of a cost/benefit analysis we present two cases prepared for World Bank investment loans. The rates of returns and Net Present Values obtained from these investments are quite high in both cases above 25%[14]. Both projects finance investment in maintenance of roads and aim at improving the quality of transport infrastructure.

[13] A recent World Bank study "Argentina: Infrastructure for Growth and Poverty Alleviation" indicates that Argentina would need to invest between 2.5 to 4% of GDP to cover its investment needs in the next 5 years.

[14] It should be highlighted that the cost-benefit analysis presented are ex-ante, no ex-post information is available to test whether the estimated benefits differ from actual benefits.

The economic analysis of both cases was carried on using the Highway Design and Maintenance Standard Model (HDM-III), which simulates the deterioration of the road on the basis of existing conditions, the traffic on the road, and measures the incremental benefits to the road users from a base "without project" alternative. A sensitivity analysis[15] was also carried out in both cases.

Cost Benefit Analysis Case 1: Bolivia's Road Rehabilitation and Maintenance Project
An economic analysis was undertaken as part of project preparation. The investment component includes the rehabilitation of the Calamarca-San Pedro and the Boyuibe-Yacuiba road segments. Table 10 below summarizes the results of the analysis of the rehabilitation component. The present value of the economic and financial benefits has been calculated using a 12 percent discount rate.

TABLE 10: BOLIVIA CASE: SUMMARY OF ECONOMIC ANALYSIS

	Present Value of Flows		Fiscal Impact	
	Economic Analysis	Financial Analysis	Taxes	Subsidies
Benefits: US$ million	45.16	60.99	15.83	-
Costs: US$ million	23.40	27.51	4.11	-
Net benefit (NPV): US $ million	21.76	33.48	11.72	-
IRR (%)	27.0 %	31.0 %		

Source: World Bank, 2001: Bolivia, Road Rehabilitation & Maintenance Project

The summary of benefits and costs suggests that the proposed project would reduce road-user transport costs by (a) lowering vehicle operation, accident, and travel time costs, (b) removing physical constraints to road transport of goods and people within Bolivia and from Bolivia to the neighboring countries of Argentina and Chile, and (c) allowing the provision of more reliable and safer transport services..

The sensitivity analysis show that both subprojects will continue to show rates of return above a cutoff of 12 percent[16] (rate most commonly used in World Bank projects) in the event of a 20 percent increase in the investment cost, a 20 percent decrease in the benefits or a combination of the two. In these latter events, the rate of return results to be 16.9 percent.

TABLE 11: BOLIVIA SENSITIVITY ANALYSIS

		Increase in Costs			
		0 %		20 %	
		NPV(US$ million)	ERR (%)	NPV(US$ million)	ERR (%)
Decrease in Benefits	0 %	21.76	27.0%	17.08	22.2%
	- 20 %	12.73	21.2%	8.05	16.9%

[15] Analysis of how sensitive outcomes are to changes in the assumptions. The assumptions that deserve the most attention should depend largely on the dominant benefit and cost elements and the areas of greatest uncertainty of the program or process being analyzed.
[16] The World Bank adopted a 12 percent discount rate for all its investment projects. This discount rate has been applied to all Cost -Benefit analysis in investment projects since 2000.

Source: World Bank, 2001: Bolivia, Road Rehabilitation & Maintenance Project.

Switching values were calculated for the increase in costs or the reduction in benefits. In the case of the Calamarca-San Pedro sub-project, costs would have to increase by more than 72 percent or benefits reduced by more than 42 percent for the sub-project to yield a rate of return lower than 12 percent. In the case of the Boyuibe-Yacuiba sub-project, costs would have to increase more than 1.5 times, or benefits reduce by more than 61 percent for the project to become not economically feasible. These results show the robustness of the economic worth of the rehabilitation investments.

Cost Benefit Analysis Case 2: Mexico's Federal Highway Maintenance Project

The main objective of this project is the reduction of road transport costs and the preservation of the road network in an efficient and sustainable manner. The proposed investments would reduce road user transport costs by lowering vehicle operating and travel time costs. An economic analysis was done for the civil works program under the project consisting of: (i) rehabilitation and maintenance program (85 percent of civil works); (ii) comprehensive maintenance by contract program (7 percent of civil works); and (iii) bridge rehabilitation program (8 percent of civil works).

Table 12 below summarizes the net present value (NPV), internal rate of return (IRR), and modified internal rate of return (MIRR) of the programs.

TABLE 12: MEXICO CASE, SUMMARY OF ECONOMIC ANALYSIS

Present Value of Flow	Rehab. & Maint. Program	Comprehensive Maint. Program	Bridge Maint. Program	All Programs
Benefits: US$ million	304	77	231	612
Costs: US$ million	54	12	11	77
Net benefits (NPV): US$ million	250	65	220	535
IRR (%)	114%	140%	68%	111%
MIRR (%)	36%	38%	57%	40%

Source: World Bank, 2000: Mexico, Federal Highway Maintenance Project

The Ministry of Communications and Transports of Mexico (SCT) estimated maintenance and rehabilitation costs in financial and economic terms (net of taxes), economic costs being on average 85 percent of financial costs; and defined vehicle fleet characteristics and unit costs for five vehicle classes. Traffic growth rate was set to 3 percent based on past trends for the duration of the analysis period. The discount rate was set to 12 percent.

An analysis of the road conditions in 2001 indicated that 23 percent of the network was in good condition, 34 percent in fair condition (requiring seals or thin overlays), 19 percent in poor condition (requiring overlays) and 24 percent in very poor condition (requiring thick overlays or reconstruction). By 2004, the successful implementation of the program resulted in roads in good and fair condition accounting for 75 percent of the total.

The sensitivity analysis shows that the first year rehabilitation and maintenance program IRR is 114 percent and the MIRR is 36 percent. Assuming there is an increase of 20 percent in agency costs, the IRR decreases to 97 percent and the MIRR to 33 percent. A 20 percent decrease in

traffic decreases the IRR to 91 percent and the MIRR to 32 percent. A combination of increase agency costs by 20 percent and a decrease in traffic by 20 percent decreases to IRR to 77 and the MIRR to 30 percent.

TABLE 13: MEXICO: SENSITIVITY ANALYSIS

		Increase in Agency Costs			
		0 %		20 %	
		IRR (%)	MIRR (%)	IRR (%)	MIRR (%)
Decrease in Traffic	0 %	114	36	97	33
	- 20 %	91	32	77	30

Source: World Bank, 2000: Mexico, Federal Highway Maintenance Project

To have a net present value equal to zero, agency costs have to be 560 percent higher than the estimated costs or traffic levels reduced to only 18 percent of the estimated traffic. These events have a very low probability of occurrence indicating that the project economic viability was very robust.

Recommendation 2: Latin America needs to bundle infrastructure investments with the adoption of policies aimed at improving the efficiency of service logistics providers.

Previous sections showed firms in Latin America need to have high levels of inventories. This responds to the lack of good quality infrastructure and unreliable service providers. For instance, it has been documented that the trucking industry in Colombia has very low standards of quality imposing high costs to export oriented firms[17].

The policies required to reduce high inventory levels are clear: improvements in transport infrastructure have to be accompanied with appropriate and effective regulation, for instance a good framework for the development of multimodal operators. Likewise the deregulation of associated markets can also have a significant impact on inventory levels and then reducing the costs of doing business. The ultimate goal of better regulation is to foster private sector investment to provide a menu of efficient logistics services, including among others dry ports and multimodal distribution centers.

Policy reforms aimed at improving sector regulation are not costly, as it requires changes in laws and other norms and regulations. However, even if the monetary costs are low, political costs could be quite high and a *de facto* barrier to change. The challenge then is to find out how countries in Latin America can generate the political consensus needed to adopt the optimal policies to reduce logistics costs.

Table 14 shows the results of an exercise conducted by Guasch [2004] that estimates the effect of reducing logistics costs from 34 percent of product value to 20 percent in Peru. The results are impressive. To achieve the reduction of logistics costs presented by Guasch, it is necessary to combine investments in infrastructure and changes in regulations. Thus, the monetary cost is difficult to estimate, but the potential benefit is huge. Assuming the increase in demand and

[17] World Bank "Infraestructura Logística y de Calidad para la Competitividad de Colombia" Report 35061, 2006

employment presented in Table 14 fosters the rate of growth just 1 percent, the Peruvian GDP would grow US$800 million per year (the nominal 2005 GDP was US$79 billion). This growth would generate additional fiscal space to fund the investment required to address infrastructure bottlenecks.

TABLE 14: IMPACT OF THE REDUCTION IN LOGISTICS COSTS FROM 34% TO 20%

Sector	Increase in Demand	Increase in Employment
Agro-industry	**12 %**	**6 %**
Wood and furniture	**14 %**	**16 %**
Textiles	**8 %**	**9 %**
Leather / shoes	**18 %**	**15 %**
Mining industry	**10 %**	**2.5 %**

Source: Guasch, 2004. Mimeo.

Recommendation 3: Latin American countries need to adopt policies to improve trade facilitation. In particular, they need to (i) strengthen the institutions that promote trade facilitation; (ii) support the internationalization of national firms, which implies helping national firms open new markets and adopt the technologies and quality standards required to compete in the global economy; (iii) the implementation of effective multimodality laws, providing in particular insurance across modes and the use of a single bill of landing; (iv) the improvement of access areas to ports and connections to the other transport modes ;and (v) facilitate the development and offer of associated service such as transport services, testing, cooling services, logistic terminals/dry ports.

In Latin America, recent studies [Soloaga et al.,2007] show that main reforms on trade facilitation are of relatively of low costs, as they relate to regulatory and policy reforms, and not to hard infrastructure. Thus, it is expected that benefits from reform will most likely outweigh the costs.

The areas that would benefit from a better policy design and implementation and a capacity building program to strengthen trade promotion institutions are:

- *Country Strategy for capacity building in trade facilitation* includes the creation (or strengthening) of an export development corporation to promote international trade National governments should aim at reducing administrative costs through better regulations. Finally, it also incorporates the 'building connections' component fostering the access and flow of information needed to achieve access to new markets or expand the share in international markets where local firms are present.

- *Support the modernization of local firms' processes related to international trade* International competition will make firms more efficient, innovative and therefore competitive. It had been observed that firms that go global tend to stay through, while firms that stay local tend to disappear overtime. Latin American firms need to insert themselves in the new international economy. Accordingly, firms need to create their own trade facilitation strategies

- *Creation of a National Logistics Council* with the participation of the public bodies responsible for providing services (Transportation, Public Works, Customs), and fundamentally those representing users (Foreign Trade, Industry, Agriculture, SMEs), and other representatives of the private sector (chambers of commerce). Its aim would be to define an agenda of actions to reduce logistics costs, establish measurement and control procedures, develop a control panel of logistics actions, and make regular follow-up of its progress. It has increasingly been recognized that achievement of real operational improvement depends crucially on improved communication among private traders and freight forwarders, transport providers, and the government services that regulate and control movements across borders.

- *Central focus on modernization and simplification of custom procedures,* introduction of computer applications to make processes more efficient and transparent, special lines for reliable clients, randomized testing and improvement in human resource management, all as instruments that will gradually shift the basic orientation of the custom services from obstructing easy flow of private international trade to actively facilitating it. Performance indicators might be collected monthly and published on the internet, which will help to stimulate action towards further improvement.

- *Special emphasis on the development of multimodality and access to essential facilities, particularly ports.* Very few countries have adopted a comprehensive multimodality law that allows for the use of a single bill of landing and provides insurance across modes. Similarly, most countries fail to have a well integrated and connected access to ports leading to congestion and urban chaos around the port areas. A plan for an effective logistic part near the port is critical.

- *Heavier emphasis on a comprehensive and coherent supply of associated logistic services.* In particular assuring the supply of effective transport services include, treatment of cool, testing and certification, logistic terminals and dry ports, adoption of quality standards.

- *Creation of regional trade facilitation committees.* The main role of these committees would be to recommend policies and procedures to improve border crossings and regional facilities so as merchandise do not need to pass through the capital, as is usually the case in most Latin American and Caribbean countries and to make the regions engines of growth. As part of the tasks of these committees a common regional website could be developed to promote trade facilitation, provide up-to-date information on procedures for crossing the various border points and on delay times, and to convey distance-learning programs in transport and logistics management, assisted by international associations.

Below we present a summary table (TABLE 15) with qualitative benefit/cost ratios. We can only provide a quantitative range for benefit/cost ratios, expressed as an Internal Rate of Return (IRR). The other two solutions involve institutional reforms that have a very low monetary cost

but are seldom implemented due to political difficulties. Accordingly, the table presents two criteria to the rank the solutions.

TABLE 15: SUMMARY TABLE WITH QUALITATIVE BENEFIT/COST RATIOS

Solutions/Recommendation	Quantitative range of IRR	Qualitative ranking*	
More and better investment in infrastructure	**Between 25-50%** (World Bank investment projects)	**Medium/high**	
Policies aimed at improving the efficiency of logistics service providers	**Higher than 50%** (due to very low monetary cost of implementation and enforcement) Costs significantly lower than investment in infrastructure)	**High**	
Policies to improve trade facilitation	**Higher than 50%** (due to very low monetary cost of implementation and enforcement) Costs significantly lower than investment in infrastructure)	**Very High**	

* Qualitative ranking: given current political constraints and difficulties associated with planning, design and implementation of infrastructure projects, Very High means that benefit/cost ratios from adopting this solution are the highest but are the least likely to be implemented given the political economy behind these policies. Despite having a lower qualitative ranking, traditional investment in infrastructure has proven easier to carry out.

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