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ADBI Working Paper Series

**Global Determinants of Stress and
Risk in Public-Private Partnerships
(PPP) in Infrastructure**

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Abstract

This study analyzes the determinants of stress in public-private partnerships (PPPs) in infrastructure investment. While project failures seldom occur, there are many stresses that hinder success. One of these is broad political risk: the prerogative of government executives to make sweeping changes in investment rules or regulations—through measures such as protracted tariff freezing—that undermine a project's market value. Broad political risk can constitute the biggest threat to project outcomes. However, this is usually only realized after other risks, such as currency risk, have materialized first. Thus, broad political risk can be controlled.

The empirical analysis in this study yields a number of surprising results: (i) strong growth and rigid currency regimes heighten risk by leading to adverse selection of proponents and moral hazard in project design; (ii) many of the World Bank's indices of governance quality lead to perverse outcomes, suggesting that new governance standards must be used to judge PPPs; and (iii) except for political risk guarantees, loans and equity from multilateral institutions have no effect on outcomes; however, political risk guarantees are rarely utilized, suggesting that they may need to be redesigned or marketed better to be more useful. The paper concludes with suggestions for policy improvements.

JEL Classification: H54, H81, F21

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1. INTRODUCTION

The 1970s and 1980s saw the emergence of privatization as a means to improve public service efficiency in developing countries. Multilateral financial institutions (MFIs) encouraged the pursuit of infrastructure privatization for a number of reasons. It was envisioned that improvements in service provision and efficiency would in the long-run mitigate the lost benefits of state-provision. Privatization was also expected to help relieve state budgets, which had been perpetually strained by state-owned enterprises operating energy, transport, telecommunications, and water services. Finally, it was argued that deficit-biased countries could count on privatization to achieve macroeconomic stabilization; this in turn would help relieve pressures on prices and on monetary policy in general.

Chile, followed by Argentina, began to pursue bold programs in privatization, fully divesting themselves of infrastructure assets. Over the last three decades, the rest of the developing world have followed suit, prompted by widening gaps between public resources and the perceived demand for infrastructure (Table 1; Yang 2008; Dailami and Leipziger 1998; Fay and Yepes 2003).

Table 1: Expected Annual Infrastructure Needs in Emerging markets, 2005–2010

By income group	New		Maintenance		Total	
	US\$mil	% GDP 3	US\$mil	% GDP 3	US\$mil	% GDP 3
Low Income	49,988	3.18	58,619	3.73	108,607	6.92
Middle Income	183,151	2.64	173,035	2.50	356,187	5.14
High Income	135,956	0.42	247,970	0.76	383,926	1.18
Developing Countries by Region						
East Asia & Pacific	99,906	3.67	78,986	2.90	178,892	6.57
Europe & Central Asia	39,069	2.76	58,849	4.16	97,918	6.92
Latin America & Carib.	37,944	1.62	32,878	1.40	70,822	3.02
Middle East & N. Africa	14,884	2.37	13,264	2.11	28,148	4.48
South Asia	28,069	3.06	35,033	3.82	63,101	6.87
Sub-Saharan Africa	13,268	2.84	12,644	2.71	25,912	5.55
All developing countries	233,139	2.74	231,654	2.73	464,793	5.47

Source: Fay and Yepes 2003.

As infrastructure privatization proliferated, new modalities of public-private partnerships (PPP) in infrastructure emerged. These modalities evolved in response to stakeholders' changing preferences in ownership and control, which in turn reflected their differing attitudes towards risk-bearing. The divestment model gave way to more complex modes of PPP, such as concessions of existing assets, greenfield investment, and management contracts.

A nation's capacity and readiness to undertake PPP in infrastructure depend on a number of variables. Among these are risk factors specific to the country, such as the macroeconomic environment, and legal and regulatory regimes; factors specific to projects themselves, such as contracts; and whether or not government and private sector participants such as investors and suppliers can agree on an acceptable allocation of risks. Thus, PPP investment projects often reach closure when stakeholders perceive that an acceptable risk allocation ex ante has been achieved. Subsequently, risk allocation is contracted, and the project is implemented. But while investments are driven by risk allocation ex ante, the success or failure of privatization always depends on the realization of risks ex post. This study looks at investment outcomes of projects ex post.

While a study of this nature is not new, much of the previous analytical work has focused on contract renegotiations in Latin America, notably Guasch (2004), who showed that renegotiations often occur at the onset of most projects. In contrast, this paper studies projects

that have been concluded, canceled, or are currently operational or distressed, with an emphasis on stresses beyond renegotiations, and over a broader horizon.

Apart from Guasch (2004), there are a number of anecdotal studies on the outcomes of PPP projects. Chief among these is the excellent study by Woodhouse (2006), which analyzed global anecdotal evidence from 33 independent power producer (IPP) projects. Woodhouse argued that sophisticated risk engineering in contracts; payment security and official credit support; participation by MFIs; and arbitration and dispute resolution were of limited effectiveness in improving IPP outcomes. Instead, strategic management of IPP programs, including competitive bidding and cost management; managing counterparty risk; commercial planning and flexible management; local partnerships; and managing rights, responsibilities, and incentives, were more effective in mitigating IPP problems. After analyzing the anecdotal evidence, Woodhouse argued that, since exposure to macroeconomic shocks rose in proportion to the fraction of power supplied by IPPs, IPPs would be more sustainable if they accounted for only a small proportion of the country's power sector. This study will empirically test this hypothesis, for a broader set of sectors and projects.

In addition to building on the existing literature on ex post outcomes, this study is also meant to complement studies that analyze ex ante investment in infrastructure PPP. The previous literature suggests that investor perceptions of good governance and macroeconomic stability drive cross-country investment patterns in PPP. Of particular interest is whether the pattern of investment outcomes validates the factors that drive global PPP investment. A study of ex post outcomes of global PPP such as this can help lay the groundwork for future policymaking on privatization; it can also create clearer expectations for stakeholders.

2. OBJECTIVES AND RATIONALE OF THE STUDY

This study aims to:

Estimate the factors that account for the greatest level of stress in infrastructure projects with PPP, over a long horizon;

Explain and analyze the severity of risks, based on their observed impact on project outcomes;

Determine which countries offer the safest and riskiest medium- to long-run environments for PPP investments;

Determine the best role for MFIs in PPP;

Use the analysis of global outcomes and econometric results to further refine definitions of risk (particularly political risk); explain how several manifestations of political risk evolve; determine how political risk is correlated with other risks; and describe how it leads to adverse project outcomes; and

Analyze the role of domestic vs. foreign investors in PPP.

The study is global in scope, since many of the risks involved are global or regional in nature.

For this study, stress is defined as a situation where private sector proponents have exited, or are contemplating exit from a project. Information on stress was derived from the World Bank's Private Participation in Infrastructure (PPI) dataset, which was used as the source for much of the data used in the estimation. This global dataset contains project-specific information on a large number of projects classifiable as PPP, including the total value of investment, sector, sub-sector, type of transaction, and multilateral participation. It covers projects which achieved financial closure from 1984 up to the present. The data is cross-sectional, with projects classified according to their current status (i.e., whether they are operational, distressed, canceled, or concluded). Although the data is cross-sectional, it contains temporal information that can also be used in analysis. Because the sample period spans the emergence of PPP in

the late 1980s, through the Asian and Argentine crisis, and beyond, the sample includes many projects that have undergone the most tumultuous experiences in PPP, as well as the periods of consolidation that followed. The PPI dataset is augmented by country-specific macroeconomic data and, where available, additional project-specific data such as country growth and exchange rate information.

The data has limitations, however. Information on bid and tendering procedures, and the criteria for awards are not available for most projects. Also, owing to the lack of complete global data, other forms of stress are not included in the empirical analysis, such as the incidence of renegotiations around the world.¹

Analyzing project stress in PPP projects is vital because the benefits of privatization are contingent on projects working smoothly: concessions having ample resources to realize their investment requirements, for instance, or toll roads being properly maintained, or seaports and airports serving commercial and passenger customers efficiently. Project stress is clearly a major factor behind the inconsistent quality of privatization outcomes.

Analyzing and addressing stress also helps stakeholders enhance PPP's attractiveness as an investment, by minimizing the fiscal and social impacts of poorly designed and managed projects.

3. OVERVIEW OF INVESTMENTS IN AND OUTCOMES OF PPP INVESTMENTS

Conventional investments are typically driven by country fundamentals. The same holds true for PPP. However, as experiences accumulate, past PPP outcomes become part of a country's fundamentals. Thus, present outcomes will tend to drive future investment patterns.

3.1 World PPP investments

The following figures were constructed using data from the World Bank's PPI database. Figure 1 lists the dollar value of global and regional PPP investments from 1984 to 2006. Global investments peaked in 1997, and then fell sharply following the financial crisis in Asia, and the subsequent crises in Russia, Brazil, and Argentina. PPP investments recovered after 2002, with telecom and transport investments driving the recovery; however, the recent oil price shock and global financial crisis threaten to reverse this trend.

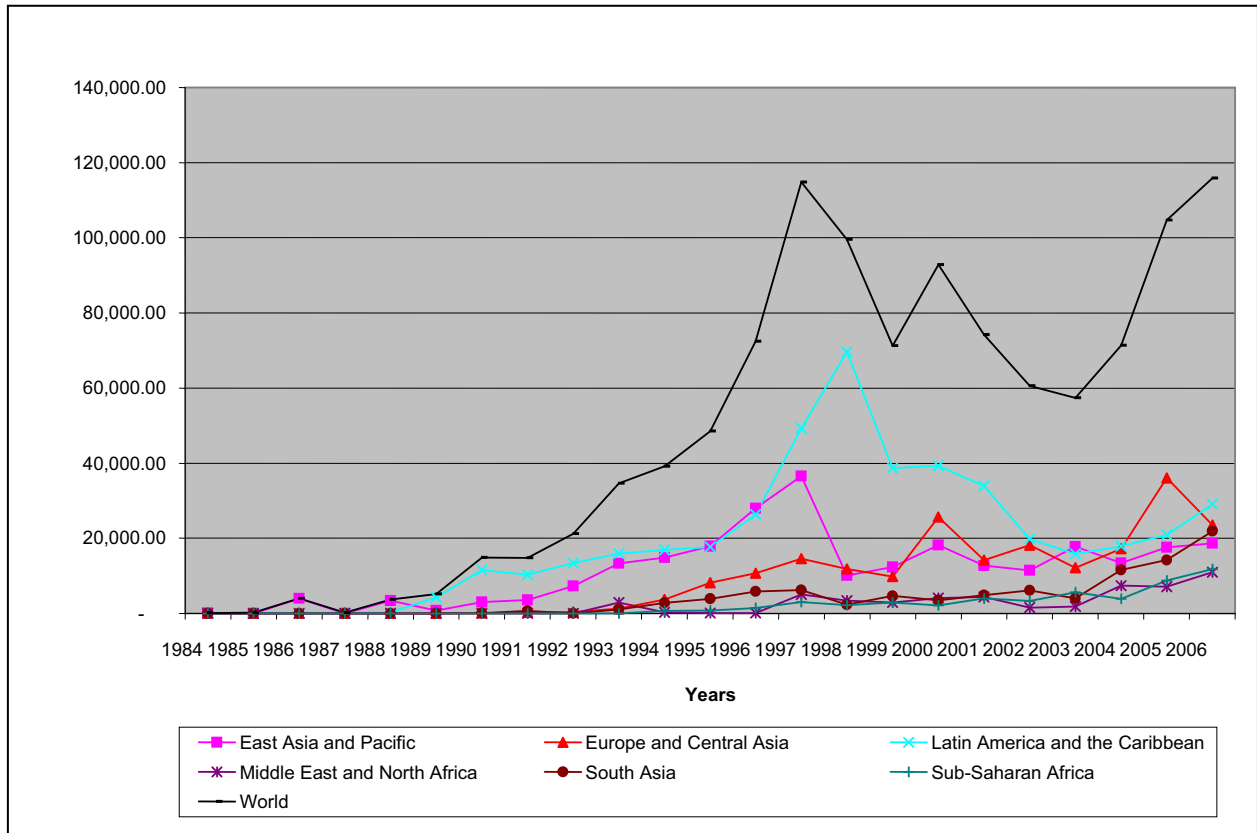
In Asia, the steep decline in PPP investments has not been followed by clear signs of recovery. Only transport investments have rebounded to pre-crisis levels. The rest have remained flat.

In Latin America and the Caribbean, PPP investments peaked following the outbreak of the Asian crisis, suggesting a diversion of investments from Asia. Although PPP investments in the region fell after the Brazilian crisis of 1999, levels have started to pick up since 2002.

PPP investments in Europe and Central Asia have trended upward since 2003. The same is true for the Middle East and North Africa, where investments have increased at an even more rapid pace, reflecting the increasing attractiveness of markets as the price of oil has increased. PPP investments in South Asia have also increased rapidly since 2003, driven primarily by high growth in India. Likewise, PPP investments in Sub-Saharan Africa have risen dramatically in the last few years.

¹ Although estimates of the incidence of renegotiation are presented in Table 4.

**Figure 1: World and Regional Breakdown of PPP Investment, 1984–2006
(millions of US\$)**



Source: World Bank PPI database

Table 2: Projects in the World Bank's PPI Database Disaggregated by Sector and Selected Sub-sector

Primary sector		Number of Projects	Proportion of World total
Energy		1,524	38.32%
Telecom		818	20.57%
Transport		1,020	25.65%
Water and Sewerage		615	15.46%
Selected sub-sectors		Number of projects	Proportion of world total
Energy	Power generation	992	24.9%
	Power distribution	561	14.1%
Telecom	Fixed telecom	343	8.6%
	Mobile	542	13.6%
Transport	Airports	121	3.0%
	Seaports	303	7.6%
	Railroads	104	2.6%
	Roads	490	12.3%
Water	Water sewerage and treatment	305	7.7%
	Water utility	336	8.4%

Source: Author's calculations using data from the World Bank PPI database. Totals of sub-sectors may not necessarily add up to sector totals because some projects may involve more than one sub-sector (e.g., in the energy sector, a project may involve both power generation AND power distribution—so a single project can be classified under both sub-sectors).

Table 2 shows the sectoral and sub-sectoral breakdown of current PPP projects in the World Bank's PPI database. The energy sector comprises the bulk of PPP projects. Transport projects (mostly seaports, airports, highways, and bridges) account for the second largest share, followed by telecommunications, then water and sewage. This sectoral breakdown reflects two key investment patterns in PPP: sectors with cross-border applications and impact, such as energy and transport, attract the biggest investments, while sectors with more local applications, such as telecoms and water and sewerage, see the least investment.

That water and sewerage investments lag behind other sectors reflects the more politicized nature of water, which continues to be perceived as a public good. It also reflects a widespread reluctance to take water supply and management from national and municipal utilities. Much of this reluctance emanates from concerns about tariff increases. Most people are aware of the typical post-privatization pattern—privatization leads to an immediate increase in tariff, with the corresponding improvements in service efficiency only coming much later, if at all.

Private investors have shown reluctance themselves, having witnessed water privatization conflicts in communities around the world (as well as frequent failures to improve service levels and coverage). Prominent failures in water privatization in places such as Buenos Aires, Argentina; Cochabamba, Bolivia; and the Philippines have not helped matters much. Also, unlike power generation, which provides wholesale bulk supply, privatizing municipal water systems puts concessionaires in direct contact with retail customers—in the front line of privatization.

3.2 World PPP Outcomes

Although PPP failures get tremendous scrutiny from researchers and the media, data would show that an overwhelming number of projects worldwide are neither “canceled” nor “distressed.” Of the roughly 4,000 projects in the World Bank’s PPI database, only 57 are listed as distressed, and only 185 are listed as canceled. Thus, although infrastructure projects have suffered the whole extent of country-specific, regional, and global shocks in the last three decades, as a whole, projects appear to have been quite resilient. Given their inherently long gestation periods, it would seem that in general, project developers, firms, investors, governments, and customers have adapted to volatile project cycle environments.

One form of adaptation is renegotiation, and indeed, although experience in Latin America has shown that renegotiations can often be opportunistic (Guasch 2004), the judicious use of renegotiation (by both government and firm) could in fact be responsible for the resiliency of projects.

Divestment can be, and in many instances has been, another response to risk.² Many recent PPP divestments have involved the exit of original foreign investors, in favor of new foreign players or emerging domestic private investors. Thus, while most projects have retained private equity investment, the nationality and composition of the private investors have changed.

On the surface, the data on PPP is encouraging. But beneath the veneer of resiliency still lies considerable stress. During the past decade, global macroeconomic shocks and other factors have led to a rash of divestments and renegotiations in Asia and Latin America. Table 3 lists the estimated frequency of renegotiations in East Asia alone. The large number of estimated renegotiations in East Asia has not only been due to volatility experienced during the Asian crisis; uncertainties experienced by investors in the People’s Republic of China (PRC) have also been a contributing factor (Woodhouse 2006). The PRC’s PPP issues are noteworthy. The government recently established formal regulatory institutions for many utilities, yet the country’s planning ministry effectively retains final pricing authority over many infrastructure-related services.

Table 3: Estimated Renegotiated PPP Contracts in East Asia, 1986–present

Projects with contracts renegotiated	826
Proportion of world projects	20.77%
Proportion of East Asia projects	71%

Source: Author’s estimate based on a survey of past PPP studies, Guasch (2004), and news reports from the Asian region.

Divestitures due to unfavorable outcomes are a manifestation of another ominous trend—a shortening in the implicit investment horizon for infrastructure, one of the external effects of past PPP experiences in Latin America and Asia. It would not be surprising to find that recent project analyses dwell as much on exit strategies as on investment. While PPP projects are originally conceived by governments with the assumption of a certain amount of stability in terms of investor composition, the opposite has in fact, occurred, with many divestments and buyouts occurring long before the end of the first decade of operations. The frequency of hasty divestments reflects the rise in risk premia, which adds to the cost of subsequent PPP investments.

² A more comprehensive study of the pattern of global divestments, as well as global renegotiations in PPP, is left for further study.

3.3 Determinants of Project Outcomes: Stress and Risk Factors in PPP Investments

3.3.1 The Role of Political Risk

Actions by government executives—political actions—can profoundly influence PPP outcomes. In developing countries, government executives may be responsible for most tariff decisions, or they may make decisions on tariffs even in the presence of formal regulatory bodies. Since the range of possible actions is broad (ranging from tariff interventions to expropriations, to changes in investment rules, regulations, and legislation), a broad definition of political risk is needed in order to capture the impact of executive discretion on projects. For this study, political risk is defined as the possibility that government executives may use their prerogative to make sweeping changes in investment rules or regulations—through measures such as protracted tariff freezing—that undermine a project's market value.³

While broad political risk can pose the biggest threat to project outcomes, it is however usually only realized after other risks—such as currency or demand risks triggered by macroeconomic shocks—have materialized first.

Recent history provides numerous examples of macroeconomic shocks that have been detrimental to PPP. The first macroeconomic shock to privatized infrastructure was the Mexican crisis of 1994, which led to large disparities in forecast and actual traffic on privatized toll roads: a realization of demand risk. The government subsequently bailed out losing projects. This was followed by the Asian crisis of 1997, which triggered the collapse of fixed exchange rates in the worst-hit countries. Overnight, countries that had been pursuing privatization were faced with a political decision—who would bear the cost of currency risk (in addition to demand risk)? In many cases, the burden was shared: governments renegotiated contracts, while taxpayers and consumers of infrastructure services assumed parts of stranded costs. The shock from that crisis reverberates to the present, with Malaysia currently encouraging IPPs to renegotiate.

Recent major macroeconomic shocks to hit PPP investments were the collapse of the Brazilian real in 1999, the breakdown of the currency board in Argentina in 2002, and the banking-related currency collapse in the Dominican Republic in 2003. As with the Asian crisis, these triggered a discrete and simultaneous realization of currency and demand risks. These also triggered renegotiations with private concession operators.

The manner in which governments in Asia and Latin America responded to these crises is a study in contrast. Although the response to such shocks was essentially political, the nature of realized political risk differed across regions. Asia's response primarily consisted of contract renegotiations and partial nationalization or subsidization,⁴ while Latin America's response consisted of tariff freezes and subsequent renegotiations over time.⁵ This was the response of the Argentine government, which froze all utilities tariffs at the height of the peso crisis in 2002 (they remain somewhat rigid and low to this day, even with occasional adjustments).⁶ In addition to imposing a tariff freeze, the government also suspended the indexation of tariffs to

3 Although laws are the domain of legislators, and not executives, I have labeled changes in law as political risk as well.

4 The exception in Asia was Indonesia, which placed a cap on tariffs charged by IPPs during contract renegotiations. Pakistan also renegotiated IPP contracts in the late 1990s, but not because of the Asian crisis. The trigger was a change in government, which brought in officials who believed that IPP contracts negotiated under the previous regime were extremely disadvantageous to the state. Unlike the early experience with privatization and PPPs in Latin America, where renegotiation was often initiated by firms, the Asian experience has been dominated by government-initiated renegotiations. This is particularly true in the case of IPPs, which have experienced government-led renegotiations in Thailand, the Philippines, Indonesia, and Pakistan.

5 There were a few exceptions in Asia, however. In Indonesia and Pakistan, government authorities set limits on tariffs after IPP contracts were renegotiated (effectively tariff freezes).

6 The government also set up a special commission to renegotiate contracts.

the US dollar, leading to the “pesofication” of tariffs. Since then, other governments in the region have used tariff freezes in response to economic shocks (e.g., Nicaragua, and the Dominican Republic after its banking sector-led shock in 2003).

Firms cannot withstand a prolonged period of tariff rigidity. Many of the distressed or canceled projects in Argentina, the Dominican Republic, and Nicaragua are energy projects which have been subjected to protracted tariff freezing. This implies that tariff freezes,⁷ a manifestation of political risk, represent a significant ratcheting up of pressure felt by infrastructure firms. Table 4 provides a sample of recent tariff freezes.

Table 4: Examples of Recent Executive-Pronounced Tariff Freezes

Country	Start Year	End Year	Sectors affected (Trigger)	Project
Argentina	2002	Present	All sectors (collapse of pegged exchange rate)	All projects
Bolivia	1999	Present	Water (public protest)	Aguas del Illimani SA
China, People's Republic of (PRC)	2006	Present	All sectors (general increase in commodities prices)	All projects
Dominican Republic (2 instances)	2000 2005	2002 Present	Energy (collapse of pegged exchange rate)	All energy projects
Indonesia	1997	2001	Water (collapse of pegged exchange rate)	Jakarta Water (Eastern District)
Indonesia	1997	2001	Water (collapse of pegged exchange rate)	Jakarta Water (Western District)
Nicaragua	2004	2005	Energy	All projects
Venezuela, RB	1999	Present	Telecom	All projects
Republic of Korea	2008	Present	Energy (general increase in commodities prices)	All projects

Source: Author's estimate based on a survey of news reports from around the world. In the absence of news about the lifting of a tariff freeze, the end year is noted as “present.”

Many of the projects listed as “distressed” or “canceled” in the World Bank's PPI database are in the sectors and countries listed in Table 4. Sweeping tariff freezes instigated by national executives in response to substantial currency risk are most directly and significantly associated with PPP project cancellations and distress (i.e., political risk manifested in tariff freezes that occur after economic crises raise break-even tariffs for project firms).

There can be other motivations for tariff freezing, such as a large devaluation or persistent price shock in an inflation-averse environment. Since any increase in utilities tariffs feeds into the general price level, the risk of tariff freezing rises when there is a sudden, large devaluation, or when there is a persistent shock to prices, such as the recent increase in global commodities prices. This risk is greater if the country pursues strict inflation targeting (as in the case of the Republic of Korea) or if government executives themselves are highly averse to inflation (as in the case of the PRC).

Protracted tariff rigidity is characteristic of markets where the government routinely intervenes through price controls. In the PRC, such controls are pervasive in wastewater treatment and water utilities.⁸ Because of the localized nature of water projects, tariff approvals for water in the PRC pass through local politicians. Proposals for tariff changes thus become more sensitive after changes in local leadership. The problem is further aggravated when the required rate or level of wastewater treatment is high (and therefore the cost of water treatment to the firm is

⁷ Also called creeping expropriation.

⁸ These controls are also the dominant reason for PPP failure in the PRC.

high, but the rigid tariff allows little or no cost recovery). Due to these and other factors, the timing and extent of net revenues tend to be uncertain. Furthermore, municipal guarantees on prices are prohibited under the law.

Apart from tariff freezing, political risk can manifest in other ways. In Malaysia, threats of contract renegotiation have hounded IPPs after the Asian crisis started to weaken the state-owned power utility, Tenaga. The government recently responded with creeping expropriation. A windfall tax on IPP profits was levied in early 2008. This was followed with an offer of a tax break to any IPP willing to renegotiate. This is a good example of currency risk subsequently triggering political risk.

Developing countries are particularly prone to political risk, because many of them still place the responsibility for tariff decisions on government executives. It may also be the case that executives make decisions on tariffs even in the presence of formal regulatory bodies. The risk of this happening is heightened during crises or some other political event. In countries such as Indonesia (after the Asian crisis) and Pakistan (after a change in government), government authorities set limits on tariffs after IPP contracts were renegotiated.⁹

The pattern of risk-allocation in a project (manifested in the contract) is itself a possible trigger of political risk. The large countries in Southeast Asia all had major difficulties with their IPPs during and after the Asian crisis, due to government-guaranteed off-takes in power purchase agreements (PPAs). All renegotiations of IPP contracts in the wake of the Asian crisis were due to the fact that PPAs passed currency and fuel risks to state-owned utilities (not an undue decision in itself. In many cases, currency risks should be passed onto the state, since the state has best control over the risk. States simply have to manage risks better by pursuing appropriate macroeconomic policies and being more prudent in contracting). The financial fragility of state-owned utilities suggests that government fiscal support, such as government guarantees, may also raise the risk of failure by significantly reducing incentives for stakeholders to conduct more thorough due diligence in projects; raising both moral hazard and adverse selection; and leading to potentially large and fiscally costly contingent liabilities (Reside 2001; Lewis and Mody 1997). The literature on government guarantees identifies a wide array of government fiscal support. This can range from government shouldering demand risk, exchange rate risk (all contractually explicit) or other risks.

Table 5 summarizes the different possible sources of political risk.

⁹ Protracted tariff rigidity, however, can be short-sighted, because it increases the risk of supply shortages. The countries cited above suffered from power shortages because of inadequate investment in affected sectors.

Table 5: Some Triggers/Sources of Political Risk and Their Outcome

Endogenous (controllable)	Exogenous (uncontrollable)
<p>Poor domestic macroeconomic management</p> <p>Political outcomes:</p> <p>Currency crisis which leads to tariff freezing</p> <p>Macroeconomic crisis, which leads to the realization of demand risk</p>	<p>Regional and global economic shocks</p> <p>Political outcomes:</p> <p>Rising price level which leads to freezing of tariffs to check effects on inflation (People's Republic of China (PRC), 2007–Present)</p>
<p>Poor or unsustainable risk allocation in PPP contracts (contract risk)</p> <p>Political outcome:</p> <p>If state-owned utilities refuse to honor off-take clauses, this may lead to project failure</p>	<p>Resource nationalism in Eastern Europe and Central Asia</p> <p>Political outcome:</p> <p>Partial or full nationalization of oil and gas investments</p>
<p>Poor procurement practices which create perceptions that the project is tainted by corruption</p> <p>Political outcome:</p> <p>The project is canceled by the succeeding government</p>	<p>Strategic and political reasons for expropriation</p>

3.3.2 The Role of Risk Factors Endogenous to a Country's PPP System

Institutional and Contractual Triggers of Political Risk

Adverse selection and moral hazard contribute to the vulnerability of projects and proponents to macroeconomic shocks (and subsequently, to broad political risk).

Global PPP experience suggests that political risk can be heightened by institutional and contractual weaknesses, such as:

- 1) The quality and transparency of the system of contracting.

In one case, the Philippine government was compelled to cancel an international airport contract in 2002, due to perceptions that the signed contract was detrimental to the interests of the state.

- 2) The capacity of government and state-owned enterprises to coordinate projects and bear some risks, especially fiscal risk.

In another case, PPAs signed by state-owned utilities with IPPs featured agreements for guaranteed off-takes, but severe economic downturns led to a drastic deterioration in the utilities' financial positions (by causing the credit risk of the off-taker to decline). With national fiscal balances under severe threat as a result of potentially large debt and contingent liability implications, the governments of Indonesia and the Philippines decided to renegotiate the PPAs in 2002 and 2003, respectively.

Weaknesses in Project Planning, Design and Contracting

Aspects of project planning and design may also heighten political risk, such as:

- 1) The capacity of off-takers and customers to pay tariffs.

Although retail prices for power had been raised in the Dominican Republic, many industrial and residential users refused to pay tariffs. The government itself missed payments regularly. Poor collection occurred since the tariff was already one of the highest in the region.

- 2) The political and public acceptability of the project, as well as the extent of public consultation performed for the project.

In some cases, project design is not done through consultation, and is railroaded through the approval process. Customers subsequently lobby government to cancel the project or nationalize it.

The examples above suggest that political events, such as contract cancellations and nationalizations, can also be endogenous with respect to institutional and contractual weaknesses. This implies that political risk can arise from situations or events that can be controlled by either the government or the investor.

In addition, there is sufficient anecdotal evidence to suggest that weaknesses in project planning, design and contracting can contribute directly to project failure. It is well known that excessive demand forecasts, severe risk misallocation in contracts, and underestimation of project risks, can all contribute to failure (Flyvbjerg, Bruzelius, and Rothengatter 2003; Flyvbjerg, Holm, and Buhl 2002; Flyvbjerg, Holm, and Buhl 2005; Mackie and Preston 1998; and MacDonald 2002).

3.3.3 Other Determinants of Projects Outcomes

Apart from the different types of risk described above, a number of other factors can help determine the outcomes of a PPP projects. These include, among others:

- 1) The nature of institutional arrangements.

Outcomes may vary depending on whether contracting is done with the federal or local governments). The federal government may have some advantages over local governments when contracting infrastructure projects (e.g., greater expertise with large projects, or greater clout when mobilizing national resources and cross-ministry coordination).

- 2) The nature of regulatory arrangements.

It is well-known that compared to rate of return regulation, price caps create stronger incentives for achieving operational efficiency in projects. If the motivation to enhance efficiency is strong enough, it may have implications on project design and operations, as well as on project outcomes. On the other hand, rate of return regulation may be the modality preferred by private project developers.

- 3) The country's openness to trade.

It may be the case that infrastructure outcomes in more open economies are superior to others because trade creates a natural demand for infrastructure (roads for access, ports, etc.), thereby reducing demand and other risks.

Macroeconomic channels of risk are those primarily related to exchange rates, growth, openness, fiscal imbalances, etc. Note that these risks can occur sequentially in projects. If project outcomes can be affected by risks that are realized sequentially, this implies that in addition to non-structural models, structural econometric models can yield important insights into project failures. Thus, the analysis tries to examine the failed events themselves, to gain more insight into the substance of project failures. This is done using narrative accounts and a review of the existing literature on crises and their effects on projects.

Many of the macroeconomic channels of risk may magnify and propagate the effects of adverse selection and moral hazard throughout the project cycle, creating potentially serious incentive problems. For example, project planners are more likely to overestimate demand when economic growth is high during the planning and design phases. High growth during planning and design can lead governments to be less thorough when screening projects and proponents. High growth periods are therefore likely to exacerbate adverse selection, by attract riskier projects and riskier proponents to environments with less stringent controls and screening. Excessive demand forecasts during project design and planning can subsequently lead to larger project costs and subsequent losses, especially during the first few years of operations.

Similarly, errors in exchange rate forecasts are more likely to be committed when exchange rates are rigid or fixed during the design phase. These errors negatively influence project outcomes, as stakeholders fail to anticipate currency collapses that can occur during the operations phase—an indication of moral hazard.

4.1.2 Other Channels: The Role of Project Planning, Design and Contracting

Figure 2 identifies other channels through which risks can affect project outcomes. As described earlier, weaknesses in project planning, design and contracting (such as excessive demand forecasts, severe risk misallocation in contracts, and underestimation of project risks) can also contribute to project failure.

The typical PPP experience in Figure 2 has implications on specifying the econometric model for estimating the determinants of PPP risk. First, political events such as the freezing of tariffs can be the direct outcomes of observable macroeconomic shocks. Second, political events such as contract cancellations and nationalizations, can also be endogenous with respect to institutional and contractual weaknesses; these include weak and non-transparent procurement systems, and contracts that pass on too much risk to government.

All of these different factors may impair the firm's value.¹⁰ Given the often complicated evolution of and relationships between risks and project outcomes, a structural econometric model is therefore appropriate for this study:

Project outcomes (fail or not fail) = f(various endogenous and exogenous factors), with endogenous variables a function of the instruments.

The model lends itself to probit, logit, multinomial, and ordered discrete dependent variable regression techniques.¹¹

¹⁰ Not all political risk is endogenous. Exogenous political risk includes nationalizations that are driven by purely political or geopolitical motives. Examples include the recent resource-based nationalizations of oil and gas assets in Russia and Kazakhstan.

¹¹ More complicated, limited variable estimation can be performed in future studies.

In the absence of global, project-specific data, one must rely on creativity and use available data as proxies to capture the impact of these risks. Globally observable macroeconomic data can give one a sense of economic conditions prevailing in two key periods of the project cycle—the project’s design phase, and the project’s operations phase (see Figure 3). It is highly possible that the macroeconomic environment prevailing during the former period influences stakeholder forecasts of growth and exchange rates during the latter period, and this is part of what this study aims to capture.

4.3 Estimation Results

Given the structural nature of political risk and other risk factors, a two stage instrumental variable probit procedure was used for estimation.

In the first stage, endogenous variables were regressed on instruments. Table 6 summarizes the endogenous variables and exogenous or predetermined variables) used in the benchmark model.

Table 6: Variables Used in the Benchmark Model

Variable Name	Description
Endogenous Variables	
TARIFFRZ2	Tariff freeze by executive decision
AVPCGDPGR6TRM	Average rate of real per capita GDP growth in the last 6 years prior to current period, or prior to cancellation or conclusion of project
OPENTRM6	Average of the ratio of total exports plus imports divided by gross domestic product in the last 6 years prior to current period, or prior to cancellation or conclusion of project
Exogenous Variables	
RPCGDPGR6CLOS	Average rate of real per capita GDP growth in the last 6 years prior to financial closure
GUAR	Whether or not a political risk guarantee was granted to the project
AVGSUR6TRM	Average fiscal position (cash surplus or deficit) in the last 6 years prior to current period, or prior to cancellation or conclusion of project
ROR	Whether or not the project subject to rate of return regulation
GOVRISK	Whether or not the project obtained government fiscal support
FDI	Whether or not foreign investors were involved
FEDCON	Whether or not the project was contracted with federal or local government
STDRER6PRCLOS	Average standard deviation of real exchange rate in the last 6 years prior to financial closure
SHORTDEBTEX	The country’s short-term debt to exports ratio
GENER (generation), DISTRIB (distribution), TRANS (transport), UTILITY (utilities), GREEN (greenfield), CONCESS (concession), MGTCON (management contract), SEAPORT (seaport), TREAT (water treatment), and REHAB (rehabilitation project)	Sectoral or project type variables which took the value 1 if the project was of a particular sector or type or zero otherwise

The residuals of the first stage were used in the second stage regression, with FAIL as the dependent variable (FAIL is a binary variable that takes the value 1 when a project is listed as distressed or canceled in the World Bank's PPI database and 0 otherwise).

Regressions with highly significant variables are displayed in Table 7 (variables that do not appear in regression results are in large part insignificant).

Table 7: Selected Second Stage Probit Regression Results (dependent variable is FAIL—distressed/canceled or not distressed/canceled)

Regression	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Constant	-0.783**	0.31	-1.17**	-2.717**	0.102	1.062**	1.159**	0.044	1.038**	-1.677**	0.777*	1.384**	1.315**	1.409**	0.66*	1.409**
TARIFFRZ2	3.981**	2.131**	5.591**	3.388**	4.478**	4.262**	4.199**	4.117**	6.646**	3.851**	3.586**	6.565**	6.373**	3.845**	2.937**	3.845**
AVPCGDPGR6TRM	-0.634**	-0.977**	-0.642**	-0.175	-0.793**	-0.829**	-0.831**	-0.763**	-0.803**	-0.741**	-0.783**	-0.786**	-0.884**	-0.816**	-0.749**	-0.816**
OPENTRM6	-0.091**	-0.083**	-0.081**	-0.072**	-0.11**	-0.129**	-0.129**	-0.123**	-0.2**	-0.117**	-0.107**	-0.138**	-0.166**	-0.127**	-0.099**	-0.127**
RPCGDPGR6CLOS	0.211**	0.39**	0.195**	0.14*	0.31**	0.338**	0.337**	0.331**	0.342**	0.316**	0.32**	0.315**	0.356**	0.339**	0.302**	0.339**
GUAR	-1.401**	-1.088**	-1.991**	-0.864	-1.571**	-1.41**	-1.413**	-1.157**	-1.613**	-1.065*	-1.193**	-1.797**	-1.949**	-1.345**	-1.009*	-1.345**
AVGSUR6TRM	-0.067**	-0.061**	-0.113**	-0.092**	-0.089**	-0.093**	-0.092**	-0.086**	-0.094**	-0.081**	-0.086**	-0.11**	-0.107**	-0.092**	-0.084**	-0.092**
STDRER6PRCLOS		-0.001*														
ROR			-1.372**													
GOVRISK			0.457*													
FDI				-1.027**	-1.096**	-1.334**	-1.393**	-0.442	-2.698**	-0.394	-1.271**	-1.86**	-2.083**	-1.36**	-0.976**	-1.36**
FEDCON				-0.39		-0.922**	-0.931**	0.002	-0.791**	0.011	-0.732**	-1.412**	-1.185**	-1.053**	-0.728**	-1.053**
SHORTDEBTEX				0.085**												
GENER								-1.668**								
DISTRIB									3.997**							
TRANS										1.688**						
UTILITY											0.502*	0.071				
GREEN													0.324*			
CONCESS														-0.597**		
MGTCON															0.633**	
SEAPORT							-0.672*									
TREAT												2.669**				
REHAB																-0.597**
Observations	1,483	1,472	1,169	1,444	1,472	1,472	1,472	1,472	1,472	1,472	1,472	1,472	1,472	1,472	1,472	1,472
Wald chi sq test statistic for exogeneity	77.41**	70.41**	74.34**	107.22**	90.29**	88.89**	87.19**	75.44**	118.24**	72.38**	74.26**	98.4**	90.99**	87.62**	72.52**	87.62**

* means the coefficient of the variable is significant at the 5% level

** means the coefficient of the variable is significant at the 10% level

Note: The endogenous variables are TARIFFRZ2, AVPCGDPGR6TRM, and OPENTRM6. The instruments include RPCGDPGR6CLOS, STDRER6PRCLOS VOICE, RULE, CORRUPT, POLSTAB, AVGRER6TRM, GOVRISK, and CONPER, among others.

Projects at the construction phase were excluded from the sample, as no conclusions may be drawn by analyzing them. Wald tests of exogeneity were performed to determine whether there is enough information in the equation to reject the null that there is endogeneity. Significant p-values indicated that a structural estimation was appropriate. In addition, it did not appear that multicollinearity posed a problem for the estimates. First of all, the size of the sample mitigated the effects of any multicollinearity. Second, cross-correlations between the variables were low (see Table 8).

Table 8: Cross-correlations Between Major Variables

Variable	OPEN TRM6	RPCGDPGR 6CLOS	GUAR	AVGSUR 6TRM	STDRER 6PRCLOS	TARIFF FRZ2	AVPCGDP GR6TRM
OPENTRM6	1						
RPCGDPGR6CLOS	0.082	1					
GUAR	-0.064	-0.009	1				
AVGSUR6TRM	0.074	-0.001	-0.036	1			
STDRER6PRCLOS	-0.109	-0.107	0.02	0.003	1		
TARIFFRZ2	0.272	0.003	0.035	0.006	-0.046	1	
AVPCGDPGR6TRM	-0.095	0.466	-0.027	-0.03	-0.136	-0.121	1

4.4 Interpretation of Results

A summary of the empirical results is listed in Table 9.

Table 9: Summary of Effects of Various Variables on PPP Outcomes

Raises failure rate	Hypothesized reason	Lowers failure rate	Hypothesized reason
Average real per capita GDP growth 6 years prior to financial closure	Moral hazard—high growth discourages diligence in project preparation Adverse selection—high growth attracts riskier projects and riskier proponents	Average real per capita GDP growth in 6 years prior to terminal or current year	High growth encourages demand for services and infrastructure
Average standard deviation of real exchange rate 6 years prior to financial closure	Moral hazard—fixed exchange rate discourages diligence in project preparation and leads stakeholders to underestimate currency risk Adverse selection—high growth attracts riskier projects and riskier proponents	Average change in real exchange rate in 6 years prior to terminal or current year (appreciation)	Appreciation lowers the cost of imported inputs
Distribution segment in power	Upstream	Average fiscal surplus in 6 years prior to terminal or current year	Greater fiscal space lowers systemic risk and allows the

Raises failure rate	Hypothesized reason	Lowers failure rate	Hypothesized reason
			government to provide selective and limited support
Number of PPP projects	Capacity constraint; large number of projects adds to explicit or implicit fiscal risk Creates problems in monitoring projects and risk Indirectly raises risk of failure by raising the probability of tariff freezing	Openness in 6 years prior to terminal or current year	International commerce and trade stimulates demand for efficiency-enhancing infrastructure
Transmission Segment in power	Vulnerable to system losses	Extent of participation by citizens in selecting government, freedom	Lowers failure rate indirectly by lowering the risk of tariff freezing
Water utilities Water treatment and sewerage segment	More politicized than other sectors	Political risk guarantee	Guarantee comes with advice on proper designing, structuring and financing of project
Average ratio of short-term debt to exports in 6 years prior to terminal or current year	Capacity constraint; government less likely to support implicit fiscal risk	Contracted with federal government	Contracting with federal government less risky than with local government
Tariff freeze by executive decision	Rigid tariff undermines firm profitability	Rate of return regulation	Price cap regulation may be too rigid in times of crisis
Tariff freeze by executive decision with additional restrictions	Rigid tariff and other restrictions undermines firm profitability	Generation segment	Upstream industry necessary for power
Duration of tariff freeze	Rigid tariff undermines firm profitability	Seaport segment	Commerce and trade-related
Government guarantees	Moral hazard and adverse selection		

4.4.1 Variables That Tend to Raise the Failure Rate of PPP

Equation 1 in Table 7 is the baseline regression. In the succeeding equations, explanatory variables were added individually.

As expected, stress and failure are positively associated with tariff freezes (their mere imposition, as well as a longer duration raises the failure rate), confirming the strong adverse impact of political risk on project outcomes.

The estimates in equation 1 also reveal that higher average real per capita GDP growth and lower volatility in of the real exchange rate six years prior to financial closure (i.e., prior to the operations phase of a project) raise the PPP failure rate. This tends to confirm the hypothesis that macroeconomic conditions during these phases lead to moral hazard and adverse selection, influencing the subsequent incidence (and depth) of project stress during the operations phase—high growth and more rigid exchange rates during the design, planning, contracting, and screening phases all lead to incentive problems and more adverse project outcomes.

That macroeconomic conditions prior to project financial closure significantly affect subsequent project outcomes is a strong sign that adverse selection exists throughout the project cycle. The data would show that countries with high per capita growth rates and perceptions of good governance attract riskier proponents and projects with excessive and overly-optimistic demand forecasts. These are the projects which subsequently fail during the operations phase.

High growth rates may also: (i) attract more rent-seeking investors; (ii) create a rapid buildup in demand for infrastructure, causing countries to fast-track their procurement procedures for PPP (which is generally good for investment unless done at the cost of due diligence); and (iii) lead to situations where opportunistic governments subsequently extract rents from infrastructure investments that were initially sunk.

Most importantly, however, strong growth and rigid exchange rate regimes may contribute to adverse selection and moral hazard by creating a psychological environment in which financiers, project designers, planners, government executives, and consumers underestimate currency risk and discount the importance of the exchange rate as a major determinant of prices¹², both during the project design phase and during the operations phase. When a large and sudden exchange rate adjustment makes it necessary to have a proportional adjustment in price, government executives are suddenly faced with the task of choosing between the firm and the consumer. This predicament raises political risk dramatically.

Rigid exchange rate regimes may also be incompatible with long-term infrastructure investments. It is unlikely that the rigidity in the exchange rate can be sustained without some large adjustment within the investment horizon for PPP. Indeed, the probability that any large macroeconomic shock can hit the economy is much higher under long-term projects. Political risk is inherently greater, the longer the investment horizon.

Moral hazard is exacerbated by the lack of accumulated fiscal risk monitoring, as well poor coordination between government agencies implementing PPP. Moral hazard can also be exacerbated by investors and multilateral institutions that are overly enthusiastic about countries with rapid per capita income growth.

Measures of explicit government support and guarantees also tend to raise risk of failure. This provides additional evidence of moral hazard and adverse selection in projects, and is consistent with Woodhouse's (2006) analysis of anecdotal evidence from projects.

¹² Given the positive correlation between currency risk and political risk, it follows that a rigid exchange rate system also underestimates political risk.

All PPP projects, even those undertaken without government guarantees, come with a certain level of implicit and explicit fiscal risk. This is apparent from a number of nationalizations and unforeseen bailouts of PPP projects, and is confirmed by the regression results.¹³ That all PPP projects carry large fiscal risks with immediate impact, clearly demonstrates that countries face binding liquidity and fiscal capacity constraints with respect to PPP. The risk of project stress and failure also rises with an increase in the average short-term debt-to-exports ratio, as well as in the average fiscal deficit. The extent to which a sector's capacity is supplied by PPP also contributes to fiscal risk, as experiences with IPPs tend to demonstrate. These results suggest that some form of soft (or even hard) "PPP restraints" may be necessary, especially in fast-growing countries with problems in inter-agency coordination and information flow. These countries may have limited ability to coordinate agencies to support PPP or to monitor fiscal risk.

An increase in the number of PPP projects also tends to raise project stress. Since PPP requires some fiscal space and monitoring capability *ex ante*, the number of projects has profound implications on the fiscal sustainability of PPP in a country in general.

4.4.2 Variables That Tend to Lower the Failure Rate of PPP

Macroeconomic conditions (real growth and exchange rates) do not only influence project design and planning, they also have a profound impact on the operations phase of a project. As expected, average real per capita GDP growth in the six years prior to the terminal or current year is associated with lower project failure. This is intuitive, as high growth during the project operations phase raises demand (and revenues) for any PPP project. An appreciation in the average real exchange rate in the six years prior to the terminal or current year during the operations phase of a project also leads to favorable outcomes. This is likewise expected, given the high import content (and foreign debt leveraging) of PPP projects. Real appreciations make imported inputs cheaper, leading to reductions in debt servicing burdens.

Fiscal surpluses during the operations phase also lead to favorable project outcomes, as governments have the fiscal space to lend limited support to projects. A higher degree of trade openness likewise reduces the risk of project stress. This may be due to the fact that countries tend to strategically situate trade-supporting PPP (roads, seaports, airports, etc.) in a manner that mitigates demand risk (i.e., close to export zones). It could also be that efficiency-enhancing infrastructure is simply valued more in open economies.

Broadly-defined political risk includes executive-instigated tariff manipulation and tariff freezing. These appear to be within the capacity of existing political risk guarantee instruments (PRGs).¹⁴ Except for PRGs, no other instrument (loans, risk management services, or equity) from multilateral and bilateral financial institutions appears to be useful in mitigating stress. It is possible that providers of PRGs provide good advice, which is additional support apart from the PRG itself. Because of their benefits, PRGs should be more accessible to stakeholders. PRGs should be strengthened to address many of the issues identified here, such as other manifestations of political risk, like tariff-freezing. Given the pervasiveness of tariff freezing, the fact that PRGs are utilized by only 3% of the projects in the World Bank's PPI dataset implies that stakeholders grossly underestimate the value of PRGs (or some form of mis-targeting in PRGs occurs). It may also mean that PRGs are simply too expensive to purchase. An initial survey of PRGs being offered by private and public agencies, as well as multilaterals, suggests that many of the risks mentioned in this

¹³ However, not all nationalizations are necessarily unwelcome fiscal events, from the point of view of the country. In the non-PPP sphere, opportunistic resource-based expropriations made for strategic political purposes may be justified, if it sacrifices short-run fiscal costs in favor of perceived long-run revenues (e.g. Russia and Kazakhstan).

¹⁴ These measures are effectively creeping expropriation, and yet are not explicitly defined as such.

study may be currently eligible for PRG cover, but affordability is a major hindrance to enhancing demand.

The coefficient of the dummy for contracts transacted with federal governments (FEDCON) was significantly negative, implying that transactions with local governments were riskier. This confirms the earlier hypothesis concerning the advantages of contracting with higher levels of government.

Rate of return regulation lowers risk, suggesting that price cap regulation may be too inflexible during periods of crisis, leading to the demise of many projects. While achieving efficiency in project design and operations is desirable in the long-run, frequent price adjustments may be needed to respond to a crisis as it evolves. Here, the clash between trying to balance affordability and public and political acceptance and project viability is most intense. The best response under these circumstances appears to be orderly coordination and thorough workout of issues within and across projects, instead of outright confrontation between government and private developers.¹⁵ Subsequent mitigation should be held off until the situation normalizes.

Foreign direct investment (FDI) likewise reduces project risk, suggesting that the ability of foreign investors to raise capital and bring in technology helps projects. However, having foreign proponents can also increase project financing costs and risks, because (i) the required returns (to cover the cost of capital) are benchmarked in foreign currencies; and (ii) the capacity to manage domestic political and social risks is lower. This may be why Guasch (2004) found that renegotiations occur more often when FDI is involved in concessions. In addition, devaluations in the host country will have generally negative effects on foreign investors' balance sheets, even if there are bearable effects on demand and tariffs.¹⁶

4.5 Sectoral Analysis

PPP in the upstream power sector (distribution and transmission segments) as well as water treatment and sewerage and water utilities, seem to be associated with higher project failures. These segments tend to be more politicized than other sectors, and are therefore more vulnerable to political risk, tariff freezing, and subsequent failure.

Rehabilitation projects are associated with lower risks of failure, as are power generation (perhaps because of its sheer necessity), and seaports (because of the natural demand for seaports created by commerce and trade).

Relative to concessions, divestitures, and merchant projects, greenfield projects and management contracts are associated with higher failure rates. While coefficients for divestitures and merchant projects were not conclusive, the coefficients for concessions suggest favorable project outcomes in general.

The sectoral results suggest that, with some exceptions, upstream PPP and PPP situated in new markets are associated with higher failure rates.

¹⁵ Perhaps a good example of relatively orderly workouts during times of crisis is the treatment of PPP projects in Thailand during the Asian crisis. No tariffs were frozen, although many investors were forced to bear partial currency risks.

¹⁶ In Asia, devaluation risk for European investors is exacerbated by the pegging of domestic currencies to the US dollar. Thus, as the Euro has appreciated tremendously relative to the US dollar in recent years, the values of European PPP investments in Asia have been affected as well. This partly explains the fall of European PPP investments in Asia, as well as the pattern of European divestments out of projects in Asia (out of the water sector, in particular).

4.6 Results of Other Qualitative Analysis Conducted for this Study

A qualitative analysis¹⁷ of canceled and distressed projects suggests that firm-embodied traits explain a substantial amount of the observed outcomes in PPP. For example, the success of water concessions hinges greatly on the firm's ability to rapidly reduce system losses at the beginning of the concession period. This in turn depends on in-house management capacity, employee efficiency, innovative ability, and the overall quality of corporate governance—factors not captured by the empirical data. A firm's ability to innovate and increase efficiency and productivity (even if not necessarily subjected to price cap regulation) may also help temper pressures to raise prices. Thus, when designing policy for PPP, governments could concentrate on mechanisms that encourage the attainment of efficiency at the beginning of the operations phase, the most failure-prone part of the project cycle.

Important information can also be gleaned from those variables that were not significantly related to PPP project outcomes (or had perverse signs, such as the World Bank's governance indicators). The type of PPP, such as whether the project was structured as build-operate-transfer, or build-operate-own, did not affect project outcomes. Likewise, empirical results suggested that patterns of ownership and control preferences, such as the dummy variables for build-operate-transfer (BOT), build-operate-own (BOO), etc., were not significant.

4.7 Does the Quality of Governance Determine PPP Investment Outcome?

While the quality of country governance (as measured by the World Bank) can influence the pattern of PPP investment flows,¹⁸ this did not directly explain favorable PPP investment outcomes in the main empirical model. Interestingly enough, many of the stressed projects were located in countries with relatively high scores in governance criteria. When the World Bank's governance indicators were individually entered into second stage probit regressions, they yielded insignificant coefficients or coefficients with perverse signs (i.e., they raised failure rates). The positive correlation between good governance criteria—government effectiveness, control of corruption, political stability, and rule of law—and stress in PPP implies that a vastly different governance paradigm for PPP should be contemplated. Good governance in PPP includes having good macroeconomic policies to prevent shocks that may lead to adverse political decisions.

Nevertheless, governance indicators play an important role as instruments for the other endogenous variables in the empirical model. Of particular interest is the role governance plays in tariff freezes. Table 10 shows the results of a typical first stage regression for the tariff freeze variable (TARIFFRZ2). The results suggest that the probability of a tariff freeze is greater: (i) the lower the extent to which a nation's citizens can select their government, and enjoy freedom of association, the press, etc. (VOICE); (ii) the more vigorous the enforcement of rule of law (RULE); and (c) the greater the extent of corruption (CORRUPT). Other governance indicators such as regulatory quality (REGQUAL) and government effectiveness (GOVEFF) tended to perform perversely in the first and second stage regressions.

In addition, tariff freezes are more likely, the greater the number of projects implemented by the country.

¹⁷ Based on interviews and a review of existing literature.

¹⁸ Per the World Bank's governance criteria, well-governed countries tend to attract a lot of PPP investments.

**Table 10: First Stage Regression for TARIFFRZ2
(for the baseline regression equation 1 in Table 6)**

Variable	Coefficient	Variable	Coefficient
Constant	-0.003	CONPER	-0.005**
VOICE	-0.065**	STDRER6PRCLOS	0.0001
RULE	0.187**	NUM	0.00033**
CORRUPT	-0.242**	RPCGDPGR6CLOS	-0.005
POLSTAB	0.033	GUAR	0.216**
AVGRER6TRM	-0.003**	AVGSUR6TRM	0.005
GOVRISK	-0.036*	FDI	0.331**
FEDCON	0.051**		

** Means the coefficient is significant at the 5 percent level of significance.

* Means the coefficient is significant at the 10 percent level of significance.

4.8 Accounting For Other Aspects of Political Risk

When the other binary political risk variables, YRSFRZ (duration of tariff freeze during the investment horizon) and POLSTRESS2 (whether or not projects experienced a tariff freeze or had witnessed a renegotiation or tariff freeze within the first two years of a change in political leadership), replaced TARIFFRZ2 in the second stage regression, they yielded similar results. The significance of POLSTRESS2 implies that regime change can be a catalyst for project failure. This is significant, given that over half the projects in the PPI dataset were affected by renegotiations and tariff freezes occurring within the first few years of a regime change (see Table 11). A similar proportion of projects experienced regime change during their most vulnerable years (see Table 12).

Table 11: Regime Change and Stress in PPP¹⁹

	Did a stress event within the first two years of a regime change affect the project?	Did the second year of the project see a regime change?	Did the first year of the project see a regime change?
Number of projects affected	2,091	1,728	1,092
Proportion of total PPP	0.526	0.434	0.275

Table 12: Number of PPP Projects Experiencing Regime Change within the First Few Years of Operations

	Did the first five years of the project see a regime change?	Did the first three years of the project see a regime change?
Number of projects affected	1,986	1,859
Proportion of total PPP	0.499	0.467

The analysis further revealed that endogenous political risk is also associated with poor procurement systems, poorly managed state-owned utilities, and even poorly designed PPP contracts.

While countries can take steps to address endogenous political risks, political risks exogenous to the country cannot be controlled. In this regard, MFIs should monitor the regional and global economy and the regional and global geo-political environment to forestall the effects of such exogenous risks. The impact of exogenous risks can be

¹⁹ A stress event is defined as tariff freezing, or the renegotiation or cancellation of a contract.

mitigated by strengthening consultation during the design phase. Improving project approval and procurement systems would also be beneficial, as this would reduce the risk of subsequent project rejection or cancellation.

4.9 Comparison of Results with Findings in the Existing Literature

It is useful to contrast the results of this study with those of Guasch (2004) (Table 13). Note that results of the renegotiation study by Guasch holds for cancelled and distressed projects in general, with two important exceptions—governance quality and the existence of regulatory bodies matter for reducing renegotiations, but not as much for reducing failures.

Table 13: Significant Variables in Studies of Stress in PPP

Variable	Concession renegotiation study by Guasch (2004, for Latin America)	This study on distressed and canceled contracts (global data)
Dependent variable	Renegotiated or not Less severe condition; may later lead to distress and eventual cancellation	Canceled, distressed or not More severe condition; includes contracts that have undergone renegotiation
Method of price regulation (independent variable)	Price cap Imposes stricter conditions on proponent, but encourages efficiency	Rate of return (reduces rate of failure) Price caps may be too inflexible in times of crisis
FDI—nationality of investor (independent variable)	Significant FDI has higher costs of capital and required returns, given its ability to mitigate political risk	Significant FDI brings much needed capital (more important than expertise)
Governance quality (independent variable)	Significant; helps reduce renegotiation	Mostly perverse effect
Existence of regulatory body	Significant	Often bypassed during crises
Number of prior projects (independent variable)	Significant	Significant—contributes to tariff freezing
Electoral cycle (independent variable)	Significant	Significant

Source: Guasch (2004) and author's own calculations

5. POLICY IMPLICATIONS AND RECOMMENDATIONS

Although numerous public-private partnership (PPP) projects have undergone stern tests in terms of changes in government, tariff freezes and renegotiations, PPP remains resilient, alive, and well in many parts of the world. For the most part, governments have remained supportive of PPP. Project firms and governments have adapted in several ways to stress, including renegotiation and (unfortunately) early divestments.

However, PPP faces great peril in countries ravaged by crisis, or in countries trying to expand and improve infrastructure with the social goal of making them affordable. In these countries, broadly-defined political risk also tends to be highest. Political risk also tends to be high in countries where governments are sufficiently strong to dictate pricing for large infrastructure proponents.

One can explain recent investment trends in PPP in light of political risks. In Asia and Latin America, PPP has declined in recent years due to massive realized political risk stemming from successive macroeconomic crises exacerbated by poor project procurement and contracting systems. Thus, part of the strategy for stimulating PPP investment in the Asian region requires addressing fragilities in regional economies first. In this way, endogenous political risks can be mitigated, even in the absence of political risk insurance.

The recent increase in global PPP has been driven by a migration towards markets where perceived political risk is lower (or has not been realized). However, the recent surge in commodities prices and the global financial crisis threaten to reverse this trend, especially in areas where PPP is already fragile. As such, early-warning indicators of increased political risk must include price and macroeconomic shocks (both domestic and global), large payments imbalances, sizeable fiscal deficits, and discrete currency devaluations. The extent of political risk in PPP also suggests that countries should undergo a period of thorough preparation for PPP, with all its possible concomitant economic and political consequences. This is particularly essential for countries which have a long tradition of price controls on utilities or other essential public services.

The gap between pre-privatization tariffs and cost recovery tariffs may be positively related to potential political risk in PPP, and may be a binding constraint to investment in PPP. Multilateral financial institutions (MFIs) should be very careful about their encouragement of PPPs, as project failure often produces negative externalities that can affect other investments, the country, and indeed the MFI itself. Well-designed pricing mechanisms can cushion the effects of privatization on the most vulnerable, while reducing the risk of tariff freezing and political risk. Some countries, notably in Latin America, can benefit from well-designed targeted subsidy mechanisms in order to reconcile cost recovery objectives with social protection concerns (Foster and Yepes 2006).

The analysis of endogenous political risk has yielded an important lesson: the best way to reduce political risk is to properly manage the macroeconomy. Since political risk is correlated with prior realizations of currency and demand risk, good macroeconomic management would probably reduce political risk exponentially; it would lower the probability of sudden and discrete changes in demand, exchange rates, and inflation—the costs of which could be passed onto consumers (or firms, depending on the government's disposition). Good global and regional macroeconomic management would prevent or mitigate external shocks from affecting the sustainability of PPP.

Although political risk is pervasive in PPP, the fact that many projects have managed to survive (even in instances of macroeconomic instability) speaks volumes about the ability of firms and investors to cope (even without political risk guarantees from MFIs). Therefore, a deeper review of the best practices could be undertaken. Based on the results of the qualitative analysis, it appears critical for project firms to develop quick and innovative methods for enhancing efficiency and productivity²⁰. This could temper the need for large and continuous changes in tariffs, thus also reducing political risk.

For better or for worse, the following general factors have the biggest impacts on PPP outcomes: pricing and regulation; type of government (federal or local); openness to trade; market growth and macroeconomic conditions; moral hazard and adverse selection; and

²⁰ This is especially important for those firms operating concessions, since they are in direct contact with consumers.

capacity constraints. Investment environments most conducive to sustainable PPP are those where:

- a) there is a supportive civic and political attitude towards privatization;
- b) reforms and privatization are done gradually and deliberately, but with enough flexibility to allow for quick and unequivocal policy adjustments, when and where they are needed;
- c) the finance ministry is deeply involved in the process to strengthen screening and provide proper incentives for project monitoring;
- d) the government, investors, and customers are able to form realistic expectations of PPP;
- e) there is good macro-prudential economic policy, coupled with flexible exchange rates that serve as a transparent component of the tariff;
- f) investor and government executives refrain from acting opportunistically;
- g) firms that are contracted have competent and innovative management and employees, to temper costs and enhance efficiency and productivity;
- h) government executives refrain from using their discretionary powers to make sweeping changes in the business, tariff, and legal environment;
- i) all stakeholders refrain from acting opportunistically, and are aware of the consequences of doing so;
- j) proper pricing policies and realistic subsidy schemes are developed for PPP, since political risk may be positively correlated with mean prevailing tariffs and cost recovery tariffs;
- k) price cap regulation can adapt quickly enough to changing crisis situations;
- l) the economy is oriented towards trade as much as possible;
- m) procurement and proponent selection is performed transparently and following a rigorous criteria, especially during periods of high growth;
- n) policies are designed to help investors achieve peak efficiency and productivity as soon as operations commence;
- o) projects are designed and planned with sufficient public consultation and with adequate transparency;
- p) contracting is done with the federal instead of local governments;
- q) well-designed and well-targeted political risk guarantees are made available and provided by agencies that are capable of providing good advice to strengthen the project;
- r) renegotiation is available as an option, but is used discriminately;
- s) there is some restraint to fiscal risk bearing and to the number and size of PPP investments;
- t) there are less fiscal liquidity constraints;
- u) there are institutions to monitor systemic risks in the country's entire PPP portfolio and off-taking institutions (to be able to anticipate where price shocks might arise), and there is transparency in reporting fiscal and other risks;
- v) the ministry of finance plays a strong role in monitoring and regulating both systemic and project-specific risks;
- w) investors are encouraged to perform thorough project design and planning;
- x) domestic financing is available, to reduce not only currency risk, but also political risk;
- y) geo-political conditions are favorable, and there is a low risk that the infrastructure service will be expropriated for strategic political reasons; and
- z) divestment is available as an option, especially since investment horizons have shortened.

Controlling for all other factors, moderate but stable growth provides better conditions for project designers, operators, and governments to make realistic demand projections. Thus, project design is best performed assuming moderate economic conditions, with an eye towards worst-case scenarios. High growth countries are more likely to experience adverse selection and moral hazard in project design, procurement, and contracting. Thus, governments in high growth economies would find it in their best interests to strengthen screening procedures; project developers, on the other hand, would do well to strengthen

due diligence. Slower growth automatically imposes discipline on the project cycle, and may therefore occasion a relaxation in standards (but not by much).

Given the nature of the risks involved, and the negative demonstration effects of project failure, there also needs to be a proper sequencing of activities to prepare the country for PPP. While macro stability should be the most fundamental step, subsequent activities could include educating citizens, politicians, and policymakers regarding PPP, and establishing the centrality of the ministry of finance in the process of approving, regulating, and monitoring PPP. There must be greater transparency in monitoring contracts, implementing projects, as well as determining systemic and project-specific risks. Proper intra-government coordination is crucial in this regard.

A culture of price controls may be detrimental to PPP, even if the country is growing rapidly. This is especially true since investment horizons have shortened. Experience has shown that strict tariff controls and tariff freezes lead to deterioration in supply, which in turn lead to shortages (or blackouts in the case of power). Thus, tariff freezes in a rapidly growing economy will cause more acute shortages than in a slower-growing one.

PPP tends to thrive better in environments that have more flexible tariffs and exchange rates. Not only does flexibility reduce moral hazard in project design, it also prepares politicians and the general public for the possibility of tariff adjustments. Where there is a huge difference between state-controlled prices and market tariffs, some pre-privatization market reforms could be implemented to push prices closer to market levels—but only if the country is prepared to make that transition. Proper transition pricing issues should be studied, to minimize political risk.

The political nature of risks suggests that domestic investors may hold inherent advantages over foreign firms in PPP. This highlights a very important synergy between foreign and domestic investors: while the former can help bring in capital, the latter can help mitigate political risks. Efforts should be made to strengthen domestic investors and augment their resources (for example, by offering more political risk guarantees to domestic financial institutions).

Even after controlling for other factors that make open economies good investment destinations, openness to trade still emerges as a significant determinant of favorable project outcomes. This is probably due to the complementarity between trade and infrastructure. Thus, PPP works best when it supports commerce and trade (as commerce and trade create a natural demand for infrastructure). Openness to trade also tends to insulate PPP investments from uncertainties facing domestic markets.

Project outcomes depend greatly on firm-specific traits, such as the quality of management and personnel. The ability to innovate is particularly important, especially in sectors where achieving short-run efficiency (i.e., achieving rapid reductions in system losses, or improving customer service) is key to sustaining investment and keeping price pressures in check (such as in water supply and electric distribution concessions). The ability to innovate would also improve collection and reduce temptations for theft and illegal connections. Innate firm capability matters as well, as this could help create efficiencies that could keep prices in check and increase public acceptance of the project, thereby lowering political risk. As such, project firms should not only be selected on the basis of price, but on basis of their innate capabilities as well.

Achieving efficiency early in the life of a project is key to keeping tariff pressures in check. Thus, regulation must be responsive to efficiency considerations. The empirical results suggest that rate of return regulation prevent stress better than price cap regulation. At the very least, countries currently implementing price cap regimes should consider switching to hybrid systems of price regulation, with elements of both price cap and rate of return regulation.

While the empirical results suggest that MFI equity, loans, and risk management services do not significantly affect project outcomes, political risk guarantees (PRGs) seem to have a positive impact. This may be due to the quality of advice given by PRG providers, which is support additional to the PRG itself. Because of their benefits, PRGs should be more accessible to stakeholders. The application of PRGs could also be broadened; PRGs could be offered to stimulate PPP investment and financing from domestic markets and financial institutions. While PRGs may perhaps raise costs in the short-run, they could be used in combination with MFI loans or equity. Unfortunately, despite their obvious benefits, PRGs are not widely utilized. This implies that stakeholders grossly underestimate the value of PRGs (or perhaps some form of PRG mis-targeting occurs). It may also imply that PRGs are simply too expensive to purchase. Whatever the reason, it does seem like multilaterals need to (i) examine PRGs more closely; (ii) market them more effectively; (iii) re-engineer them to apply to a broader set of circumstances; (iv) calibrate their pricing and adjust such pricing for risk while minimizing incentive problems in PPP; and (v) adapt them to recent changes in the global, regional, and domestic investment environment and making them supportive of domestic capital market development.

Since the empirical work in this study allows one to discriminate between more and less risky PPP environments, it is conceivable that PRG providers can use the analysis in this study to develop more finely calibrated risk-adjusted pricing strategies, making PRGs more affordable in countries where, for example, macroeconomic risks are low, so that the risk of tariff-freezing is also low. Guarantee premia can then be adjusted to reflect changes in economic and political environments in discrete time periods. The robustness of the beneficial effects of PRGs cannot be ignored. While PRGs may raise costs to the proponent in the short-run, they could be used on their own, or in combination with MFI loans or equity (interacting PRG with loans and equity in regressions produced favorable results).

Broad political risk can also be mitigated by strengthening or reforming political and executive institutions to reduce opportunism. Multilateral institutions can help reduce risk by providing better education for government executives and politicians regarding PPP, and by surveying politicians about their views regarding PPP. The decision to implement PPP is itself a political decision. Therefore, the views of politicians are crucial. Proper project planning should take into account mechanisms, practices, and policies affecting economic and political decision-making in the economy. Signs of past opportunism should be noted.

Countries wishing to expand their portfolio of PPP projects must be prepared to improve macroeconomic management, absorb additional explicit and implicit fiscal risks, and strengthen political and executive institutions involved in the project cycle. PPP projects cannot survive a static government environment, much less an environment that simply looks at PPP as a tool for relieving budget constraints.

What creates negative outcomes in PPP, political risk, is also what discourages investment. The recent decline in PPP in Asia and Latin America is a reflection of realized political risks. PPP governance starts with improving long-run macroeconomic governance; but it also involves strengthening firm and government decision-making processes for project screening and development, as well as regulation and pricing. PPP is a complicated activity; to reduce political risk, it is essential to have not only capable, well-informed, and credible political leaders, but also a strong and well-educated bureaucracy that is able to understand and manage PPP risk; promote political stability; and create a consultative environment. Attention also needs to be given to adequate contingency planning for PPP, especially in response to crisis. Reforms along these lines therefore need to be implemented, to ensure the long-run viability of PPP.

Finally, it is clear that accelerating the development of long-term domestic capital markets is a critical element of a long-term privatization and PPP strategy. This is especially crucial for domestic investors. This is easier said than done, however. The instability of PPP contracts implies that the real assets used to generate revenues to pay off bond and equity owners are

themselves highly uncertain, limiting demand for such securities. Long-term capital market development may thus itself be endogenous to political risk. With such unstable contracts, securities markets backed by cash flows from PPP projects may also be undermined. Fundamental reforms need to occur: macroeconomic stabilization, fortification of the bureaucracy, and the creation of mechanisms for decision-making, especially with respect to project planning and tariff management.

APPENDIX A: VARIABLES USED IN REGRESSION ANALYSIS

Dependent variables

- 1) Has the private investor exited (cancellation) or considered exiting (distress) the project? FAIL (discrete)—1 if the project is listed in the PPI database as being “distressed” or “canceled,” 0 otherwise. Source: World Bank’s PPI database.

Independent variables

Regulation

- 1) What is the actual or perceived degree of regulatory independence? INDEPREG (discrete)—1 if the sector is perceived as not having an independent regulator, 0 otherwise. Sources: Singh (2005, 2007), Kennedy (2003), and CUTS (2006).
- 2) Was the project subject to price cap regulation? PRICECAP (discrete)—1 if yes, 0 otherwise. Sources: Singh (2005, 2007), Kennedy (2003), and CUTS (2006).
- 3) Was the project subject to rate of return regulation? ROR (discrete)—1 if yes, 0 otherwise. Sources: Singh (2005, 2007), Kennedy (2003), and CUTS (2006).
- 4) Was contract award based on lowest tariff bid?²¹ LOWPRICE (discrete)—1 if the basis for awarding the contract was the lowest price offered. Source: World Bank PPI database, augmented by data gathered by the author from Singh (2007) and various reports available from the web.
- 5) Was contract award based on highest payment?²² HIGHPRICE (discrete)—1 if the basis for awarding the contract was the highest price offered. Source: World Bank PPI database, augmented by data gathered from by the author from Singh (2007) various reports available from the web.

Tariff/Political

- 1) Did the project go through a period in which a tariff freeze was imposed by government executives? TARIFFRZ2 (discrete)—1 yes, 0 otherwise. Source: Author’s review of individual country experiences, from newspaper reports and existing literature.
- 2) Did the project go through a period in which a tariff freeze was imposed by government executives, along with convertibility restrictions? TARIFFRZ3 (discrete)—1 if the project scores a 1 in the variable TARIFFRZ2 above, and there was evidence of other government actions undermining tariffs (such as suspension of convertibility, etc.), 0 otherwise. Source: Author’s review of individual country experiences, from newspaper reports and existing literature.
- 3) Duration of tariff freeze during the investment horizon. YRSFRZ (discrete). Source: Author’s review of individual country experiences, from newspaper reports and existing literature.

²¹ Although data from the PPI dataset were thin, they were nonetheless used in the regressions.

²² See previous footnote.

- 4) Did the project go through a period in which its tariff was frozen, or there was some other stress event within the first two years after a change in political leadership? POLSTRESS2 (discrete)—1 if yes, 0 otherwise. Source: Author’s review of individual country experiences, and information on political regime change, from the POLITY IV dataset from Marshall and Jaggers (2007) and Gasiorowski (1996).

The tariff variables developed for this study (TARIFFRZ2, TARIFFRZ3, YRSFRZ, and POLSTRESS2) are proxies for political risk. They capture various political motives, ranging from the desire to insulate the public from macroeconomic shocks (at the expense of the firm), to the desire to gain favorable approval ratings. Unlike tariff freezes imposed by independent regulators, which tend to cover only a subset of sectors, sweeping tariff freezes imposed by government executives tend to have more systemic effects. At the same time, since government executives have other discretionary powers (such as suspending convertibility, or canceling/renegotiating/expropriating a project) broadly defined political risk can be the key determinant of outcomes in PPP projects.

Legal and institutional framework

- 1) Rule of law: the extent to which agents have confidence in and abide by the rules of society; includes the quality of contract enforcement and property rights, the police, and the courts, as well as the likelihood of crime and violence: RULE (continuous)—country’s average annual score for this criterion in the World Bank’s governance indicators.
- 2) Government effectiveness: the quality of public services; the capacity of the civil service and its independence from political pressures; and the quality of policy formulation. GOVEFF (continuous)—country’s average annual score for this criterion in the World Bank’s governance indicators.
- 3) Control of corruption: the extent to which power is exercised for private gain; includes both petty and grand forms of corruption, as well as “capture” of the state by elites and private interests: CORRUPT (continuous)—country’s average annual score for this criterion in the World Bank’s governance indicators.
- 4) Political stability: the likelihood that the government will be destabilized through unconstitutional or violent means, including terrorism: POLSTAB (continuous)—country’s average annual score for this criterion in the World Bank’s governance indicators.
- 5) Regulatory quality: the ability of the government to provide sound policies and regulations that enable and promote private sector development: REGQUAL (continuous)—country’s average annual score for this criterion in the World Bank’s governance indicators.
- 6) Voice and accountability: the extent to which a country’s citizens are able to participate in selecting their government; includes freedom of expression, freedom of association, and a free media: VOICE (continuous)—country’s average annual score for this criterion in the World Bank’s governance indicators.

Macroeconomic–economic conditions during the operations phase

Most of the macroeconomic data comes from the International Monetary Fund’s International Financial Indicators (IFS)

- 1) Average rate of real per capita GDP growth in the last 6 years prior to current period, or prior to cancellation or conclusion of project (continuous)—this is a proxy for capacity to pay: AVGPCGR6TRM.

- 2) Average change in real exchange rate in the last 6 years prior to current period, or prior to cancellation or conclusion of project (continuous): AVGRER6TRM.
- 3) Average standard deviation of real exchange rate in the last 6 years prior to current period, or prior to cancellation or conclusion of project (continuous): AVGSTDRER6TRM.
- 4) Average inflation rate in the last 6 years prior to current period, or prior to cancellation or conclusion of project (continuous): AVGINF6TRM.
- 5) Average of the ratio of total exports plus imports divided by gross domestic product in the last 6 years prior to current period, or prior to cancellation or conclusion of project (continuous): OPEN6TRM.

Project design phase

Economic conditions during project design phase

- 1) Average rate of real per capita GDP growth in the last 6 years prior to financial closure (continuous): RPCGDPGR6PRCLOS. Source: IFS.
- 2) Average standard deviation of real exchange rate in the last 6 years prior to financial closure (continuous): STDRER6PRCLOS. Source: IFS.

Structure of transaction

- 1) Type of transaction (discrete)—The following variables are binary in nature; 1 if the condition is present, 0 otherwise. Source: World Bank's PPI database.
 - a) Management contract (MGTCON)
 - b) Concession (CONCESS)
 - c) Divestiture (DIVEST)—Full (FULL) or Partial (PARTIAL)
 - d) Greenfield (GREEN)
 - e) Merchant (MERCH)
- 2) Type of PPI (discrete)—The following variables are binary in nature; 1 if the condition is present, 0 otherwise. Source: World Bank's PPI database.
 - f) BOT (BOT)
 - b) BOO (BOO)
- 3) Was the infrastructure built by the proponent? BUILD (discrete, 1 or 0). Source: World Bank's PPI database.
- 4) Was the infrastructure owned by the proponent? OWN (discrete, 1 or 0). Source: World Bank's PPI database.
- 5) Was rehabilitation involved? REHAB (discrete, 1 or 0). Source: World Bank's PPI database.
- 6) Contract period: CONPER (continuous). Source: World Bank's PPI database.
- 7) Value of investment (continuous)—INVST (continuous, investment in physical assets) and TINVST (continuous, total investment). Source: World Bank's PPI database.
- 8) Value of investment to GDP ratio—INVST2GDP (continuous). Sources: World Bank's PPI database and IFS

Multilateral or bilateral support

- 1) Loan: LOAN (discrete)—1 if the project received a loan from multilateral financial agencies (MFIs), 0 otherwise. Source: World Bank PPI database.
- 2) Political risk guarantee: GUAR (discrete)—1 if the project received a political risk guarantee from MFIs, 0 otherwise. Source: World Bank PPI database.
- 3) Equity: EQUITY (discrete)—1 if the project received equity from MFIs, 0 otherwise. Source: World Bank PPI database.
- 4) Risk management: RISK (discrete)—1 if the project received financial risk management services from MFIs, 0 otherwise. Source: World Bank PPI database.
- 5) Cumulative support: CUMSUP2 (continuous)—total amount of support from MFIs. Source: World Bank PPI database.
- 6) No assistance from MFIs: NOASSIST (discrete)—1 if the project did not receive assistance from MFIs, 0 otherwise. Source: World Bank PPI database.

Contract

- 1) Government fiscal support: GOVRISK (discrete)—1 if the project benefited from some form of risk absorption by government, 0 otherwise. Source: World Bank's PPI database. The glossary of the World Bank's PPI database lists primarily greenfield projects as receiving explicit forms of guarantees (the exception being merchant facilities). This includes projects designed as build-lease-transfer (BLT), build-operate-transfer (BOT), build-operate-own (BOO), and projects wherein governments rent facilities from private investors.
- 2) Contracted with federal or local government? FEDCON (discrete)—1 if the project was contracted by the federal government, 0 otherwise. Source: World Bank's PPI database.

Nationality

- 1) Foreign investor involvement: FDI (discrete)—1 if there was foreign investor involvement in the project, 0 otherwise. Source: World Bank's PPI database.

Country's fiscal capacity

- 1) Average fiscal position (cash surplus or deficit) in the last 6 years prior to current period, or prior to cancellation or conclusion of project: AVGSUR6TRM (continuous). Source: IFS.
- 2) Number of projects supported by the country since start of data collected: NUM (discrete). Source: World Bank's PPI database.
- 3) Number of years since the first recorded PPP project in the country: TIMEPER (discrete). Source: World Bank's PPI database.
- 4) Short-term debt to exports ratio: SHORTDEBTEX (continuous). Source: IFS.
- 5) Absolute number of IPPs: IPPS (discrete). Source: World Bank's PPI database.

Sectoral dummies (The primary source of data is the World Bank's PPI database)

Primary sector dummies—ENERGY, WATER, TELECOM, TRANSPORT

Sub-sector dummies—ELECSUB (electricity), GENER (generation), DISTRIB (distribution), TRANS (transmission), NATGASUB (natural gas)

Water and sewerage dummies—UTILITY, TREAT (treatment and sewerage)

Telecoms dummies—FIXDACC (fixed access), MOBILE

Transport dummies—HIGHWY (highway), ROADS (toll roads), SEAPORT, AIRPORT, RAIL

Regional dummies—these are regional groupings based on the World Bank's PPI database. Latin America and the Caribbean (LATAM), East Asia and the Pacific (EASIA), South Asia (SASIA), Eastern Europe and Central Asia except Russia (EUROCNORUS), Europe and Central Asia (EUROCASIA), Middle East and North Africa (MENA), Sub-Saharan Africa (AFRICA)

Others—Size of population: POP6TRM. Source: IFS

APPENDIX B: STATISTICS FOR SELECTED VARIABLES

Table A.1: Canceled projects

Country	Total projects by country	Number canceled	Total projects by country
Afghanistan	6	0	0.00%
Albania	11	4	36.36%
Algeria	16	0	0.00%
American Samoa	1	0	0.00%
Angola	5	0	0.00%
Argentina	191	38	19.90%
Armenia	10	0	0.00%
Azerbaijan	8	3	37.50%
Bangladesh	20	0	0.00%
Barbados	5	0	0.00%
Belarus	4	0	0.00%
Belize	6	3	50.00%
Benin	5	1	20.00%
Bhutan	1	0	0.00%
Bolivia	27	3	11.11%
Bosnia and Herzegovina	5	0	0.00%
Botswana	2	0	0.00%
Brazil	323	13	4.02%
Bulgaria	22	0	0.00%
Burkina Faso	5	0	0.00%
Burundi	3	0	0.00%
Cote d'Ivoire	13	1	7.69%
Cambodia	18	0	0.00%
Cameroon	7	0	0.00%
Cape Verde	2	0	0.00%
Central African Republic	3	1	33.33%
Chad	4	2	50.00%
Chile	128	2	1.56%
China, People's Republic of	727	36	4.95%
Colombia	127	7	5.51%
Comoros	2	1	50.00%
Congo, Democratic Republic of	8	1	12.50%
Congo, Republic of	6	2	33.33%
Costa Rica	27	1	3.70%
Croatia	12	1	8.33%
Cuba	6	0	0.00%
Czech Republic	67	0	0.00%
Djibouti	4	0	0.00%
Dominica	3	0	0.00%
Dominican Republic	21	7	33.33%

Country	Total projects by country	Number canceled	Total projects by country
Ecuador	27	3	11.11%
Egypt, Arab Republic of	21	0	0.00%
El Salvador	16	0	0.00%
Equatorial Guinea	3	0	0.00%
Eritrea	1	0	0.00%
Estonia	13	1	7.69%
Fiji Islands	2	0	0.00%
Gabon	9	1	11.11%
Gambia, The	4	1	25.00%
Georgia	18	0	0.00%
Ghana	14	3	21.43%
Grenada	3	0	0.00%
Guatemala	24	0	0.00%
Guinea	7	1	14.29%
Guinea-Bissau	3	0	0.00%
Guyana	4	1	25.00%
Haiti	6	1	16.67%
Honduras	10	0	0.00%
Hungary	58	2	3.45%
India	239	4	1.67%
Indonesia	83	11	13.25%
Iran, Islamic Republic of	7	0	0.00%
Iraq	3	0	0.00%
Jamaica	11	0	0.00%
Jordan	9	1	11.11%
Kazakhstan	31	2	6.45%
Kenya	15	1	6.67%
Kiribati	2	1	50.00%
Kyrgyz Republic	6	0	0.00%
Lao PDR	8	1	12.50%
Latvia	9	0	0.00%
Lebanon	7	3	42.86%
Lesotho	3	0	0.00%
Liberia	4	0	0.00%
Lithuania	10	1	10.00%
Macedonia, FYR	3	0	0.00%
Madagascar	9	1	11.11%
Malawi	6	1	16.67%
Malaysia	104	7	6.73%
Maldives	2	0	0.00%
Mali	4	1	25.00%
Mauritania	2	0	0.00%
Mauritius	12	0	0.00%
Mexico	167	21	12.57%

Country	Total projects by country	Number canceled	Total projects by country
Moldova	6	0	0.00%
Mongolia	3	0	0.00%
Montenegro	1	0	0.00%
Morocco	13	0	0.00%
Mozambique	15	0	0.00%
Myanmar	3	0	0.00%
Namibia	4	1	25.00%
Nepal	8	0	0.00%
Nicaragua	10	2	20.00%
Niger	4	0	0.00%
Nigeria	47	2	4.26%
Oman	14	0	0.00%
Pakistan	41	0	0.00%
Panama	17	0	0.00%
Papua New Guinea	2	0	0.00%
Paraguay	5	0	0.00%
Peru	50	5	10.00%
Philippines	84	5	5.95%
Poland	49	0	0.00%
Romania	21	0	0.00%
Russian Federation	294	1	0.34%
Rwanda	4	1	25.00%
Sao Tome and Principe	3	0	0.00%
Samoa	1	0	0.00%
Senegal	9	1	11.11%
Serbia and Montenegro	7	1	14.29%
Seychelles	3	0	0.00%
Sierra Leone	4	0	0.00%
Slovak Republic	13	0	0.00%
Solomon Islands	1	0	0.00%
Somalia	7	0	0.00%
South Africa	36	2	5.56%
Sri Lanka	22	0	0.00%
St. Kitts and Nevis	2	0	0.00%
St. Lucia	2	0	0.00%
St. Vincent and the Grenadines	1	0	0.00%
Sudan	7	0	0.00%
Swaziland	1	0	0.00%
Syrian Arab Republic	3	0	0.00%
Tajikistan	6	0	0.00%
Tanzania	20	2	10.00%
Thailand	100	3	3.00%
Timor-Leste	1	0	0.00%
Togo	6	1	16.67%

Country	Total projects by country	Number canceled	Total projects by country
Tonga	2	0	0.00%
Trinidad and Tobago	6	1	16.67%
Tunisia	6	0	0.00%
Turkey	37	3	8.11%
Turkmenistan	1	0	0.00%
Uganda	12	0	0.00%
Ukraine	21	2	9.52%
Uruguay	13	3	23.08%
Uzbekistan	8	2	25.00%
Vanuatu	2	0	0.00%
Venezuela, RB	18	4	22.22%
Viet Nam	17	1	5.88%
West Bank and Gaza	5	1	20.00%
Yemen, Republic of	8	1	12.50%
Zambia	6	0	0.00%
Zimbabwe	5	0	0.00%
Total	3977	242	

Table A.2: Countries ranked by percentage of projects in PPI dataset experiencing stress

Rank	Country	Percent canceled	Estimated percentage canceled, distressed, or renegotiated contracts	Number of projects
1	Argentina	19.90%	98.43%	191
2	China, People's Republic of	4.95%	74.97%	727
3	Venezuela, RB	22.22%	72.22%	18
4	Dominican Republic	33.33%	61.90%	21
5	Nicaragua	20.00%	60.00%	10
6	Pakistan	0.00%	58.54%	41
7	Philippines	5.95%	58.33%	84
8	Chad	50.00%	50.00%	4
9	Comoros	50.00%	50.00%	2
10	Kiribati	50.00%	50.00%	2
11	Lebanon	42.86%	42.86%	7
12	Honduras	0.00%	40.00%	10
13	Azerbaijan	37.50%	37.50%	8
14	Albania	36.36%	36.36%	11
15	Indonesia	13.25%	34.94%	83
16	India	1.67%	33.47%	239
17	Belize	50.00%	33.33%	6
18	Congo, Republic of	33.33%	33.33%	6
19	Central African Republic	33.33%	33.33%	3
20	Trinidad and Tobago	16.67%	33.33%	6
21	Mexico	12.57%	32.34%	167
22	Malaysia	6.73%	28.85%	104
23	Uzbekistan	25.00%	25.00%	8
24	Guyana	25.00%	25.00%	4
25	Namibia	25.00%	25.00%	4
26	Rwanda	25.00%	25.00%	4
27	Ghana	21.43%	21.43%	14
28	Benin	20.00%	20.00%	5
29	West Bank and Gaza	20.00%	20.00%	5
30	Bolivia	11.11%	18.52%	27
31	Peru	10.00%	18.00%	50
32	Malawi	16.67%	16.67%	6
33	Togo	16.67%	16.67%	6
34	Brazil	4.02%	16.41%	323
35	Uruguay	23.08%	15.38%	13
36	Tanzania	10.00%	15.00%	20
37	Colombia	5.51%	14.96%	127
38	Guinea	14.29%	14.29%	7
39	Serbia and Montenegro	14.29%	14.29%	7
40	Cameroon	0.00%	14.29%	7
41	Congo, Democratic Republic of	12.50%	12.50%	8
42	Lao PDR	12.50%	12.50%	8
43	Yemen, Republic of	12.50%	12.50%	8
44	Guatemala	0.00%	12.50%	24
45	Gabon	11.11%	11.11%	9
46	Jordan	11.11%	11.11%	9
47	Madagascar	11.11%	11.11%	9

48	Senegal	11.11%	11.11%	9
49	Lithuania	10.00%	10.00%	10
50	Ukraine	9.52%	9.52%	21
51	South Africa	5.56%	8.33%	36
52	Thailand	3.00%	8.00%	100
53	Cote d'Ivoire	7.69%	7.69%	13
54	Estonia	7.69%	7.69%	13
55	Ecuador	11.11%	7.41%	27
56	Kenya	6.67%	6.67%	15
57	Viet Nam	5.88%	5.88%	17
58	Nigeria	4.26%	4.26%	47
59	Hungary	3.45%	3.45%	58
60	Kazakhstan	6.45%	3.23%	31
61	Turkey	8.11%	2.70%	37
62	Chile	1.56%	2.34%	128
63	Poland	0.00%	2.04%	49
64	Russian Federation	0.34%	0.34%	294
65	Gambia, The	25.00%	0.00%	4
66	Mali	25.00%	0.00%	4
67	Haiti	16.67%	0.00%	6
68	Croatia	8.33%	0.00%	12
69	Costa Rica	3.70%	0.00%	27
70	Czech Republic	0.00%	0.00%	67
71	Bulgaria	0.00%	0.00%	22
72	Sri Lanka	0.00%	0.00%	22
73	Egypt, Arab Republic of	0.00%	0.00%	21
74	Romania	0.00%	0.00%	21
75	Bangladesh	0.00%	0.00%	20
76	Cambodia	0.00%	0.00%	18
77	Georgia	0.00%	0.00%	18
78	Panama	0.00%	0.00%	17
79	Algeria	0.00%	0.00%	16
80	El Salvador	0.00%	0.00%	16
81	Mozambique	0.00%	0.00%	15
82	Oman	0.00%	0.00%	14
83	Morocco	0.00%	0.00%	13
84	Slovak Republic	0.00%	0.00%	13
85	Mauritius	0.00%	0.00%	12
86	Uganda	0.00%	0.00%	12
87	Jamaica	0.00%	0.00%	11
88	Armenia	0.00%	0.00%	10
89	Latvia	0.00%	0.00%	9
90	Nepal	0.00%	0.00%	8
91	Iran, Islamic Republic	0.00%	0.00%	7
92	Somalia	0.00%	0.00%	7
93	Sudan	0.00%	0.00%	7
94	Afghanistan	0.00%	0.00%	6
95	Cuba	0.00%	0.00%	6
96	Kyrgyz Republic	0.00%	0.00%	6
97	Moldova	0.00%	0.00%	6
98	Tajikistan	0.00%	0.00%	6
99	Tunisia	0.00%	0.00%	6

100	Zambia	0.00%	0.00%	6
101	Angola	0.00%	0.00%	5
102	Barbados	0.00%	0.00%	5
103	Bosnia and Herzegovina	0.00%	0.00%	5
104	Burkina Faso	0.00%	0.00%	5
105	Paraguay	0.00%	0.00%	5
106	Zimbabwe	0.00%	0.00%	5
107	Belarus	0.00%	0.00%	4
108	Djibouti	0.00%	0.00%	4
109	Liberia	0.00%	0.00%	4
110	Niger	0.00%	0.00%	4
111	Sierra Leone	0.00%	0.00%	4
112	Burundi	0.00%	0.00%	3
113	Dominica	0.00%	0.00%	3
114	Equatorial Guinea	0.00%	0.00%	3
115	Grenada	0.00%	0.00%	3
116	Guinea-Bissau	0.00%	0.00%	3
117	Iraq	0.00%	0.00%	3
118	Lesotho	0.00%	0.00%	3
119	Macedonia, FYR	0.00%	0.00%	3
120	Mongolia	0.00%	0.00%	3
121	Myanmar	0.00%	0.00%	3
122	Sao Tome and Principe	0.00%	0.00%	3
123	Seychelles	0.00%	0.00%	3
124	Syrian Arab Republic	0.00%	0.00%	3
125	Botswana	0.00%	0.00%	2
126	Cape Verde	0.00%	0.00%	2
127	Fiji Islands	0.00%	0.00%	2
128	Maldives	0.00%	0.00%	2
129	Mauritania	0.00%	0.00%	2
130	Papua New Guinea	0.00%	0.00%	2
131	St. Kitts and Nevis	0.00%	0.00%	2
132	St. Lucia	0.00%	0.00%	2
133	Tonga	0.00%	0.00%	2
134	Vanuatu	0.00%	0.00%	2
135	American Samoa	0.00%	0.00%	1
136	Bhutan	0.00%	0.00%	1
137	Eritrea	0.00%	0.00%	1
138	Montenegro	0.00%	0.00%	1
139	Samoa	0.00%	0.00%	1
140	Solomon Islands	0.00%	0.00%	1
141	St. Vincent and the Grenadines	0.00%	0.00%	1
142	Swaziland	0.00%	0.00%	1
143	Timor-Leste	0.00%	0.00%	1
144	Turkmenistan	0.00%	0.00%	1

Table A.3: Statistics for selected variables

Percent annual change in real exchange rate	average of last 6 years	standard deviation of last 6 years	standard deviation of average of last 6 years
Afghanistan	n/a	n/a	n/a
Albania	-7.30	19.33	15.39
Algeria	-21.39	14.37	16.93
Angola	-817.59	861.74	705.51
Argentina	-329.50	448.67	483.54
Armenia	-109.63	255.63	310.11
Australia	-0.44	8.22	3.55
Austria	4.69	10.55	5.12
Azerbaijan, Republic of	-38.52	72.25	83.37
Bahamas, The	0.13	1.32	0.89
Bahrain, Kingdom of	2.56	1.44	0.94
Bangladesh	-6.47	2.92	0.94
Barbados	0.10	2.16	0.50
Belarus	-108.82	92.63	61.28
Belgium	5.02	10.91	4.75
Belize	0.95	1.77	0.75
Benin	-3.89	13.75	9.28
Bhutan	-11.81	6.91	6.21
Bolivia	-128.98	277.96	480.04
Botswana	-12.49	9.06	4.70
Brazil	-611.03	565.76	617.97
Bulgaria	-133.54	212.61	106.77
Burkina Faso	-1.26	17.00	9.08
Burundi	-19.20	9.80	8.51
Cambodia	-4.67	8.21	3.93
Cameroon	-2.33	17.67	8.98
Canada	0.70	4.11	2.68
Cape Verde	-2.61	8.49	5.02
Central African Republic	-0.80	16.64	9.55
Chad	-2.96	22.31	10.19
Chile	-12.87	8.03	10.32
China, People's Republic of	-6.92	9.03	9.07
Colombia	-27.28	8.26	13.34
Comoros	-2,167.35	3,822.07	2,346.44
Congo, Democratic Republic of	-67.81	30.04	21.31
Congo, Republic of	-13.03	13.58	7.77
Costa Rica	-12.30	6.56	3.44
Côte d'Ivoire	-37.88	90.56	109.05
Croatia	-4.30	13.79	10.46
Cyprus	-1.58	8.32	6.63
Czech Republic	n/a	n/a	n/a
Denmark	2.55	9.79	4.67
Dominica	0.71	1.24	0.56
Dominican Republic	-24.56	23.84	15.97
Ecuador	1,871.85	4,755.10	8,197.43
Egypt	-16.51	13.35	11.76
El Salvador	-10.66	7.60	11.64

Percent annual change in real exchange rate	average of last 6 years	standard deviation of last 6 years	standard deviation of average of last 6 years
Equatorial Guinea	-5.83	19.93	10.67
Estonia	-4.73	10.32	9.34
Ethiopia	-9.94	12.90	7.46
Fiji Islands	-2.67	9.01	4.43
Finland	0.78	12.85	3.97
France	4.21	9.86	3.63
Gabon	-1.09	19.03	9.46
Gambia, The	-12.30	10.34	8.13
Georgia	-8.73	15.78	5.52
Germany	-1.33	9.15	n/a
Ghana	-45.16	19.74	8.22
Greece	-15.80	7.91	3.97
Grenada	0.73	1.06	0.43
Guatemala	-16.66	11.40	12.29
Guyana	-6.60	4.88	1.63
Haiti	-24.23	17.91	10.35
Honduras	-23.86	16.63	11.02
Hong Kong, China	-1.28	2.26	4.17
Hungary	-20.33	10.54	13.90
Iceland	-6.33	11.82	8.60
India	-11.05	6.51	6.17
Indonesia	-15.69	20.79	9.88
Iran, Islamic Republic of	-30.96	27.79	14.49
Iraq	n/a	n/a	n/a
Ireland	2.89	9.62	3.73
Israel	-16.22	15.37	20.32
Italy	-1.90	11.13	4.96
Jamaica	-29.17	23.22	17.95
Japan	5.04	10.36	3.87
Jordan	-4.73	8.18	6.49
Kazakhstan	-18.79	20.65	19.94
Kenya	-17.86	14.92	11.18
Korea, Republic of	-2.78	11.19	4.67
Kuwait	0.71	1.04	0.66
Kyrgyz Republic	-16.29	20.87	16.46
Lao PDR	-43.49	44.49	27.51
Latvia	-5.65	8.58	8.67
Lebanon	-141.49	133.64	61.47
Lesotho	-13.23	13.93	5.52
Liberia	n/a	n/a	n/a
Libya	-6.74	9.50	3.70
Lithuania	-9.68	28.27	33.47
Luxembourg	4.96	11.04	4.96
Macedonia, FYR	-0.82	9.67	6.67
Madagascar	-22.58	21.82	8.82
Malawi	-40.81	25.80	15.68
Malaysia	-1.53	6.66	3.43
Maldives	-3.79	5.45	5.09
Mali	-4.05	17.79	7.76

Percent annual change in real exchange rate	average of last 6 years	standard deviation of last 6 years	standard deviation of average of last 6 years
Malta	1.30	7.39	4.41
Mauritania	-10.55	9.37	3.16
Mauritius	-7.72	7.87	2.83
Mexico	-32.85	27.74	29.16
Moldova	-22.53	22.52	10.78
Mongolia	-29.69	30.58	31.37
Morocco	-0.53	5.85	3.08
Mozambique	-38.61	31.72	39.99
Myanmar	-20.59	14.24	5.52
Namibia	n/a	n/a	n/a
Nepal	-12.11	7.52	6.01
Netherlands	5.46	10.73	5.56
Netherlands Antilles	0.54	1.04	0.48
New Zealand	0.82	9.96	4.51
Nicaragua	-1,252.44	1,308.39	1,851.23
Niger	-0.61	18.67	10.70
Nigeria	-38.82	25.58	15.75
Norway	0.96	7.78	3.53
Oman	1.85	1.16	n/a
Pakistan	-11.38	4.87	4.54
Panama	2.02	0.92	0.85
Papua New Guinea	-12.25	11.74	9.25
Paraguay	-24.95	12.82	11.53
Peru	-659.71	1,018.89	942.24
Philippines	-9.48	10.18	3.44
Poland	-75.53	86.20	86.87
Portugal	-5.68	9.45	1.75
Qatar	-2.54	17.21	5.43
Romania	-90.25	58.81	63.90
Russia	-52.10	50.93	45.28
Rwanda	-16.50	17.23	11.57
Samoa	-3.55	7.12	2.47
Saudi Arabia	2.24	1.54	0.75
Senegal	-1.01	17.65	9.28
Seychelles	-43.63	34.15	12.55
Sierra Leone	-21.47	15.94	13.06
Singapore	-35.52	25.27	28.61
Slovak Republic	2.08	9.40	7.21
Slovenia	-10.10	9.96	5.68
Solomon Islands	-12.94	9.17	4.02
Somalia	n/a	n/a	n/a
South Africa	-12.14	11.07	6.74
Spain	-1.11	10.06	5.14
Sri Lanka	-14.33	6.14	1.51
St. Kitts and Nevis	0.08	1.81	1.07
St. Lucia	-0.06	1.99	0.35
St. Vincent & Grenadines	0.60	1.60	0.62
Sudan	-78.16	40.69	53.06
Suriname	2,713.53	6,939.79	6,243.04

Percent annual change in real exchange rate	average of last 6 years	standard deviation of last 6 years	standard deviation of average of last 6 years
Swaziland	-13.30	11.22	5.30
Sweden	0.04	10.42	4.03
Switzerland	3.54	10.21	4.23
Syrian Arab Republic	-9.38	11.66	13.47
Tanzania	-30.64	9.27	19.38
Thailand	-2.89	7.36	4.44
Togo	-2.66	18.47	10.69
Tonga	-5.55	8.64	4.55
Trinidad and Tobago	-6.54	6.34	4.21
Tunisia	-3.79	6.70	2.38
Turkey	-90.36	26.22	32.53
Uganda	-46.99	33.50	61.36
Ukraine	-59.22	76.54	87.99
United Kingdom	0.49	6.10	2.49
United States	0.00	0.00	0.00
Uruguay	-59.18	24.55	41.74
Vanuatu	-1.36	7.35	3.05
Venezuela	-57.98	32.52	17.88
Viet Nam	-5.42	6.97	0.42
Yemen, Republic of	-32.32	24.09	20.32
Zambia	-82.02	41.66	54.09
Zimbabwe	-97.16	71.06	112.26

Table A.4: Openness

Openness Ratio	average of last 6 years	standard deviation of last 6 years	standard deviation of average of last 6 years
Albania	0.53	0.05	0.09
Algeria	0.53	0.06	0.08
Anguilla	1.68	0.09	0.09
Antigua and Barbuda	1.60	0.08	0.19
Argentina	0.24	0.04	0.09
Armenia	0.82	0.10	0.12
Aruba	1.58	0.07	0.13
Australia	0.38	0.02	0.03
Austria	0.74	0.04	0.04
Azerbaijan, Republic of	0.87	0.09	0.10
Bahamas, The	1.13	0.09	0.08
Bahrain, Kingdom of	1.59	0.09	0.15
Bangladesh	0.27	0.02	0.07
Barbados	1.05	0.05	0.04
Belarus	1.19	0.22	0.18
Belgium	1.37	0.06	0.05
Belize	1.14	0.08	0.07
Benin	0.56	0.05	0.03
Bhutan	0.74	0.06	0.04
Bolivia	0.49	0.04	0.04
Botswana	0.94	0.08	0.12
Brazil	0.20	0.02	0.04
Bulgaria	1.02	0.10	0.14

Openness Ratio	average of last 6 years	standard deviation of last 6 years	standard deviation of average of last 6 years
Burkina Faso	0.34	0.03	0.02
Burundi	0.32	0.05	0.04
Cambodia	0.69	0.15	0.43
Cameroon	0.40	0.03	0.01
Canada	0.68	0.05	0.11
Cape Verde	0.82	0.04	0.02
Central African Republic	0.44	0.05	0.05
Chad	19.00	3.20	4.41
Chile	12.82	2.39	3.23
China, People's Republic of	0.51	0.07	0.18
Colombia	0.37	0.02	0.04
Congo, Democratic Republic of	0.45	0.15	0.08
Congo, Republic of	1.12	0.12	0.18
Costa Rica	0.84	0.05	0.10
Côte d'Ivoire	0.69	0.07	0.09
Croatia	0.96	0.04	0.05
Cyprus	1.03	0.05	0.02
Czech Republic	1.17	0.07	0.12
Denmark	0.76	0.04	0.09
Dominica	1.17	0.07	0.05
Dominican Republic	0.76	0.06	0.05
Egypt	0.49	0.06	0.05
Equatorial Guinea	1.72	0.35	0.50
Estonia	1.51	0.10	0.07
Ethiopia	0.34	0.04	0.10
Fiji Islands	1.19	0.07	0.07
Finland	0.60	0.04	0.08
France	0.45	0.02	0.02
Gabon	0.90	0.06	0.05
Georgia	0.62	0.08	0.11
Germany	0.53	0.04	0.03
Ghana	0.51	0.05	0.07
Greece	0.46	0.03	0.04
Grenada	1.12	0.08	0.06
Guatemala	0.44	0.02	0.03
Guinea-Bissau	0.55	0.07	0.02
Guyana	1.61	0.23	0.19
Haiti	0.45	0.10	0.07
Honduras	0.86	0.07	0.14
Hong Kong, China	71.84	8.50	11.55
Hungary	1.00	0.13	0.30
Iceland	0.70	0.03	0.04
India	0.24	0.03	0.07
Indonesia	0.58	0.08	0.07
Iran, Islamic Republic of	0.39	0.07	0.07
Iraq	0.20	0.12	0.15
Ireland	1.32	0.10	0.18
Israel	0.76	0.06	0.06
Italy	0.43	0.02	0.04
Jamaica	0.99	0.07	0.04

Openness Ratio	average of last 6 years	standard deviation of last 6 years	standard deviation of average of last 6 years
Japan	0.20	0.02	0.02
Jordan	1.21	0.12	0.08
Kazakhstan	0.86	0.08	0.07
Kenya	0.57	0.07	0.04
Korea, Republic of	0.67	0.06	0.08
Kuwait	1.01	0.26	0.17
Kyrgyz Republic	0.83	0.09	0.06
Lao PDR	1.09	0.29	0.66
Latvia	1.85	0.26	0.17
Lesotho	2.67	0.96	1.17
Libya	2.46	0.45	0.37
Lithuania	0.05	0.01	0.01
Luxembourg	223.58	38.31	37.30
Madagascar	0.52	0.09	0.09
Malawi	0.65	0.10	0.07
Malaysia	1.79	0.14	0.30
Mali	0.55	0.05	0.04
Malta	1.76	0.12	0.08
Mauritania	0.85	0.10	0.06
Mauritius	1.26	0.07	0.03
Mexico	0.50	0.05	0.11
Mongolia	1.04	0.17	0.29
Morocco	0.53	0.04	0.06
Mozambique	0.61	0.13	0.09
Myanmar	0.03	0.01	0.02
Namibia	1.07	0.06	0.08
Nepal	0.47	0.05	0.09
Netherlands	1.10	0.05	0.07
New Zealand	0.59	0.04	0.03
Nicaragua	0.70	0.07	0.06
Niger	0.44	0.04	0.02
Nigeria	0.65	0.11	0.13
Norway	0.72	0.03	0.01
Oman	0.85	0.04	0.08
Pakistan	0.34	0.02	0.02
Panama	1.53	0.13	0.16
Papua New Guinea	1.04	0.05	0.11
Paraguay	0.91	0.12	0.12
Peru	0.32	0.02	0.04
Philippines	0.85	0.08	0.20
Poland	0.53	0.06	0.10
Portugal	0.64	0.04	0.02
Qatar	0.85	0.05	0.06
Romania	0.60	0.07	0.12
Russia	0.66	0.13	0.15
Rwanda	0.31	0.05	0.03
San Marino	2.89	0.77	1.01
Saudi Arabia	0.68	0.06	0.05
Senegal	0.61	0.04	0.04
Seychelles	1.39	0.15	0.27

Openness Ratio	average of last 6 years	standard deviation of last 6 years	standard deviation of average of last 6 years
Sierra Leone	0.43	0.04	0.03
Singapore	2.91	0.20	0.17
Slovak Republic	1.32	0.08	0.16
Slovenia	1.29	0.23	0.27
Solomon Islands	1.27	0.08	0.15
South Africa	0.49	0.04	0.05
Spain	0.44	0.03	0.07
Sri Lanka	0.76	0.04	0.06
St. Kitts and Nevis	1.27	0.06	0.11
St. Lucia	1.28	0.08	0.12
St. Vincent & Grenadines	1.23	0.07	0.13
Suriname	0.99	0.30	0.26
Swaziland	1.55	0.14	0.20
Sweden	0.72	0.05	0.11
Switzerland	0.76	0.04	0.07
Syrian Arab Republic	0.64	0.07	0.08
Tanzania	n/a	n/a	n/a
Thailand	0.97	0.09	0.24
Togo	0.84	0.10	0.09
Trinidad and Tobago	0.90	0.07	0.10
Tunisia	0.91	0.05	0.05
Turkey	0.41	0.05	0.06
Uganda	0.34	0.03	0.04
Ukraine	0.86	0.13	0.23
United Arab Emirates	1.27	0.09	0.15
United Kingdom	0.54	0.02	0.03
United States	0.23	0.01	0.02
Uruguay	0.42	0.03	0.05
Venezuela	0.51	0.05	0.03
Viet Nam	0.92	0.10	0.25
WAEMU	0.64	0.02	0.02
Yemen, Republic of	0.62	0.08	0.14
Zambia	0.63	0.07	0.07
Zimbabwe	0.60	0.16	0.12

Table A.5: Real per capita GDP growth

Real per capita GDP growth	average of last 6 years	Standard deviation of last 6 years	standard deviation of average of last 6 years
Albania	0.00	10.84	5.63
Algeria	4.08	9.64	3.86
Angola	3.78	5.49	1.96
Anguilla	2.36	5.34	0.95
Antigua and Barbuda	2.59	3.20	2.49
Argentina	0.94	6.08	2.16
Armenia	9.92	3.71	2.55
Aruba	-0.13	3.58	1.23
Australia	1.15	1.11	0.38
Azerbaijan	n/a	n/a	n/a
Bahamas, The	-3.71	2.88	n/a
Bahrain, Kingdom of	2.48	2.93	1.02
Bangladesh	2.60	0.86	0.65

Real per capita GDP growth	average of last 6 years	Standard deviation of last 6 years	standard deviation of average of last 6 years
Barbados	0.66	3.06	1.65
Belarus	3.32	5.38	5.11
Belgium	2.05	1.62	0.44
Belize	3.83	4.21	2.88
Benin	0.80	2.11	0.93
Bhutan	6.55	4.25	1.55
Bolivia	1.16	1.50	0.74
Bosnia & Herzegovina	n/a	n/a	n/a
Botswana	5.04	4.40	2.20
Brazil	0.96	2.14	0.67
Brunei Darussalam	-1.11	2.11	0.80
Bulgaria	80.41	195.39	181.79
Burkina Faso	4.53	7.81	3.27
Burundi	-1.83	3.51	2.09
Cambodia	4.76	2.50	1.88
Cameroon	-1.33	2.26	3.54
Cape Verde	3.51	2.22	1.77
Central African Republic	-0.17	3.54	1.25
Chad	n/a	n/a	n/a
Chile	4.36	2.58	1.76
China, People's Republic of	8.47	2.37	1.19
Colombia	1.33	1.95	1.23
Comoros	n/a	n/a	n/a
Congo, Democratic Republic of	-5.34	2.71	0.07
Congo, Republic of	-2.12	2.97	0.81
Costa Rica	2.26	2.63	0.49
Côte d'Ivoire	n/a	n/a	n/a
Croatia	4.15	2.70	0.43
Cyprus	3.45	2.65	1.16
Czech Republic	2.91	2.47	0.99
Denmark	1.63	1.43	0.64
Djibouti	n/a	n/a	n/a
Dominica	2.24	2.80	1.77
Dominican Republic	2.97	3.60	1.67
ECCU	3.05	2.03	1.79
Ecuador	1.02	3.19	1.16
Egypt	2.54	1.34	0.68
El Salvador	2.19	2.63	1.91
Equatorial Guinea	24.71	31.46	18.43
Estonia	7.48	3.22	1.17
Ethiopia	1.08	8.33	2.42
Fiji	2.25	4.55	1.02
Finland	2.02	2.71	1.92
Gabon	2.79	12.47	2.95
Gambia, The	-1.64	9.78	1.92
Georgia	7.01	3.11	1.19
Ghana	1.61	0.78	0.22
Greece	1.99	1.49	1.44
Grenada	2.06	8.20	0.59
Guatemala	1.16	0.87	0.65

Real per capita GDP growth	average of last 6 years	Standard deviation of last 6 years	standard deviation of average of last 6 years
Guinea-Bissau	-1.83	6.97	2.26
Guyana	2.78	3.31	2.66
Haiti	-2.17	3.66	1.69
Honduras	0.86	2.40	0.58
Hong Kong, China	2.93	3.45	1.85
Hungary	1.87	3.09	2.85
Iceland	1.84	2.61	1.47
India	3.51	1.92	1.16
Indonesia	3.08	3.30	2.17
Iran, Islamic Republic of	1.58	4.58	2.23
Iraq	n/a	n/a	n/a
Ireland	5.65	2.36	1.54
Israel	1.47	2.28	0.57
Jamaica	1.10	1.90	1.50
Jordan	0.15	3.88	2.78
Kazakhstan	7.37	4.16	2.91
Kenya	0.07	2.19	1.44
Korea, Republic of	5.62	3.28	1.69
Kuwait	0.98	7.02	4.10
Kyrgyz Republic	1.61	5.03	2.93
Lao PDR	3.42	2.13	1.29
Latvia	7.15	1.97	1.44
Lesotho	19.31	43.45	38.32
Libya	0.25	4.53	1.70
Lithuania	6.08	3.59	1.65
Luxembourg	4.75	4.55	1.14
Macao, China	3.40	5.06	3.78
Macedonia, FYR	1.46	3.12	0.35
Madagascar	-0.87	3.94	1.12
Malawi	-0.55	6.72	2.10
Malaysia	4.06	3.40	1.97
Maldives	5.50	3.19	1.02
Mali	0.46	5.00	0.50
Malta	3.59	2.34	1.57
Mauritania	1.89	5.89	2.20
Mauritius	4.15	1.85	1.09
Mexico	1.36	2.97	0.76
Moldova	5.08	6.48	2.60
Mongolia	0.18	3.96	3.20
Montserrat	1.28	9.56	3.52
Morocco	1.72	5.22	1.01
Mozambique	3.99	5.10	2.34
Myanmar	3.47	3.68	3.90
Namibia	1.33	2.40	0.59
Nepal	2.39	2.36	0.84
Nicaragua	2.15	1.88	0.69
Niger	-1.29	3.83	1.30
Nigeria	1.09	1.89	1.23
Norway	2.37	1.26	0.86
Oman	2.02	2.63	1.07

Real per capita GDP growth	average of last 6 years	Standard deviation of last 6 years	standard deviation of average of last 6 years
Pakistan	1.82	1.87	0.95
Panama	2.06	3.88	1.71
Papua New Guinea	0.63	5.57	2.83
Paraguay	0.05	2.00	1.24
Peru	0.62	5.10	3.17
Philippines	1.25	2.25	0.74
Poland	3.03	4.73	3.35
Portugal	2.72	2.00	1.21
Qatar	2.57	6.45	3.27
Romania	0.06	5.14	3.69
Russia	2.31	10.55	7.68
Rwanda	11.82	30.36	8.91
Samoa	1.19	3.38	1.54
San Marino	n/a	n/a	n/a
Saudi Arabia	0.09	3.23	1.09
Senegal	0.53	2.27	1.38
Seychelles	3.12	2.99	1.41
Sierra Leone	-1.13	9.01	4.77
Singapore	4.34	3.61	1.74
Slovak Republic	4.03	2.24	0.89
Slovenia	3.35	1.57	1.26
Solomon Islands	1.52	13.71	5.81
South Africa	0.20	1.77	1.58
Sri Lanka	3.75	2.35	0.84
St. Kitts and Nevis	4.52	2.66	1.75
St. Lucia	2.16	3.57	2.13
St. Vincent & Grenadines	3.11	2.94	1.13
Sudan	5.19	16.79	5.66
Suriname	1.86	11.90	2.82
Swaziland	1.83	1.71	1.49
Sweden	1.90	1.67	1.10
Syrian Arab Republic	1.81	4.62	1.76
Tanzania	0.60	2.45	1.58
Thailand	4.78	3.80	3.34
Togo	-0.64	6.22	2.06
Tonga	1.48	4.17	1.26
Trinidad and Tobago	3.43	2.78	4.15
Tunisia	2.84	2.04	0.93
Turkey	2.01	5.74	1.14
Uganda	9.21	12.93	3.96
Ukraine	n/a	n/a	n/a
United Arab Emirates	n/a	n/a	n/a
Uruguay	1.71	4.53	1.90
Venezuela	-0.40	5.58	1.64
Viet Nam	5.77	1.17	0.59
Yemen, Republic of	3.02	3.77	0.78
Zambia	-1.79	3.46	0.66
Zimbabwe	-0.95	4.75	2.79

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