Effects of Corruption and Logistics Performance Inefficiencies on Container Throughput: The Latin America Case

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Abstract—Trade liberalizations measures, as import tariff cuts, are not a sufficient trigger for trade growth. Given that price margins are narrow, traders and cargo operators tend to opt out of markets where the process of goods clearance is slow and costly. Excess paperwork and slow customs dispatch not only lead to institutional breakdowns and corruption but also to increasing transaction cost and trade constraints. The objective of this paper is, therefore, two-fold: First, to evaluate the relationship between institutional and infrastructural performance indexes and trade growth in container throughput; and, second, to investigate the causes for differences in container demurrage and detention fees in Latin American countries (using other emerging countries as benchmarking). The analysis is focused on manufactured goods, typically transported by containers. Institutional and infrastructure bottlenecks and, therefore, the country logistics efficiency – measured by the Logistics Performance Index (LPI, World Bank-WB) – are compared with other indexes, such as the Doing Business index (WB) and the Corruption Perception Index (Transparency International). The main results based on the comparison between Latin American countries and the others emerging countries point out in that the growth in containers trade is directly related to LPI performance. It has also been found that the main hypothesis is valid as aspects that more specifically identify trade facilitation and corruption are significant drivers of logistics performance. The exam of port efficiency (demurrage and detention fees) has demonstrated that not necessarily higher level of efficiency is related to lower charges; however, reductions in fees have been more significant within non-Latin American emerging countries.

Keywords—Container throughput, logistics performance, corruption, Latin America.

I. INTRODUCTION

THE main changes that trade globalization have resulted are related to shifts in the world economic structure of production. One can argue that the way goods and services are produced, and also how, where and by whom they are produced, are a consequence of transnational corporations' strategies

If there is one change, above all others, which has affected politics at the highest inter-state level and, at the other extreme, the life chances of individuals throughout the world, it is change in the production structure of the world economy. That is to say, in what goods and services are produced, how, where and by whom. This change is not so much the emergence of the

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'multinationals' so-called-they have been around for a long time; it has been the change from production mostly designed and destined for one local or national market, to production mostly designed and destined for a world market, or at least for several national markets. In short, it is not the enterprises that are multinational. (The word was always a misnomer, anyway.) It is the market. Production for the larger world market has transformed innumerable national or local enterprises into transnational corporations (TNCs) [1, p. 44]

In addition to asking "how, where and by whom" the goods are produced, the manner in which these goods are carried to final consumers is also observed, since logistics services are considered to be the backbone of many industries [2]. In this sense, this article discusses not only the operating direction of logistics, but also nuances this activity enjoys. Nonetheless, the emphasis of this paper is given to the illegal practices in logistics that make this much needed sector to suffer losses in some countries. Thus, corruption, and generation of demurrage and detention are the focus of the research.

Bearing in mind that international trade is the engine of global economy and that cross border trade has the logistics efficiency as one of its major determinants [3], this paper evaluates the existence of corruption costs, beside the total volume of containers throughput by ten countries taken as example. The objective is to identify a relation among corruption, bureaucracy, and the development of international trade.

The countries selected in this analysis are middle and emergent economies that aim at a significant degree of economic development. Firstly, South American emergent economies will be examined and their performances will then be compared to other emergent countries. The countries in the research are: Argentina, Brazil, Chile, Colombia, Peru, China, India, Malaysia, Russian Federation and South Africa.

For a deeper data comparison, information about import was prioritized. It is known that emergent economies are usually remarkable exporters of commodities and importers of manufactured goods. Thus, the data about import processes are more coherent with the evaluation of trade by containers that is the most adequate equipment for added value goods.

Also, to analyze the logistics cost in a different fashion, this paper identifies whether there is any connection between the logistics performance score and the value paid for demurrage and detention in each country of the sample determined by one carrier. Since the charging of these fees changes after non-

regular periods, it was established a 30-day period cut for all the analyses. Demurrage and detention are not always going to happen, but when it does happen, the final cost for the importer is changed in an unplanned way, most of times.

II. LITERATURE REVIEW: TRADE FACILITATION, MENU COSTS AND PORT THROUGHPUT

This brief literature review focuses on two relevant topics in terms of the impact of logistics and institutional bottlenecks on container trade. First, and at a more general level, we review the argument that trade liberalization and logistics facilitation policies, along with the role of multilateral organizations, improve container throughput. Second, we argue that corruption can be an optimal behavior under a scenario of bounded rationality.

The first aspect to consider is that international trade is important as it encourages economies of scale and allows emerging countries to become part of global supply chains. Therefore, it is necessary both a logistics and a regulatory environment able to promote trade across borders efficiently [4], once the quality of logistics services produces strong impact on transport costs, customs, and time to market of goods [5]. The relationship among trade facilitation, logistics and international trade is, therefore, direct and also complex. The term trade facilitation is commonly used to refer to the "simplification of customs procedures" in order to make more efficient international trade of goods, and also includes the improvement of transport infrastructure [6]. A broader and more modern definition, however, also points to a more subjective factor, as the regulatory and institutional environments in which international trade takes place [7]. Thus, the practices related to trade facilitation are [8]:

- Simplification of requirements and procedures for the release and clearance of goods and encouragement of cooperation among the agents of international trade to the development of simplified documents.
- Improvement of working methods for more transparent and efficient operations.
- reduction, simplification and standardization of data in the documentation requested by the customs.
- Application of modern customs techniques, including risk assessment, simplified procedures for entry and release of goods, subsequent controls, and methods of firms auditing.
- Provisions to facilitate the imports of goods through the use of simplified customs procedures and processes or pre-arrival.

Another aspect that deserves attention is the investment attracting factor. That is, there are more attractive factors for foreign investment in countries where goods can be imported and exported in a short window of time and where the deadlines are met, as delays and overcomplicated processes are seen as additional costs to trade [9].

As in [6], trade facilitation can generate many benefits. The increase of efficiency and predictability that reduces delays and uncertainty, making it possible to decrease costs for importing and exporting, is a good example. As a result of lower costs, there is an increase to investments and diversification of trade and economic growth. The benefits of trade facilitation are even greater when countries combine customs reforms with promoting improved transport infrastructure.

The second feature deals with the effects of corruption practices in customs clearance operations and in other logistics procedures along the process of container trade. The economic effects and causes of corruption has established a long tradition in economic theory [10]. In general, one can argue that corrupt practices – as for instance solicitation of informal payments (by customs clearance authorities) are a consequence of a monopolistic behavior of public agents that are constrained by sufficient regulatory and institutional constraints.

Bribe payers may seek a reduction in container transit time in port premises. Although this is a small cost in terms of the overall import operation of a container cargo, the welfare or social effect can be very significant. That argument resembles the menu cost hypothesis [11] which points out that nominal rigidity can be a result of the (small) costs of changing nominal prices. Similarly, in our case, we argue that bribery may remain (or become) an optimal individual behavior given that bribery cost is relatively low and that regulatory and public procurement systems are weak. Social impacts of bribery and corruption practices have been estimated to be fairly significant [12] and include losses in efficiency allocation, economic growth, investment attraction and income distribution.

III. LOGISTICS AND INSTITUTIONAL PERFORMANCE INDEXES: METHODOLOGICAL ASPECTS

In this section, we deal with three of the most popular indicators of logistics and institutional performance: The Corruption Perception Index (CPI), from International Transparency; the LPI and Doing Business (DB), both from the WB. Given that the focus of this paper is on the impact of corruption and excessive paperwork on container traffic, some specific sub-indicators – such as the "solicitation of informal payments", in the LPI index, and the "trade across borders", in the DB index – are also relevant for the analysis (and are also described below).

The LPI is based on a pooling research with logistics operators around the world, who evaluate the logistics environment in the main countries where they do their business. The country scores are calculated based on six dimensions: Customs, efficiency of clearance process; Infrastructure, quality of transport infrastructure (as ports and roads); Ease of arranging competitively priced shipments; Logistics services: quality and competence transport services; Tracking and tracing: the ability to track and trace consignments; and Timeliness: frequency that shipments are delivered on stipulated time [13].

As in [14], customs operations in developing countries have some problems such as the long clearance times and overcomplicated procedures. In this context, the adoption of available technologies such as the new generation scanners

could be a means to gain efficiency in inspections procedures. In an ideal scenario, the inspections would be carried out together in a single day [15]. The longer the time a load is in a port, the greater the cost to the company, consumer, and the entire economy itself.

The CPI, created in 1955, is the most widely accepted indicator about levels of country corruption. The CPI index is produced by Transparency International and it varies from zero (highly corrupt) to 100 (very clean). The country position is determined by the corruption level perception in the public sector in comparison to other countries [16]. Transparency International defines corruption as the abuse of power in order to generate privative gains [17].

Corruption, independently from the level it takes place, impacts on political, economic, social and environmental contexts. Clearly, corruption means an obstacle to democracy, to the development of fair and competitive markets and, finally and most importantly, to boost private investment. In practice, corruption is related to bribery; that is, for example, requests trough illegal or unfair actions to obtain advantages [18].

Although the corruption factor is not the most responsible for the commercial performance of a country or port, the collection and offer of bribes for customs clearance impacts negatively on international trade. As in [19], corruption in the customs processes is a reality rather found in less developed countries. In Brazil, for example, inspectors are recurrently reported for charging fees from ship containers with some kind of irregularity, or that have long been awaiting release. One such case was brought to court by Operation Arctic in 2009, aiming at investigating corruption in imports. Besides bribery, the operation also signaled the occurrence of falsification of documents [20]. In this sense, corruption proves detrimental to the country where it is installed causing losses in the legal collection of taxes and to the attractiveness of the country for investment and commercial partnerships.

Finally, the DB index measures the level of ease to do business in countries overseas. The objective of this index is to rate the impact of regulations over business activities around the globe, in particular concerning small and medium enterprises' activities [21]. This indicator evaluates countries in 10 topics, with equal importance, classifying them accordingly to a parameter called "distance to frontier" – ranking from 1 (best placed) to 189 (worst placed) [22].

In case of the scope of this paper – the performance of container throughput in selected emerging markets – the DB index (in its "Trade Across Borders" topic) is a relevant explanatory variable as it measures time and logistics costs to import and export goods. The aspects evaluated in this topic comprise, for instance, the documentation requirements and conformity at the customs clearance authority of the specific country [23].

IV. EMPIRICAL EVIDENCE: HOW PAPERWORK, CORRUPTION AND BAD LOGISTICS IMPACT ON CONTAINER TRAFFIC

In this section, we deal with container throughput and logistics and institutional bottlenecks and costs for 10 selected developing nations. Fig. 1 shows the most representative ports of the countries in the sample in terms of container cargo movement according to World Port Rankings (American Association of Port Authorities [24]) and the WB [25]. In addition, Table I lists the main ports in all countries in the sample as well as the total container throughput by country. Clearly, the container movement is higher and diversified by a larger number of ports for the case of the largest (geographically and economically) countries.

TABLE I
CONTAINER THROUGHPUT, MAIN PORTS AND TOTAL TRAFFIC – SELECTED DEVELOPING COUNTRIES – 2014

Port	Container throughput, by ports (TEUs), 2014	Country	Total container throughput, by country (TEUs), 2014
Shanghai	35.286.000	China	181.635.245
Shenzhen	23.798.000		
Hong Kong	22.374.000		
Port Kelang	10.736.000	Malaysia	22.718.784
Tanjung Pelepa	7.897.000		
Jawaharlal Nehru	4.496.000	India	11.655.635
Madras	1.552.000		
Santos	3.685.000	Brazil	10.678.564
Durban	2.664.000	South Africa	4.831.462
Cartagena	2.385.542	Colombia	3.127.994
St. Petersburg	2.375.000	Russia	3.903.250
Callao	1.992.000	Peru	2.234.582
Buenos Aires	1.400.760	Argentina	1.775.574
Valparaiso	928.905	Chile	3.742.520

Data: American Association of Port Authorities [24]; WB [25]. Elaborated by the authors.

Table II shows the changes in logistics performance, container throughput and Gross Domestic Product (GDP). All growth rates in the three periods are expressed in % per year. For the case of Argentina, Brazil and India, there is a strong relationship between the increase in container throughput and the increase in logistics performance and in GDP. In the case of Chile, China and Malaysia, there is only a positive correlation between container traffic and GDP; the absence of an expected result for container throughput and logistics performance is maybe due to the fact that, for these three countries, the LPI index is already relatively high. For the other four countries in the sample, we found out mixed results; except for high container throughput growth experienced during 2010-12.
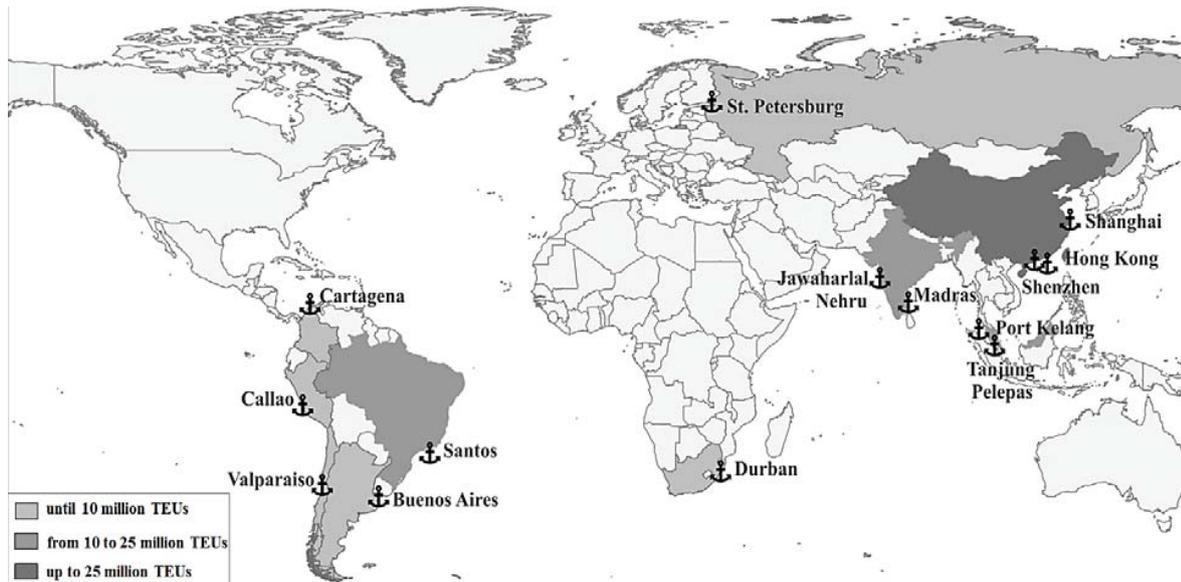
Fig. 1 Container throughput and main container ports – Selected Developing Countries – 2014 (Data: American Association of Port Authorities [24]. Elaborated by the authors)

TABLE II
EVOLUTION OF LPI, CONTAINER PORT TRAFFIC AND GDP

Country | Indicator	Annual grouth			Country | Indicator	Annual grouth		
	2007-10	2010-12	2012-14		2007-10	2010-12	2012-14
Argentina				**China**			
LPI	0,97	-0,57	-0,66	LPI	1,23	0,27	0,14
Container port traffic	1,91	-0,58	-3,67	Container port traffic	5,84	7,38	4,03
GDP	8,81	9,4	-3,82	GDP	14,43	11,9	6,96
Brazil				**India**			
LPI	3,84	-0,7	-2,03	LPI	0,36	-0,42	0,05
Container port traffic	5,93	4,63	4,63	Container port traffic	7,15	1,77	4,28
GDP	12,13	3,66	-0,6	GDP	8,37	2,35	3,8
Chile				**Malaysia**			
LPI	-1,22	0,85	0,85	LPI	-0,28	0,51	0,91
Container port traffic	3,87	4,28	1,33	Container port traffic	5,35	4,55	2,86
GDP	5,88	6,83	-0,91	GDP	7,14	7,23	2,45
Colombia				**Russian Federation**			
LPI	2,67	1,13	-2,74	LPI	2,44	-0,3	1,39
Container port traffic	4,15	6,98	1,49	Container port traffic	1,95	7,09	-0,23
GDP	8,46	8,8	0,72	GDP	4,08	9,75	-2,64
Peru				**South Africa**			
LPI	0,3	1,56	-1,08	LPI	-0,55	2,03	-2,23
Container port traffic	6,83	9,81	3,23	Container port traffic	0,48	4,63	3,48
GDP	9,8	9,06	1,69	GDP	5,81	1,92	-4,13

Data: WB [25]-[27]. Elaborated by the authors.

Next, we analyze the data results of the three main institutional indicators that matter for container trade costs. Table III comprises the results for CPI and the DB indexes results and for the main sub-indexes of the LPI. With respect to the CPI result, we found out that there is a significant gap between the best ranked country (Chile) and the worst one (Russia). Besides, it is clearly that there is a concentration within the range from 30-50, indicating that most of the countries in the sample (with the exception of Chile) can be regarded as medium-to-highly corrupted countries. In terms of the ease of doing business, the rankings of the selected countries are more volatile than the results for CPI scores. That result can be viewed, for instance, by the remarkable difference between doing business in Malaysia (87) and in Russia (37). Both poor logistics performance and corruption costs can produce higher costs in ports operations for container imports.

TABLE III
IMPORT COSTS BY COUNTRY

COSTS TO IMPORT		Argentina	Brazil	Chile	Colombia	Peru	China	India	Malaysia	Russian Federation	South Africa
CPI score (2015)		32	38	70	37	36	37	38	50	29	44
DB / Trade Across Borders score (2015)		53,0	50,6	80,6	62,8	71,4	70,5	56,9	86,7	37,4	58,0
LPI indicators (2014)	Lead time to import (days)	3	3	1	2	2	3	2	1	4	2
	Cost to import (US$)	1.670	1.015	669	1.655	1.118	683	518	3.000	1.732	1.623
	Number of documents - imports	5	4	2	5	3	5	4	4	5	4
	Clearance time without physical inspection (days)	3	5	1	1	1	2	1	1	1	1
	Clearance time with physical inspection (days)	4	8	1	2	3	3	2	2	3	4

Data: WB [26] and [28]; Transparency International [16]. Elaborated by the authors.

A further and more direct evidence concerns the main sources in logistics delays in port operations. Table IV summarizes the results for the countries in the sample. The results stress, according to the WB LPI, that the solicitation of informal payments and pre-shipment inspection are the main sources of delays of port operations and international trade. One of the main results refers to the fact that, for Brazil, Colombia, India, Peru and Russia, pre-shipment inspection was responded to be "often or nearly always" a main source of delay in logistics processes. One reason for this is the lack of port infrastructure, as for instance, container scanning equipment. Other significant cause for port operation inefficiencies is the solicitation of informal payments. Argentina, China, India, Peru, Russia and Malaysia are the countries which raked this answer greatly.

TABLE IV
MAIN SOURCES OF DELAY IN LOGISTICS PROCESS

Sources of Major Delays	Domestic LPI (2014)									
	Argentina	Brazil	Chile	Colombia	Peru	China	India	Malaysia	Russia	South Africa
Compulsory warehousing/ transloading	33,0%	25,0%	14,0%	16,6%	33,0%	29,0%	41,9%	0,0%	57,1%	14,3%
Pre-shipment inspection	33,0%	27,3%	0,0%	50,0%	66,7%	94,0%	48,5%	0,0%	57,1%	14,3%
Maritime transshipment	25,0%	27,3%	28,6%	0,0%	33,0%	64,0%	40,4%	33,0%	50,0%	14,3%
Criminal activities	83,0%	18,2%	14,3%	16,7%	33,0%	0,0%	18,7%	33,0%	28,6%	21,4%
Solicitation of informal payments	50,0%	91,0%	0,0%	0,0%	66,7%	15,6%	44,2%	33,0%	57,1%	71,0%

Data: WB [26]. Elaborated by the authors.

Taking into account that infrastructure and institutional bottlenecks delay port operations, in Fig. 2 we depict the relationship between the logistics performance and the cost of a 30-day demurrage to clear a container import operation (in US$). The general perception, based on this sample, is that countries with low LPI score pay more expensive values on demurrage costs than the countries with superior logistics performance. In other words, the poorer the logistics conditions (including port equipment to deal with container cargo) of the country the higher the costs for an importing company to delay the operation to clear its containers from port storage facilities. Other factors do influence demurrage costs and port policies, as increasing demurrage marginal costs and non-extendable deadlines, are also key measures to avoid container detention.

The different demurrage costs, by time of stay at the port facility and by each country in the sample, are displayed in Table V. The last column in the table summarizes the total cost for a 30-day stay. The results (also depicted in Fig. 2) show that Peru and Chile are the countries where port authorities charge the most expensive demurrage cost and, not surprisingly, Malaysia owns the cheapest rate for demurrage detention (which can be explained by the fact that Malaysia also has the best logistics performance in the sample).
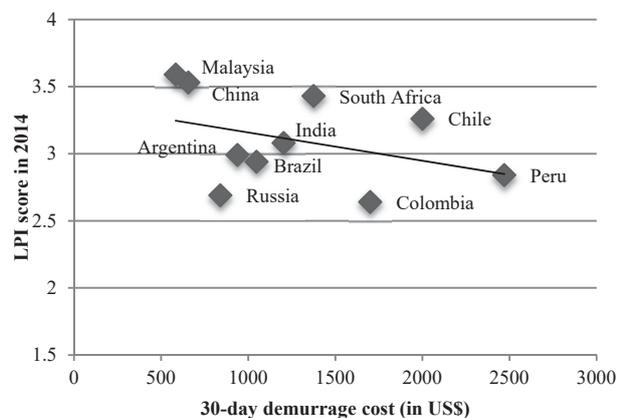

Fig. 2 Relation between LPI score in 2014 and the cost of demurrage in a period of 30 days in US dollar (Data: WB [26]; CMA-CGM [29]. Elaborated by the authors)

In order to search for real effects of corruption, Fig. 3 displays the relationship between the growth rate of container throughput (accumulated in the period 2007-2014) and the change in requests of illicit payments, calculated by the change (in percentage points) in the country score between 2007 and 2014 LPI reports. The analysis of Fig. 3 allows us to affirm that the improvement in the perception of this criterion

in Peru, Malaysia and Brazil (between 10 and 20 pp) is associated to high growth rates of container throughput. On the other hand, losses of corruption perception – measured by negative changes in the solicitation of informal payments – are linked to low rates of container traffic growth, as in the cases of Argentina, South Africa and, most remarkably, Russia. Therefore, Fig. 3 shows that a reduction of bribery (or the perception of this occurrence) tends to lead, in the case of the countries in this sample, to an increase in container trade.

TABLE V
DEMURRAGE COSTS IN CONTAINER IMPORTS, BY SELECTED COUNTRIES – 2014

| Country	Days of free time	Taxes ranges (weeks)				Merged D&D in 30 days (US$)
		1st	2nd	3rd	4th	
Argentina	7	US$ 35 8th -11th	US$ 42 12th Onwards	-	-	938
Brazil	6	US$ 32 7th - 15th	US$ 46 16th - 25th	US$ 60 26th Onwards	-	1048
Chile	5	US$ 80 6th Onwards	-	-	-	2000
Colombia	10	US$ 75 11th - 20th	US$ 95 21th Onwards	-	-	1700
Peru	7	US$ 90 8th - 14th	US$ 115 15th Onwards	-	-	2470
China	7	US$ 11 8th - 15th	US$ 23 16th - 20th	US$ 45 21st Onwards	-	656
India	5	US$ 22 6th - 10th	US$ 42 11th - 19th	US$ 65 20th Onwards	-	1203
Malaysia	7	US$ 16 8th - 10th	US$ 20 11th - 14th	US$ 24 15th - 20th	US$ 31 21th Onwards	584
Russia	12	US$ 35 13th - 20th	US$ 36 21th - 25th	US$ 76 26th - 30th	-	840
South Africa	5	US$ 40 6th - 15th	US$ 55 16th - 20th	US$ 70 21st Onwards		1375

Data: CMA-CGM [29]. Elaborated by the authors.
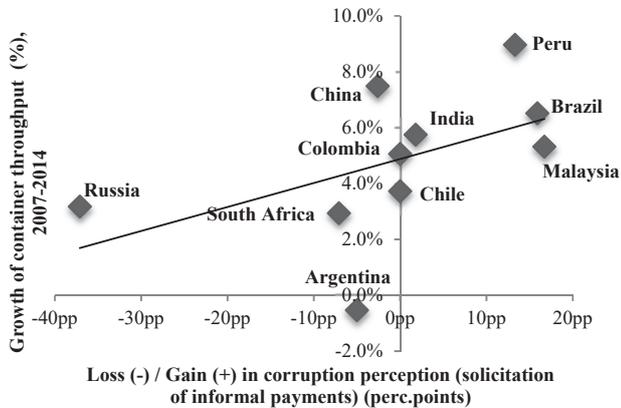
Fig. 3 Relation between trade in containers and the occurrence of bribes (Data: WB [25] and [26]. Elaborated by the authors.)

V. CONCLUSION

The main objective of this paper is to show a relationship between corruption costs and the growth of container throughput in emerging countries. In this sense, we tried to evaluate objective aspects - such as the performance of the selected countries in international trade and the growth of their economies - and other more subjective goals – such as their logistical and institutional performances.

From the empirical evidence presented, a first conclusion that can reached is that there is no significant difference between the data of Latin American countries and other emerging markets. That is, in both groups there are countries with good and bad results regarding the evaluated indicators, concerning that some have as major problems the high import costs while others have as major restriction the charging time of release. If we associate the occurrence of corruption with these customs costs and time, however, we observed that all countries have problems related to this illegal practice.

It is important to note also that there is some convergence among the results obtained by analysis of the CPI, LPI, DB, and demurrage rates indicators. This is because the level of corruption perceived in each country is also reflected in the perception of its logistics efficiency and attractiveness for doing business and trade.

As pointed out in the literature review, it can be postulated that corruption costs, logistics and even paperwork, even if relatively small, can have significant adverse impacts on the container throughput.

Although it is not possible to point out the real impact of corruption in the composition of the costs and the import time, it can be said that the reduction of the occurrence of corruption brings benefits to international trade. As emphasized in the conventions on trade facilitation, corruption at the port level can be reduced by measures such as the simplification and harmonization of procedures and documentation required for

the release and clearance of goods; application of modern customs techniques and improvement of working methods concerning more transparent and efficient operations; and provisions to facilitate the imports of goods through the use of simplified customs procedures and processes or pre-arrival – such as pre-shipment inspections (PSI). Therefore, the possibility of the occurrence of bribes and other illegal practices would be reduced and at the same time the cost and time required for the marketing of goods would decrease. Moreover, the struggle against corruption in the port sector can help to improve the country's image with other traders and investors with regard to international trade, at least.

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