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Comparison of Logistics Performance Indexes between Latin-America & Caribbean Trade Partners and the United States.

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**ABSTRACT**

**The core purpose of this research is to further investigate reports of the World Bank on logistics indexes and compare the performances of Latin America and the Caribbean countries and the USA. This paper suggests that Latin American countries and Caribbean must work to improve their logistic performance.**

**KEYWORDS:** World Bank, Logistics Performance Index, Latin America and the Caribbean, United States, International Trade.

**INTRODUCTION**

In the academic literature, the use of variables that allow measures to analyze performance logistics have improved the analysis between government agencies and the private sector, determining priorities in international and transportation issues. Still, the competitive edge logistics requires the national or sub-regional levels needs to be more than just the rising realization of the size assessment of trade or the way to transport, but also the design of plans and policies, which exemplify fluctuations in national, control of regulations, taxes or infrastructure reserves in specific analytical methods.

Finding opportunities for improvement in the infrastructure component more than in the other strategic components have been highlighted since the first report of the Logistics Performance Index (LPI hereinafter) of the World Bank in 2007 (Arvis et al., 2007). Countries that have small logistics representation have increased their LPI scores more fairly than the best performing nations. This interpretation is support by considerable improvements in the

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infrastructure index, especially in nations with low performance, rather than improving their logistics services or their customs index.

In general, advances in technology has shown to facilitate improvements of the infrastructure of a country, but some other factors are still in need of improvement, such as quality and service of logistics providers and efficiency of customs and clearance of goods. Therefore, the main challenge in the future is to improve logistics service more than the infrastructure. This conclusion follows under the same concept that just implementing new technology without improving the processes is not good enough. The next steps for many countries requires including a better analysis with a greater number of stakeholders involved. With increasing pressure, the reliability and timeliness of delivery of shipments and efficient border control are some of the key aspects in terms of the logistics of a country. It is critical to have a coordination between government agencies of control besides customs and the processes aspects that are essential for improvement, especially considering that those agencies are generally more reluctant to change.

Globalization have caused increased competitiveness that has forced logistics to become one of the key elements in international trade. International supply chains become more efficient, and hence, more competitive, if they have higher logistics quality services, better infrastructure, faster and more reliable transportation of goods.

According to Mustra, (2011) logistics is one of the most important elements of national competitiveness. Therefore, having access to high quality logistics and infrastructure is key to ensure safe transportation of goods between different nations. When countries have ineffective logistics, it produces big losses, such as increased transportation costs, loss of business opportunities and lower country trade performance, resulting in reduced turnover (Warren H. et al., 2005). In the report of Trading Blocs by Lisa H Harrington, she proposes that the effects of ineffective logistic infrastructure such as poor roads, railways, airports and ports, leads to high costs of transportation and shipping, which in turn leads to restrictions for firms that want to conduct business with international partners (Harrington, 2003).

The Council of Supply Chain Management Professionals reported that the average of the United States logistics was 7.85% in 2015 (Logistics Management, 2016). As evidence that logistics plays a critical role in the international trade, the Organization for Economic Co-Operation and Development (OECD) indicate that transactions costs (TTCs) range around 2% and 15% of the total value of the total of traded goods. However, as specified, a large part of the variation in the Trade Transaction Costs (TTCs) is country specific. Therefore, empirical studies

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investigating specific nations are crucial to the understanding of global logistics (Walkenhorst and Yasui, 2009).

A variable that is critical in the determination of national growth and that helps to understand the components of the logistics index is logistics performance. It is easier for developed countries to do business with similar countries. However, the focus of this research is how under-developed countries can compete to gain markets in developed countries that operate with developed trade policies and logistics systems.

The performance of logistics is significant to the national income. By comparing the components in the logistics indexes, it is possible to determine what countries are main competitors to each other. Successful countries in logistics like Germany or Singapore compete, for example, with countries like the United States or the Netherlands. However, countries like Burundi, the Bahamas and Syria, need to work hard to improve the logistics indicators to perform well and be able to compete in international trade. Several researchers confirm that a good transportation infrastructure, high logistics quality, low transportation costs and other logistics indicators have a positive influence on export performance and trade facilitation of the country (Limao & Venerables, 2001; Portugal-Perez&Wilson, 2011).

The globalized supply chain gives increased opportunities for developing countries to increase their roles in global trade. However, many of the logistics performance indicators show us that countries from Latin America and the Caribbean (LAC) are lagging behind industrialized countries and several developing regions Guerrero et al. (2009). It is important that LAC countries maintain competitiveness in international trade since they have the opportunity to benefit from their proximity to the United States.

The purpose of this research is to compare the logistics performance of the United States with Latin America and the Caribbean countries to analyze which countries can be the best partners to the United States, and to check potential benefits of these partners in terms of logistics facilitation. To investigate this matter, the research utilizes the Logistics Performance Index (LPI) by the World Bank report of 2012.

The logistics index is used as a toll by both government and the private sector to determine the most important indicators in international trade. In the first report of the logistics index of the World Bank in 2007, the need for logistics was addressed. The report stated that poorly performing countries in the logistic index need to increase their indicators, for example their infrastructure and customs, to increase performance and do more trade with other countries. Countries that have low performance usually improve infrastructure before customs. This kind of

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infrastructure improvements means improving technology and information systems but infrastructure, as railways often remain unimproved.

One of main challenges in the future is to improve logistics services efficiently and focus the development in different areas of infrastructure. There are no recipes on how to “easily” improve the infrastructure. The next steps of improvements will be more complex and a greater number of stakeholders need to be involved.

With increasing pressure to deliver shipments reliably and on time, a well-functioning border control is of key importance to ensure effectiveness of the logistics process when entering the country. The coordination between government and agencies in control of logistics is essential to ensure reliability and timeliness. This coordination can be of difficulty because both institutions are often viewed as reluctant to change.

## **LITERATURE REVIEW**

The ongoing strategic growth in exports and imports between Latin America, the Caribbean (LAC), and the United States’ market, have created an increase of interest among researchers investigating the topic. In the following paragraphs, the author will expose the different variables that have been analyzed in the area of logistics and measurement of productivity, i.e. cost, customer and supplier selection, quality (right condition), lead-time (right time), right products, location (right place) and availability (right quantity). These factors are explained below.

International Trade today represents a big challenge in logistics operations, which contains transportation and the storage of products in other countries. In fact, high logistics costs and low quality hinder international trade. According to Coyle John et al., (2016), logistics is more around accomplishment the right cost, to the right customer (market), in the right quantity(availability), in the right condition (quality), at the right place, at the right time (lead time), and at the right product. Logistic is not only the traditional concept of transportation or the way to transport products. Using the previous definition of logistics, it can be seen the critical elements in the logistic process such as, product, quality, time, customers quantity, destination and cost. These elements lead to the concept of logistic management, which deals with efficient and effective management of day-to-day activity in producing the company has finished goods and services (Garcia Marquez et al., (2013); Tseng et al., (2005); Chandra, et al. (2016); Ming et al., (2015); Chung, (2011)). In addition, these elements helped to understand the logistic index analyzed in this work.

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Numerous studies have pointed to one of the most critical element in any international logistics: **the cost** (Garcia-Marquez Fausto et al., (2013); Chung, 2011)). In addition, the World Bank in the report of 2012 affirms that the transaction and operational costs in international logistics play a crucial role in any decision related to the area, (Arvis et al., 2012). Logistics costs are found as a significant part of trading companies' cost. Due to fierce competition in all sectors, costs represent a critical factor to improve, through better procedures and control methods ((Archetti & Speranza Grazia, (2016); Silva et al., (2014); Jiang Lin et al., (2016)). As pointed out by these authors, customers are very sensitive to the logistics cost, and it is a decision point in the selection of any provider (Santi, (1992); Cachon & Martin, (2005)).

In another study, Batabyal & Nijkamp, (2016) explained the effect in international trade of the transportation costs, which they consider logistics cost. According to them costs are the strategic factor that allow the companies select their international partners. Other researchers make strong points in the issue that transportation costs has been the factor in any decision related with the international supply chain (Venkatachalam & Narayanan, (2016); Grant,D et al., (2006); World Bank (2016); Michaely & Wajnry,(2016); Limao & Venables, (1999)).

Continuing with the definition of logistics, another variable considered as strategic is **customers**. The selection process of international customers (sometimes considered as partners), is critical in the success of the international trade. Andersen & Buvik, (2002) established an agenda on the selection of international markets or customers. It is known that the American companies put a strong emphasis in the selection of their customers. According to Sakarya et al (2007) the selection of international customers or markets relies on macroeconomic and political factors, they proposed a methodology that considers several aspects that are found in Latin American markets, such as trust, time and cost.

According to the World Bank report 2016, one critical issue in the logistic index in the adequate selection of the market (customers), because it increases the possibility of success and good relationships in the supply chain (Coyle John et al., (2016)). Also it is important an efficient logistics process that will help in the growing market, with a logic consequence; a continuous increment of customers and markets.

Latin America is a region that grows constantly, for that reason the United States keep a close eye in the development of the Asian and European providers , Nunes de Faria et al., (2009). On the other hand, in the upstream of the supply chain, the supplier must be mentioned in this study. There a lot of approaches in the selection of suppliers (some representative works

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are, (Ho et al., (2009); Hokey, (1994); Gonzalez et al., (2003)) among others. It is important to mention the supplier selection process because some authors interpret that the supplier plays a role as customers, but the same rules of trust, lead time and reliability are applied (Koojaroenpaisan, (1997); Inemek & Tuna, (2009); Melitz & Ottaviano, (2008); Mayer et al., (2014)).

Another variable mentioned in the logistic definition is **right condition (quality)**, this variable is related with the final quality that is delivered. This aspect plays an important role in the Logistic Index, as in any field, the quality dimension has been analyzed and discussed by a lot of researchers, all of them point out the same conclusion: a right condition of the product (quality) improves the perception and acceptability of the product (Bellone et al., (2016); Antonadies, (2015); Manova & Zhang, (2012); Crozet et al., (2012); Behrens et al., (2014)). Imports and exports generally are based on several aspects or specifications, most of these aspects are international rules, but the negotiation between the buyers and the seller is essential. Factors that could be included in these negotiations are; physical aspect, costs, shipping mode, quality (final condition) among others. Several authors place a special emphasis in two aspects; 1) on-time delivery and quality. As Schellberg, (1976) stated in an interesting research, condition of the final delivery is often difficult to achieve, but it is a challenge for continuous improvement. In a lot of transactions, sellers are concerned mostly on the final cost rather than in the quality of the product, making more competitive the market (China incorporated to the international trade the concept of low cost and competitive quality) that is not the same Japanese concept of high quality at a competitive and fair cost, Gonzalez et al., (2003).

Ho et al., (2009) demonstrated that ambiguity in the quality in the final destination can significantly decrease the demand for foreign goods. The interpretation of quality or right condition of the shipments or products is in most of the cases clear for sellers and buyers, the current markets know about final condition of products and the high demand and variety, producing more competition and continuous improvement on the processes in order to reduce the uncertainty of the final condition of the products. As stated in a lot of research, quality of the products may be the most important element in current competition. (Bellone et al., (2016); Antonadies, (2015); Manova & Zhang, (2012); Chen & Scott (2009); Manova & Zhang (2012)).

According to Coyle John et al., (2016), another strategic variable in logistics is the **right time (lead time)**. The vision of several empirical studies emphasized that delivery time has become very important. According to Nordas et al (2006) delivery time in international trade

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plays a critical role in the decision of new customers, suppliers and markets. Kremer, (1993), in a seminal paper in the area, stated that time is critical to satisfy the customers' needs and the market's expectations. Other authors believe that delivery time is the factor that determines if a relationship in international markets must be increased or decreased, (Harrigan, (2005); Hummels, (2001); Duranton and Storper (2005)). According to these authors, the likelihood to increase relationships and more trade that is international depends mostly in the delivery time rather than in other factors. If we analyze the delivery time factor, the influence in other factors such as; trade volumes, prices and customers satisfaction is critical and tactical. Numerous studies have found that suppliers with above average lead-time fetch lower prices for their products (Nordas, et al. (2006); Hummels (2001). Hummels, (2005)).

Another logistic variable to consider in our analysis is the **right product**, the selection of a suitable product for many people is the most difficult step because of the large number of alternatives available in the market, but if the consumer and seller understood several aspects like; financial capacity, objectives, risk tolerance, financial knowledge and profitability, it would be much easier to choose the products that best fit the customer's needs (Kapia & Holmstrom (2007)). The fundamental mission of business logistics is to provide suitable products (goods and services) at the right place at the right time. This is when adequate, accurate and desired conditions contribute more to the profitability of the firm. According to Kapia & Holmstrom (2007), the products might be accessible to the markets via new channels that are not familiar to the organization.

Another variable to consider in our investigation is **the right place (location)**. The critical goal of the business logistics is to place the right products (goods and services) in the right place, at the right time and in the desired conditions, contributing as much as possible to the profitability of the firm (Gonzalez, 2003). The demand for your product may vary depending on geography and other factors. It is necessary to understand that companies must do extensive market investigation to know the exact places that need to be targeted, as certain areas might have demand of a product whereas the areas might not care about the product at all. After selecting the place it's very significant to choose a distribution strategy that would satisfy the demand without oversupplying or undersupplying the product at any given point.

Lastly, another important factor in logistics is the **right quantity (availability)**. Availability in logistics is about the safe delivery of the proposed product. The quality of the products should be maintained until the time it reaches the end user or the customer. The distribution strategy should be such that it preserves the quality of the product without

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increasing the overhead costs. According to several authors (Corsten & Gruen (2004); Kurata, (2014); Dai et.al. (2012)), a critical factor in the international trade is the product availability. A situation of out of stock will produce an important impact in the customer satisfaction, generating trust problems and the need to try to find other providers. In real retail businesses, such as convenience stores and grocery stores, product availability, combined with a long shopping hour strategy (e.g. 24/365 service), is considered a key service factor (Kurata, 2014).

### ***Background of the Logistics Performance Index (LPI)***

According to several authors and empirical research, logistics performance has become an important part in the export arena. (Arvis, et. at (2007); Arvis, et. at (2012)). Every two years, the World Bank publishes the logistics performances index with the purpose to identify opportunities and show logistics hindrances faced by the countries listed in the index. These statistics help better highlight the challenges that countries in international trade and their trading partners face when trying to increase their national logistics performance ,World Bank, (2016).

In the logistics index published by the World Bank, the performance of the included nations are measured after six indicators. These indicators are: customs, infrastructure, international shipments, logistics quality and competence, tracking and trading and timeliness (Arvis et. al., (2016); Warren H. et.al., (2005); World Bank, (2016); (Arvis et. al., 2012)).

The indicators tell how easily and efficiently products are transferred inside and outside of the country. The World Bank compiles the logistics index every two years. The logistics index is created by stakeholders that possess specialized education in logistics and international trade. The stakeholders fill in a questionnaire that yields a score ranging from 1(worst) to 5(best) performance. The total results from the questionnaire are published as the logistics index.

A benchmarking tool like the logistics performance index play a great role in showing current trends related to logistics reforms. Countries such as Germany and Singapore score among the highest performers in the logistics index report. Germany for example is among the highest countries because of its manufacturing industry. Singapore is one of the highest because of its role as an international trade hub, having ports and logistics services that connect with different countries, Arvis et al., (2016).

Conversely, there are also economies with poor logistics. These are landlocked countries such as Burundi (Africa), Uzbekistan (Central Asia), Slovakia (Central Europe) and Bolivia (South-America). Landlocked countries tend to be paying 50% more than costal countries in transportation costs and have roughly 60% lower volume of trade. The main causes

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of the high transportation costs are due to inefficiencies in customs and transit transportation. (GFPPTT 2003).

This means there are significant differences among developing countries and their participation in international trade because some are landlocked while some possess coastlines. This means, due to environmental and geographical differences, logistics performances will be different in comparison with higher ranked countries.

The logistics performance index reveals the study of the global private sector on how countries are globally connected through their main trade entries. It might not level for mirror logistics performance index, and scores might reverse access problems outside the country in landlocked countries and small-island states Arvis et al., (2007).

Transportation logistics are handled under different global situations. Among these methods of transportation, air and maritime is widely common. A country can, however, choose its method of transportation services and find out which method of transportation is better suited for them. The choice depends on the infrastructure and the condition of the country, as well as what type of companies there are. Countries that have railroads are able to conveniently deliver a large amount of goods and services, which may serve as a factor that contributes to a higher score in the logistics index.

Moreover, in the 2012 logistics report, which highlights more conditions for efficient logistics, all the best-performing countries have maintained and developed a strong dialogue between the public and private sectors; countries with good performances have an excellent partnership between the policy makers, ministers, investors and academics leading this integration to increase the logistics services, infrastructure and the transportation services.

In the logistics index 2012 report the country with the highest performance score was Singapore. Countries that have improved greatly in previous years include Chile, China, India, Morocco, South Africa and United States. From the performances measured by the indicators, it is clear that economies with high-income are on the top, while economies with lower incomes are ranked lower.

Common traits among the low-ranking countries are that they are developing countries that do not have coastlines; or they are small islands such as the Solomon Islands, the Bahamas, etc. Other traits among the low ranking countries are that they are emerging from conflict or have low institutional quality with a high rate of corruption.

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By looking at the logistics index of 2012 we can better observe these trends. When the countries are categorized by income we can read that among the top performers are countries such as South Africa, China and Turkey. Among middle income countries, top performers are India, Morocco and the Philippines, and among the low income Benin, Malawi and Madagascar are top performers, Arvis et al., (2012).

## **THEORETICAL DEVELOPMENT/MODEL**

### ***Latin America and the Caribbean Logistics***

Today, in the 21st century, it is understandable how logistics play an important role in the competitiveness and performance of the economy. Globalization is an ever increasing process and it is important that Latin America and the Caribbean take this opportunity to increase their logistics flows.

Historically it has been hard for the LAC countries to compete with larger economies because of issues related to money, infrastructure and institutions. Because of globalization, the LAC nations hope to contribute to and take a larger role in world logistics.

There are wide differences in the economies, infrastructure and institutions of Latin America and the Caribbean countries. Some nations are performing well in these areas such as Brazil, Peru, Panama or the Dominican Republic; and others are performing poorly such as Venezuela, Bolivia, Haiti, or Nicaragua. An example of the poor infrastructure in these countries is their port system. They are not developed and anything going through will take a long time and be of high cost. Because of this, the ports cannot serve as efficient trade hubs for these nations.

Because of such inefficiencies, many Latin American and Caribbean countries are looking for ways to increase their logistics performance. To do so, the LAC are looking at the trade relationship between North America and Europe. Compared to the LAC countries, North America and Europe score high in performance of infrastructure such as ports, airports and highways.

The terminal facilities appear to be a preferable course of action for ports to take. The political regulations in all the nations require that improvements in cargo and handling capacity to be accomplished with minimal adverse environmental and social impacts. Meeting these environmental and social expectations whilst improving productivity to accommodate both existing and anticipated demand in container volume presents a daunting challenge.

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Among LAC countries that are developing their infrastructure in order to improve their logistics performance is Panama. Recently Panama finished the project "Third Set Locks" which added new lanes to increase traffic and to allow larger ships to pass by building deeper and wider lanes in the Panama Canal, a project inaugurated on June 26 2016 (USA Today 2016). Another project was started by Costa Rica in the Port of Limon. Here the number of terminals has increased the capacity of the port. According to the newspaper the Times, the first berth should be operational by September 2016 and the second part will be ready in January 2018, Tico Times, (2016). Other countries are improving their infrastructure to increase their logistics performance. Such countries are Chile and Brazil.

Chile and Brazil face crucial decisions for the logistics development of the country. In order to make good decisions, it is necessary that there is a consensus between the different actors involved in the development. They need to have a clear path with specific goals towards where they want to go. This can allow them to make immediate changes, seize opportunities and face challenges. Efficient logistics services play an important part in the international movement of goods and facilities in the aptitude of nations. Specific and clear goals will allow them to move forward properly to overcome the immediate challenges and seize the opportunities that the United States generates nationally and internationally through efficient logistics service performances which play an important part in the international movement of goods; this will help in the aptitude of nations interested while reducing the speculation, Warren H. et. al., (2013).

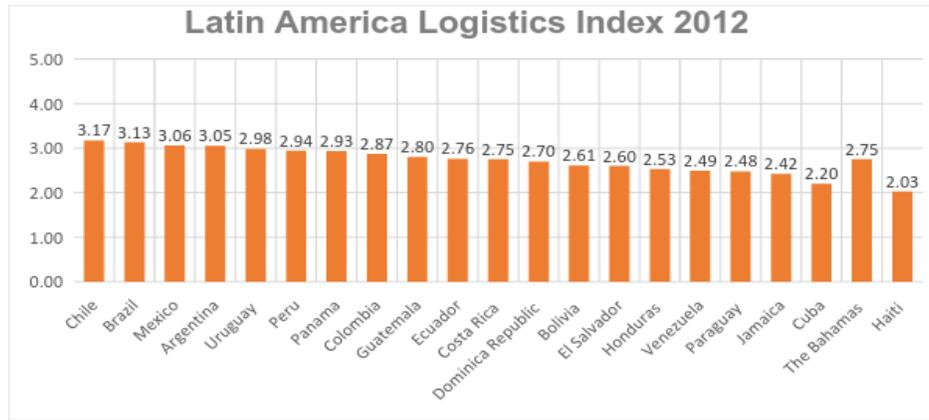
International trade is ever increasing and distribution systems which load and ship goods must be further developed in LAC countries. The importance has increased thanks to the geographically dispersed supply chain, which requires flexibility and the advanced distribution of products quickly, along with improvements to the customs systems.

### ***Results and Explanation of the Latin American and Caribbean Logistics Index in 2012***

As can be seen in Figure 1 *Logistics Performance of 2012 of Latin American and the Caribbean countries*, Chile is the position 39<sup>th</sup> in the World and the first in the region with a 3.17 average; the lowest country in this year is Haiti, 20<sup>th</sup> in the region and 151 in the world with an average of 2.03.

The Latin American and the Caribbean countries need to work hard to improve the Logistics Index. The only way to have success is to work on transportation, trade agreements, movement of goods, new ports, customs and international shipments, and timeliness. In an article in Trading Blocks, published by Lisa Harrington, it is discussed that an inefficient logistics

area such as poor infrastructure of road, railways, airports and ports, high cost of shipping among other things, may introduce restrictions on the companies conducting business with international partners, Harrington (2003).



**Figure 1 Latin America Logistics Index 2012.**

**Data from the World Bank - 2012.**

### ***Logistics in the United States***

The logistics and transportation industry in the United States has been highly competitive. Investing in this sector, large multinational logistics companies have positioned themselves to help the flow of goods on the market. Logistics companies, both domestic and international, found in the United States have benefited from the highly skilled labor force and relatively low regulatory costs.

The book, *New World of Freight Brokering* by Milton Collier, states that the logistics and transportation industry in the United States is highly complete. In terms of the spending in this segment, international companies place themselves to simply improve measures of properties throughout the world's largest consumer market.

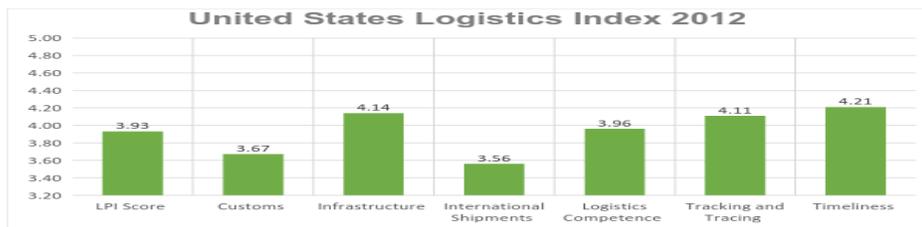
International and domestic companies in this sector advance since there is an extremely skillful labor force and comparatively small costs besides controlling burdens, Collier, (2013).

According to (US, (2015)) the United States, spend in the logistics and transportation industry \$1.48 trillion in 2015, an amount that represents 8% of the annual Gross Domestic Product of the US. Figure 2 shows the five strategic subsectors of the logistic industry in the United States.



**Figure 2 Subsectors in the United States Logistics Industry. Illustration from the magazine "Transportation Intelligence".**

In Figure 3, shows that the United States infrastructure has good development in transportation infrastructure which supports the needs of its economy, scoring a 4.14 in infrastructure. The large variance found came likely from the results in timeliness.



**Figure 3  
United States Logistics Index Reference World Bank 2012**

The United States' performances in customs and international shipments weighted it down in the ranking, with its fourth-ranked infrastructure regarded as one of its strengths. However, some would argue that the infrastructure shipping capacity and performance and hobbling the economy that distance friction is actually imparting the movement of the people and goods across the nation, Autry et al., (2013).

The international and national companies in the logistics sector benefit from a highly skilled workforce and relatively lowest rules loads, that is one of the reason why the United States is a country very mature outsourcing market in logistics because they focused on freight on road freight. The report of transport intelligence in 2006, affirms the total logistics in the United States is around \$210 billion with an estimated 18.6% outsourced to a third-party provider in the market of \$39 billion (Intelligence, 2006).

In the United States the logistics and transportation industry is highly competitive. By investing in this sector multinational, companies position themselves to better facilitate the flow of goods throughout the world's largest consumer market.

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***International Trade- United States and Latin America***

The United States, in recent years has promoted reforms of the free trade agreements with Latin America and the Caribbean countries, with the aim that trade to the American market in the region stays open.

This planning by the United States is to promote investment and create jobs in Latin America and Caribbean nations; however, a problem is arising in the economic and trade policies moving towards the region, which revolves around achieving bilateral and regional free trade agreements to promote the creation of free trade zones. The first trade agreement of United States in Latin America was with Mexico.

The United States has six free agreements with Latin America and Caribbean countries which are 1) North America Free Trade Agreement (Mexico, Canada and United States, which was enforced on January 1, 1994. 2) Central America and the Dominican Republic enforced in the United States, El Salvador, Guatemala, Honduras and Nicaragua in 2006 Dominican Republic in 2007 and Costa Rica in 2009. 3) Chile enforced on the 1st of January in 2004. 4) Peru enforced on the 1st of February in 2009. 5) Panama enforced on the 31st of October in 2012 and 6) Colombia enforced on May 15th, of 2012. (Representative, 2016).

With the Free Trade Agreement with Latin America, those countries gained access to the United States markets using agreements such as the Generalized System of Preference, Caribbean Basin Initiative (CBI) and the Andean Trade Promotion and Drug Eradication Act. Latin America has been considerate to the grand strategy of the United States to improve social stability through trade development and regional security.

In many Latin American countries, the United States is the largest trading partner, particularly in Mexico, Central America and Panama, and in the islands of the Caribbean.

According to the international agreements,- United States Trade Developments 2014-2015 -, which was published by the Commission Economic for Latin America and the Caribbean, the region of Latin America and Caribbean countries represents the fifth part in the United States foreign trade (ELAC, 2014), See Table 1.

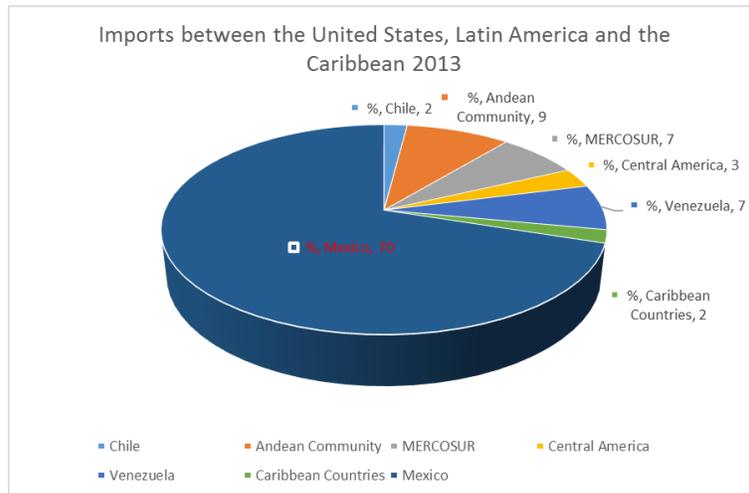
Area of Latin America and the Caribbean	Year and Percent					Annual Growth Rate
	1980	1990	2000	2010	2013	1980-2013
Exports	17.1	13.1	21.6	22.4	24.9	8.2
Imports	14.2	12.9	16.9	18.1	19.2	8.9
Total Trade	15.7	13.1	19.3	20.2	22	8.5

**Table 1.**

**Exports, Imports and Total Trade of Latin America and the Caribbean 1980-2013**

**Reference: ELAC, United States Developments 2014-2015 and United Nations Commodity Trade Data Base.**

Figure 4 shows us the United States is an important trading partner for Mexico, countries of Central America, such as Costa Rica, and the Caribbean countries. The imports from Mexico represent over two-thirds of United States from Latin America and the Caribbean.



**Figure 4**

**Imports between United States and Latin America and Caribbean Countries 2012**

**Reference: ELAC, United States, Trade Developments 2014-2015, United States Commodity Trade Data Base**

After analyzing the table 1 and the Figure 4, it can be concluded that any possible alterations made by the new American president on exports and imports of Latin America and the Caribbean, especially Mexico as a leading partner, would have significant impact.

**Methodology and Results**

The data collection is all secondary data from the World Bank and the World Trade Organization (WTO). The data was collected for 2012, which includes the logistics performance index (LPI), the GDP (which measures the value added during the production of goods and

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services) and the distance between the Latin American countries (LAC hereafter) and the USA (kilometers). The data was then transformed to natural logarithms for better interpretation and understanding. We first will show results and analysis for the Logistics Performance Index (LPI), followed by the results of the Gravity Model, which will evaluate the commercial flow between the USA and each of the LAC countries. Then, the application of the multiple regression (run using Stata) in order to analyze the impact of GDP and LPI from both LAC and the USA. This way, we would be able to provide a ranking of which countries are better potential USA commercial partners.

### ***World Bank Data of Logistics Performance Index***

In this research, we use the data from the World Bank related to the Logistics Performance Index (LPI). The data is secondary data available in the website. The focus is in Latin American countries compared to the USA. The LPI reflects the assessment of the logistics area of a country. The LPI is very important for businesses that are planning to expand their current markets, or that are planning to select new international business partners. According to the World Bank, the index components were chosen based on theoretical and empirical research and on the practical experience of logistics professionals worldwide (World Bank, 2016).

These components are:

- The efficiency of customs and border management clearance (“Customs”).
- The quality of trade and transport infrastructure (“Infrastructure”).
- The ease of arranging competitively priced shipments (“Ease of arranging shipments”).
- The competence and quality of logistics services-trucking, forwarding and customs brokerage (“Quality of logistics services”).
- The ability to track and trace consignments (“Tracking and tracing”).
- The frequency with which shipments reach consignees within scheduled or expected delivery times (“Timeliness”).

The following figure represents the LPI along with the individual components for all Latin American countries and the USA:

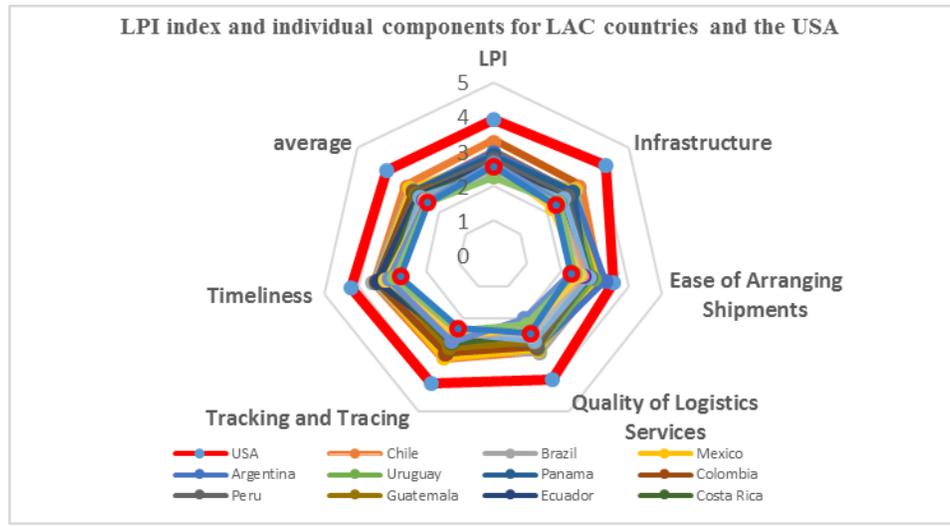


Figure 5.

**LPI index and individual components for Latin America and the USA**

Figure 5 shows a significant difference between the USA and LAC. However, we would like to test if those differences are statistically significant and we do this using ANOVA. The following table shows the ANOVA results:

ANOVA

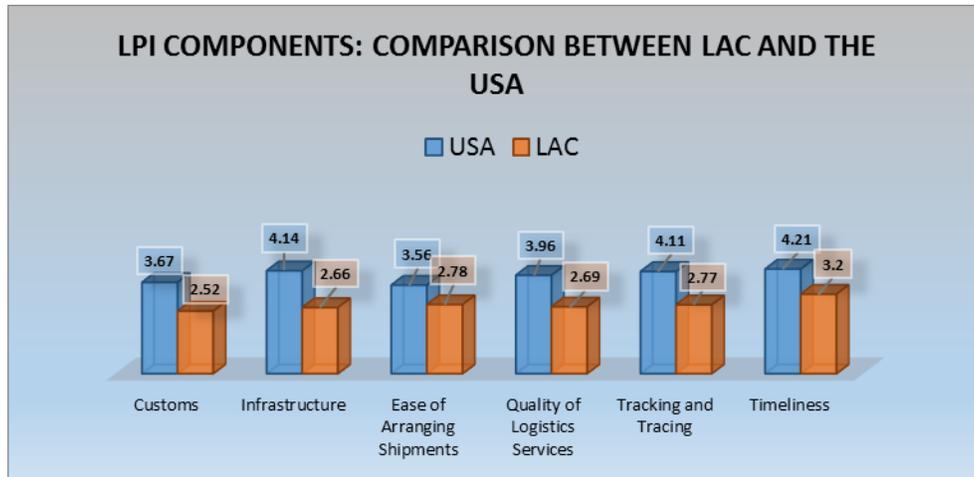
Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	13.785	18	0.766	9.9967	0	1.713439
Within Groups	7.299	95	0.077			
Total	21.084	113				

Table 2.

**ANOVA results of LPI components**

We can see that there are significant differences among all countries. When we run post-hoc tests to determine which pairs are different, we found that the USA is significantly higher than all LAC countries (at 95% confidence level), therefore, we have enough evidence to answer research question #1:

**Research Question 1: What are the components of the Logistics Performance Indicator (LPI) where Latin America and the Caribbean (LAC) is inefficient compared to the United States?**



**Figure 6.**  
LPI components: Comparison between LAC and the USA

As shown in Figures 5 and 6 and proven in the ANOVA results, the USA is superior in all components of the LPI when compared to all countries of LAC. This means that the region (LAC) needs to work hard in order to improve the logistics performance in overall. Lisa Harrington posits that effects of inefficient logistics area such as poor infrastructure of road, railways, airports and ports, and high cost of shipping, among others, may introduce restrictions on the companies to conduct business with international partners (Harrington 2003).

When we analyze the post-hoc tests, we find that not all LAC countries are the same. This section let us answer research question #2.

***Research Question 2: What are the best and worst performer countries in Latin America and the Caribbean countries (LAC) when comparing all components of the LPI?***

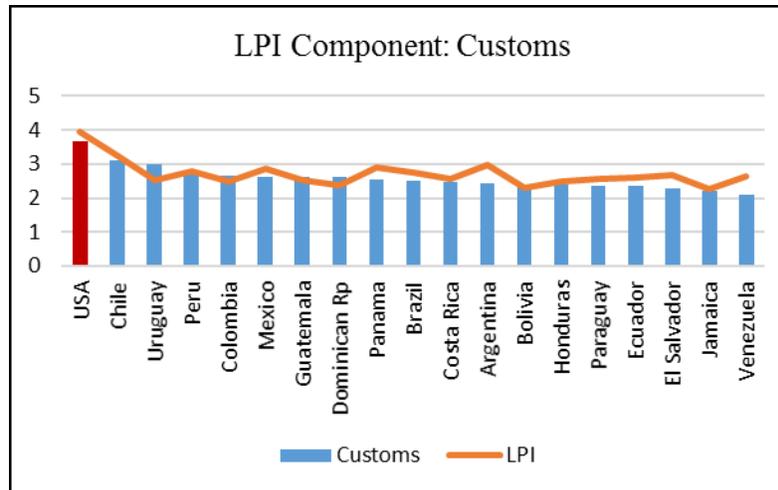
Brazil, Chile and Mexico show significantly better performance than the lowest performers (Jamaica, Paraguay and El Salvador). Chile shows to be also better than Venezuela, Bolivia and Honduras. Therefore, the worst performers are Jamaica, Paraguay and El Salvador. The best performers are Brazil, Chile and Mexico, making them more attractive for the USA when analyzing only the logistics performance.

In order to go deeper in the analyses, we will show in the following sections, comparisons among LAC and USA countries for each of the LPI components:

**Customs**

Customs is measuring the efficiency of customs and border management clearance. It is considered an area for policy regulations, an input for the supply chain service delivery (Arvis et al., 2016). As shown in Figure 7, the USA is significantly higher in terms of Customs. However,

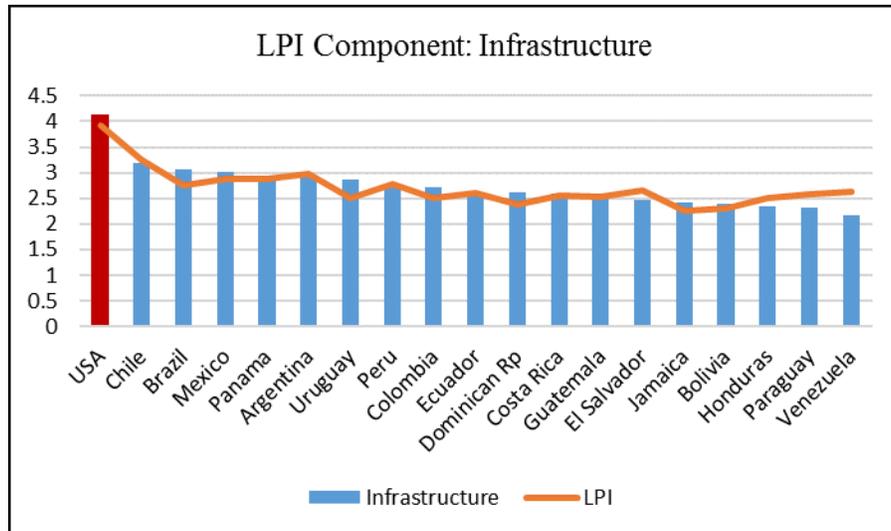
the graph allows us to identify that Chile and Uruguay show higher results than the rest of LAC. Also, Venezuela seems to be the lowest performer. It is certainly an area of improvement of most LAC countries, by making their borders and clearance procedures more efficient, without jeopardizing the safety of the country. In overall, efficiency of customs and border management clearance shows to be a challenging area for the majority of LAC countries, being the lowest overall performance component of all.



**Figure 7.**  
**Customs: Comparison between LAC and the USA**

### **Infrastructure**

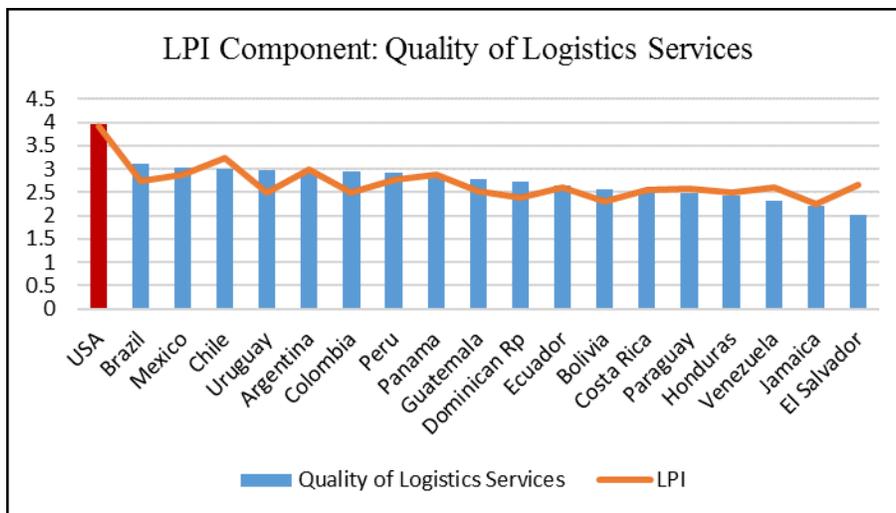
The quality of trade and transport infrastructure (ports, railroads, roads, information technology) is another one of the inputs in supply chain service delivery. A poor infrastructure will result in lowest service performance, including delays and even posing a risk to the merchandise. Figure 8 shows that Mexico, Brazil, and Chile are keeping up with above 3 scores, closely followed by Panama and Argentina in terms of infrastructure. Again, the lowest performing is Venezuela with a score of 2.17.



**Figure 8.**  
**Infrastructure: Comparison between LAC and the USA**

**Quality of Logistics Services**

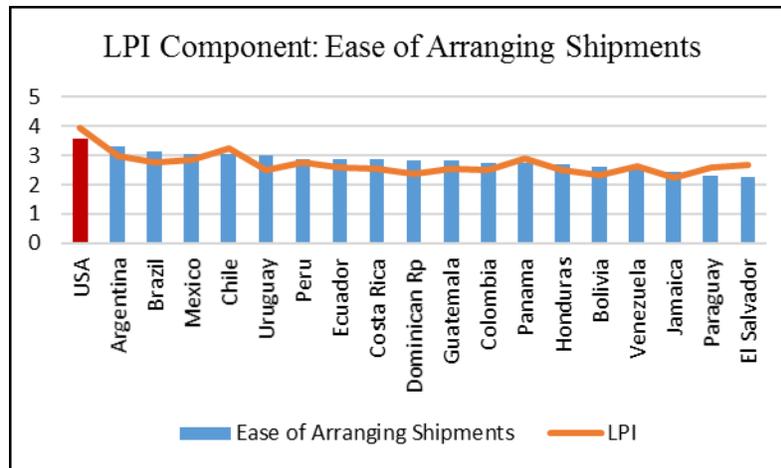
The quality of logistics services is the last one of the inputs in supply chain service delivery. This component measures the quality and operational excellence of the logistics and transport operations (transport operators and customs brokers). Figure 9 shows that Brazil, Mexico, Chile, Uruguay, Argentina and Colombia are the best countries in offering higher quality of logistics services. Venezuela, Jamaica and El Salvador are shown to be the least performing countries, which may affect the satisfaction level of their potential and current customers.



**Figure 9.**  
**Quality of Logistics Services: Comparison between LAC and the USA**

### **Ease of Arranging Shipments**

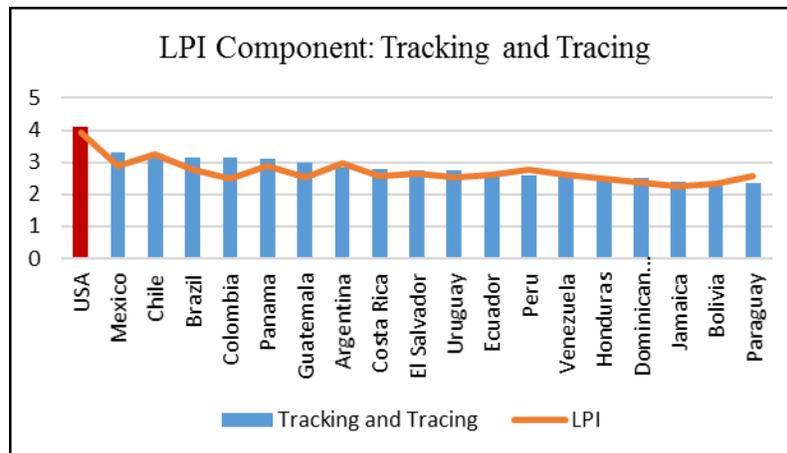
The ease of arranging competitively priced shipment is an output in supply chain service delivery (cost). A low performance in this measure does not allow the country to show competitiveness when compared to their competing countries. Unless the country offers unique products, then, price is always going to be a determinant in negotiating in international trade. Figure 10 shows that within LAC, Argentina, Brazil, Mexico, Chile and Uruguay are the best countries in facilitating ease of arranging competitively priced shipments. Mexico has a great advantage in this set of countries, due to the proximity to USA (a factor that will be analyzed later under the Gravity Model section). Both Paraguay and El Salvador are shown to be the least performing countries which may reduce the chances to win bids where price is a key factor.



**Figure 10.**  
**Ease of Arranging Shipments: Comparison between LAC and the USA**

### **Tracking and tracing**

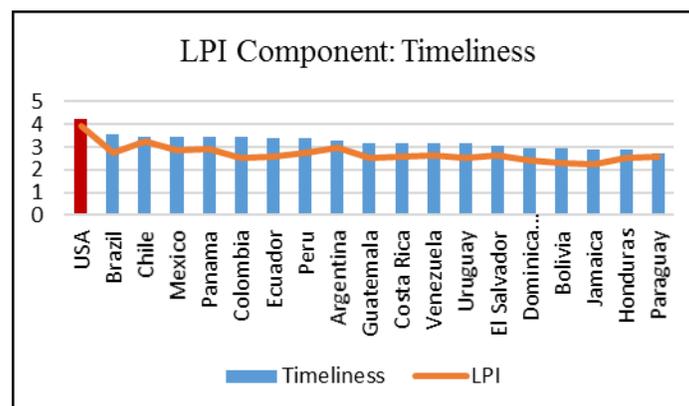
The ability to track and trace consignments is an output in supply chain service delivery (reliability). In today's business environment, it is crucial for business partners to have transparency of information, which includes real time tracking and tracing of shipments. Figure 11 shows that within LAC, Brazil, Mexico, Chile, Colombia, Panama and Guatemala are the best countries in their ability to track the exact location and the route of each consignment. Traceability is a result of the collaboration of all members of the supply chain, since they all contribute their part of information. Both Paraguay and Bolivia are shown to be the least performing countries in tracking and traceability.



**Figure 11.**  
**Tracking and Tracing: Comparison between LAC and the USA**

### Timeliness

The frequency with which shipments reach consignees within scheduled or expected delivery times is the last output in supply chain service delivery (time). Customers are more demanding each day, timeliness in delivering orders is no longer an order winner, in fact, it is an order qualifier, and firms must provide reliable and fast delivery times that results from good supply chain coordination and planning. Timeliness is the best of the components for most LAC countries. In fact, it is the only component in which about 72% of the countries show scores higher than 3 (which is the set mark for the higher performers analyzed in each component). Even the lower performing countries have values higher than 2.7, which in the other components, lower performers were closer to 2.3 or below. The lowest performing countries are Jamaica, Honduras and Paraguay. The highest performing countries are: Brazil, Chile, Mexico, Panama, Colombia, Ecuador, Peru, Argentina, Guatemala, Costa Rica, Venezuela, Uruguay and El Salvador. Timeliness is a very important measurable component of quality (Hummels and Schraur 2012).



**Figure 12.**  
**Timeliness: Comparison between LAC and the USA**

## **CONCLUSIONS AND RECOMMENDATIONS**

### *Conclusions*

By writing this research, we have seen differences that exist between two commercial areas, LAC and the United States, differences mainly in logistics practices and performance. We have gained an understanding of the importance of Logistics Indexes in international trade and the impact that these indexes have on the international trade

Competition in international trade helps understanding the need of international agreements. The Logistics Performance Index (LPI) is a useful tool for monitoring logistics competitiveness between countries. The Logistics Index of the World Bank is a way to compare the workings of international trade and logistics.

The United States show significantly higher scores than all LAC countries in all components of the LPI, which is not a surprising result due to the fact that the USA is the only developed country in America. In overall, using the LPI, Brazil, Chile and Mexico are the best performers in LAC, making them better trade partners in terms of logistics. On the other hand, Jamaica, Paraguay and El Salvador show the lowest scores. This means that these countries must work very hard in order to increase their competitiveness in international trade.

When analyzing individual components, we found that Venezuela is the lowest performer in the quality of trade and transport infrastructure, the quality of logistics services and the efficiency of customs and border management clearance. It is very important to emphasize that there is a big window of opportunity for LAC as a whole in terms of efficiency of customs and border management clearance. This is the overall lowest score for the region, which means that they face big challenges, due to political and crime instability, but they still need to improve efficiency of clearance and customs, without jeopardizing the safety of the people and the security of the cargo. This challenge goes beyond port administration authorities, but it should include the government, private and public organizations.

Chile has shown to be a country with great prosperity, being in the top performing group for all six of the LPI components, followed by Mexico and Brazil, which only lack the top performing rank in the efficiency of customs and border management clearance. Therefore, low performers could use these three countries as examples in analyzing their best practices and learn

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from benchmarking with their own. They are countries with similarities in terms of culture and language, but low performers, such as Venezuela, Jamaica, El Salvador and Paraguay, and many others in between, can benefit greatly from learning what Chile, Mexico and Brazil are doing in international trade logistics.

Using the gravity equation and regression analysis, we have seen how Gross Domestic Product, Logistics Performance Index and Distance affects the trade flow of different countries.

### ***Recommendations***

There are multiple actions, which can be undertaken by the United States and Latin American nations in order to become more successful in their logistics performances and to be competitive in international trade. Firstly, it is highly recommended to extend their logistics function. What that means is, the port should create a favorable marine environment for development and implement open policies for port transportation.

Secondly, in order to survive in such a competitive industry, low performing countries, such as Paraguay, Venezuela, El Salvador and Jamaica, should improve their logistics indexes in order to raise capital and use it wisely on aspects that are important for the nations.

Better efficiency in logistics performance could be achieved by better coordinating trade policies and logistics systems for each of the countries in Latin America and the Caribbean. Next, we believe that better information exchange is the key to improvement in the field of operations of international trade.

Countries should look at indexes such as the LPI as a tool to identify better global practices, to identify areas of improvement that could benefit the international competitiveness, and to become more attractive to bigger partners. The indexes help countries identify areas of improvement in order to be a successful trading nation and compete with other countries. It is very important for countries to develop new trade policies that help facilitate international exchanges and to increase the satisfaction of their people working in international trade, and hence, increase the satisfaction of their trade partners.

### **REFERENCES**

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