

Chapter 5

Institutional and political determinants of private participation in infrastructure

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This chapter brings together a large panel of project-level technical and financial data and country-level economic, institutional, political and governance variables, to assess the determinants of private financing of infrastructure in emerging markets and developing economies.

Controlling for economic characteristics, we find that overall private participation of infrastructure financing increases with freedom from corruption, rule of law, quality of regulations, and decreases with court disputes. We provide plausible explanations of deviations from this pattern when data is disaggregated at the sectoral level. We also found that legal systems — types of democracy or dictatorship — do not play a role in whether the private sector invests in infrastructure. Our results do not vary when controlling for income inequality and across quartiles of experience, country wealth and wealth per capita. The research shows that upstream “enabling” institutions, policies and regulations and sector economics need to be addressed simultaneously to facilitate private infrastructure investment financing.

The links between infrastructure and development are well established. They 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 channels¹. The demand for infrastructure is rising with the accelerating pace of globalisation and urbanisation. Every month in the developing world, more than five million people migrate to urban areas. This trend is compounded by the growing need for low CO₂ and climate-resilient investments to combat the challenges of climate change (Fay and Toman, 2010; Bhattacharya and Romani, 2013).

As a result of the fiscal constraints in many economies 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.

While private-sector financial commitments to infrastructure projects have risen to about USD 181 billion per year in EMDEs, this is less than 20% 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 decades². Annual commitments³ to PPI projects have increased from USD 22 million in 1990 to USD 181 million in 2012 (see Figure 5.1). Importantly, most of this growth since 2000 has been mainly in the energy and transport sectors (see Figure 5.2).

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, are 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 pre-condition 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.

Figure 5.1. Private investment in infrastructure in low- and middle-income countries

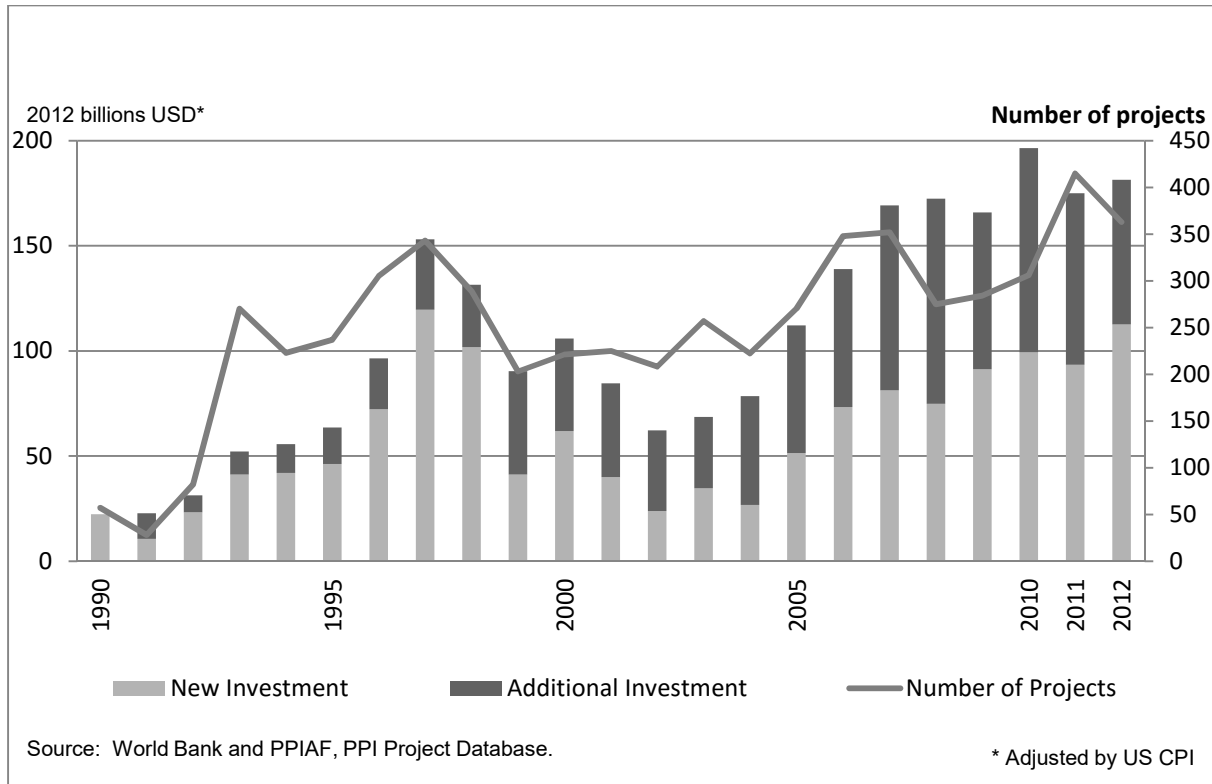
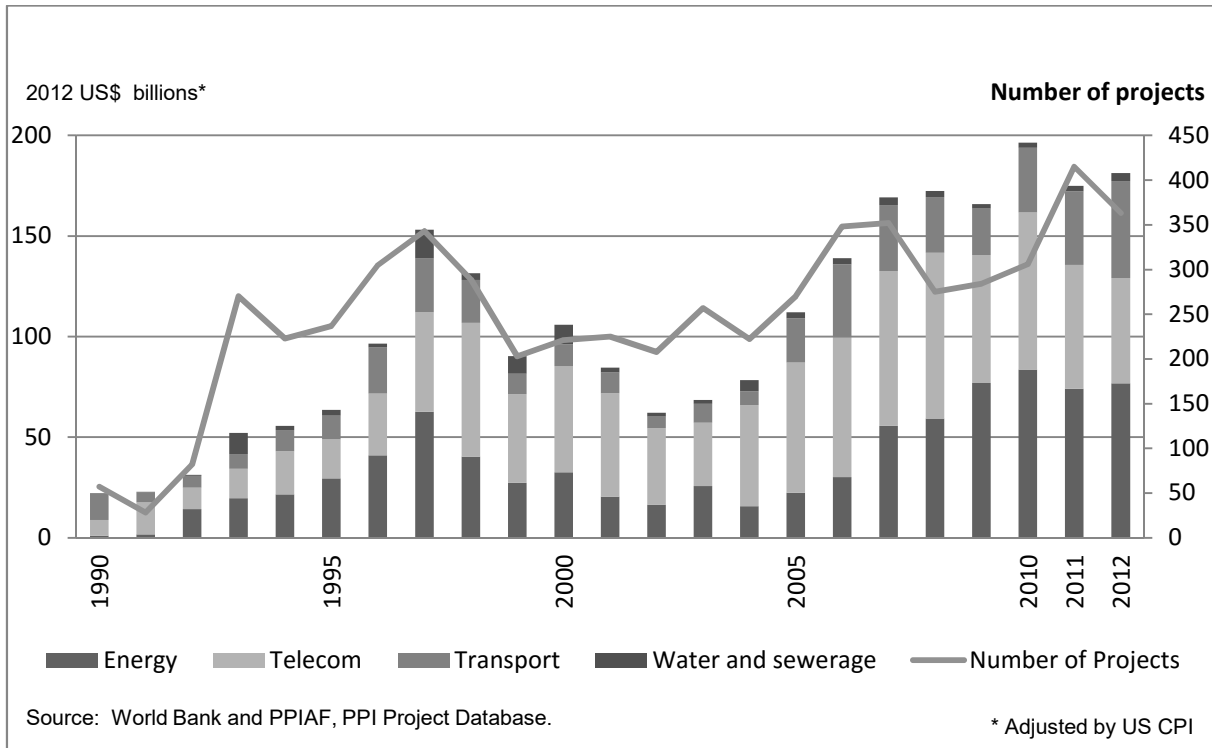


Figure 5.2. Private investment in infrastructure in low- and middle-income countries, by sector



Against this background, this chapter aims to assess the determinants of private financing of infrastructure with a special focus on institutional, political and governance characteristics. It then identifies areas in which additional efforts are required if the private sector were to play a larger role in financing infrastructure development in EMDEs.

Theoretical background to understand the determinants of PPI

Existing literature

There exists 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 (see Annex 5.1 for a literature taxonomy and mapping of these drivers).

The empirical literature is focused on foreign direct investment (FDI) rather than infrastructure investments, and most of the works utilise 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) analyse 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% increase in the probability of having private participation in infrastructure commitment and a 41% higher level of investment, in dollar terms, in 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 materialise.

Hammami *et al.* (2006) use the World Bank PPI Database to analyse 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 captures the effect on the number of projects committed, but not the investment levels *per se*, 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 PPIs 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, Pragal (2003) and Kirpatrick *et al.* (2006) 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 liberalising the investment regime, while Kirpatrick *et al.* (2006) find that institutional framework and regulation matter most. Similarly, Banerjee *et al.* (2006) 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 attract more PPIs.

A study by Tewodaj (2013) analyses 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 a lower tax burden and a more stable macroeconomic environment, receive more PPI), PPI into SSA countries is — from a social planner’s perspective — sub-optimally allocated. In particular, when it comes to larger PPI investments the findings suggest that corrupt countries with inefficient governments seem to attract more PPI in infrastructure. Basilio (2011) shows that 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.

Jensen *et al.* (2005) analyse the institutional determinants of private-sector participation in the water and sanitation sector in 60 developing countries. The regression results provide support for the hypothesis 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. Gasmı *et al.* (2010) assess the extent to which the level of development of the 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.

The objective of this research is to contribute to the literature by 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, using a novel dataset on quality of governance and on number of PPI disputes⁴, and extending previous analyses with a cross-country panel for the period 1984-2012⁵.

Methodology

To identify the determinants of PPI, we construct a toy model that captures institutional and political variables along with economic and financial variables.

Let us assume a three-stage investment, predictable cash flows and terminal value model:

- In t_0 , the public agent and/or private investor invest I with certainty (construction risks are absorbed by the constructor; there may be a differential in investment efficiency though);
- In $t_{1,2,\dots,n}$, predictable cash flows CF are realised (in financial modeling, these are cash flows broken down year by year, e.g. 5-8 years);
- In $t_{n+1,\dots,\infty}$, the terminal value (TV) is realised with uncertainty (in a Discount Cash Flow -- DCF — valuation, the TV accounts for ca. 40-70% of the present value of the asset, depending on the discount rate)⁶;
- The public agent, unlike the private investor, can receive transfers TR conditional on states of TV : if TV is low, the public agent can levy taxes from the public at large and subsidise the project; if TV is high, the public agent will lower prices (directly or through regulation) to gain political support;
- TR have an expected value of zero, so that the public agent's $TV +$ transfers (TR) have the same expected value, but lower volatility than TV alone; i.e. $E(TV+TR) = E(TV)$ and $SD(TV+TR) < SD(TV)$.

The TV is relevant for the private investor inasmuch as he has a stake in the long-term operations of the asset. For institutional arrangements (e.g. joint ventures), the private investor has an interest in preserving the value of the assets. For finite-time contractual arrangements (e.g. concessions), the salvage value of the asset for the private investor is not greater than its market value. Therefore, from the public agent's standpoint, the volatility of the TV increases in private ownership and decreases in contract duration, in line with assumption (5).

From Assumptions (1)-(5), the Net Present Value for public investments equals:

$$NPV_{pu} = -I_{pu} + \sum_{j=1}^n \frac{CF_{pu,j}}{(1+r_{pu})^j} + \frac{TV + TR|TV}{(1+r_{pu})^n} \quad (1)$$

and for private investments:

$$\begin{aligned} NPV_{pr} &= -I_{pr} + \sum_{j=1}^n \frac{CF_{pr,j}}{(1+r_{pu})^j} + \frac{TV}{(1+r_{pu} + r_{premium})^n} = \\ &= -I_{pr} + \sum_{j=1}^n \frac{CF_{pr,j}}{(1+r_{pu})^j} + \frac{TV}{(1+r_{pr})^n} \end{aligned} \quad (2)$$

where r_{pu} is the social discount rate and r_{pr} is the private discount rate equal to the social discount rate plus a risk premium for higher variance (higher β) of TV without TR . Under these assumptions, the discount rate during the predictable period n is the same for both the public and private sectors; the risk premium is only realised in the terminal value. The risks during the predictable period are absorbed in the expected value of the cash flows, not the discount rate. If the distribution of the cash flows is unknown, then n should be shortened and the discount rate adjusted.

Arguably, if investments and cash flows are different under public and private provision, so are cash flows after period n captured in the terminal value TV . For simplicity, we assume that TV are equal under public and private provision (secular trend) and all rents from the private to the public sector are extracted through transfers TR , in accordance with assumption (4).

At the margin (i.e. where the choice between traditional procurement and PPI is indifferent), $NPV_{pu} = NPV_{pr}$, therefore:

$$-I_{pu} + \sum_{j=1}^n \frac{CF_{pu,j}}{(1+r_{pu})^j} + \frac{TV + TR|TV}{(1+r_{pu})^n} = -I_{pr} + \sum_{j=1}^n \frac{CF_{pr,j}}{(1+r_{pu})^j} + \frac{TV}{(1+r_{pr})^n} \quad (3)$$

$$I_{pu} - I_{pr} + \sum_{j=1}^n \frac{CF_{pr,j}}{(1+r_{pu})^j} - \sum_{j=1}^n \frac{CF_{pu,j}}{(1+r_{pu})^j} = \frac{TV + TR|TV}{(1+r_{pu})^n} - \frac{TV}{(1+r_{pr})^n} \quad (4)$$

Since $SD(NPV_{pu}) < SD(NPV_{pr})$, in equilibrium $r_{pu} < r_{pr}$ (conf. CAPM; otherwise no investor would invest in a riskier project).

Normalising by $I_{pu} - \sum_{j=1}^n CF_{pu,j}/(1+r_{pu})^j = (TV + TR|TV)/(1+r_{pu})^n$:

$$\frac{I_{pr} - \sum_{j=1}^n \frac{CF_{pr,j}}{(1+r_{pu})^j}}{I_{pu} - \sum_{j=1}^n \frac{CF_{pu,j}}{(1+r_{pu})^j}} = \frac{TV \cdot (1+r_{pu})^n}{(TV + TR|TV) \cdot (1+r_{pr})^n} \quad (5)$$

Given that TR is a mean-preserving spread [$E(TR) = 0$],

$$\frac{I_{pr} - \sum_{j=1}^n \frac{CF_{pr,j}}{(1+r_{pu})^j}}{I_{pu} - \sum_{j=1}^n \frac{CF_{pu,j}}{(1+r_{pu})^j}} = \left(\frac{1+r_{pu}}{1+r_{pr}} \right)^n \quad (6)$$

i.e. the preference for private participation in infrastructure will be given by:

$$\frac{\sum_{j=1}^n \frac{CF_{pr,j}}{(1+r_{pu})^j} - I_{pr}}{\sum_{j=1}^n \frac{CF_{pu,j}}{(1+r_{pu})^j} - I_{pu}} + \left(\frac{1+r_{pu}}{1+r_{pr}} \right)^n > 0 \quad (7)$$

This toy model yields the following comparative statics:

Variable	Meaning	Preference for PPI Pr[$NPV_{pr} > NPV_{pu}$]	Captured econometrically by
$1 - I_{pr}/I_{pu}$	Investment efficiency	+	Country dummies and subsample sector regressions; GDP per capita controls
CF_{pr}/CF_{pu}	Productivity differential	+	Country dummies and subsample sector regressions; GDP growth control
n	Industry stability (inverse of industry risk)	+	Subsample sector regressions; regulatory quality
r_{pu}/r_{pr}	Political stability (inverse of political risk)	+	Political variables: rule of law, corruption perception, regulatory quality and number of disputes; corporate taxation and country exchange rate volatility controls

Controlling for economic and industry factors, we derive a number of testable predictions:

- **Prediction 1:** An increase in the rule of law — following North and Weingast (1999) — will be associated with a lower differential in the public and private discount rates and thus higher PPI.
- **Prediction 2:** An increase in regulatory quality will be associated with higher predictability of cash flows and thus higher PPI.
- **Prediction 3:** An increase in freedom from corruption will be associated with a lower political risk premium and thus higher PPI.
- **Prediction 4:** An increase in the number of disputes will be associated with a higher political risk premium and thus lower PPI.

Data description

Data is an unbalanced panel 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.

In order to obtain PPI levels, we utilised the World Bank PPI Database. This source offers detailed information by year, country, sector and form of public-private partnership. Within sectorial categories, it distinguishes among primary and secondary sectors by investment⁷. It also provides the form of private investments, so we can distinguish between greenfield projects and concessions of existing assets among other types of partnerships and investments.

The database, however, captures both public contributions to the infrastructure investments as well as private contributions. That is, the database notes total project size in commitments, later adjusted to actual disbursements, investments or transfers, where information is available. Those commitments combine private and, in many cases, public sources. Only projects that have come to financial closure are included in the database. If a purely public investment is carried out in tandem with a private operator or a private management contractor, the database does not include them. All project figures are noted in the year that the project comes to financial closure.

For the purpose of this research, the PPI database is an appropriate source of information because it reports the commitments of the investments for each year by country and by sector once a contract has come to financial closure; that is, a licence, sale, concession, lease, BOT or other contractual agreement is signed by both parties and financial arrangements have been secured. Having the commitments instead of the actual investments allows us to establish a clearer relationship between investments and institutional, political and governance variables at a given point in time. The decision of investing (commitment) and the willingness of financiers to come to closure on that commitment are made, *inter alia*, in the context of the political conditions, economic performance, sovereign credit worthiness and fear of expropriation at the time of financial closure. Because there may be exogenous reasons for differentiation between an original commitment to invest and the eventual disbursement levels — including external shocks, canny renegotiations or changes in tariffs or relative prices — the best time to value an investment relative to country risk is the moment at which the commitment comes to financial closure.

Taking the data from the PPI database, we gather information regarding 130 developing countries from 1990 to 2010. The panel data were complemented by data from World Development Indicators with variables such as GDP, GDP growth, inflation, country openness and population.

The Quality of Governance Standard Database (Teorell *et al.*, 2013) is panel data that draws on a number of freely-available data sources related to quality of governance and its correlates. This is our main source for the following variables: freedom from corruption, rule of law, quality of regulations, bureaucracy quality and political regimen, parliamentary democracy, mixed (semi-presidential) democracy, presidential democracy, civilian dictatorship, military dictatorship and royal dictatorship. A detailed description of these variables is presented in Annex 2.

Furthermore, we rely on the UNCTAD Database of Treaty-based Investor-State Dispute Settlement Cases to construct the variables on a number of disputes and average time to solve them by sector and country. This database has 394 observations covering disputed cases pending and concluded, which were disclosed by the parties or arbitral institutions from 1987 to 2010.

Summary statistics and the correlation of independent variables are presented in Annex 5.A3, Tables 5.A3.1 and 5.A3.2.

Results

The model is specified in logarithms. We use a moving average of 15 years for water projects, ten years for energy (plants and transmission) projects, eight years for transport projects and five years for telecom projects - roughly one-third 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.

We explore the intensity of the different determinants, given that a country has received private investments in infrastructure. We run the following 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):

$$\begin{aligned}
\log PPI_{it} = & \alpha_i + \beta_1 \log GDP_{it-1} + \beta_2 \log POP_{it} + \beta_3 \log GROWTH_{it-1} \\
& + \beta_4 \log INFLATION_{it-1} + \beta_5 \log OPENNESS_{it-1} \\
& + \beta_6 \log DEBT_{it-1} + \beta_7 \log ACCESSTOFINANCE_{it-1} \\
& + \sum \beta_j \log X_{itj} + \varepsilon_{it}
\end{aligned} \tag{8}$$

Equation (8) shows that $\log PPI_{it}$ 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. We 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 USD millions 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 5.A3.3 – 5.A3.7. 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 an 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 seen to indicate a higher risk of default by the private sector. As a debt measure we use the total debt service divided by the gross national income.
- Access to finance, i.e. access to commercial bank credit.

Table 5.A3.3 presents the results using country-fixed effect and year dummies. In these specifications, the overall R-squared is around 50%, a high value for a panel data model⁸.

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 PPIs.

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 PPIs.

The higher a country score on freedom from corruption, the higher the average level of investments with private participation in infrastructure. Decreasing corruption by ten points can increase PPI by 6.7%. That is, if a country like Serbia can lower its corruption level and become like South Africa (which has similar GDP per capita), the private sector will invest 7% more⁹.

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%. That is, if a country like Bhutan can improve its environment of property rights and enforceability of contracts and become like Jordan (which has a similar GDP per capita), the private sector will invest 4% more¹⁰.

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. In developing countries 45% of investors named breach of contract and 58% named adverse regulatory changes as the most important political risks they will face in the next three years; 40% of the survey respondents mentioned that they experienced financial losses through adverse regulatory changes and 34% 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% in the level of infrastructure investment in PPIs. For example, if we consider two countries with the same level of GDP per capita such as Mexico and Turkey, Mexico can gain a 3% increase in infrastructure investment in PPIs if the country achieves the quality of regulations of Turkey¹¹.

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 4%¹². 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 its proper use.

We estimate the determinants of PPI by sector to see whether the impacts vary among the energy, transport, telecom and water sectors (see Table 5.A3.4). 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 deciding 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.

Transport is one of the most corrupt sectors of infrastructure. Kolstad and Wiig (2013) find that “increased corruption within a country is associated with increased extractive industry FDI, but at a diminishing rate as corruption increases grow large.” Thus, while threats to ownership rights deter investment in resource sectors (Bohn and Deacon, 2000; Cust and Harding, 2013), increased corruption would not follow this “rule”, as available measures of (perceived) corruption do not capture such a threat, because corruption has been a means of securing ownership rights or because countries perceived as becoming more corrupt offered better opportunities for FDI beyond ownership rights (such as geological

prospects and reduced regulatory constraints). Although corruption may be costly, it is a cost that also offers flexibility and has helped secure deals for companies to maximise profits (Shaxson, 2007).

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 PPIs, 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 water¹³.

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 additional dispute can decrease PPI investments in those sectors by approximately 12%.

Variables in institutional and political regimens, such as parliamentary democracy, mixed (semi-presidential) democracy, presidential democracy, civilian dictatorship, military dictatorship and royal dictatorship were also included as controls, but none of them were statistically significant.

As a robustness check, we have run the regressions without year dummies (see Tables 5.A3.5 and 5.A3.6). Insignificant changes in the main results were found.

We expected that countries with more experience on PPIs and higher income would have PPI investments less sensitive to institutional and governance variables. However, we found that results did not vary by quartile of experience, GDP and GDP per capita (see Table 5.A3.7). According to field experts, it is not the quantity but the *quality* of experience (i.e. successful projects) that matters, for which we do not control.

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%). The costs and risks faced by investors are high, particularly in 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. The 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 chapter provides empirical evidence of the relationship between institutional, political and governance variables and the level of PPI investments in infrastructure in developing countries. Our

results support the arguments that industry and political stability are key ingredients to increase the level of PPI investments in infrastructure.

We conclude that 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: decreasing corruption by ten points can increase PPI by 6.7%; improving rule of law by one standard deviation (i.e. by 0.1) can increase PPI by 4.3%; improving quality of regulation by one standard deviation (0.1) produces an average increase of 3.2% in the level of infrastructure investment in PPIs; and having one more project going to court decreases investments by 4%.

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 the cause of these discrepancies.

Importantly, the evidence does not show any significant difference in the results across experience and economic level quartiles.

A sound investment climate is a critical factor affecting the supply of 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 analysis of synergies and adoption of a holistic approach to infrastructure development.

Notes

1. 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.
2. Private participation in infrastructure can be treated as equivalent to public private partnerships.
3. 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 modernisation 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 in facility expansion and modernisation 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.

4. Previous literature has only used the number of calendar days to resolve a payment through the courts [Djankov *et al.* (2007)], but not PPI disputes specifically.
5. The latest study is by Tewodaj (2013) and uses data up to 2008.
6. The following stylised numerical example illustrates this point: let us assume a series of USD 100 perpetual cash flows (CF), discounted at a rate (r) of 10% annually. The first ten years (n) account for 61% of the present value, while the terminal value --i.e. the cash flows from year 11 onwards -- accounts for 39% of the present value. The shorter the period accounted for the foreseeable cash flows, the lower the discount rate; and the higher the terminal value cash flows' growth in perpetuity, the higher the proportion the terminal value will have in the present value. For example, for $n = 5$ and $r = 7\%$, the terminal value represents 71% of the present value.
7. As examples, energy and transport are “primary sectors”, whereas electricity distribution and airports are “secondary sectors”.
8. Values over 10% are accepted in the common literature, due to the bi-dimensional nature (countries and time) of the panel data model.
9. In the year 2011, Serbia had a GDP per capita of USD 9 687 and a freedom-of-corruption index of 35, while South Africa had a GDP per capita of USD 9 830 and a freedom-of-corruption index of 45.
10. In the year 2011, Bhutan had a rule-of-law index of .12 and a GDP per capita of USD 5 162, while Jordan had a rule-of-law index of .22 with a GDP per capita of USD 5 268.
11. In the year 2011, Mexico and Turkey had a GDP per capita of USD 12 813 and USD 13 468, respectively, while their quality-of-regulation indexes were .34 and .42, respectively
12. We used the number of disputes in the last ten years before the commitment in order to capture the countries' reputation in this matter.
13. For a robustness check, we 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.

Annex 5.A1

Table 5.A1.1. Determinants of PPI -- literature taxonomy and mapping

		Theoretical Framework			Empirical Studies	
		Economics/Finance	Political Economy	Institutional Analysis		
Variables	Discount rate	Social discount rate (Arrow & Lind, 1970); interest rate differential (Moszoro, 2014a)	Lower government beta and access to capital vs. investment efficiency and productivity differential (Groot, 2003)			
	Access to capital	Access to external financing (Esty, 2011)				
	Investment efficiency	Lower investment outlays and shorter investment period (Moszoro, 2014a)				
	Productivity differential	Lower operational costs (Moszoro, 2014b)				
	Bundling	Incentive theory and economies of scope (Iossa & Martimort, 2013)	Expropriation risk and LPVR (Engel, Fischer & Galetovic, 2001)	Incomplete contract theory: bundling of investment and operations (Hart 2003; Hart, Shleifer & Vishny 1997); governance of hybrids and boundaries of bureaucracy (Williamson 1979, 1999)		
	Risk allocation	Post-tender renegotiations (Iossa & Martimort, 2011)				
	Contracting flexibility & regulation					Regulatory and institutional framework (Pragal 2003; Kirpatrick <i>et al.</i> 2006; Basilio 2011); property right and quality of the bureaucracy (Jensen <i>et al.</i> 2005).; corruption and rule of law (Hammami <i>et al.</i> , 2006); bureaucratic quality (Barnejee <i>et al.</i> 2006; Gasmii <i>et al.</i> , 2010; Tewodaj, 2013)
	Corruption, political stability & rule of law					
	Bureaucracy		Low third-party opportunism risk (Moszoro & Spiller, 2014)			

Annex 5.A2

Definition of Variables

- **Quality of Government** is the mean value of the 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.
- **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.

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 5.A3

Table 5.A3.1. Summary statistics

Variable	Obs.	Mean	Std. Dev.	Min.	Max.
In GDP_1	7 388	22.76985	2.411881	15.99307	30.33849
In Inflation_1	6 588	1.95406	1.402989	-13.4379	10.19474
In 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
In 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
Govt. 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 5.A3.2. Correlation of independent variables

	In GDP_1	In Inflation_1	In Trade_1	Debt_1	Growth_1	In Population	Access to finance	Free of corruption	Government effectiveness	Rule of law	Regulation quality	Gini coefficient	Disputes
In GDP_1	1.00												
In Inflation_1	0.02	1.00											
In 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								
In 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 5.A3.3. **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)	-4.75 (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 5.A3.4. **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)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
	ln_PPI_ energy	ln_PPI_ energy	ln_PPI_ energy	ln_PPI_ energy	ln_PPI_ transport	ln_PPI_ transport	ln_PPI_ transport	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 5.A3.4 (cont'd). **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)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
	ln_PPI_ energy	ln_PPI_ energy	ln_PPI_ energy	ln_PPI_ energy	ln_PPI_ transport	ln_PPI_ transport	ln_PPI_ transport	ln_PPI_ transport
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)	-2.920** (1.232)	-2.938** (1.293)
Freedom from corruption	0.0129*** (0.00450)	0.0231*** (0.00497)	0.0129*** (0.00449)	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 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.A3.5. **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 5.A3.6. **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_ 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	0.625*** (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 5.A3.6 (cont'd). **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_ 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	0.860*** (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)	0.0407*** (0.0156)	0.0182* (0.0106)	0.0412*** (0.0156)
Growth_1	-0.000759 (0.00645)	-8.70e-05 (0.00717)	-3.02e-05 (0.00647)	0.000437 (0.00721)	-0.0332*** (0.0102)	-0.0289*** (0.0106)	-0.0326*** (0.0103)	-0.0282*** (0.0106)
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** (0.00189)	-0.00539*** (0.00204)	-0.00422** (0.00190)	-0.00544*** (0.00204)
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

Table 5.A3.7. **Determinants of private participation in infrastructure by quartile of experience and GDP.**

Dependent variable: Log of total private investments in infrastructure by quartile of experience and GDP.

Specification with country fixed effects and year dummies

VARIABLES	EXPERIENCE				GDP				GDP per capita			
	(1) ln PPI	(2) ln PPI	(3) ln PPI	(4) ln PPI	(1) ln PPI	(2) ln PPI	(3) ln PPI	(4) ln PPI	(1) ln PPI	(2) ln PPI	(3) ln PPI	(4) ln PPI
In GDP_1	-2.818*** (0.802)	-0.260 (0.422)	1.360*** (0.382)	0.662*** (0.141)	-1.111 (0.839)	0.218 (0.399)	1.361*** (0.253)	0.870*** (0.241)	0.395 (0.464)	1.458*** (0.286)	0.592** (0.259)	0.855*** (0.312)
In Inflation_1	-0.0446 (0.0996)	0.0228 (0.0480)	-0.118* (0.0672)	-0.00677 (0.0294)	-0.0748 (0.144)	-0.0610 (0.0701)	-0.121*** (0.0457)	0.0200 (0.0523)	0.0107 (0.0809)	0.0394 (0.0461)	0.00834 (0.0539)	-0.148*** (0.0543)
In Trade_1	-4.217*** (1.006)	-1.226*** (0.385)	0.338 (0.506)	0.318* (0.175)	-1.613 (0.994)	-1.135** (0.457)	0.449 (0.310)	0.668** (0.315)	0.148 (0.377)	-0.989*** (0.306)	-0.275 (0.330)	1.743*** (0.481)
Debt_1	0.0969** (0.0452)	0.0119 (0.0221)	-0.00242 (0.00633)	0.000204 (0.00719)	0.00247 (0.00857)	0.0398 (0.0286)	-0.0296** (0.0124)	0.00572 (0.0138)	0.00175 (0.00752)	0.0242 (0.0176)	0.0201 (0.0189)	-0.0202* (0.0114)
Growth_1	-0.0420** (0.0208)	-0.0210* (0.0123)	-0.0354*** (0.0121)	-0.00495 (0.00634)	-0.0140 (0.0250)	-0.00375 (0.0136)	-0.0443*** (0.0126)	-0.0108 (0.0108)	0.0274 (0.0186)	-0.00949 (0.00995)	-0.0217** (0.00982)	-0.0653*** (0.0128)
In Population	0.792 (6.280)	-0.822 (2.706)	3.914* (2.350)	-0.397 (0.801)	6.224** (2.948)	1.256 (1.548)	7.124*** (1.177)	0.254 (1.220)	6.589** (2.976)	6.065*** (1.269)	-0.103 (1.035)	-3.833** (1.506)
Freedom from corruption	-0.0361 (0.0221)	0.00768 (0.00901)	-0.00848 (0.0104)	-0.00907* (0.00544)	0.0459* (0.0230)	0.0171 (0.0104)	0.0120* (0.00673)	0.0168** (0.00703)	0.00433 (0.00987)	0.00494 (0.00730)	0.00869 (0.00650)	-0.00896 (0.00780)
Government effectiveness	-0.315 (0.688)	-0.300 (0.438)	0.522 (0.476)	0.0248 (0.191)	0.676 (0.735)	-0.0960 (0.468)	1.527*** (0.340)	-0.440 (0.282)	-0.0386 (0.489)	0.405 (0.279)	0.179 (0.275)	0.509 (0.384)
Rule of law	-0.102 (0.724)	-0.101 (0.394)	0.679 (0.467)	0.110 (0.182)	1.090 (0.771)	0.288 (0.474)	1.144*** (0.333)	-0.175 (0.270)	0.193 (0.412)	0.110 (0.307)	0.287 (0.292)	0.812** (0.388)
Quality of regulation	-0.137 (0.541)	0.216 (0.394)	-0.0276 (0.351)	0.648*** (0.151)	-1.302 (0.894)	0.384 (0.459)	-0.688*** (0.236)	0.731*** (0.222)	-0.192 (0.390)	0.729*** (0.278)	0.320 (0.236)	-0.137 (0.271)
Access to finance	0.00586 (0.00601)	-0.000321 (0.00608)	0.000102 (0.00435)	0.00173 (0.00157)	0.0255 (0.0178)	0.00472 (0.00629)	-0.00287 (0.00328)	0.00637** (0.00255)	0.0215** (0.00925)	0.00503 (0.00309)	0.00303 (0.00348)	0.00501 (0.00327)
Constant	69.54 (98.53)	25.25 (40.77)	-89.58** (39.31)	-4.662 (14.84)	-55.09 (43.07)	-17.75 (26.06)	-141.5*** (19.90)	-24.02 (23.85)	-114.8** (46.29)	-125.5*** (23.02)	-7.397 (18.15)	40.06 (28.19)
Observations	120	206	320	392	90	234	341	365	184	267	245	334
R-squared	0.661	0.461	0.227	0.499	0.580	0.494	0.610	0.494	0.635	0.750	0.579	0.410
Number of countries	55	79	82	63	19	35	43	38	26	38	39	43

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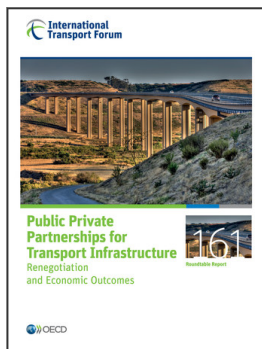
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