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MASTER OF SCIENCE IN MANAGEMENT

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**Determinants of infrastructure  
investment through Public-Private  
Partnership in Latin America and the  
Caribbean**

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## **ABSTRACT**

Latin America and the Caribbean should invest about 5% of GDP on infrastructure in the long-term in order to decrease the infrastructure gap that the region has. To address this problem this study perform an empirical analysis about cross-country determinants of infrastructure investment through Public-Private Partnership in Latin America and the Caribbean. We consider 6 factors that determine PPP projects in LAC: the legal framework and the public sector efficiency, the political environment, the financial obligation compliance, the macroeconomic stability, and the market conditions. We find the regulatory framework and the public sector efficiency as the most influent factor for PPP investment. Likewise, market size is also significant for explaining the infrastructure investment. Therefore, strong legal environment controlled by efficient public institutions plus large potential demand encourage PPP initiatives for infrastructure investment.

## 1 Introduction

Public-Private Partnerships (PPP) refers to a long-term cooperation between the public agent and the private sector in order to provide public goods and services by sharing risk, costs and resources (Hodge & Greve, 2007). Although cooperation between government and private sector is not a new issue, this figure has been developed in the 90's since many countries throughout the world have been growing rapidly, increasing the need for infrastructure but with limited resources to finance these types of projects. According to Blanc-Brude and Ismail (2013), between US\$60 and US\$100 billion per year of infrastructure projects are financed through PPP.

PPP programs have been developed in different countries with a similar pattern. It begins with toll-roads concessions because of the "self-financed" nature of this type of project, and in the next stage, countries move to social infrastructure. Then, PPP projects become more diverse and tend to require closer public sector monitor and stronger PPP laws (Yescombe, 2007).

Moreover, there has been many assessment and commentary about the different PPP experiences. For example, The London Underground PPP was an arrangement between the public agent, London Underground, and three PPP consortiums. The public entity was in charge of operating the train and the private party was responsible for the maintaining and rehabilitation of the underground infrastructure. The settlement was for 30 years beginning in 2004 but by 2010 private consortiums had failed and control of the infrastructure went back to the public agency (Williams, 2010). On the other hand, for instance, the Republic of Korea adopted the PPP approach for build-transfer-lease (BTL) school project which resulted more efficient than publicly financed project as they were able to provide an infrastructure that satisfied the main stakeholders like teachers, students, parents, etc. and at the same time they delivered timely school services to the public. Given its success, BTL school projects have been promoted across the country estimating an increase of 1,3 billion of dollars per year after 2017 (Kim, Kim, & Choi, 2011).

Inadequate infrastructure constrains growth and competitiveness, particularly in Latin-American and the Caribbean (LAC) in which infrastructure services are often inappropriate to meet demand, causing congestion in the provision of services. In addition, they are often of poor quality and reliability, while in many areas are simply insufficient. According to empirical studies, the region should invest about 5% of GDP on infrastructure (equivalent to USD 250.000 million in 2010) over a long period of time in order to decrease the infrastructure gap. In the 1980's, investment in infrastructure exceeded 3% of GDP, but since then it dropped sharply and fluctuated between 2% and 3%, placing the region far from the target of 5% investment required to close the gap (Serebrisky, 2014).

The poor performance of the infrastructure creates important challenges that government must face. First, countries are simply not spending enough to provide the necessary infrastructure, because of funding constraints or because governments have different fiscal priorities. Second, poor planning and coordination, poor analysis applied in the selection of the project, the search for political gain and corruption, make limited resources allocated to wrong projects. Moreover, the supply of infrastructure assets and services are often disappointing: the

construction of new assets costs more and takes longer than expected, and the provision of services is poor. Finally, infrastructure assets tend to have very poor maintenance (concept generally not included as part of project planning and therefore not budgeted), which increases costs and lowers long-term benefits (International Bank for Reconstruction and Development, The World Bank, Asian Development Bank, and Inter-American Development Bank, 2014).

In this sense, Public-Private Partnerships used properly, can be a very useful tool for the development of infrastructure like roads, schools, hospitals, etc.; and also for the improvement of basic services like energy, water, sanitation, health and education, which play a fundamental role in enhancing the quality of life of thousands of people, especially in LAC. The main reasons for developing a PPP are the lower costs than in sole private investments and the higher quality than in the sole public provision of the public good. Lower costs result from lower capital cost of the public partner, and higher quality comes from the know-how transfer from the private to the public partner (Moszoro & Gąsiorowski, 2008).

Moreover, PPP implies a conflict of interest between the public agent and the private party. The government seeks to achieve an infrastructure that maximizes social welfare benefits. On the other hand, the private sector must maximize profits fulfilling all its financial obligations. In this way, public and private interests must be reflected in the PPP contract, so this matter should be analyzed and balanced carefully when the PPP contract is being designed (Sharma, Cui, Chen, & Lindly, 2010).

More specifically, Hammami *et al.* develop a study about the determinants of PPP in infrastructure for developing countries from 1990 to 2003, which constitutes the first empirical approach about the topic. According to this research, the most important channel that determines PPP arrangements is the market conditions, defined by market size and purchasing power. Following, governments with heavy debt burden and macroeconomic stability also attract infrastructure investment. In addition, institutions with previous experience, less corrupted and with effective rule of law enforcement are more common for PPP projects. Beyond these, at the industry level, they find that the nature of the goods and the technology required to provide it have also an effect on PPPs determinants.

Nevertheless, there is no specific study of PPP investment for Latin American and the Caribbean region. LAC economic characteristics, legal system, and past PPP experiences are different from other regions. Moreover, past experiences in PPP reported by the CAF – Latin America Development Bank (2015) show that the region still lacks agents with the expertise and the preparation to manage and monitor these type of projects. Also, there are many failed projects because of the expropriation risk. Likewise, the renegotiation contract rate is very high compared to other regions. Moreover, in many cases, there is a lack of competitive bidding process to award the projects and decision-making process is not clear enough. Thus, it is necessary a further study about PPP practices in LAC.

Consequently, this research is looking to establish the determinants of infrastructure investment through Public-Private Partnership considering 19 Latin American and Caribbean countries for the years 2009, 2010, 2012 and 2014. Based on the literature review, we consider 6 factors that determine PPP projects in LAC: the legal framework and the public sector

efficiency, the political environment, the financial obligation compliance, the macroeconomic stability, and the market conditions.

We use Hammami *et al.* study as a starting point, however, we consider different aspects of the topic. We allow for only Latin American and Caribbean countries with more recent data. We limit to Greenfield and concession projects, excluding management and leasing contract since they do not fit into the concept of PPP arrangements. The measurement of some explanatory variables is different since we use the Infrascope Index from the Economist Intelligence Unit, which makes the scope of the analysis a little bit different from the previous study.

Our findings support the legal framework and public entity efficiency as the factor with the strongest effect on infrastructure investment in LAC, following by market size which is part of the markets condition factor. The legal framework and public agents must reflect fairness and transparency in the management of bidding process, risk allocation, conflict resolution, and decision-making. Also, significant potential demand attracts capital investors and lenders who look to mitigate high demand risk of an infrastructure project.

The paper is planned as follow: first, section 2 introduce the literature review about the factors that we consider to be the main determinants of PPP infrastructure investment in LAC. Second, section 3 present the hypotheses to be tested, followed by section 4 which report the methodology that we use to analyze the relationship between the variables, and the explanation of the data and the measurement of the variables. Next, section 5 present the results and the analysis of the study. Finally, section 6 concludes the paper.

## 2 Literature review

### 2.1 Public–Private Partnership

#### 2.1.1 PPP an introduction

In the mid-80s countries in Latin America and the Caribbean started economic reforms by allowing the participation of the private sector to provide infrastructure services, with the purpose of improving sector performance and secure investments that governments weren't able to provide. These private firms are either individual corporations or consortiums (Guasch, 2004).

Commonly, there are many types of private participation in the provision of infrastructure service (Table 1), each type differs according to the private participation level, risk allocation, investment responsibilities, operational requirements and incentives for operators (Guasch, 2004). Nonetheless, the three broad ways to provide infrastructure are traditional provision, PPPs, and privatization.

*Table 1. Types of Private Participation in Infrastructure*

<b>Public supply and operation</b>	
<b>Outsourcing</b>	
<b>Corporation and performance agreements</b>	
<b>Management contracts</b>	
<b>Leasing (affermage)</b>	“Concessions”
<b>Franchise</b>	
<b>Concession</b>	
<b>Build-operate-transfer (BOT)</b>	“Privatization”
<b>Build-own-operate (BOO)</b>	
<b>Divestiture by license</b>	
<b>Divestiture by sale</b>	
<b>Private supply and operation</b>	

*Source: Guasch (2004).*

There are several countries in which governments retain some control in various sectors because of concerns about efficiency. Therefore, governments do not transfer public assets ownership to the private party, so for these cases, there have been innovative strategies to include the participation of private sector in developing infrastructure (Guasch, 2004).

Even though private sector participation in public investments is not new, the use of Public-Private Partnerships has been implemented in the recent years because it leads to a more

comprehensive, participatory and effective field for the provision of infrastructure and public services.

There are several definitions of the term Public-Private Partnership. Currently, there is no single accepted definition of PPP, however, for the purpose of this study the PPP will be defined as a long-term contract between a private party and a public entity to provide a public asset or public service in which the private party assumes a significant risk and responsibility of management, and remuneration is linked to performance (International Bank for Reconstruction and Development, The World Bank, Asian Development Bank, and Inter-American Development Bank, 2014).

The main characteristics of a PPP are (Kwak, YingYi, & Ibbs, 2009):

- The assets or services provided are defined in terms of outcome rather than a product.
- The role of the project transferred to the private party can vary according to each contract, however in all the cases the private party is responsible for the project performance.
- The private party assumes a significant risk of the project, as well as the management responsibility.
- The payment to the private party is subject to the performance and outcomes reached.

Also, the above definition includes several types of contracts that depend on three main factors (International Bank for Reconstruction and Development, The World Bank, Asian Development Bank, and Inter-American Development Bank, 2014):

- a) **Assets types.** It can include new assets denominated Greenfield project, or the project can work over existing assets in which the responsibility to update and manage the assets or services is transferred to the private party, this is called brownfield project.
- b) **Duties of the private party.** A central feature of a PPP contract is that it accumulates multiple project phases. However, the tasks that the private party is responsible vary and may depend on the type of asset or service concerned. Among the most common functions, are the following: design, development or rehabilitation, financing, operation, and maintenance.
- c) **Payment mechanism.** It depends on the function assumed by the private party, which can receive payments from the service users, the government or a combination of both.

There are other types of contracts between the government and private firms that have similar characteristics with PPP contracts, but they differ in some aspects:

- **Management contracts:** they include performance indicators and requirements similar to the PPPs. However, these contracts have a shorter term than PPP

contracts, and they do not involve significant private equity investment, whereas performance incentives are created mainly through schemes of payments and penalties.

- **Design-construction contracts or turnkey contract:** they also include similar specifications based on results; although, as the contract term is shorter it doesn't establish the same performance incentives in the long term as PPPs.
- **Financial leasing contracts:** they are long-term contracts for the provision of public assets. Nevertheless, these contracts transfer a significantly lower risk to the private party compare to the PPPs.

There three types of agreements for PPPs projects are (World Bank Group, 2016):

- a) **Concessions:** public party transfers to the concessionaire ( a private entity) a long-term right to use the facility, including the operation and the responsibility of some investments. The asset is transferred to the public entity at the end of the contract. The concessionaire pays a concession fee to the public sector and obtains most of the revenues from the exploitation of the transferred asset.
- b) **Build-Operate-Transfer (BOT):** includes the legal ownership and control of project assets. The private company owns the project assets until they are transferred at the end of the contract. The company is in charge of the designing, building, financing, operation and maintenance of the facility. Inflows could be from the government or from the users.
- c) **Design-Build-Operate (DBO):** the private entity designs, builds and operates the facilities. The government keeps the ownership of the asset and finances the construction. It consists of a turnkey contract plus an operating contract. The private company is paid for the designing and building and receives an operating fee for the operation of the project.

### 2.1.2 PPP structure

As mentioned before, one of the main characteristics of the PPP is the possibility of transfer the responsibility and the risk to the private party in order to allocate funds to large-scale projects, like infrastructure projects. The financial structure of a PPP should minimize financing cost, be bankable and at the same time fulfill the contractual obligations.

PPPs can be financed by three mechanisms (World Bank Group, 2016):

- **Government funding.** It's when the state finance part or all the capital investment needed for the project, and the private sector contribute with the expertise and know-how.
- **Corporate or on-balance sheet finance.** A private operator assumes part of the capital investment and uses corporate financing to fund the project. With corporate financing, the private operator finances the project through its own balance sheet. This mechanism is typically used in projects where the cost of financing is not significant enough to use the mechanism of Project Finance, or

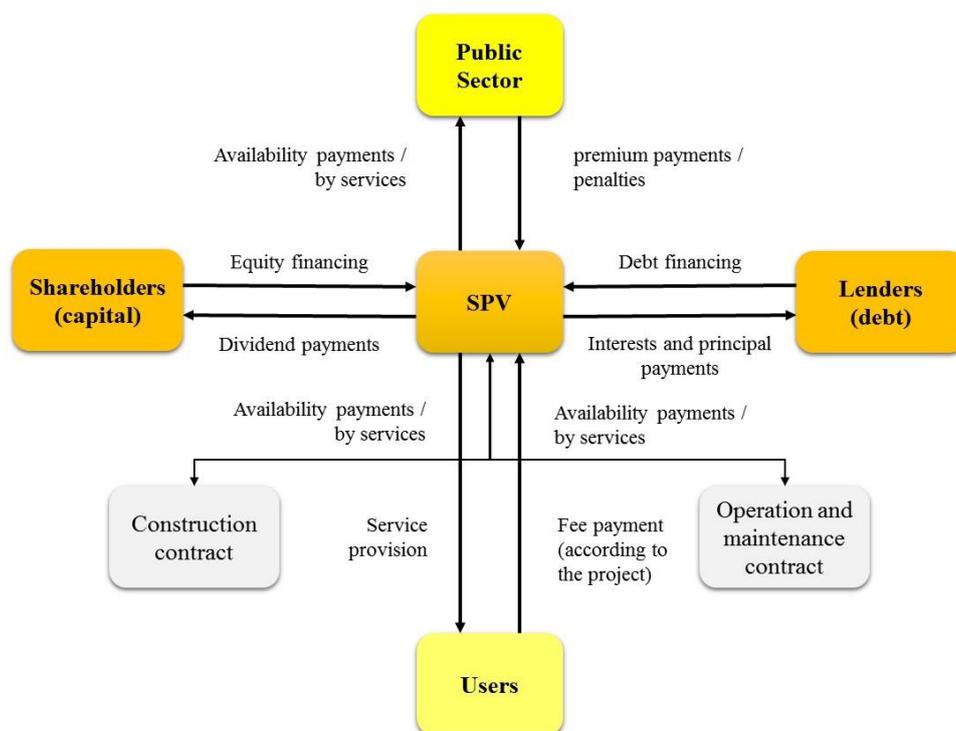
the operator is so large that choose to finance the project with its own balance sheet.

- Project finance.** Also known as “limited resource” or “non-resource” financing. A specific company is created for the project, and it’s usually called Special Purpose Vehicle (SPV). The SPV provides the construction and operation necessary to meet the requirements of the PPP contract operations, often with the same companies that constitute the shareholders. SPV assume the responsibilities from the contract and organize the funding usually in the form of Project Finance. Project Finance is a financing mechanism for projects in which creditors’ main or only source of payment are the future cash flows that the project will generate. This type of contract cannot be used in all projects, it is necessary a regulated sector or a project that has broad market or buyers committed under long-term contracts.

Most PPPs are financed with project finance. By 2013, total project finance is around USD 350-400 billion annual, of which 20% are oil and gas projects and 80% are infrastructure projects. Of these infrastructure projects, around USD 60-100 billion annual are PPPs, of which 75% are in the transport sector and 20% fund government services (Blanc-Brude & Ismail, 2013).

The SPV raises fund through a combination of capital, provided by the shareholders of the project company; and debt, supplied by banks or bonds or other financial instruments. Figure 1 shows the financial and contractual structure of a PPP project.

Figure 1. PPP Project structure



Source: International Bank for Reconstruction and Development, The World Bank, Asian Development Bank, and Inter-American Development Bank (2014).

The initial capital investors, which developed the PPP proposal, are often called project stakeholders. Typical equity investors are usually project developers, engineering or construction companies, infrastructure management firms and private equity funds. Lenders of PPP projects in developing countries may include commercial banks, multilateral and bilateral development banks, and financial institutions such as pension fund managers (International Bank for Reconstruction and Development, The World Bank, Asian Development Bank, and Inter-American Development Bank, 2014).

The main government contractual relationship is with the project company and not with the constituent companies of the SPV. The project company hires companies to manage the design and construction. These contractors may be also the capital investors of the SPV (International Bank for Reconstruction and Development, The World Bank, Asian Development Bank, and Inter-American Development Bank, 2014).

The capital investment is the "first in, last out", which means that the losses of the project are covered first by equity investors, then by the lenders, who suffer only if investment capital is lost. Lenders receive regular payments under the terms of their loans, bonds or another debt instrument. Equity investors expect to receive dividends and share appreciation in the value of the SPV. This means that capital investors require a greater return on investment than lenders, in exchange for assuming a higher level of risk on the amount, timing and security of payments (International Bank for Reconstruction and Development, The World Bank, Asian Development Bank, and Inter-American Development Bank, 2014).

Because capital is more expensive than debt, shareholders use the highest proportion of debt to finance the project that the market will accept at a competitive cost. In the meanwhile, they also try to reduce the risk level of the SPV through negotiations with the public sector and its contractors. From the perspective of investor capital, this helps manage risk and lower their capital costs; for lenders, it means undertaking a thorough diligence (International Bank for Reconstruction and Development, The World Bank, Asian Development Bank, and Inter-American Development Bank, 2014).

### **2.1.3 PPP critical factors**

The study made by Xueqing Zhang (2005) based on quantitative measures and the results of a questionnaire survey of international experts and practitioners opinions from the industrial sector and from the academic sector identifies 5 critical success factors for PPPs in infrastructure development in both developed and developing countries. The 5 main critical success factors are:

1. Favorable investment environment.
2. Economic viability.
3. Reliable concessionaire consortium with strong technical strength.
4. Sound financial package.
5. Appropriate risk allocation via reliable contractual arrangements.

Each type of the infrastructure investment deals with different types of risks. The sectors for infrastructure investment include (Grimsey & Lewis, 2002):

- **Energy:** supply and power generation.
- **Transport:** toll roads, rail systems, bridges and tunnels.
- **Water:** sewerage, wastewater treatment, and water supply.
- **Telecommunications:** telephones.
- **Social infrastructure:** hospitals, prisons, schools, etc.

In addition, infrastructure project finance faces at least nine risks (Grimsey & Lewis, 2002):

1. Technical risk.
2. Construction risk.
3. Operating risk.
4. Revenue risk.
5. Financial risk.
6. Force majeure risk.
7. Political and legal risk.
8. Environmental risk.
9. Project default risk.

Based on the above list, the risks can be classified as global or elemental. Global risks are those allocated through the project agreement and include political, legal, environmental, and commercial risk. On the other hand, elemental risks are the ones related to the project itself such as technical, construction, operating, financial and revenue risk (Grimsey & Lewis, 2002).

#### **2.1.4 Environment for PPP development**

PPP projects should be developed in a favorable environment and provide necessary support for private sector participation, and at the same time ensure that projects are delivered at acceptable standards and quality.

To encourage infrastructure investment from private sector and lenders, it depends greatly on the environment where these projects will be developed. For instance, an environment where local authorities with poor credit quality and poor legal system are undesirable for investors. For PPP projects, there should be a political, legal, economic, and commercial favorable environment in order to attract private investors and lenders. In addition, it is necessary some governmental guarantees in order to manage certain risks such as foreign currency stability, delays in approval of permits, corruption, etc. (Zhang, 2005).

## **2.2 Legal framework and public sector efficiency**

According to some studies, the legal framework has a strong impact in attracting foreign capital for investment projects. Laws are important to protect investors' rights in case of potential conflicts. A high legal environment risk decreases the incentives for investors to join PPP arrangements (Hammami, Ruhashyankiko, & Yehoue, 2006).

Given the conflict of interest between the public party and the private sector, the expertise and know-how transfer should be well defined and secured in legal documents. In addition, a reliable legal system is required to provide instruments to ensure public and private interests (Moszoro, 2014).

Good representation of all the parties involved and strong and effective legal input can benefit the PPP transaction and provide tools of mitigation for potential legal issues that could interfere with the project cycle. In addition, appropriate contractual arrangement help to manage risk by allocating them to the party best able to control them (Zhang, 2005).

The contract contents the identification and allocation of risk which are important issues in a contractual arrangement. Also, it establishes the objectives, the obligations and rights of the contracting parties, technical specifications, formal dispute resolution process, and motivation and incentives to the parties (Zhang, 2005).

The public sector is in a better position to create favorable environment whilst private sector is in charge of successful implementation of PPP projects. Institutional quality is important because PPPs are arrangements between governments and private sector, which depend on the regulatory environment controlled by public institutions. Weak institutions encourage uncertainty about the legal enforcement of a country and therefore discourage investments (Hammami, Ruhashyankiko, & Yehoue, 2006).

Moreover, the concessionaire undertakes far more commitments and assumes broader and deeper risks than any other project participant. In this way, competitive selection of the concessionaire through a fair tendering process is crucial for the success of the project (Zhang, 2005). Private sector and countries with past PPP project experiences are more likely to develop successful infrastructure projects since they improve knowledge, capability, and managerial skills to succeed in these type of complex projects (Hammami, Ruhashyankiko, & Yehoue, 2006).

## **2.3 Political environment**

The evidence suggests that countries with ethnical fractionalization require satisfying different individual needs by providing a variety of public goods and services while reducing the probability of conflicts over common resources. Hence, high level of infrastructure project adds a financial burden on the public sector which requires private financing in order to satisfy public infrastructure demand. Also, political stability helps accountable governments to apply for efficient infrastructure programs. In addition, governments with market-oriented policies are more willing to encourage PPP projects (Hammami, Ruhashyankiko, & Yehoue, 2006).

According to a study by Singh & Kalidindi (2014), lenders take into account the political environment to assess the risk profile. In this matter, political consensus is an important mean to mitigate political risk. Lenders study the political record of the country and based on this they do not consider projects in countries with political turbulent. Also, they assess the government support for PPP projects, which reflects the political will of the state for the implementation of PPP projects.

In the same way, countries with changing political environment present a clearly risk of losses in the provision of PPP infrastructure because the prices charged for many public services and goods are very politically sensitive (Grimsey & Lewis, 2002).

## **2.4 Financial obligation compliance**

The risk valuation for this type of projects is completely different from other ones. It is complex since it requires the analysis from two different perspectives; the public and the private part (Grimsey & Lewis, 2002).

As mentioned before, most of the PPPs are financed by project finance through an SPV. The SPV has two sources of financing: equity and debt. Regarding equity, it might be optimal for the government to be part of the shareholding structure. The shareholding of the government can lower the cost of capital and private participation can increase the quality of the project due to the transfer of know-how. In addition, in the case of emerging markets with deep market failures, the participation of the government in the SPV can help to correct these failures (Moszoro, 2014). It is proved that private sector is able to provide infrastructure cheaper than the public sector. Nonetheless, the cost of capital for a the private party is on average 100-300 basis points higher than for the public sector (Moszoro & Gąsiorowski, 2008).

On the other hand, most of the PPPs are highly leveraged, with debt funding around 70-90% of the project total cost. Debt providers care about the downside risk and the measures to mitigate the risk. Debt holders have a key role in debt financing since they are in charge of identify, allocate, assess and manage the risks related to the project. Even though the contract is between the public agent and the private company, the lenders are the ones that set the parameters to mitigate the risk and assess if the project can be financed. In the end, this risk evaluation is reflected in the risk premium that is included in the cost of debt. (Singh & Kalidindi, 2014).

Moreover, lower financing cost should be ensured for the entire term of the project. This is not an inconvenient for funding upfront project, but if the fund is required for the entire term of the project, ensure cheap financing cost would imply that the public party must maintain its creditworthiness and apply sound macroeconomic policies (Moszoro, 2014). These macroeconomic conditions include stable low inflation, maintenance of steady growth, the track record of honouring public debt, etc. Most of these characteristics are reflected in sovereign credit ratings (Hammami, Ruhashyankiko, & Yehoue, 2006).

## **2.5 Macroeconomic stability**

Macroeconomic stability is necessary in order to incentive private sector to engage in PPP projects. During loan approval-process the lenders examine the economic viability of the project

by sensitive analysis which includes economic stress scenario. Many of the macroeconomic variables have a direct effect on PPP projects. For instance, the exchange rate can significantly affect the profitability of the project since most of the PPP projects are financed with foreign capital from loans and equities. High overall price reflects structural problems in public sector finance, therefore is a wakeup call for instability. Hence, exchange risk and unstable inflation are important risks limit the number of PPPs (Hammami, Ruhashyankiko, & Yehoue, 2006).

## 2.6 Market conditions

PPPs are a good mean to leverage infrastructure since these type of projects require high upfront payments. Therefore, profitability is a key factor in order to encourage private participation. Profitability comes from the revenues generated by the project which is subject to commercial risk. Thus, market conditions are crucial for attracting private sector investment. (Hammami, Ruhashyankiko, & Yehoue, 2006)

Regarding PPP projects, there are some factors to consider in order to succeed: long-term demand for the product/service; limited competition from other projects; sufficient profit to attract investors; long-term cash flow to attract lenders; and long-term availability of suppliers needed for the normal operation of the project.

According to the study, there are many aspects of the project to take into account to assess its risk profile. In order to anticipate funding inconvenient, Project Company take a prior evaluation of the project's creditworthiness. The criteria framework include financial strength, in which it assesses the capability of the project to deal with debt service and demand risk, in which it evaluates the potential demand volume estimated and tariff pricing mechanism, this help to determine the demand risk of the project (Singh & Kalidindi, 2014).

In addition, since most PPPs are characterized by the formation of an SPV, and there's a significant uncertainty regarding the financial closure because of the risk that predicted revenues won't be achieved and therefore it could affect the commercial viability of a project. In this way, finance providers take into account cash flow of the project and potential risk related to it (Grimsey & Lewis, 2002).

Private agent equity is based on stakeholder funds under certain requirements. Stakeholders demand to maximize the IRR in order to be willing to invest in the project (Jasiukevičius & Vasiliauskaitė, 2014). Specifically, from the private company's perspective, the risk analysis focuses on potential risks that impact on the equity return. The relevant risks are demand risk, the risk of capital expenditure and asset management costs being greater than forecasted, operating risk and performance risk (Grimsey & Lewis, 2002).

From a lender's perspective, the assets from the project do not have financial worth since they won't be able to sell the public asset to realize the value in case of failing project. The difference between equity holders and lenders is that for lenders there is not an upside gain in the project, only downside risk that affects the borrower capability to meet financial accountabilities under the loan agreement. Therefore, lenders focus on revenues stream and establish robust coverage ratios (Grimsey & Lewis, 2002).

Each type of risk is common to any type of project and their impact depends on the project concerned, i.e. in some PPP projects demand risk and commercial risk might be low whilst in others they can have a significant impact on the cash flow stream. Thus, PPP projects can be evaluated using the same techniques as for another type of projects. However, the critical evaluation is about the uncertainty of revenues streams and if it would be enough to cover debt service, operating costs and return on capital. Therefore, it is required several risk analysis of the nature of the risks, tailored to match the interests of the parties of the project (Grimsey & Lewis, 2002).

In addition, since long-term service charges must be ensured to mitigate risks, public affordability is also a key element to making the project viable. If users are charged for a service, appropriate toll/tariff levels should be established considering the user's affordability (Zhang, 2005).

These findings imply that market size and consumer's income are determinants of market conditions. Market size is a parameter for the potential number of consumers paying market prices for infrastructure services. Also, the ability to pay these markets prices comes from the level of income of these potential consumers (Hammami, Ruhashyankiko, & Yehoue, 2006).

## **2.7 Public Private Partnership practices in Latin America and the Caribbean**

Nowadays, LAC are one of the regions most active in processes of public-private partnership. Based on the study published by the CAF – Latin America Development Bank about projects executed through the PPP model in LAC, this model has not been exempted from success and failures, so there is still room for improvement. Therefore, there are some recommendations and lessons learned that can be widely applied.

### **2.7.1 Highways San Jose-San Ramon and San José-Caldera, Costa Rica**

Costa Rica has been improving in certain fields such as health and education, however, the country still faces challenges to encourage investment in order to improve its competitiveness in all areas of infrastructure. Specifically, the development of transport is one of the main problems of the country. Costa Rica has a lag behind in infrastructure over 25 years, and many of the works that exist today are in critical condition. According to the National Transport Plan, on average the country needs to invest USD 2.400 million per year in order to reduce the infrastructure gap. (Vassallo Magro, 2015).

The case is about the only two concessions in highway infrastructure that the country has developed until the date. The San José-Caldera highway has been executed and the concession has been extended. On the other hand, the concession contract for San José-San Ramón highway has been canceled (Vassallo Magro, 2015).

The economic crisis in the 80's limited the country's external debt, so the scarcity of public resource restricted the government to invest in infrastructure. Therefore, the public sector opened to private investment in order to provide the country with the necessary infrastructure, achieving the greater benefits for the population at the lowest cost to the state. The concession

offers a very attractive way to obtain other funding sources that help to develop large projects that are key to the growth of the nation (Vassallo Magro, 2015).

One of the main problems to implement the concession model in Costa Rica is the public approval of the projects since the society is not used to pay any tariff for highways. The government should create awareness about the necessity that the country faces and foster dialogue with citizens. In addition, the public entity should assess the social benefit of the project and evaluate which projects can be financed through taxes or toll (Vassallo Magro, 2015).

Even though San José-Caldera highway project dealt with a different kind of inconvenient, it had wider acceptance than the San José-San Ramón highway because *a priori* there were clear differences between both roads. In the case of the San José-Caldera highway, it consists in adding a new highway to another one that already existed. For this road, the citizens had alternative routes so charging a toll didn't have a negative social impact. On the other hand in that time, San José-San Ramón highway was one of the main routes of the country and its alternatives routes were much more uncomfortable or even nonexistent (Vassallo Magro, 2015).

Moreover, during the development of the San José-Caldera project there was a lack of experience in concessions, insufficient professionals specialized in the different fields, and problems related to expropriation that led to multiple renegotiations of the contract, and therefore, the project was delayed for 8 years (Vassallo Magro, 2015).

Likewise, due to the lack of promotion of the projects there has been not enough competition in the bidding process, therefore for both San José-Caldera highway and San José-San Ramón highway, there was only one bidder. In this situation, there is a strong pressure for the public entity because it is forced to accept the conditions of the consortium. The lack of promotion also affected the financial closure of the contracts because the lenders required more guarantees from the government and the modification of certain conditions. This was the case for the San José-San Ramón project, which did not achieve the financial closure (Vassallo Magro, 2015).

The country also has a gap with the General Law of Public Works Concession, which allows the final dealer acquires a very strong power to renegotiate with the administration to rebalance the terms of the contract. As a consequence, in the San José-San Ramón project the company managed the administration to approve tariffs and terms that led to the social rejection of the project and thereby rescission of the contract (Vassallo Magro, 2015).

### **2.7.2 Airport Terminal El Dorado in Bogota, Colombia**

In Colombia, the concessions and the Public Private Partnership model have been key factors for the development of infrastructure in the country. The main airport of Colombia is about to be the main HUB of America, it is situated in the third place of importance regarding traffic of passenger and first place in traffic freight in the Latin America. Even though there is not a deep delay regarding ports and airports, according to the Global Competitiveness Report 2010-2011, the country is below the global average in infrastructure quality (Vassallo Magro, 2015).

Recognizing this situation, the state has been encouraging public and private investment in infrastructure in the past years. This case is about the International Airport El Dorado in Bogotá. Specifically regarding airport infrastructure, the public entity was interested in modernizing and expanding different airports of the country in order to take advantage of its strategic geographic position and the opportunity to integrate the regional and national economy. In addition, the accelerated growth of the Colombian economy sets the necessity to decentralize the airports of the country, hence, the private participation through the concession model has been an alternative to accomplish this objective (Vassallo Magro, 2015).

In this context, Colombia is a country that has a wide experience of 30 years in concession projects, including airport infrastructure. This allowed the country to learn and improve its efficiency regarding the reallocation of risk and investment management. Moreover, the state has strengthened the infrastructure process by establishing in 2012 the legal framework for Public-Private Partnerships and creating institutions that support the structuring and technical management of concessions (Vassallo Magro, 2015).

Nevertheless, there have been inconvenient in the development of the airport's concessions, explicitly the traffic forecasting and investment overruns. Regarding the projected levels of traffic, it has been far outweighed by the actual values which would produce a lag of more than 100% before half the concession period. As a consequence, there was a modification of the original agreement and the demolition of the passenger terminal in exchange for the remodeling, and a renegotiation process that delayed the project for 3 additional years and increased around 35% the initial value of the contract (Vassallo Magro, 2015).

### **2.7.3 Municipal administrative center in Tlajomulco de Zuniga, Mexico**

Mexico is known as one of the Latin America countries more active in private initiative. The country has had a wide experience in public work concessions with different outcomes, which led to a positive development in concessions (Vassallo Magro, 2015).

After the economic crisis of the 80's, with the restriction of limited public resources and the necessity to develop infrastructure, the government launched the Highway Concession National Program to allow the construction of 5.500 km of highway with 52 concessions, which was financed through capital contributions and bank loans from the private sector. However, the tolls were too high so the traffic level was below the estimations. In addition, the December 1994 crisis brought the devaluation of the Mexican peso and the rise of the interest rate. As a consequence, many highways had problems and therefore in 1997 the government rescued 23 of the 53 concession with a cost USD 6.000 million to taxpayers (Vassallo Magro, 2015).

Following the different problems from the Highway Concession National Program, the government restructure legal framework and set a difference between concessions, service delivery projects and asset utilization schemes. With the service delivery projects, the public spending in social infrastructure and public services is more efficient, the public sector avoids incurring budgetary funding through a partnership with the private sector, which assumes project financing and the risk is translated to the agent more capable of managing it. Also, it allows the government to require certain quality requirements (Vassallo Magro, 2015).

The case is about the municipal administrative center in Tlajomulco de Zúñiga, located in the metropolitan area of Guadalajara, Jalisco State in Mexico. In the last 30 years, there has been an increase of 607% of Tlajomulco de Zúñiga population. However, the facilities and infrastructure have been the same as in the eighties. There was a growing demand for public services and infrastructure, but the facilities of the different units of the municipality were dispersed and had significant capacity shortages, this caused significant inefficiencies. In addition, the offices rent, the maintenance, and reposition costs have been increasing progressively over the years (Vassallo Magro, 2015).

The Municipal Development Plan for the 2010-2012 Government intended to substantially improve the provision of municipal public services by renovating the facilities, restructuring and reorganizing the areas, providing new equipment and supplies for the maintenance of the infrastructure (Vassallo Magro, 2015).

Finally, the service delivery project of the municipal administrative center of Tlajomulco was successful. Despite its little experience in PPPs projects, the municipality achieved its objective and got a facility that centralized the public service and improved its quality (Vassallo Magro, 2015).

Despite the good results of the project, there are some aspects to take into account for future initiatives. First, the bidding process lacked competition since there was only one bidder. In order to avoid this, it is necessary to promote the project in advance to potential national and international investors. Second, there was a low transfer of management risk to the developer of the project. This is related to the contract design, in which it seems that it was more oriented to improve the perception of the funders, whose always try to take less risk, instead of enhancing the management of the project. By last, there was a flaw in the establishment of the performance standards. The performance standards were set in a very conventional way so that the developer had no room for innovation. The contract design could determine the performance standards based on the user's perception and allow the private sector to apply its capacity for innovation to reduce costs in providing services (Vassallo Magro, 2015).

#### **2.7.4 Lessons from Chilean experience**

Chile is one of the wealthiest economies in Latin America with high human development indexes. Corruption levels are low, even lower than many European countries, including France. Chile is the developing country with most successful PPP programs in the region. The private investments have improved significantly the infrastructure of the country and reduced the transportation costs (Fischer, 2011).

Geographical conditions make the country highly susceptible to high transportation costs, for this reason, the public entity decided to focus on reducing this disadvantage by decreasing the internal and border transport cost. In 1991 the congress approved a law that allows private investment for public works, however because of several deficiencies, the law was reformed and by 2007 50 projects have been in a concession to the private sector, which corresponded to about 10% of Chilean GDP in that period. Another important reform was the substantial mitigation of expropriation risk, which helps strengthened property rights (Fischer, 2011).

Nevertheless, Chile faced some problems in the development of the PPP programs. PPPs do not provide additional resources; investment is paid through availability payments or resources are derived from user's fees, in both cases, there are not additional resources generated. In the first one, the government assumes the same obligations as under a loan, and in the last case, the public entity could use the user's fee to pay for a loan (Fischer, 2011).

Moreover, the PPPs were related to a corruption scandal and as a consequence, the PPPs process was delayed for several years while new reforms were carried out. In addition, Chile has a high rate of contract renegotiations. Original contracts represent only 26% of total PPP investments, this is mainly due to the corruption and lack of incentives for correct design of the projects from the public entity. Highway concessions are the more renegotiated, 26 projects have been renegotiated 109 times, 4,2 per concession. In most cases, there was an increase in the payments to the concessionaire or upgrades to the original project (Fischer, 2011).

Likewise, there was a lack of external regulatory framework. The MOP (Ministry of Public Works) has been in charge of designing, implementing, supervising and renegotiating contracts. As a consequence, since the MOP was in charge of renegotiating the contracts, it has the incentives and the opportunity to cover up its mistakes. This also has an impact in renegotiations. The renegotiations can be bilateral or under the supervision of a commission. In a bilateral renegotiation, the only participants are the MOP and the concessionaire without any external independent supervision. On the other hand, if they didn't reach an agreement, a commission tries to conciliate and then arbitrates. From 144 renegotiations, 74 have been bilateral and about 84% of additional amount have been conceded after bilateral renegotiations (Fischer, 2011).

The lessons learned from the Chilean experiences are (Fischer, 2011):

- A clear contract that includes legislation regarding conflict resolution mechanisms.
- Cost benefits analysis of the projects and hurdle rate for the approval of the projects.
- The final form of the projects before they are awarded.
- External regulatory framework.
- Well-design bidding process including technical and financial requirements.

### **2.7.5 Obstacles for PPP development in Latin America and the Caribbean**

Worldwide, there are various problems in infrastructure development, from the slow implementation of the projects, strong public opposition to political instability. Most of these problems are due to the characteristics of PPPs projects such as broad range of risk and uncertainties, the different participants involved, and especially in Latin America and the Caribbean, the lack of expertise and experienced professionals in the field (Zhang, 2005).

The World Bank has identified 11 obstacles for PPPs development in Latin America (Zhang, 2005):

1. Wide gaps between public and private sector expectations.
2. Lack of clear government objectives and commitment.
3. Complex decision making.
4. Poorly defined sector policies.
5. Inadequate legal/regulatory framework.
6. Poor risk management.
7. Low credibility of government policies.
8. Inadequate domestic capital markets.
9. Lack of mechanisms to attract long-term finance from private sources at affordable rates.
10. Poor transparency.
11. Lack of competition.

To conclude, the challenges that Latin America and the Caribbean face in order to develop the PPP model are related to the public entity by building an analysis framework that helps to demonstrate the additional value of PPPs process compared to other types of project development. Also, the government should not pursue projects that are not socially viable and end up generating significant budgetary burdens in the future. In addition, the state should promote the PPP projects in order to encourage competitive participation and efficiency. Regarding this matter, it is also important the communication of project to the public and the transparency in the information, especially to the community affected in order to avoid public opposition and potential corruption scandals that delay the projects for many years. Moreover, the contract must be designed with an effective risk allocation between the parties that translate the risk to the counterpart better suited to manage it. Another issue regarding the contract is the renegotiation, it should only happen when the social utility is affected. Likewise, the conflict resolution mechanisms should be strengthened and include professional and independent experts (Vassallo Magro, 2015).

### **3 Conceptual framework and Hypothesis development**

This study is looking to describe the determinants of infrastructure investment through Public-Private Partnership in Latin America and the Caribbean. In order to answer this research question, there are some studies that help to analyze the problem. According to the literature, the main factors to consider in order to foster infrastructure investment are the legal framework, the public sector efficiency, the political environment, the financial obligation compliance, the macroeconomic stability, and the market conditions.

#### **Legal framework and Public entity efficiency**

Legal framework refers to the legal system of the country which includes PPP laws and regulations. Given the complexity of the arrangements of PPP projects, a reliable legal system is key to ensure public and private interests, and therefore foster infrastructure investment. Some aspects to consider are the definitions of risk allocation to different parties according to their ability to manage them, the conflict resolution system, regulatory enforcement, and the bidding process fairness which have a direct impact on the contract design.

At the same time, public entity efficiency consists of the quality of the public institutions to carry these PPP process and regulations, their capacity to plan and oversee PPPs, their previous experience in PPP, the availability of government officials with expertise in the field, and proper cost-benefit analysis techniques established.

*Hypothesis 1 – Countries with strong legal framework and reliable public entities are able to encourage more infrastructure investment.*

#### **Political environment**

The political context is an important aspect considered by the private sector. Developing countries are characterized by an unstable political environment, so as a consequence, they are risky and uncertain for foreign investment. Regarding PPP projects, a proper political environment is about the political stability, the degree of independence of the public service from political pressures, the quality of policy formulation and implementation, the credibility of the government's commitment to such policies, the corruption level, and the transparency. Also, the political consensus to provide favorable implementation frameworks for PPP.

*Hypothesis 2 – PPP infrastructure projects are more prevalent in stable political context.*

#### **Financial obligations compliance**

Sovereign rating assesses the relative likelihood of default from a country. According to Cantor and Parker model, the ratings are a function of economic fundamentals, like per capita income, GDP growth, inflation, external debt, etc., and qualitative judgment based on ad hoc information from the country. Only governments with stable economic growth and controlled public balance are able to fulfill the financial obligations. In addition, this compliance encourages public sector's credibility and reliability and reduce financing cost. Therefore, significant government payment risk is an important factor in fostering PPP investment in Latin America and the Caribbean.

*Hypothesis 3 – Countries with good track record of fulfilling financial obligations and providing guarantees to investors are more attractive for infrastructure investors.*

### **Macroeconomic stability**

Stable, credible and predictable macroeconomic conditions encourage private investment. Macroeconomic stability is more common in countries with low inflation, therefore, stable inflation is essential for PPP developments.

*Hypothesis 4 – Macroeconomic stability based on low inflation foster infrastructure providers.*

### **Market conditions**

Since infrastructure investment implies high upfront investment, commercial viability is a key factor for the private sector. Finance providers take into account cash flow of the project and potential risk related to it. Infrastructure project's profitability is given by revenues stream and financing cost. Larger market size and consumer's purchasing power are good perspectives for potential revenues.

*Hypothesis 5 – Markets with larger demand and purchasing power tend to be more common for PPP projects.*

## 4 Methodology and Data

In the previous section, we establish five hypotheses that link the main factors of the infrastructure investment determinants. In order to represent infrastructure investment through PPP, we consider the annual PPP investment in millions of dollar. Therefore, our basic methodology rests on Ordinary Least Square (OLS) regression. In addition, we include countries even though they do not present any amount of infrastructure investment during the sample period, as we believe that these initiatives take some time to be committed so if there is no annual investment, it does not reflect the total absence of PPP process.

There are different sources regarding the infrastructure investment determinants. For the dependent variables' source is from the Private Participation in Infrastructure Database of the World Bank. We consider the data from Infrascope of The Economist Intelligence Unit, which contain benchmarking indicators that assess the capacity of countries in Latin America and the Caribbean to carry out sustainable Public-Private Partnerships (PPPs) in infrastructure. Moreover, we also allow for some Worldwide Governance Indicators which are a research dataset summarizing the views on the quality of governance provided by a large number of enterprise, citizen and expert survey respondents in industrial and developing countries. In addition, we use the World Bank database for some development indicators.

The projects data only includes concessions and Greenfield projects because other types of projects fall under different legislation and the relationship between the public and private sector is different from the concept of Public Private Partnership. Also, it comprises the water, telecommunication, transport and energy sectors. Water sector refers to drinking water and sanitation projects; transport sector denotes to seaports, airports, roads and highways and rail; and energy refers to energy generation, specifically electricity generation. Energy extraction is not covered. For the year selection, we use the year of investment instead of year of financial closure. Also, we consider all the levels of income (low income, low-middle income, and upper middle income).

Some scores have been normalized on the basis of:

$$x_n = \frac{x - \text{Min}(x)}{\text{Max}(x) - \text{Min}(x)}$$

Where  $\text{Min}(x)$  is the lowest value and  $\text{Max}(x)$  is the highest value for a given indicator. Then, the normalized value is transformed from a 0-1 value to a 0-100 score to make it directly comparable with other indicators.

The sample period is 2009, 2010, 2012 and 2014 (because of data availability from the Infrascope Index), considering 19 Latin American and Caribbean countries (Argentina, Brazil, Chile, Colombia, Costa Rica, Dominican Republic, Ecuador, El Salvador, Guatemala, Honduras, Jamaica, Mexico, Nicaragua, Panama, Paraguay, Peru, Trinidad y Tobago, Uruguay, and Venezuela). For PPP investment in millions of dollar, there are 75 observations for infrastructure investment projects in energy, transport and water sectors.

Regarding the independent variables, for legal framework and public sector efficiency we use the average of the indicators Regulatory Framework, Institutional Framework and

Operational Maturity. Data for Political Environment is measured with the average of the indicators Political Distortion and Political Will. Financial Obligation compliance is represented by the Government Payment Risk Index. Macroeconomic stability comes from the Inflation as the annual percentage change of GDP deflator. As proxies of market conditions we use real GDP per capita for purchasing power and total population for market size.

Detailed information on the hypothesis, the expected effect of the explanatory variables on the dependent variable, explanatory variables measurement as well as their sources is included in Table 2. Table 3 summarizes the definition of each variable and Table 4 gives the summary statistics of the variables (see the Appendix).

## 5 Empirical analysis and results

The results are obtained using Eviews software and they are presented in Table 5 in the appendix.

Moreover, since some variables may present collinearity making the regression not reliable, we estimate the Variance Inflation Factor (VIF) which measures the degree of collinearity between the independent variables in the regression model. The VIF tells how much the variance of a coefficient is inflated because of the dependence on other explanatory variables. It is calculated by running a regression for each independent variable on all the others predictors, then the resulted  $R^2$  from that regression is used in the following formula:

$$VIF = \frac{1}{1 - R^2}$$

As a rule thumb, we consider values of VIF greater than 10 as highly correlated. The variables present no collinearity problem, Table 6 of the appendix shows the outcomes of the test.

Regarding heteroscedasticity, the Breusch-Pagan-Godfrey test reflects that the regression has no correlation between the residuals. From the resulting regression, the goodness of fit based on the adjusted  $R^2$  has a value of 0,569119, which means that the regression model explains 56,91% of the variability of the observed data around the mean. In reference to the overall significance, according to the p-value of the F-statistic the regression model in overall is significant at 1% level of confidence.

For all the estimators the sign of the effect is according to what we expected (see Table 2). The results indicate that legal framework and public sector efficiency, and market size are the most important factors that determine the infrastructure investment at 1% level of significance. Interestingly, political environment, financial obligations compliance, macroeconomic stability, and purchasing power do not have a significant effect on the level of investment in PPP.

The efficiency is reflected in public entities with proper agents to monitor PPPs arrangements, with previous experience in PPP projects, with the ability to manage regulations and bidding process, and with the capability to allocate effectively the risk between the government and the private sector. Since PPPs are complex arrangements between two different parties, it is necessary for the public party to have the required qualities and capabilities to successfully develop this type of enterprise. Thus, public entity efficiency attracts private investors who care about their counterpart in PPP contracts. According to Vassallo Magro (2015) the main actor for the challenges that Latin America and the Caribbean face regarding PPP initiatives is the public entity, which should assess not only the additional value of PPPs but also the social viability. In addition, the author states that governments that encourage competitive participation, efficiency, proper communication and information transparency are able to avoid public opposition and potential corruption scandals.

Moreover, public entities are in charge of developing and monitor regulations that affect PPP projects. Countries with strong legal framework are able to raise more long-term money

from investors. Consistent regulations, fair bids and contract changes, and transparent mechanisms for resolving controversies foster investment because investors are interested in efficient law enforcement that protects their rights, and in contractual foundation that provide instruments to ensure public and private interests and prevent opportunistic behavior.

Countries with large markets attract more PPP investment because it represents the potential demand for the public service. Since PPP projects are financed by Project Finance, capital investors require security of payments and lenders set the coverage ratio based on the potential revenue stream. Moreover, one of the relevant risks in infrastructure projects is the demand risk because the capability of the project to upfront return on equity and debt service is strongly related to the potential demand to generate enough cash flow to cover these financial obligations. This result is according to Hammami *et. al* (2006) findings in a study of cross-country and cross-industry determinants of PPP arrangements. The author also states that PPPs tend to be more common in countries where market size is large. Therefore, market size is an important determinant of infrastructure investment.

Unexpectedly, stable inflation and purchasing power do not appear particularly relevant. Nevertheless, the study by Hammami *et al.* (2006) finds that purchasing power and overall price stability are crucial determinants of PPPs. The same study also suggests that good political environment by controlling corruption and enforcing the rule of law encourage infrastructure investment.

Following, we analyze the marginal effect of the significant coefficients by comparing the standard deviations of the variables. The standardized coefficients are calculated using the formula (see results in Table 7 of the Appendix):

$$\text{Standardized coefficient} = \frac{\text{Standard deviation (explanatory variable)} \times \beta_j}{\text{Standard deviation (dependent variable)}}$$

- An increase of legal framework and public sector efficiency by 1 standard deviation is associated with about half of standard deviation (0,52) in infrastructure investment, all else held constant. For this case, the effect is economically significant but not very large.
- *Ceteris paribus*, a raise of market size by 1 standard deviation, increases the infrastructure investment by 0,32 standard deviation, which is not too significant.

In summary, according to the results legal framework public entity efficiency and market size are the determinants of infrastructure investment with PPP initiatives. Strong legal system, reliable public sector management, and large potential demand are important to encourage PPP arrangement for infrastructure development in Latin America and the Caribbean.

## 6 Conclusions and further research

Infrastructure is a major factor for sustainable development, especially in Latin America and the Caribbean where infrastructure is deficient. Infrastructure provides quality life to the citizens by satisfying basic needs like water supply, road access, and electricity availability. Infrastructure requires a long-term and large amount of investment, and in many cases governments in developing countries do not have enough resources to allocate in this type of endeavor. Also, these projects imply a high level of risk which makes it impossible for the private sector to carry out all by them self. Therefore, a partnership between the public and private sector can help to promote the development of infrastructure.

This research studies the determinants of infrastructure investment with PPP in Latin America and the Caribbean. We consider the data from 19 countries from Latin America and the Caribbean, for the years 2009, 2010, 2012 and 2014. We use the OLS regression model to find the infrastructure investment determinants considering 6 main factors: the legal framework and the public sector efficiency, the political environment, the financial obligation compliance, the macroeconomic stability, and the market conditions. The empirical evidence shows that the most relevant factors are the legal framework, the public sector efficiency, and the market condition, specifically the market size. These results are consistent with the finding from Hammami *et al.* (2006) study about the determinants of PPPs in infrastructure for developing countries.

Significant legal framework and public sector efficiency suggest that consistent PPP regulations, well-defined decision-making process and effective and rigorous evaluation for project selection carry by the public sector is essential for encouraging infrastructure investment. In addition, countries with judiciaries that enforce government, operators and investors rights, help to ensure the fairness in the risk allocation between the parties according to their capabilities to manage them and mitigate expropriation risk. Also, the quality and the experience of public institutions in charge to plan and oversee PPPs play a key role in attracting PPP providers. These aspects are reflected in the main characteristics of success and failure from previous PPP practices in the region.

Capital investors and lenders care about demand risk since it is one of the critical features to make a project commercially viable. Moreover, market size represents the potential demand for PPP project, thus, it is an important factor for infrastructure initiatives.

We consider that our model represents the main features that affect PPP development in the last decade in Latin American and Caribbean countries. Nevertheless, the sample data is small so it tends to increase the variance of the estimators and also it is more sensitive to changes in the observation. Moreover, the sample period is not representative enough. Also, the predictors tend to present collinearity which may also inflate the variance of the estimators.

The given results suggest that in order to encourage PPP initiatives in America Latina and the Caribbean, governments should be more focused on developing strong institutions that help to manage and oversee PPP projects. Public sector institutional capacity can be improved by creating specialized PPP units with a strong mandate, expertise and technical support for public authorities in order to develop PPP procurements. PPP projects required a much wider range of

capabilities than those used in public sector projects, and it is a fact that public sector lacks supply of this type of capabilities. Hence, these PPP units need to have specialists from different areas and a mixture of experiences in both private and public sector.

Also, these institutions should be supported by regulations that protect parties' rights and facilitates effective conflict resolution mechanism. Likewise, public institutions in charge of legal enforcement should be unbiased from any political influence in order to ensure transparency and justice. Also, it is necessary a clear legal framework that provides clarity on procurements and explicit procedures for changes in project's specification in order to avoid too many renegotiations. In addition, legal arrangements should set the basis for political commitment through explicit legislation.

Based on the evidence provided by this research, for future studies it would be interesting to focus on the role of the public sector for developing PPP projects and which are the factors that have an influence on the performance of this actor in this field.

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## APPENDIX

Table 2. Determinants, Hypotheses, Expected effect, Explanatory Variables, and Data Sources

Determinants	Hypothesis	Expected effect	Explanatory variables	Source
<b>Legal framework and public sector efficiency</b>	H1: Countries with strong legal framework and reliable public entities are able to encourage more infrastructure investment	Positive	Average of: <ul style="list-style-type: none"> <li>Regulatory Framework Index.</li> <li>Institutional framework Index.</li> <li>Operational maturity Index.</li> </ul>	<ul style="list-style-type: none"> <li>The 2014 Infrascope Index from The Economist Intelligence Unit.</li> </ul>
<b>Political environment</b>	H2: PPP infrastructure projects are more prevalent in stable political context.	Positive	Average of: <ul style="list-style-type: none"> <li>Political distortion Index</li> <li>Political will Index.</li> </ul>	<ul style="list-style-type: none"> <li>The 2014 Infrascope Index from The Economist Intelligence Unit.</li> </ul>
<b>Financial obligations compliance</b>	H3: Countries with good track record of fulfilling financial obligations and providing guarantees to investors are more attractive for infrastructure investors	Positive	<ul style="list-style-type: none"> <li>Government payment risk Index.</li> </ul>	<ul style="list-style-type: none"> <li>The 2014 Infrascope Index from The Economist Intelligence Unit.</li> </ul>
<b>Macroeconomic stability</b>	H4: Macroeconomic stability based on low inflation foster infrastructure providers.	Negative	<ul style="list-style-type: none"> <li>Inflation (annual percentage change of GDP deflator)</li> </ul>	<ul style="list-style-type: none"> <li>World Development Indicators from the World Bank Database.</li> </ul>
<b>Market conditions</b>	H5: Markets with larger demand and purchasing power tend to be more common for PPP projects.	Positive	<ul style="list-style-type: none"> <li>GDP per capita (current USD).</li> <li>Total population (log).</li> </ul>	<ul style="list-style-type: none"> <li>World Development Indicators from the World Bank Database.</li> </ul>

Table 3. Definition of the explanatory variables

1. **Total investment in PPP project:** It is the sum of investment in physical assets and payments to the government recorded in millions of US dollars per year.
2. **Regulatory framework:** country's legal and regulatory framework for private participation in infrastructure. It is the weighted average of the indexes: Consistency and quality of PPP regulations (37.5%), Effective PPP selection and decision-making (25%), Fairness/openness of bids, contract changes (12.5%), and Dispute resolution mechanisms (25%)
  - **Consistency and quality of PPP regulation:** the score ranges from 0-4 and it assesses consistency of PPP laws and regulations for PPP projects; regulation's clear requirements and oversight mechanisms for project implementation; allocation of risk between parties according to ability to manage them; and clear system for compensating the private sector for acts of authority that change sector-specific economic conditions not foreseen during bidding.
  - **Effective PPP selection and decision-making:** the score ranges from 0-4 and it measures the regulations' efficient planning frameworks and proper accounting of contingent liabilities; regulators' appropriate project planning and cost-benefit analysis techniques to ensure that a PPP is the optimal project-financing and service-provision option; and Budget Office's measurement for contingent contractual liabilities and accountability for delayed investment payments in a way consistent with public investment accounting.
  - **Fairness/openness of bids and contract changes:** the score ranges from 0-4 and it assesses if regulations unfairly favor certain project bidders and operators over others; if regulations require and establish competitive bidding (that is, use of objective criteria during the selection process, requiring the publishing of necessary bidding documents, contracts, and changes in contracts); if regulations require bidding for any significant, additional work necessary; and if system includes independent oversight of renegotiation procedures and conditions.
  - **Dispute resolution mechanisms:** the score ranges from 0-4 and it evaluates the fairness and transparency of mechanisms for resolving controversies between the state and the operator; adequacy and efficiency of conciliation schemes provided by the law; and if arbitration rulings proceed according to law and to contracts, without lengthy appeals.
3. **Institutional framework Index:** the design and responsibilities of institutions that prepare, award and oversee projects. It is the weighted average of Quality of institutional design Index (66.67%) and PPP contract, hold-up and expropriation risk Index (33.33%).
  - **Quality of institutional design Index:** this indicator ranges from 0-4 and it evaluates the existence and role of various agencies necessary for

proper project oversight and planning at the federal level, such as a PPP board at ministerial level, a State Contracting Agency and a PPP Advisory Agency and a Regulatory Agency for the enforcement of project standards. It also considers the oversight role and involvement of government budget and planning offices.

- **PPP contract, hold-up and expropriation risk:** this indicator ranges from 0-4 and it evaluates property rights and arbitration rulings; if the judiciary uphold contracts related to cost recovery; if investors can appeal against rulings by regulators, expedite contract transfer for project exit and obtain fair compensation for early termination; and also considers whether the state has an expedited mechanism for replacing failed operators to protect creditors' rights.
4. **Operational maturity:** a government's ability to uphold laws and regulations for concessions, as well as the number of past projects and their success rate. It is the weighted average of the indexes: Public capacity to plan and oversee PPPs (25%), Methods and criteria for awarding projects (12.50%), Regulators' risk-allocation record (12.5%), Experience in PPP projects (concessions) (25%), and Quality of PPP projects (concessions) (25%).
- **Public capacity to plan and oversee PPPs indicator:** the score ranges from 0-4 and it assess the public capabilities for planning, design/engineering, environmental assessment, oversight of project service standards and conflict resolution; government officials expertise in project financing, risk evaluation and contract design; employment of proper accounting practices from financial authorities when considering fiscal and contingent liabilities; and public sector's reputation for designing contracts that reduce post-bid opportunism.
  - **Methods and criteria for awarding projects indicator:** this indicator ranges from 0-4 and it evaluates the track record of federal agencies for using competitive bidding and objective economic factors as the primary consideration in final project and contract awards; and the efficiency of schemes used for allocating projects (for example, in toll-road projects, using net present value of revenue with contract periods of variable length).
  - **Regulators' risk-allocation record indicator:** the score ranges from 0-4 and it assesses the allocation of risk between the state and the private sector for projects in recent years; and effectiveness of guarantees and performance bonds for project risk diversification.
  - **Experience with transport, water and electricity projects indicator:** this indicator varies from 0-4 and draws on information about the number of concession projects that reached financial closure in the past ten years and observations made by researchers in-country.

- **Quality of transport, water and electricity projects indicator:** this indicator draws on the distress and failure rates of transport, water and electricity concession projects over the past ten years from the World Bank's PPI database and observations made by researchers in-country. It ranges from 0-4.
5. **Political distortion indicator:** it evaluates the level of political distortion affecting the country's private sector. Each country's score is a weighted average of The Economist Intelligence Unit's political stability and government policy effectiveness risk scores and the Transparency International Corruption Perceptions Index. Scores range from 0 to 100, where 0=worst and 100=best.
  6. **Political will Index:** this indicator range from 0-3 and it evaluates the level of political consensus, or will, to engage private parties in concessions (PPPs) and to provide favorable implementation frameworks across the electricity industry and water/sanitation and transport sectors.
  7. **Government payment risk Index:** it varies from 0-4 and it evaluates if the government regularly fulfill obligations for PPP contracts or use liquidity-guarantee schemes to reduce non-payment risk, and it also considers The Economist Intelligence Unit's sovereign debt risk ratings.
  8. **Inflation (annual percentage change of GDP deflator):** Inflation, as measured by the annual growth rate of the GDP implicit deflator, shows the rate of price change in the economy as a whole. The GDP implicit deflator is the ratio of GDP in current local currency to GDP in constant local currency.
  9. **GDP per capita (current USD):** GDP per capita is gross domestic product divided by midyear population. GDP is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products.
  10. **Total population:** is based on the de facto definition of population, which counts all residents regardless of legal status or citizenship--except for refugees not permanently settled in the country of asylum, who are generally considered part of the population of their country of origin.

Table 4. Summary Statistics

	Mean	Median	Standard Deviation	Minimum	Maximum	Count
<b>Infrastructure investment</b>	1,527	1,679	1,572	0,000	4,627	76
<b>Legal framework and public sector efficiency</b>	35,864	30,200	21,412	0,000	79,700	76
<b>Political environment</b>	50,101	52,125	22,401	6,000	92,150	76
<b>Financial obligations compliance</b>	43,750	50,000	30,856	0,000	100,000	76
<b>Macroeconomic stability</b>	5,923	4,985	7,553	-27,633	45,943	75
<b>Purchasing power</b>	7779,837	6541,031	4575,149	1478,971	21323,755	75
<b>Market size</b>	7,093	7,001	0,559	6,121	8,314	76

Table 5. Determinants of infrastructure investment in Latina America and the Caribbean

Dependent variable: Total investment in PPP projects (log)	OLS
<b>Legal framework and public sector efficiency</b>	0,038*** (3,243)
<b>Political environment</b>	0,004 (0,370)
<b>Financial obligations compliance</b>	0,002 (0,210)
<b>Macroeconomic stability</b>	-0,000 (-0,020)
<b>Purchasing power</b>	3,60E-06 (0,108)
<b>Market size</b>	0,910*** (3,376)
Observations	75
R-squared	0,604055
Adjusted R-squared	0,569119
F-statistic	17,29018
Prob(F-statistic)	0,000000

Legend: Robust t statistics in parentheses

\* statistically significant at 10% level of confidence, \*\* at 5% level of confidence, and \*\*\* at 1% level.

*Table 6. Variance Inflation Factor results*

	$R_j^2$	VIF
<b>Legal framework and public sector efficiency</b>	0,76995	4,3
<b>Political environment</b>	0,79607	4,9
<b>Financial obligations compliance</b>	0,34435	1,5
<b>Macroeconomic stability</b>	0,73634	3,8
<b>Purchasing power</b>	0,37865	1,6
<b>Market size</b>	0,46079	1,9

*Table 7. Standardized coefficients*

	Legal framework and public sector efficiency	Market size
Coefficient	0,038	0,910
SD explanatory variable	21,412	0,559
SD dependent variable	1,572	1,572
<b>Standardized coefficient</b>	<b>0,522715</b>	<b>0,323672</b>