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SGH Warsaw School of Economics

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What Drives Private Participation in Infrastructure in Developing Countries?

Marian Moszoro, Gonzalo Araya,
Fernanda Ruiz-Nuñez, and Jordan Schwartz*

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* Moszoro: University of California, Berkeley and Kozminski University, Poland, mmoszoro@berkeley.edu; Araya: Ministry of Transport and Telecommunications of Chile, gonzaloarayaa@gmail.com; Ruiz-Nuñez: PPPs Group at the World Bank, fruinunez@worldbank.org; Schwartz: PPPs Group at the World Bank, jschwartz3@worldbank.org. This paper summarizes the main findings of Moszoro *et al.* (2014). We are particularly indebted to Daniel Benítez, Julie de Brux, Luis Guasch, Dejan Makovšek, Stéphane Saussier, and participants at the International Transport Forum organized by the OECD, World Bank, and George Mason University for valuable comments. The findings, interpretations, and conclusions expressed herein do not necessarily reflect the views of the Board of the Executive Directors of the World Bank or the governments they represent.

1. Introduction

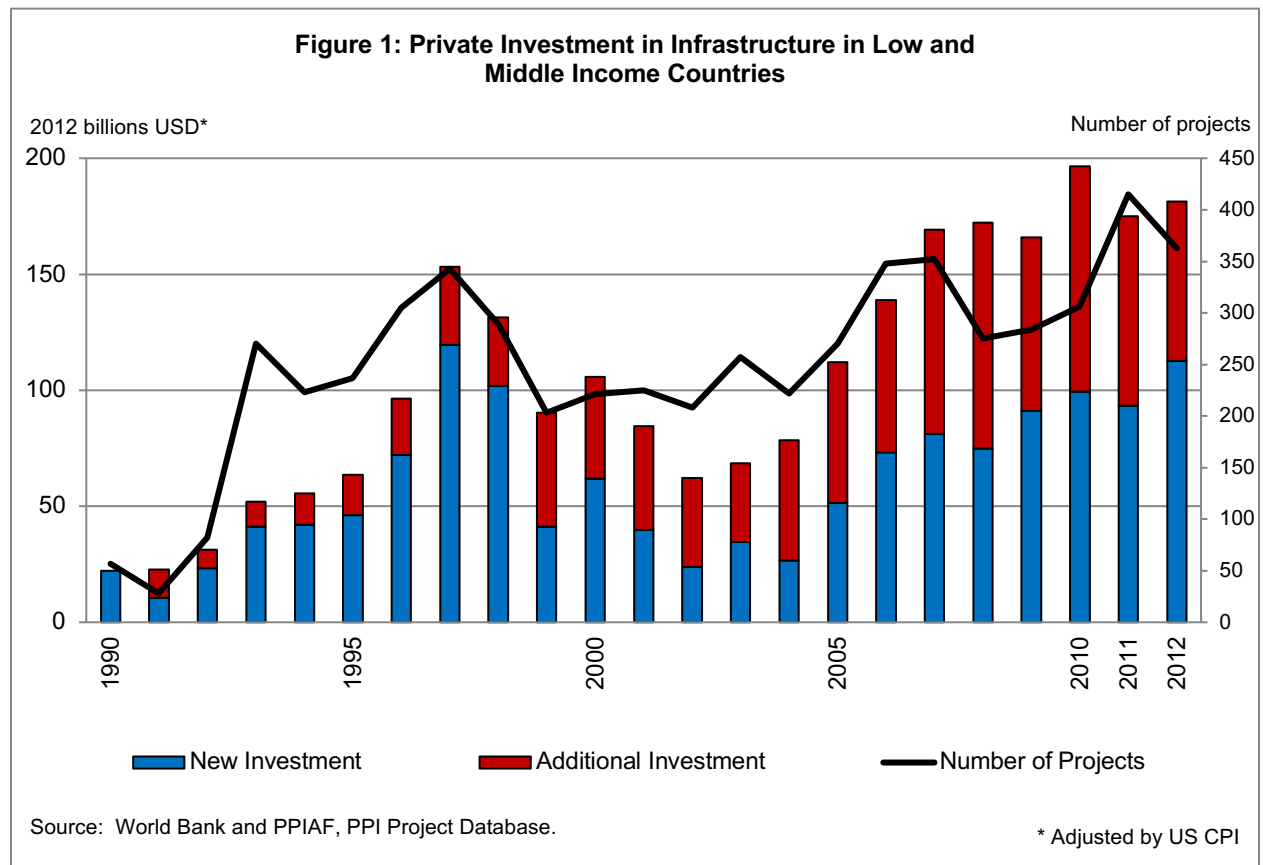
Since the mid-1980s, the notion of private participation in infrastructure (PPI) has attracted considerable discourse in Western countries, but the discussions have tended to be polarized, and both advocates and opponents of private sector involvement in the provision of public services have voiced their opinions (Ghere 2001; Grimshaw, Vincent, and Willmott 2001). Despite the controversies over PPI, the United Nations and the European Commission have promoted and fostered it as an instrument for development, especially in countries whose public budgets cannot support substantial expenditures (see, for example, Chang, Memon, and Imura 2003).

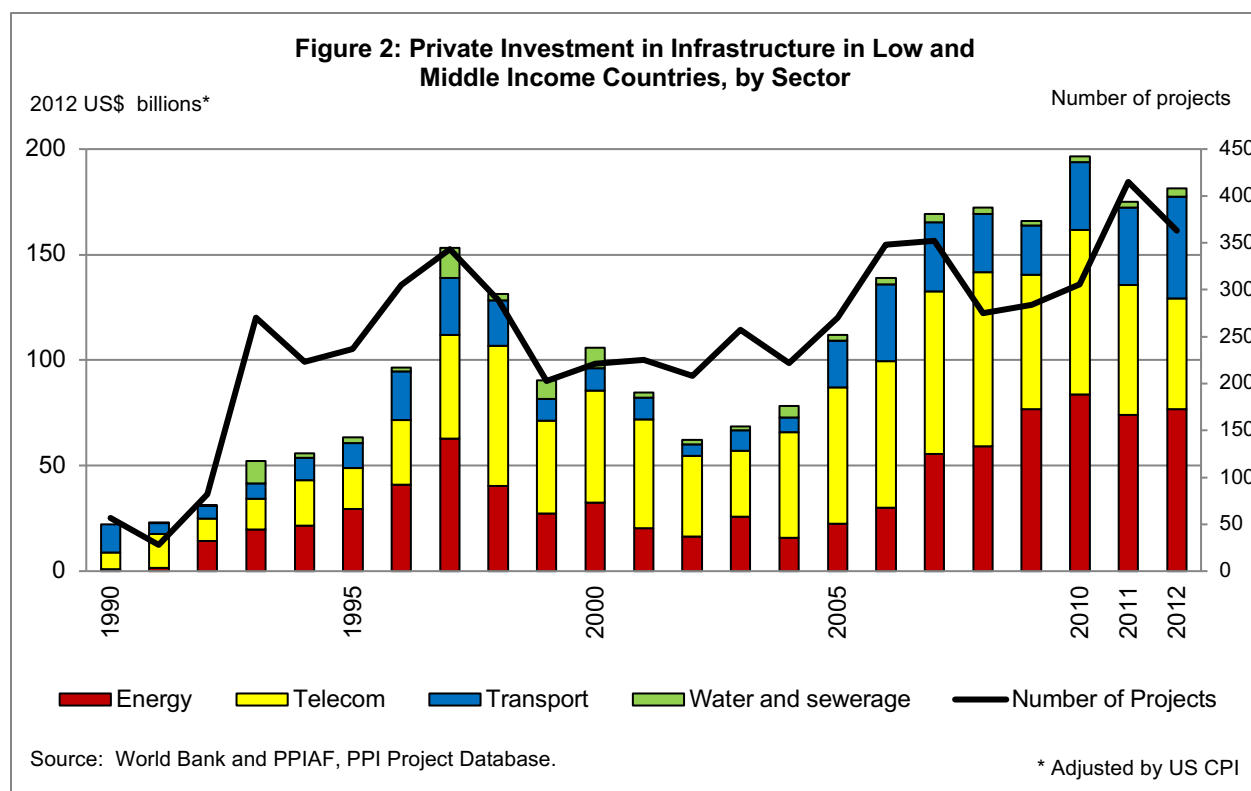
The links between infrastructure and development include the impact of infrastructure on poverty alleviation, equity, growth, and specific development outcomes such as job creation, market access, health, and education (Straub 2008; Calderón and Servén 2004, 2008, 2010). These relationships are complex and dynamic; even with respect to growth and job creation, infrastructure's effects are felt through multiple channels.ⁱ

On the one hand, the demand for infrastructure is rising with the accelerating pace of globalization and urbanization. Every month in the developing world, more than five million people migrate to urban areas. This trend is compounded by the growing need for climate-resilient investments to combat the challenges of climate change (Fay and Toman 2010; Bhattacharya and Romani 2013). On the other hand, however, as a result of the fiscal constraints caused by the onset of the global financial crisis, government budgets—traditionally the major source of financing for infrastructure—cannot alone be expected to finance the infrastructure needs in emerging markets and developing economies

(EMDEs). Yet the volume of private participation in financing infrastructure projects in EMDEs remains modest with respect to OECD countries.

While private sector financial commitments to infrastructure projects have risen to about US\$181 billion per year in EMDEs, this is less than 20 percent of the overall current infrastructure investment in these economies. There has been an important increase in private participation in infrastructure financing (PPI) over the last two decades.ⁱⁱ Annual commitmentsⁱⁱⁱ to PPI projects have increased from USD22 billion in 1990 to USD181 billion in 2012 (see Figure 1). Most of this growth since 2000 has been mainly in the energy and transport sectors (see Figure 2) decreasing the importance of telecoms.





There are a number of current and emerging challenges that are expected to undermine the attractiveness of long-term private investments such as furthering infrastructure. The weakness in and deleveraging of commercial banks and the regulatory constraints such as Basel III is likely to persist into the medium term, which implies a growing mismatch between the time horizon of available capital and that of productive long-term investment projects (World Bank 2013).

Even under more normal credit conditions, the costs and risks faced by private investors in infrastructure are high, particularly in EMDEs, where economic and financial conditions tend to be weaker and less stable. Another critical and overarching precondition to attract private investors is an enabling institutional framework, including peace and stability, the rule of law, good governance with accountability and transparency, the absence of corruption, clear property rights, and enforceable contracts.

From a public policy perspective, given the positive economic, social, and environmental externalities that quality infrastructure can provide, efforts to lower the overall riskiness of infrastructure investments and enhance the availability of efficient risk-sharing instruments can have important implications in efficiency and distribution. At the same time, there is a need to ensure that efforts to encourage private sector participation in infrastructure offer optimal benefits but do not impose an inappropriate burden on the public sector.

Against this background, this paper reviews the empirical literature on the determinants of private participation in infrastructure investments and presents a more detailed discussion of the political, institutional and governance determinants based on Moszoro *et al.* (2014). It also identifies areas in which additional efforts are required if the private sector were to play a larger role in financing infrastructure development in EMDEs.

2. Literature on the Determinants of PPI

There is considerable economic and financial literature attempting to explain the determinants of investment and the relationship between investment and risk. Most of the theoretical literature points to access to capital, investment efficiency, the social (as opposed to the financial) discount rate, operational efficiency, bundling of investment and operations, risk allocation, and contract flexibility as the main economic drivers of private investment in infrastructure

The empirical literature is focused on foreign direct investment rather than infrastructure investments, and most of the works utilize cross-country specifications. For

example, Chakrabarti (2001) concludes that market size is a robust determinant of FDI, and Nunnenkamp (2002) identifies exchange rate, openness, growth rate, and trade balance as determinants of overall investment levels.

The literature on infrastructure investments and risk is thinner. Araya *et al.* (2013) analyses the relationship between private participation in infrastructure and country risk. They show that a difference of one standard deviation in a country's sovereign risk score is associated with a 27 percent increase in the probability of having private participation in infrastructure commitment and a 41 percent higher level of investment in dollar terms with the energy sector (among infrastructure sectors) and concessions (among contractual types). They also show that conflict-affected countries typically require six to seven years to attract significant levels or forms of private investments in infrastructure from the day that the conflict is officially resolved. Private investments in sectors in which assets are more difficult to secure—such as water, power distribution, or roads—are slower to appear or simply never materialize.

Hammami *et al.* (2006) use the World Bank PPI Database to analyze the determinants of PPI and conclude that lower levels of corruption and more effective rule of law are associated with more Public-Private Partnership projects. This study focuses on capturing the effect on the number of projects committed rather than investment levels *per se*. It breaks down the number of projects by sector, but not the levels, leaving room for further study, especially if we consider that bigger projects (committing more resources) may be more sensitive to the risk of the country.

The empirical evidence on determinants of PPI uses a cross-country panel regression approach, looking at whether indicators of macroeconomic stability, measures

of institutional and regulatory quality, and a variety of other controls impact the total amount of PPI received by a country. For example, there are papers that concentrate in specific regions such as Pragal (2003) and Kirpatrick *et al.* (2006). These papers look at the importance of the regulatory framework as a determinant of PPI respectively for Latin America and the Caribbean (LAC) and the broader set of developing countries. Pragal (2003) finds that the most significant determinant of PPI is the passage of legislation liberalizing the investment regime, while Kirpatrick *et al.* (2006) find that institutional framework and regulation matter most. A study by Tewodaj (2013) analyse the determinants of private participation in infrastructure comparing Sub-Saharan Africa (SSA) with low and middle income countries (LMICs). The study finds that PPI investments in LMICs seem to be, in principle, determined by the expected factors (i.e., larger, open, more developed democracies with lower tax burden and more stable macroeconomic environment receive more PPI), PPI into SSA countries is—from a social planner’s perspective—sub-optimally allocated.

There are sector studies such as Jensen *et al.* (2005) that looks at the water and sanitation sector and Gasmi *et al.* (2010) that look at the power sector. Jensen *et al.* (2005) analyses the institutional determinants of private sector participation in the water and sanitation sector in 60 developing countries. The regression results provide support for the hypotheses that PPI is greater in larger markets where the ability to pay is higher and where governments are fiscally constrained. The protection of property rights and the quality of the bureaucracy emerge as the most important institutions that encourage PPI. Gasmi *et al.* (2010) assess the extent the level of development of financial sector is a determinant of private investment in the power sector in 37 developing countries. The

results suggest that investors tend to take countries' governance quality into account in their decisions to invest. The empirical results highlight that the development of the financial sector also plays a significant role in private investors' decisions to enter infrastructure sectors.

There are a few paper in the literature that cover the basic infrastructure sectors (energy, water, transport and telecoms) in the developing world. In particular, when it comes to larger PPI investments the findings suggest that corrupt countries with inefficient governments seem to be associated with more PPI in infrastructure. Banerjee *et al.* (2006) using a sample of 40 developing countries over the period 1990-2000, look at the question of whether institutions matter for PPI. While their results indicate that property rights and bureaucratic quality play a significant role in promoting PPI, they find that countries with higher levels of corruption are associated with more PPI. Basilio (2011) using a sample of 72 developing countries shows that the market size and purchasing power are critical determinants of infrastructure flows. The institutional quality matters mostly for the decision to invest in emerging countries, but it is less important with regard to the intensity of the investment than financial and economic conditions.

Using those previous studies as a starting point, Moszoro *et al.* (2014) contribute to the literature by (i) disentangling the relevant institutional, political, and governance determinants of country risk at a granular level through providing a theoretical framework to derive the testable hypotheses; (ii) using an new empirical approach that to account for the fact that data is on discrete observations of commitments; (iii) using a novel dataset on quality of governance and on number of PPI disputes^{iv} that allow to add

new variables that were not previously considered due to data limitations; and (iv) extending previous analyses with a cross-country panel of 130 developing countries for 1984-2012 period for transport, energy, telecoms and water sector.^v

3. Results from Moszoro et al. (2014)

Using panel data assembled from the World Bank’s Private Participation in Infrastructure dataset, Quality of Government dataset, UNCTAD Database of Treaty-based Investor-State Dispute Settlement Cases, and country-level economic variables from the World Development Indicators Database, Moszoro *et al.* (2014) analyzes the institutional, political, and governance variables determinants of PPI for 130 developing countries for the period 1984-2012.

The paper explores the intensity of the different determinants given that a country has received private investments in infrastructure. It runs an OLS regression with country-fixed effect and year dummies to capture for changes over time that are common across countries (e.g., the financial crisis). The model is specified in logarithms and uses a moving average of 15 years for water projects, 10 years for energy (plants and transmission) projects, 8 years for transport projects, and 5 years for telecom projects—roughly 1/3 of the depreciation time estimated by the World Bank, i.e., arguably an approximation of refurbishing time—to account for the fact that data is on discrete observations of commitments.

$$\begin{aligned}
 \log PPI_{it} = & \alpha_i + \beta_1 \log GDP_{it-1} + \beta_2 \log POP_{it} + \beta_3 \log GROWTH_{it-1} \\
 & + \beta_4 \log INFLATION_{it-1} + \beta_5 \log OPENNESS_{it-1} \\
 & + \beta_6 \log DEBT_{it-1} + \beta_7 \log ACCESSTOFINANCE_{it-1} \\
 & + \sum \beta_j \log X_{itj} + \varepsilon_{it}
 \end{aligned}
 \tag{1}$$

Equation (1) shows that, where $\log PPI_{it}$ equals logarithms of the levels of the moving average of private investment in infrastructure for country i at the period t . Most econometric specifications dealing with GDP and Investments suffer from endogeneity. The paper address this problem by assuming that the investments are being affected by events of the previous year. GDP_{it-1} is the Gross Domestic Product purchasing power parity in current US millions dollars for the country i in the year $t-1$. $GROWTH_{it-1}$ is the GDP's growth and both are expected to have a positive impact on investment levels. POP_{it} captures the size of the population and $INFLATION_{it-1}$ captures the monetary instability for the country i in the year $t-1$ and is expected to have a negative impact. $OPENNESS_{it-1}$ is a proxy of the openness of the country calculated as the sum of exports and imports over the GDP; $ACCESSTOFINANCE_{it-1}$ captures the access to commercial bank credit for the country i in the year $t-1$ and is expected to have a positive impact; and X_{itj} are the political and institutional variables including for country i at time t : (a) freedom from corruption; (b) government effectiveness; (c) rule of law; (d) quality of regulations; and (e) number of court disputes.

The regression results are presented in Tables 3–7. All specifications control for the main characteristics of the economies as commonly used in the previous literature:

- Size of the market: GDP and population. PPI tends to be more common in larger markets where demand is larger.
- Inflation: PPI is more prevalent in countries with more stable macroeconomic conditions. Higher inflation is less attractive for investors as it imposes inflation risk premium.

- Openness (proxied by trade): more open countries are more likely to attract big foreign investors.
- Debt: countries with higher levels of debt are more likely to require the private sector to invest in infrastructure. However, they could be perceived as a higher risk of default by the private sector. As a debt measure, the paper uses the total debt service divided by the gross national income.
- Access to finance, i.e., access to commercial bank credit.

Table 3 presents the results using country-fixed effect and year dummies. In these specifications, the overall R-squared is around 50 percent, a high value for a panel data model.^{vi}

The coefficients associated with large markets, stable inflation, access to finance, freedom from corruption, rule of law, quality of regulations, and number of disputes, are statistically significant indicating that they are relevant channels for the determination of investments in PPI.

Interestingly, the political regimens such as parliamentary democracy, mixed (semi-presidential) democracy, presidential democracy, civilian dictatorship, military dictatorship, and royal dictatorship do not affect significantly the level of PPI infrastructure investment.

Countries with large markets and high demand for infrastructure (larger population and higher lagged GDP) tend to have more PPI.

Governments with less inflation have a more stable environment fostering private sector investments in infrastructure PPI.

The higher a country score on freedom from corruption, the higher the average level of investments with private participation in infrastructure. Decreasing corruption by 10 points can increase PPI by 6.7 percent. That is, if a country like Serbia can lower its corruption level by 10 points as measured by the Transparency International's Corruption Perceptions Index (CPI) reaching for example the level of South Africa (which has similar GDP per capita), the private sector will invest seven percent more.^{vii}

The higher a country score on rule of law, the higher the average level of investments with private participation in infrastructure. Improving rule of law by one standard deviation (i.e., by 0.1) can increase PPI by 4.3 percent. That is, if we consider two countries like Buthan and Jordan which have similar GDP per capita,^{viii} Buthan can gain four percent increase in infrastructure investments in PPI if the country achieves the quality of the environment of property rights and enforceability of contracts that Jordan has today as measured by the World Bank worldwide governance indicators project.

Breach of contract and regulatory issues remain the most important political risk concerns for investors into developing economies, according to the annual MIGA-EIU Political Risk Survey. Forty-five percent of investors in developing countries named breach of contract and 58 percent named adverse regulatory changes as the most important political risks they will face in the next three years. Forty percent of the survey respondents mentioned that they experienced financial losses through adverse regulatory changes and 34 percent through breach of contract over the past three years. Therefore, it is not surprising to observe that both quality of regulations and number of previous disputes are statistically significant.

The model also shows that an improvement of one standard deviation (0.1) in quality of regulation produces an average increase of 3.2 percent in the level of infrastructure investment in PPI. For example, Mexico can gain three percent increase in infrastructure investments in PPI if the country achieves the quality of regulations of a country such as Turkey (with similar level of GDP^{ix}) as measured by the World Bank worldwide governance indicators project.

On disputes, the estimation indicates that the higher the number of disputes, the lower the level of investments. Having one more project going to court decreases investments by four percent.^x We presumed that the number of disputes could have a non-linear effect on private investments (e.g., no disputes could also reflect an anticipation of risk and therefore lack of private investments); however adding disputes squared was found to be statistically not significant. Unfortunately the variable on time to solve a dispute was incomplete for half of the sample, impeding expanding the analysis in that area.

The paper also analyzes difference across sectors, i.e. whether the impacts vary among the energy, transport, telecom, and water sectors (see Table 4). Freedom from corruption is statistically significant for all sectors except for transport. While corruption generally reduces the prospects for investment in all sectors, the lack of sensitivity of the transport sector could be explained by the fact that corruption matters primarily regarding investors' decision to *enter* the transport market, not the subsequent level of investment, which may indicate that the investors are protected against such risks once they do invest.

Rule of law is statistically significant for overall PPI, but it is not significant at the sector level. The coefficients are of almost the same magnitude but not significant due to smaller sample size when we run regressions at the sector level.

Quality of regulation is statistically significant for all sectors except water. Regulatory quality includes measures of the incidence of price controls and perceptions of the burdens imposed by excessive regulation. Improving the quality of regulations in a country can attract more private investors to infrastructure PPI, but since water is a socially sensitive sector and very likely to be politically influenced, investors may prefer price controls and strong regulation, as they limit *ex ante* the risk of domestic politics around water.^{xi}

The coefficient on disputes is statistically significant for all sectors except for energy. PPI investments in telecoms and water are particularly sensitive to the accumulated number of disputes in that particular sector. Having one more dispute can decrease PPI investments in those sector by approximately 12 percent.

The paper also finds that variables of institutional and political regimens such as parliamentary democracy, mixed (semi-presidential) democracy, presidential democracy, civilian dictatorship, military dictatorship, and royal dictatorship are not statistically significant. Results did not change by quartile of experience, GDP, and GDP per capita. According to field experts, it is not the quantity, but *quality* of experience (i.e., successful projects) what matters, for which unfortunately data is not available.

4. Conclusions

Fostering private sector investment in infrastructure depends on investors facing an appropriate investment climate. Currently private sector investment is a small portion of the total infrastructure investment (less than 20 percent). The costs and risks faced by investors are high, particularly in emerging market and developing economies (EMDEs) where the economic, institutional, and financial conditions are weaker and less predictable. One of the main concerns of private sector investors considering investment in infrastructure in EMDEs is the quality of the underlying investment climate.

A supportive enabling environment reduces the costs and risks of investing in infrastructure. Investment climate is affected by many factors, including political instability, regime uncertainty, rule of law and property rights, government regulations, government transparency, and accountability. The existence of a stable and predictable environment in which both domestic and foreign investors can operate is vital for providing confidence to investors.

This paper reviews the empirical literature of the determinants of PPI and describes the empirical evidence of the relationship between institutional, political, and governance variables and the level of PPI investments in infrastructure in developing countries. The existing empirical literature supports the arguments that the enabling environment for PPPs is very important to increase the level of PPI investments in infrastructure.

The latest paper by Moszoro *et al.* (2014) covers all the main infrastructure sectors and 130 developing countries. It shows that the intensity of PPI investment in infrastructure is highly sensitive to the quality of government variables such as freedom

from corruption, rule of law, quality of regulations, and the number of disputes in the sector. These results hold when data is disaggregated at the sectoral level. However, transport investments are not found to be sensitive to improvements in “freedom from corruption,” water investments to improvements in quality of regulations, and energy investments to the number of accumulated disputes in the sector. More work needs to be done to understand these discrepancies. Importantly, the evidence does not show any significant difference in the results across experience and economic level quartiles.

These findings support the argument that a sound investment climate is a critical factor affecting the supply of private infrastructure investment financing. The challenges from upstream “enabling” institutions, policies, and regulations and sector economics down to pipeline development need to be addressed simultaneously. Tackling such a complex and interconnected agenda requires building the institutional capacity and the quality of regulations and governance, as well as, adopting of a holistic approach to infrastructure development.

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Annex I

Definition of Variables

Quality of Government is the mean value of the International Country Risk Guide (ICRG) variables “Corruption,” “Law and Order,” and “Bureaucracy Quality,” scaled 0-1. Higher values indicate higher quality of government.

Freedom from Corruption relies on Transparency International’s Corruption Perceptions Index (CPI), which measures the level of corruption in 152 countries to determine the freedom from corruption scores of countries that are also listed in the *Index of Economic Freedom*. The CPI is based on a 10-point scale, in which a score of 10 indicates very little corruption, and a score of 0 indicates a very corrupt government. In scoring freedom from corruption, the authors convert each of these raw CPI data to a 0-100 scale by multiplying the CPI scores by 10.

Government Effectiveness combines into a single grouping responses on the quality of public service provision, the quality of the bureaucracy, the competence of civil servants, the independence of the civil service from political pressures, and the credibility of the government’s commitment to policies. The main focus of this index is on the “inputs” required for the government to be able to produce and implement good policies and deliver public goods.

Rule of Law includes several indicators which measure the extent to which agents have confidence in and abide by the rules of society. These include perceptions of the incidence of crime, the effectiveness and predictability of the judiciary, and the enforceability of contracts. Together, these indicators measure the success of a society in developing an environment in which fair and predictable rules form the basis for economic and social interactions and the extent to which property rights are protected. This indicator is part of the World Bank worldwide governance indicators project.

Regulatory Quality includes measures of the incidence of market-unfriendly policies such as price controls or inadequate bank supervision as well as perceptions of the burdens imposed by excessive regulation in areas such as foreign trade and business development. This indicator is part of the World Bank worldwide governance indicators project.

Regimen Institutions: The classification contains the following regimes: parliamentary democracy, mixed (semi-presidential) democracy, presidential democracy, civilian dictatorship, military dictatorship, and royal dictatorship. This classification is elaborated by Cheibub, Gandhi, and Vreeland (2010).

Annex II

Table 1: Summary Statistics.

Variable	Obs	Mean	Std. Dev.	Min	Max
ln GDP_1	7,388	22.76985	2.411881	15.99307	30.33849
ln Inflation_1	6,588	1.95406	1.402989	-13.4379	10.19474
ln Trade_1	6,938	4.141784	0.638758	-1.17505	6.13225
Debt_1	4,242	4.927175	6.766934	0	208.0971
Growth_1	7,140	2.05112	6.012271	-50.2904	92.58597
ln Population	8,178	15.33762	2.106291	8.982059	21.01901
Access to finance	2,291	7.47474	17.92406	0	150
Free of corruption	2,987	40.07265	23.22481	0	100
Government effectiveness	2,437	-0.05928	0.997779	-2.45416	2.407654
Rule of law	2,492	-0.06741	0.993558	-2.67015	2.001923
Regulatory quality	2,438	-0.06711	0.991987	-2.67544	2.247345
Gini coefficient	2,710	41.53993	9.80825	20.96	74.33
Disputes	4,780	0.687657	3.303972	0	65

Table 2: Correlation of Independent Variables.

	ln GDP_1	ln Inflation_1	ln Trade_1	Debt_1	Growth_1	ln Population	Access to finance	Free of corruption	Government effectiveness	Rule of law	Regulation quality	Gini coefficient	Disputes
ln GDP_1	1.00												
ln Inflation_1	0.02	1.00											
ln Trade_1	-0.30	0.02	1.00										
Debt_1	0.01	0.05	0.19	1.00									
Growth_1	0.06	-0.02	0.17	-0.02	1.00								
ln Population	0.80	0.07	-0.48	-0.06	0.03	1.00							
Access to finance	0.28	-0.04	0.06	0.21	-0.06	0.10	1.00						
Free of corruption	0.23	-0.12	0.12	0.13	-0.06	-0.09	0.18	1.00					
Government effectiveness	0.42	-0.14	0.06	0.08	0.02	0.10	0.26	0.72	1.00				
Rule of law	0.22	-0.14	0.11	0.07	0.01	-0.04	0.20	0.72	0.85	1.00			
Regulatory quality	0.31	-0.21	0.06	0.08	-0.01	-0.01	0.28	0.66	0.81	0.74	1.00		
Gini coefficient	0.04	-0.10	-0.09	0.01	-0.20	-0.12	-0.02	0.25	0.22	0.11	0.25	1.00	
Disputes	0.43	0.02	-0.21	0.05	0.05	0.32	0.09	0.06	0.20	0.06	0.09	0.11	1.00

Main Results

Table 3: Determinants of Private Participation in Infrastructure. Dependent Variable: Log of Total Private Investments in Infrastructure. Specification with Country Fixed Effects and Year Dummies.

VARIABLES	(1) ln_PPI	(2) ln_PPI	(3) ln_PPI	(4) ln_PPI	(5) ln_PPI	(6) ln_PPI
ln GDP_1	0.699*** (0.145)	0.605*** (0.152)	0.694*** (0.144)	0.104 (0.180)	0.103 (0.208)	0.579*** (0.150)
ln Inflation_1	-0.0561* (0.0305)	-0.0242 (0.0309)	-0.0504* (0.0302)	-0.0643* (0.0331)	-0.0732** (0.0368)	-0.0173 (0.0305)
ln Trade_1	0.0736 (0.183)	-0.147 (0.186)	0.141 (0.182)	-0.115 (0.209)	-0.150 (0.230)	-0.0775 (0.184)
Debt_1	-0.00509 (0.00553)	-0.000334 (0.00561)	-0.00444 (0.00548)	-6.26e-05 (0.00608)	-0.00268 (0.00619)	-2.83e-05 (0.00554)
Growth_1	-0.0161** (0.00643)	-0.00844 (0.00669)	-0.0130** (0.00641)	0.00111 (0.00745)	-0.00243 (0.00840)	-0.00409 (0.00668)
ln Population	2.304*** (0.610)	1.434** (0.639)	2.062*** (0.607)	0.716 (0.692)	0.116 (0.792)	1.189* (0.633)
Freedom from corruption	0.00718* (0.00406)	0.0166*** (0.00420)	0.00669* (0.00402)	0.0110** (0.00459)	0.0161*** (0.00497)	0.0155*** (0.00416)
Government effectiveness	0.0587 (0.178)	-0.107 (0.180)	0.120 (0.177)	-0.109 (0.201)	0.0178 (0.215)	-0.0461 (0.179)
Rule of law	0.404** (0.180)	0.279 (0.179)	0.431** (0.178)	0.463** (0.201)	0.436** (0.219)	0.325* (0.177)
Quality of regulation	0.431*** (0.152)	0.638*** (0.150)	0.317** (0.153)	0.660*** (0.173)	0.598*** (0.185)	0.515*** (0.150)
Access to finance	0.00455** (0.00196)	0.00539*** (0.00195)	0.00355* (0.00195)	0.00205 (0.00220)	0.00251 (0.00244)	0.00405** (0.00195)
Gini coefficient		0.00318 (0.00967)			0.00757 (0.0116)	-0.000675 (0.00959)
Disputes (moving sum)			-0.0385*** (0.00908)	-0.0378*** (0.0104)	-0.0350*** (0.0105)	-0.0380*** (0.00844)
Dispute time				0.0335 (0.0223)	0.0237 (0.0227)	
Constant	-50.19*** (10.74)	-33.81*** (11.57)	-46.44*** (10.67)	-10.15 (12.26)	-0.475 (14.47)	-29.32** (11.46)
Observations	1,041	867	1,041	771	651	867
R-squared	0.487	0.547	0.497	0.528	0.540	0.559
Number of countries	111	98	111	108	95	98

Table 4: Determinants of Private Participation in Infrastructure by Sector. Dependent Variable: Log of Total Private Investments in Infrastructure by Sector. Specification with Country Fixed Effects and Year Dummies.

VARIABLES	(7) ln PPI energy	(8) ln PPI energy	(9) ln PPI energy	(10) ln PPI energy	(11) ln PPI transport	(12) ln PPI transport	(13) ln PPI transport	(14) ln PPI transport
ln GDP_1	0.510** (0.213)	0.415* (0.229)	0.506** (0.213)	0.406* (0.229)	0.518** (0.257)	0.399 (0.258)	0.567** (0.256)	0.455* (0.258)
ln Inflation_1	-0.0349 (0.0453)	0.00567 (0.0478)	-0.0347 (0.0453)	0.00601 (0.0478)	-0.0840* (0.0499)	-0.0377 (0.0499)	-0.0754 (0.0497)	-0.0299 (0.0497)
ln Trade_1	-0.0952 (0.268)	-0.286 (0.285)	-0.0910 (0.268)	-0.281 (0.285)	1.337*** (0.296)	1.323*** (0.300)	1.374*** (0.295)	1.367*** (0.299)
Debt_1	0.00177 (0.00685)	0.00279 (0.00749)	0.00181 (0.00686)	0.00282 (0.00749)	0.00420 (0.0115)	0.0213 (0.0146)	0.00510 (0.0115)	0.0217 (0.0145)
Growth_1	-0.0162* (0.00955)	-0.00894 (0.0100)	-0.0158 (0.00963)	-0.00822 (0.0101)	-0.0586*** (0.0113)	-0.0431*** (0.0116)	-0.0540*** (0.0114)	-0.0389*** (0.0116)
ln Population	-2.214** (0.988)	-3.010*** (1.070)	-2.237** (0.992)	-3.052*** (1.073)	0.152 (1.229)	-0.818 (1.217)	0.152 (1.221)	-0.785 (1.211)
Freedom from corruption	0.0121** (0.00567)	0.00811 (0.00605)	0.0120** (0.00569)	0.00782 (0.00608)	0.00217 (0.00777)	0.00617 (0.00801)	0.00259 (0.00772)	0.00688 (0.00797)
Government effectiveness	-0.218 (0.243)	-0.297 (0.260)	-0.217 (0.243)	-0.298 (0.260)	-0.500* (0.291)	-0.771*** (0.294)	-0.484* (0.290)	-0.753** (0.293)
Rule of law	-0.115 (0.252)	0.160 (0.268)	-0.112 (0.253)	0.172 (0.269)	0.359 (0.297)	0.176 (0.302)	0.501* (0.301)	0.326 (0.307)
Quality of regulation	0.466** (0.214)	0.460** (0.224)	0.455** (0.218)	0.438* (0.228)	1.081*** (0.236)	1.500*** (0.238)	0.995*** (0.237)	1.415*** (0.239)
Access to finance	0.00553** (0.00243)	0.00435* (0.00250)	0.00549** (0.00243)	0.00426* (0.00250)	0.0108*** (0.00264)	0.00972*** (0.00257)	0.00984*** (0.00265)	0.00886*** (0.00259)
Gini coefficient		0.0369** (0.0144)		0.0361** (0.0145)		0.0215 (0.0150)		0.0166 (0.0150)
Number of disputes energy sector			-0.00626 (0.0208)	-0.0119 (0.0210)				
Number of disputes transport sector							-0.0676** (0.0262)	-0.0589** (0.0250)
Constant	27.64 (17.71)	42.96** (19.74)	28.09 (17.79)	43.92** (19.82)	-17.41 (22.43)	0.429 (22.64)	-18.76 (22.31)	-1.420 (22.53)
Observations	754	660	754	660	577	512	577	512
R-squared	0.249	0.280	0.249	0.281	0.275	0.327	0.285	0.335
Number of countries	87	75	87	75	76	67	76	67

Table 4 (continued): Determinants of Private Participation in Infrastructure by Sector. Dependent Variable: Log of Total Private Investments in Infrastructure by Sector. Specification with Country Fixed Effects and Year Dummies.

VARIABLES	(15) ln PPI telecom	(16) ln PPI telecom	(17) ln PPI telecom	(18) ln PPI telecom	(19) ln PPI water	(20) ln PPI water	(21) ln PPI water	(22) ln PPI water
ln GDP_1	0.579*** (0.152)	0.528*** (0.173)	0.590*** (0.151)	0.529*** (0.172)	0.671*** (0.250)	0.657** (0.263)	0.731*** (0.247)	0.701*** (0.259)
ln Inflation_1	-0.0323 (0.0316)	-0.0283 (0.0349)	-0.0305 (0.0315)	-0.0249 (0.0349)	-0.00966 (0.0510)	0.00134 (0.0528)	0.00749 (0.0506)	0.0153 (0.0522)
ln Trade_1	0.161 (0.193)	-0.0617 (0.216)	0.163 (0.192)	-0.0560 (0.215)	1.441*** (0.324)	1.134*** (0.337)	1.627*** (0.324)	1.328*** (0.339)
Debt_1	0.00187 (0.00577)	0.00583 (0.00625)	0.00278 (0.00577)	0.00618 (0.00624)	0.0118 (0.0101)	0.0255* (0.0152)	0.0120 (0.00999)	0.0255* (0.0150)
Growth_1	0.00335 (0.00669)	0.00173 (0.00759)	0.00436 (0.00669)	0.00334 (0.00761)	-0.0251** (0.0110)	-0.0211* (0.0115)	-0.0189* (0.0110)	-0.0141 (0.0116)
ln Population	2.572*** (0.653)	1.904** (0.741)	2.649*** (0.653)	1.912*** (0.740)	-2.784** (1.250)	-2.941** (1.313)	-2.922** (1.232)	-2.938** (1.293)
Freedom from corruption	0.0129*** (0.00450)	0.0231*** (0.00497)	0.0129*** (0.00496)	0.0229*** (0.00496)	0.0165** (0.00745)	0.0161** (0.00815)	0.0164** (0.00734)	0.0154* (0.00803)
Government effectiveness	-0.294 (0.189)	-0.321 (0.205)	-0.258 (0.189)	-0.277 (0.206)	0.239 (0.338)	0.414 (0.359)	0.324 (0.334)	0.483 (0.355)
Rule of Law	0.350* (0.192)	0.276 (0.207)	0.298 (0.193)	0.234 (0.208)	0.296 (0.298)	0.339 (0.306)	0.357 (0.294)	0.395 (0.302)
Quality of regulation	0.548*** (0.159)	0.570*** (0.170)	0.566*** (0.159)	0.579*** (0.170)	-0.183 (0.231)	-0.208 (0.248)	-0.285 (0.230)	-0.298 (0.246)
Access to finance	0.00155 (0.00203)	0.00237 (0.00219)	0.00115 (0.00203)	0.00194 (0.00220)	0.000438 (0.00271)	-0.000832 (0.00285)	-4.93e-05 (0.00268)	-0.00135 (0.00281)
Gini coefficient		-0.0122 (0.0112)		-0.0124 (0.0112)		0.0178 (0.0171)		0.0205 (0.0169)
Number of disputes								
Number of disputes telecom sector			-0.142** (0.0614)	-0.141** (0.0689)				
Number of disputes water sector							-0.122*** (0.0399)	-0.120*** (0.0406)
Constant	-53.31*** (11.49)	-40.45*** (13.35)	-54.85*** (11.48)	-40.63*** (13.32)	26.47 (24.30)	30.14 (25.63)	26.43 (23.94)	27.98 (25.25)
Observations	977	821	977	821	334	308	334	308
R-squared	0.493	0.492	0.496	0.495	0.452	0.473	0.470	0.490
Number of countries	106	91	106	91	40	36	40	36

Table 5: Determinants of Private Participation in Infrastructure. Dependent Variable: Log of Total Private Investments in Infrastructure. Specification with Country Fixed Effects (No Year Dummies).

VARIABLES	(1) ln PPI	(2) ln PPI	(3) ln PPI	(4) ln PPI	(5) ln PPI	(6) ln PPI
ln GDP_1	0.830*** (0.0795)	0.843*** (0.0798)	0.863*** (0.0801)	0.801*** (0.0942)	0.856*** (0.101)	0.874*** (0.0803)
ln Inflation_1	-0.138*** (0.0284)	-0.137*** (0.0288)	-0.140*** (0.0283)	-0.148*** (0.0313)	-0.171*** (0.0338)	-0.141*** (0.0287)
ln Trade_1	0.298* (0.170)	0.201 (0.178)	0.366** (0.171)	0.296 (0.204)	0.311 (0.228)	0.273 (0.179)
Debt_1	0.000734 (0.00562)	0.00780 (0.00581)	0.00130 (0.00560)	0.00493 (0.00635)	0.00396 (0.00643)	0.00805 (0.00579)
Growth_1	-0.0128** (0.00631)	-0.00323 (0.00652)	-0.0113* (0.00631)	-0.00323 (0.00750)	-0.00163 (0.00824)	-0.00153 (0.00653)
ln Population	4.337*** (0.497)	4.466*** (0.524)	4.401*** (0.496)	4.245*** (0.590)	3.999*** (0.674)	4.569*** (0.523)
Freedom from corruption	0.00720* (0.00417)	0.0159*** (0.00442)	0.00692* (0.00416)	0.0111** (0.00484)	0.0169*** (0.00527)	0.0153*** (0.00441)
Government effectiveness	0.197 (0.182)	0.124 (0.188)	0.241 (0.182)	-0.109 (0.210)	0.120 (0.226)	0.171 (0.188)
Rule of law	0.387** (0.183)	0.267 (0.187)	0.395** (0.182)	0.408* (0.209)	0.466** (0.227)	0.285 (0.186)
Quality of regulation	0.227 (0.153)	0.419*** (0.155)	0.140 (0.155)	0.465*** (0.178)	0.388** (0.192)	0.332** (0.158)
Access to finance	0.00126 (0.00154)	0.00211 (0.00162)	0.000943 (0.00153)	0.00246 (0.00185)	0.00239 (0.00207)	0.00174 (0.00162)
Gini coefficient		0.00454 (0.0100)			0.00257 (0.0120)	0.00139 (0.0101)
Number of disputes			-0.0256*** (0.00917)	-0.0234** (0.0109)	-0.0214** (0.0109)	-0.0237*** (0.00872)
Dispute time				0.0755*** (0.0226)	0.0653*** (0.0230)	
Constant	-86.38*** (6.838)	-89.73*** (7.458)	-88.43*** (6.853)	-83.75*** (8.221)	-81.97*** (9.777)	-92.26*** (7.484)
Observations	1.041	867	1.041	771	651	867
R-squared	0.446	0.483	0.451	0.458	0.468	0.488
Number of countries	111	98	111	108	95	98

Table 6: Determinants of Private Participation in Infrastructure by Sector. Dependent Variable: Log of Total Private Investments in Infrastructure by Sector. Specification with Country Fixed Effects (No Year Dummies).

VARIABLES	(7) ln_PPI_en ergy	(8) ln_PPI_en ergy	(9) ln_PPI_en ergy	(10) ln_PPI_en ergy	(11) ln_PPI_tra nsport	(12) ln_PPI_tra nsport	(13) ln_PPI_tra nsport	(14) ln_PPI_tra nsport
ln GDP_1	0.625*** (0.111)	0.688*** (0.115)	0.624*** (0.112)	0.685*** (0.115)	0.515*** (0.133)	0.556*** (0.130)	0.532*** (0.133)	0.569*** (0.130)
ln Inflation_1	-0.130*** (0.0421)	-0.116** (0.0448)	-0.130*** (0.0422)	-0.115** (0.0449)	-0.115** (0.0452)	-0.0886** (0.0449)	-0.117*** (0.0450)	-0.0907** (0.0448)
ln Trade_1	0.344 (0.244)	0.232 (0.262)	0.341 (0.246)	0.226 (0.264)	1.500*** (0.272)	1.489*** (0.274)	1.516*** (0.271)	1.505*** (0.273)
Debt_1	0.00716 (0.00703)	0.00859 (0.00767)	0.00715 (0.00704)	0.00859 (0.00767)	0.0128 (0.0114)	0.0353** (0.0143)	0.0137 (0.0114)	0.0360** (0.0142)
Growth_1	-0.0116 (0.00903)	-0.00905 (0.00937)	-0.0116 (0.00907)	-0.00920 (0.00940)	-0.0491*** (0.0101)	-0.0393*** (0.00999)	-0.0467*** (0.0101)	-0.0375*** (0.0100)
ln Population	1.395* (0.771)	1.414* (0.833)	1.392* (0.773)	1.403* (0.836)	0.843 (0.918)	0.816 (0.890)	0.974 (0.917)	0.923 (0.889)
Freedom from corruption	0.00996* (0.00587)	0.00747 (0.00629)	0.00998* (0.00588)	0.00756 (0.00631)	0.00173 (0.00779)	0.00551 (0.00800)	0.00222 (0.00776)	0.00601 (0.00798)
Government effectiveness	0.00755 (0.248)	-0.0750 (0.267)	0.00752 (0.248)	-0.0744 (0.267)	-0.296 (0.290)	-0.505* (0.291)	-0.263 (0.289)	-0.472 (0.291)
Rule of law	-0.0307 (0.260)	0.164 (0.277)	-0.0314 (0.260)	0.161 (0.277)	0.310 (0.296)	0.0489 (0.297)	0.415 (0.298)	0.150 (0.302)
Quality of regulation	0.125 (0.215)	0.0560 (0.226)	0.128 (0.219)	0.0649 (0.231)	0.888*** (0.232)	1.296*** (0.233)	0.808*** (0.234)	1.226*** (0.236)
Access to finance	0.000128 (0.00189)	0.00139 (0.00201)	0.000128 (0.00189)	0.00139 (0.00201)	0.00368* (0.00191)	0.00496** (0.00194)	0.00327* (0.00191)	0.00456** (0.00195)
Gini coefficient		0.0520** * (0.0146)		0.0524** * (0.0147)		0.0297** (0.0148)		0.0265* (0.0149)
Number of disputes energy sector			0.00178 (0.0212)	0.00431 (0.0214)				
Number of disputes transport sector							-0.0579** (0.0262)	-0.0452* (0.0248)
Constant	-35.66*** (10.97)	-39.25*** (12.10)	-35.57*** (11.03)	-38.98*** (12.18)	-29.01** (13.19)	-31.27** (12.99)	-31.63** (13.19)	-33.28** (13.01)
Observations	754	660	754	660	577	512	577	512
R-squared	0.170	0.196	0.170	0.196	0.230	0.285	0.238	0.291
Number of countries	87	75	87	75	76	67	76	67

Table 6 (continued): Determinants of Private Participation in Infrastructure by Sector. Dependent Variable: Log of Total Private Investments in Infrastructure by Sector. Specification with Country Fixed Effects (No Year Dummies).

VARIABLES	(15) ln_PPI_tele com	(16) ln_PPI_tele com	(17) ln_PPI_tele com	(18) ln_PPI_tele com	(19) ln_PPI_w ater	(20) ln_PPI_w ater	(21) ln_PPI_w ater	(22) ln_PPI_w ater
ln GDP_1	0.860*** (0.0809)	0.872*** (0.0874)	0.870*** (0.0811)	0.878*** (0.0878)	0.474*** (0.122)	0.519*** (0.128)	0.485*** (0.123)	0.529*** (0.129)
ln Inflation_1	-0.0993*** (0.0293)	-0.114*** (0.0319)	-0.101*** (0.0293)	-0.115*** (0.0320)	-0.125** (0.0500)	-0.117** (0.0519)	-0.126** (0.0500)	-0.118** (0.0520)
ln Trade_1	0.404** (0.176)	0.295 (0.200)	0.414** (0.176)	0.304 (0.200)	1.690*** (0.284)	1.395*** (0.307)	1.734*** (0.295)	1.445*** (0.318)
Debt_1	0.00559 (0.00579)	0.0114* (0.00629)	0.00631 (0.00581)	0.0116* (0.00629)	0.0180* (0.0105)	* (0.0156)	0.0182* (0.0106)	* (0.0156)
Growth_1	-0.000759 (0.00645)	-8.70e-05 (0.00717)	-3.02e-05 (0.00647)	0.000437 (0.00721)	0.0332** *	0.0289** *	0.0326** *	0.0282** *
ln Population	4.505*** (0.538)	4.383*** (0.607)	4.629*** (0.545)	4.449*** (0.614)	0.187 (0.932)	0.761 (0.999)	0.278 (0.946)	0.896 (1.024)
Freedom corruption	0.0132*** (0.00457)	0.0235*** (0.00507)	0.0132*** (0.00457)	0.0234*** (0.00507)	0.0174** (0.00777)	0.0149* (0.00850)	0.0175** (0.00778)	0.0147* (0.00852)
Government effectiveness	-0.174 (0.190)	-0.117 (0.207)	-0.146 (0.190)	-0.0966 (0.209)	0.669* (0.346)	0.760** (0.369)	0.702** (0.351)	0.792** (0.373)
Rule of law	0.278 (0.194)	0.206 (0.210)	0.247 (0.195)	0.191 (0.211)	0.603* (0.308)	0.641** (0.318)	0.622** (0.310)	0.659** (0.320)
Quality of regulation	0.423*** (0.158)	0.401** (0.171)	0.426*** (0.158)	0.399** (0.171)	-0.545** (0.233)	-0.569** (0.250)	-0.577** (0.240)	-0.602** (0.256)
Access to finance	0.00175 (0.00158)	0.00174 (0.00177)	0.00145 (0.00159)	0.00161 (0.00178)	0.00415* *	0.00539* **	0.00422* *	0.00544* **
Gini coefficient		-0.0145 (0.0113)		-0.0146 (0.0113)		0.0315* (0.0177)		0.0321* (0.0178)
Number of disputes telecom sector			-0.0869 (0.0614)	-0.0498 (0.0692)				
Number of disputes water sector							-0.0238 (0.0404)	-0.0260 (0.0417)
Constant	-91.61*** (7.488)	-89.87*** (8.700)	-93.89*** (7.656)	-91.12*** (8.873)	-19.26 (14.14)	-30.47* (15.64)	-21.22 (14.54)	-33.24** (16.27)
Observations	977	821	977	821	334	308	334	308
R-squared	0.465	0.454	0.466	0.455	0.352	0.367	0.353	0.368
Number of countries	106	91	106	91	40	36	40	36

ⁱ See Agénor and Moreno-Dodson (2006) for an overview and Estache *et al.* (2013) and Schwartz *et al.* (2009) for a treatment of infrastructure's effects on jobs and growth.

ⁱⁱ Private participation in infrastructure can be treated as equivalent to public-private partnerships.

ⁱⁱⁱ Investment in this paper refers to the resources the project company commits to invest in facilities during the contract period. Investments can be either in new facilities or in the expansion and modernization of existing facilities. Data entry varies across sectors: For projects other than telecommunications and large energy utilities, the total cost of developing or expanding the facility during the contract period is entered as investment data during the year of financial closure (for which data are typically available). For telecommunications projects and some large energy utilities, annual investments on facility expansion and modernization are entered as investment data in the year of investment when information is publicly available. Investments are recorded in millions of US dollars in either the year of financial closure or the year of investment as indicated above.

^{iv} Previous literature has only used the number of calendar days to resolve a payment through courts from Djankov *et al.* (2007), but not PPI disputes specifically.

^v The latest study is Tewodaj (2013) that uses data up to 2008.

^{vi} Values over 10 percent are accepted in the common literature, due to the bi-dimensional nature (countries and time) of the panel data model.

^{vii} In the year 2011, Serbia had a GDP per capita US\$9,687 and a freedom of corruption index of 35 while South Africa had a GDP per capita of US\$9,830 and a freedom of corruption index of 45.

^{viii} In the year 2011, Buthan had a rule of law index of .12 and a GDP per capita of US\$5,162, while Jordan had a rule of law index of .22 with a GDP per capita of US\$5,268.

^{ix} In the year 2011, Mexico and Turkey had a GDP per capita of US\$12,813 and US\$13,468, respectively, while their quality of regulation indexes were .34 and .42, respectively

^x We used the number of disputes in the last 10 years before the commitment in order to capture the countries' reputation in this matter.

^{xi} For a robustness check, the authors have added the Gini coefficient as an explanatory variable, expecting that, when controlling for income inequality, the coefficient will become significant for water. However, it is still not significant.