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Emerging Infrastructure Financing Mechanisms in Sub-Saharan Africa

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Abstract

It is widely acknowledged that infrastructure plays a fundamental role in stimulating economic growth in developing countries. Conversely, the large infrastructure gap in low and middle income countries (LMICs) is a major impediment to growth. The deficit is particularly acute for Sub-Saharan Africa (SSA) where new infrastructure investment needs are estimated at US$ 22 billion a year for the next decade. While many SSA countries are unable to finance these investments on their own, the continent has experienced a significant increase in infrastructure investments since the 2000s. A substantial portion of these investments is coming from "non-traditional" sources: The private sector and emerging countries, especially China. However, the determinants of these investments, the terms of engagement underlying the new flows, and the associated tradeoffs are not well-understood. From the policy perspective, while the rise of funding for infrastructure is welcome, if the resources are not channeled adequately, the risk is that the funds will not be invested in a way that would contribute to economic growth and development, and will therefore be wasted. Thus, the overall goal of this dissertation is to better understand the new flows and their policy implications.

Given that the issues associated with Chinese and private sector financing are very different in nature, the dissertation takes a mixed-method approach and is broadly divided into two parts. In a first part, a systematic qualitative comparison between the Chinese approach to infrastructure financing in SSA and that of other large multi- and bilateral financiers is undertaken. Unlike previous research, this dissertation takes a holistic approach and compares the different financing models using a framework that assesses infrastructure financing along the "lifecycle" of an infrastructure investment – from the planning stage to the monitoring and upkeep of the facility once it has been built. In a second part, the determinants and the extent of private participation in infrastructure (PPI) in SSA are compared to that in other LMICs using a cross-country panel regression framework. Additionally, using theoretical findings from the literature on the broader topic of private delivery of public services, the contracting mechanisms used for PPI are further explored.

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Abbreviations

ADF	African Development Fund
AFD	Agence Française du Développement
AfDB	African Development Bank
BMZ	Bundesministerium für wirtschaftliche Zusammenarbeit und Entwicklung (translates to "Federal Ministry for Economic Cooperation and Development")
CADF	China Africa Development Fund
CDB	China Development Bank
DEG	Deutsche Investitions- und Entwicklungsgesellschaft (translates to "German Investment and Development Corporation")
DFI	Development Finance Institutions
DRC	Democratic Republic of Congo
EIB	European Investment Bank
EXIM Bank	Export-Import Bank
FDI	Foreign Direct Investment
FOCAC	Forum on China–Africa Cooperation
G8	Group of Eight
GDP	Gross Domestic Product
HIPC	Highly Indebted Poor Countries
IATI	International Aid Transparency Initiative
IBRD	International Bank for Reconstruction and Development (World Bank)
ICA	Infrastructure Consortium for Africa
ICB	International Competitive Bidding
ICT	Information Communications Technologies
IDA	International Development Association (World Bank)
IEF	Index of Economic Freedom
IFC	International Finance Corporation (IFC)
IFI	International Finance Institution
JBIC	Japan Bank for International Cooperation
JICA	Japan International Cooperation Agency
KfW	KfW Entwicklungsbank (translates to "KfW Development Bank")

LAC	Latin America and the Caribbean
LDC	Least Developed Countries
LMIC	Low and Middle Income Country
MDGs	Millennium Development Goals
MOFCOM	Ministry of Commerce of the People's Republic of China
NGO	Non-Governmental Organization
NTF	Nigerian Trust Fund (AfDB)
ODA	Official Development Assistance
OECD	Organisation for Economic Co-operation and Development
OECD-DAC	The OECD Development Assistance Committee
OLS	Ordinary Least Squares
PBC	People's Bank of China
PIU	Parallel implementation units (PIUs)
PPI	Private Participation in Infrastructure
PPP	Public Private Partnership
PRC	People's Republic of China
PROPARCO	Promotion et participation pour la Coopération (translates to "Investment and Promotions Company for Economic Cooperation")
RMC	Regional Member Countries
SOE	State Owned Enterprise
SSA	Sub Saharan Africa
WDI	World Development Indicators
WTO	World Trade Organization

1. Introduction

Motivation and policy relevance

It is widely acknowledged that investments in infrastructure can play a fundamental role in stimulating economic growth particularly in developing countries (e.g., Esfahani and Ramirez 2003; Canning and Pedroni 2008; Aschauer 1989). Indeed, infrastructure serves as an input in the production process and can enable improvements in productivity and efficiency through reductions in time wastage resulting from decreased service interruptions, as well as better communications capabilities, improved access to information and markets, and lower costs of transportation and logistics. Furthermore, by improving access to services such as water &sanitation, electricity, and information communication technologies (ICT) infrastructure can play a role in improving living standards (Straub 2011; World Bank 1994).

By the same token, one of the major impediments to growth in low and middle income countries (LMICs) is the shortfall in infrastructure investments, i.e., the failure to keep up with the investments required to support economic growth and meet social demands for infrastructure. The deficit is particularly acute for Sub-Saharan Africa (SSA)[1] where, after decades of neglect, new infrastructure investment needs are now estimated at US$ 22 billion a year over the next ten years (Foster et al. 2009).

While many countries in SSA are unable to finance these investments on their own, the continent has received a significant increase in infrastructure investments, particularly in the hydroelectric, transportation (roads and railways), and telecommunications sectors since the early 2000s. In contrast to historical trends where infrastructure was financed either through bilateral Official Development Assistance (ODA)[2] from Western governments (primarily Group

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[1] Sub-Saharan Africa includes all the countries in Africa located south of the Sahara desert. It therefore excludes the Northern African countries, i.e., Algeria, Djibouti, Egypt, Libya, Morocco and Tunisia

[2] In this dissertation, aid is defined according to the widely accepted OECD definition of Official Development Assistance (ODA) (OECD-Development Assistance Committee 2008). According to this definition, the two characteristics of ODA are as follows:

"i. [flows] provided by official agencies, including state and local governments, or by their executive agencies; and

ii. each transaction of which:

      a) is administered with the promotion of the economic development and welfare of developing countries as its main objective; and

      b) is concessional in character and conveys a grant element of at least 25% (calculated at a rate of discount of 10%)."

An important note to that respect is that, "[i]f the loan satisfies the ODA criteria, then the whole amount is reported as ODA. The grant element itself is not reportable as a flow."

of Eight (G8) countries[3]) or multilateral concessional loans, a substantial portion of the investments is now coming from non-traditional sources: The private sector and emerging countries, especially China (Foster et al. 2008; UNCTAD 2008; Moyo 2009). However, the determinants of these investments, the terms of engagement underlying the new flows, and associated policy implications are not well-understood.

Thus far, research on the new flows has been unbalanced. In the last five years, the rise of Chinese investments in SSA's infrastructure has attracted considerable press and scholarly attention in the context of the overall increase of Chinese presence on the continent (e.g., Michel and Beuret 2009; Bräutigam 2009; Rotberg 2008; Cheru and Obi 2010; Polgreen and French 2007; The Economist 2008). The diverse and novel ways investments are being undertaken, the lack of transparency in the dealings between Chinese entities and SSA governments, and the absence of concrete information on the amounts and the mechanisms used has led to a contentious treatment of the topic, especially with regards to whether the increased investments have been beneficial to the continent. The main concerns have hovered around the ideas that Chinese involvement is reminiscent of colonial trading patterns and/or that Chinese financing is propping up illegitimate African governments as China observes 'non-interventionist' policies and the funds are usually devoid of the traditional conditionalities imposed by OECD donors/financiers (Davies 2011; Jacobs 2011).

In contrast, the role of private participation in infrastructure (PPI) financing in SSA has not generated as much interest partly because SSA has received much less private investment in infrastructure relative to other developing regions. Nevertheless, at its highest, in 2007, PPI represented as much as 47 percent of the commitments to infrastructure in Africa (ICA 2011).

From the policy perspective, while the rise of funding for infrastructure is welcome, if the resources are not channeled adequately, the risk is that the funds will be invested in a way that would not contribute to economic growth and development, and will therefore be wasted in part or in full. As noted by Mold (2012), the last infrastructure "boom" on the continent in the 1960s and 1970s, enabled by high commodity prices, had just those negative consequences: A lot of the countries built "white elephant" projects— large, expensive, highly visible but non-productive investments that did not necessarily contribute to the long-term growth of the local economy, and ultimately led to unsustainable levels of debt.

Thus, to enable African policymakers to adopt policies that maximize the gains from the new capital inflows in terms of accelerated economic growth and improved social outcomes, it is important to understand the tradeoffs related to these relatively new financing sources. This entails identifying the full costs and benefits both in the short and longer run throughout the whole process of investments in infrastructure, from the planning to the post-construction stages.

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[3] Forum of governments of the world's eight wealthiest countries including: Canada, France, Germany, Italy, Japan, and Russia (with the European Union also being represented).

A better grasp of the underlying issues can also instruct the policies of organizations that have been involved in infrastructure financing in SSA for a longer period of time- i.e., the G8 countries and the multinational institutions (The World Bank, the African Development Bank (AfDB), the European Commission (EC), etc.). Indeed, the emergence of new financiers poses challenges to the financing models that traditional players have developed over four decades of engagement in SSA. Gaining a better understanding of the new sources of funds can highlight the strengths and weaknesses of their approach to infrastructure financing and potentially provide indications on how to address the challenges and opportunities associated with the emergence of new financiers of infrastructure.

General aims and research questions

The overall aim of this research is to better understand the new flows going into infrastructure in SSA in terms of their tradeoffs and associated policy implications. The questions addressed are as follows:

1. What are the new mechanisms used for infrastructure finance in SSA?
2. What accounts for these flows to the region?
3. Are these flows different from what the region has received in the past? If so, how?
4. What are the costs and benefits, both implicit and explicit, in the short and long run?

As noted earlier, the issues, as well as the existing knowledge and data around the two types of new flows— the Chinese funds and the private sector funds– are dissimilar in nature, in that the existing research on Chinese involvement in sub-Saharan Africa is more speculative and lacking of official data, while the amount of the private sector's involvement is known but its determinants have not been explored in detail. Thus, the research addresses these two issues separately and takes a mixed methods approach, adapting the questions and methods to the types of issues and the type of data available.

As described in the figure below, the first part of the research takes a qualitative approach to systematically compare the Chinese involvement in SSA infrastructure to those of the other large bilateral and multilateral financiers. The goal is to understand the full range of differences between China and the traditional donors, in order to better assess the tradeoffs between the various financing models and ultimately identify the policy implications for both SSA policymakers and traditional financiers of infrastructure on the continent.

The second part of the research quantitatively addresses the questions as they relate to private participation in infrastructure in SSA. Using panel cross-country data from the World Bank's Private Participation in Infrastructure database as the primary data source, this part explores the extent of PPI in SSA, the characteristics of countries receiving PPI and the factors influencing the amounts of PPI received, and how these differ from what other developing countries are receiving. Additionally, the research explores the structure of PPI contracts on the continent in

terms of the level of involvement of the private sector, and whether these contracts are optimal from the public policy perspective.
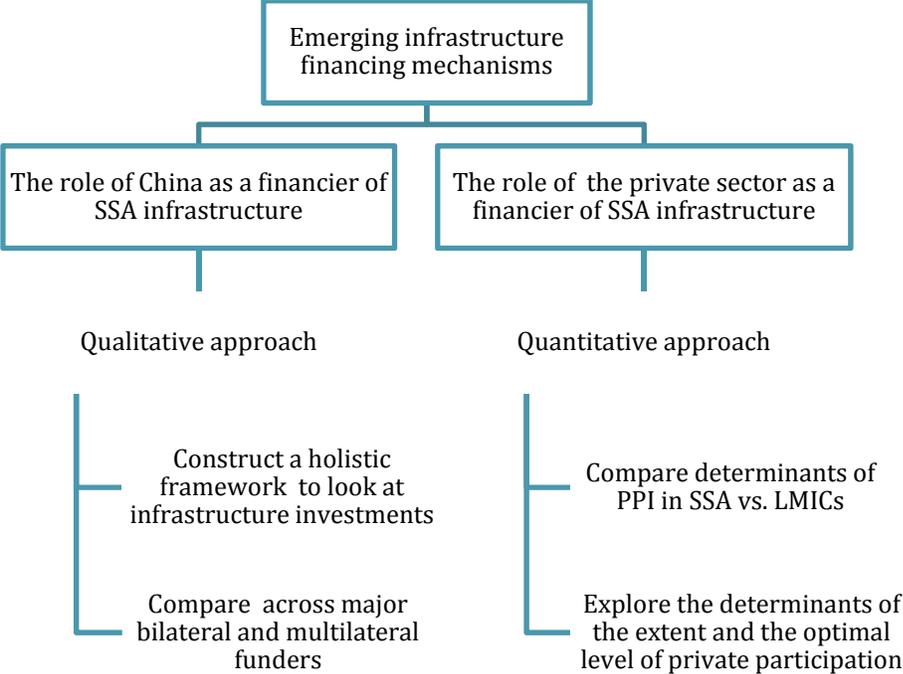
Organization of dissertation

The next chapter provides the definition of infrastructure used in this dissertation, as well as a brief historical background of infrastructure investments and current needs on the continent. Subsequently, Chapter 3 explores the role of China as a financier of infrastructure on the continent. The next three chapters address the role of the private sector in infrastructure financing. Chapter 4 explores the factors characterizing countries receiving PPI in SSA compared to LMICs, as well as the determinants of the amounts of PPI receipts. Chapter 5 starts to delve into the contracting mechanisms used for PPI in SSA and assesses the determinants of the degree of private sector involvement in terms of the level of risk the private sector assumes and the amount of new capital it commits. Chapter 6 extends this analysis to determine whether PPI contracts are being assigned optimally given the inherent characteristics of each of the infrastructure sectors covered in the analysis. Chapter 7 summarizes the findings of the research and discusses their policy implications. Appendices A through K contain additional overview information, as well as information on data sources and detailed tables and figures of the analyses performed in Chapters 3 through 6.

2. Overview and Background

In this chapter, I first introduce and define the basic concepts used in this dissertation in order to clarify the contours of the analysis. I then provide a historical overview of infrastructure investments in SSA in order to elucidate the context in which the new investments are being made.

Defining infrastructure

While the concept of infrastructure has been discussed extensively in the literature, there is no universally accepted definition. For Hirschman (1958), infrastructure is very broad and includes "all public services from law and order through education and public health to transportation, communications, power and water supply as well as agricultural overhead capital such as irrigation and drainage systems" (p. 83). The World Bank adopts an equally broad definition in its World Development Report centered on infrastructure: "An umbrella term for many activities referred to 'social overhead capital'", but also qualifies this definition with the addition that infrastructure "encompass[es] activities that share technical features (such as economies of scale) and economic features (such as spillovers)" (World Bank 1994, p. 2). Others (e.g., Fourie 2006; Baldwin and Dixon 2008) have attempted to distinguish common features of what is considered infrastructure, including the following:

- Investments are capital intensive and, once constructed, the facilities have monopolistic features to varying degrees depending on the type of infrastructure as market power generates economies of scale.
- Investments are fixed, durable, and irreversible.
- Constructed facilities have no substitutes in the short to medium run.
- Infrastructure goods are, at least partially, public in nature, and therefore, depending on infrastructure type, have some degree of non-excludability and non-rivalry of use. On the flipside, the construction and operation of facilities can generate negative externalities such as environmental pollution or displacement of populations.

Within this broad set of activities, the literature has further distinguished two types of infrastructure (Fourie 2006; Baldwin and Dixon 2008). Economic infrastructure refers to facilities promoting economic activities that support other factors of productions such as transport, power, telecommunication, and water &sanitation. Social infrastructure refers to facilities promoting social objectives such as schools, libraries, hospitals, museums, and parks. Overlap between the two types is possible, as for some types of infrastructure (e.g., water

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&sanitation) there is not always a clear cut differentiation between economic and social objectives.

In this dissertation, I define "infrastructure" as "economic infrastructure." More specifically, following the priorities of the Program for Infrastructure Development in Africa (PIDA),[4] I include the following infrastructure types: Transport (including air, maritime, rail, and road), information and communication technologies (ICTs), power generation and distribution, and water &sanitation. In addition, when referring to infrastructure costs and investments, I include maintenance costs unless otherwise specified.

Historical overview of infrastructure investments in SSA

Between the late 1950s and the 1970s, in the context of post-colonialism and an economic orthodoxy that promulgated capital accumulation as the path to economic growth, SSA governments established infrastructure as a priority sector. Enabled by favorable external conditions resulting from commodity booms, particularly in the 1970s, SSA governments also invested heavily in this priority sector.

This trend was, however, reversed in the 1980s and 1990s with the advent of the debt crisis, the fall of commodity prices, and the pursuant constraints of SSA governments' abilities to take on additional loans to finance infrastructure investments (Mold 2012; Farooki 2012). At the same time, there was a pervasive belief within the international development community that infrastructure could, under certain market conditions, be financed by the private sector leading governments and development financiers to focus on other sectors of the economy. The conditions in SSA were, however, not conducive to private sector participation due to several factors including low population densities that rendered the cost of providing network infrastructure prohibitive and the lack of technological advances that are necessary for a minimum threshold for profitable production. In addition, many African countries suffered from governance deficits and some from conflict, creating overall an unattractive investment climate for potential private investors (Jerome 2011; Mold 2012; Foster et al. 2008; Yepes, Pierce, and Foster 2008).

As a result, the existing infrastructure stock deteriorated and investments lagged. By the early 2000s, SSA trailed behind much of the developing world in terms of infrastructure endowments (Table 1) and the infrastructure gap—the difference between the infrastructure needs[5] and the actual historic investment in infrastructure—grew considerably (Yepes, Pierce, and Foster 2008; Foster and Briceño-Garmendia 2010). This, in turn, constrained economic growth, as poor

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[4] PIDA is a joint initiative by the African Union (AU), New Partnership for African Development (NEPAD), and the African Development Bank (AfDB).

[5] Infrastructure need is defined in terms of infrastructure needed to support economic growth and social demands for infrastructure.

infrastructure is a significant deterrent to investment in productive enterprises and impedes on the expansion of domestic and regional trade. For example, firms in the formal sector report loosing up to five percent of sales due to power shortages and regular interruptions to services, while those in the informal sector (which typically do not own generators) report loosing up to 20 percent of sales. Further, the lack of adequate ports, railroads, and roads has meant that freight costs in Africa are 250 percent of the global average and account for 40 percent increase in transport costs for coastal countries and up to 60 percent for landlocked countries (Economic Commission for Africa, African Development Bank, and African Union 2011; Foster and Briceño-Garmendia 2010; Escribano, Guasch, and Pena 2010; Teravaninthorn and Raballand 2008).

Table 1 Infrastructure endowment by developing region

	Sub-Saharan Africa	South Asia	East Asia and Pacific	Latin America and the Caribbean	Middle East and North Africa
Electrical generating capacity (MW per 1 million people, 2003)	70	154	231	464	496
Water (% of households with access, 2002)	63	72	75	90	85
Sanitation (% of households with access, 2002)	35	48	60	77	77
Density of total road network (km/1,000 arable km2, 2001)	2,558	1,400	5,385	8,850	30,319
Density of fixed-line telephones (subscribers per 1,000 people, 2004)	33	39	90	197	100
Density of mobile telephones (subscribers per 1,000 people, 2004)	101	86	208	350	224

Source: Yepes et al. (2008)

The World Bank estimates that SSA as a whole would need to spend around US$ 93 billion each year on infrastructure (maintenance and rehabilitation as well as new investment), or 15 percent of GDP, in order to meet the current infrastructure needs—that is to keep up with the new demands created by economic growth and to meet a number of social targets, including those set under the Millennium Development Goals (MDGs). The World Bank estimates suggest that the needs are highest in the power sector, followed by water &sanitation, transportation, and information and communications technologies (ICT), each requiring respectively US$ 41 billion, US$ 22 billion, US$ 18 billion and US$ 9 billion annual investments (Foster and Briceño-Garmendia 2010).[6]

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[6] See Foster and Briceño-Garmendia (2010) for assumptions and details of the estimates.

While still not reaching these targets, the last decade has seen a gradual redress in the level of infrastructure investments throughout the continent. Effectively, current spending on infrastructure (including maintenance) is in the order of US$ 45.3 billion a year - 66 percent of which is financed through tax revenues and user charges, while 21 percent is financed by the private sector, 8 percent through ODA and the remaining 5.5 percent by non-OECD financiers. Public funds are used mostly for operation and management and only about one third are used for new capital investments. The bulk of new investments and reconstruction is provided by external funds from private participation in infrastructure (PPI) as well as ODA from OECD countries and non-OECD financiers (Foster and Briceño-Garmendia 2010).

Thus, the main sources of growth over the last decade have been two-fold: A rise in the allocation of public funds generated through taxes and user fees, and a marked increase in external sources, including PPI, ODA- particularly after 2005, and elevated investments from emerging economies, chiefly China but also India, Arab states and their associated multilateral organizations (Foster et al. 2008; ICA 2010, 2011).

Focusing on the external sources, several trends are noted. First, the level of ODA committed by OECD countries has risen sharply, mostly as a result of more concerted and coordinated efforts from the donor community with the creation of the Infrastructure Consortium for Africa (ICA) at the 2005 G8 Gleneagles Summit. Second, until the recent economic downturn, PPI in Africa had risen steadily, reaching a high of US$ 17.5 billion in investment commitments in 2007 and, after the downturn of 2008 and 2009 where the levels fell to US$ 11.4 billion, PPI is slowly recovering with US$ 13.8 billion in investment commitments in 2010 (Figure 2, PPIAF 2011; ICA 2010). Third, the role of non-OECD bilateral financiers has grown with their commitment rising from less than US$ 1 billion in 2000 to US$ 13 billion in 2010. Within this category, China's investment is by far the largest with US$ 9 billion (Figure 2; Foster et al. 2008; Foster et al. 2009; ICA 2011).

Figure 1 Total commitments to African infrastructure from China and the private sector
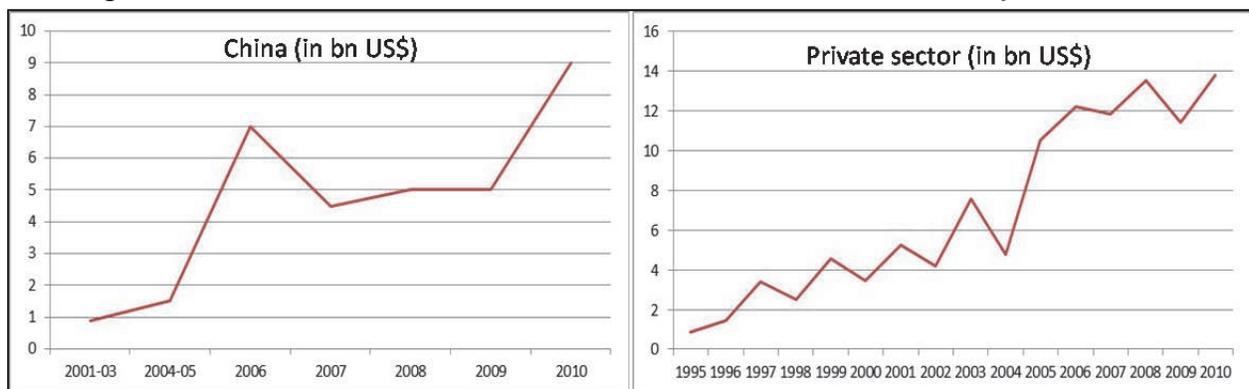
Note: The figures for China also include North Africa, and are in US$ billion
Sources: ICA (2011) and World Bank (2012)

This dissertation centers on the last two trends and attempts to tease out their determinants, the associated tradeoffs, and the policy implications. The next chapter looks at the role of China as a financier of infrastructure in SSA.

3. The Role of China as a Financier of SSA Infrastructure

As noted in the introduction, the overall rise of Chinese investments in SSA has attracted considerable attention due to the sheer size of the investments as well as the novel terms of engagement. However, the resulting discussion has been highly contentious and opinionated. This chapter examines the role of China in financing infrastructure – the sector in which Chinese entities have been the most active on the continent— and compares it with other large bilateral and multilateral financiers. The main aim is to provide a framework by which to assess the Chinese investments and consider the tradeoffs associated with these investments as compared to alternatives.

The chapter begins with an overview of the existing literature on China's role in financing infrastructure in SSA and outlines the ways in which this research contributes to existing knowledge. The methodology and the guiding framework for the analysis are then presented. Subsequently, the main bilateral and multilateral financiers of infrastructure in SSA are identified, followed by a discussion of the range of practices along the infrastructure lifecycle. The chapter concludes with a discussion of the tradeoffs associated with the various mechanisms and the related policy implications.

Previous research

One of the most important challenges for research in this area is that the exact extent of China's involvement in SSA infrastructure is unknown. The Chinese government does not provide statistics on its activities on the continent, nor do SSA governments indicate to what degree their infrastructure is being funded by Chinese monies. Partly, the problem is that the Chinese government does not have a central entity governing its aid and investment relations – these relations are managed across several state agencies, including the Ministry of Commerce, the Ministry of Foreign Affairs, and the Ministry of Finance, as well as individual Chinese embassies within the respective recipient countries. None of these entities releases consistent longitudinal figures on divestitures in foreign countries. An additional layer of complication is that in the Chinese case it is often difficult to distinguish aid from investments as many of the interventions, particularly those in infrastructure, are a mix of the two: On the one hand, much of China's aid comes in the form of concessional loans which could be regarded as aid, on the other hand, much of the foreign direct investment (FDI) by private companies are secured by bilateral agreements, making the financial risks on the Chinese companies negligible and therefore substantially different from traditional FDI (Salidjanova 2011; Gernot 2007; Foster et al. 2009; Lum et al. 2009).

Thus, while the literature on the increased Chinese presence in SSA is prolific, only a handful of papers have centered specifically on China's role in financing SSA's infrastructure, and these have been mostly exploratory. For instance, some papers, including Foster et al. (2008, 2009) and ICA (2011), have attempted to estimate the extent of Chinese aid to SSA's infrastructure by triangulating information from media sources (primarily Chinese but also some international press articles) and subsequently confirming the information with Chinese sources. Other research has centered on the motivation of Chinese entities to fund infrastructure on the continent: For example, the Center for Chinese Studies at the Stellenbosch University (2007) explores the links between the growth in the Chinese construction sector and its expansion outside of China and the growth of Chinese infrastructure investments in SSA (see Appendix C for more details).

Two papers have compared aspects of China's involvement with that of traditional partners: Fletcher (2010) compares the Chinese involvement with that of two multilaterals—the European Commission (EC) and the World Bank, while Jacobs (2010) compares it to that of European bilateral partners and the EC. Similarly to Foster et al., both look exclusively at aid flows, Fletcher (2010) in the context of one African country (Mali) and Jacobs (2010) for the continent as a whole. In their findings, both papers highlight the differences in terms of how aid is delivered. In particular, they point to the differences in approach. The West has generally focused on its role as a donor, fostering paternalistic relationships with policymakers in SSA and delivering projects in a top-down fashion. In contrast, China has negotiated agreements in the context of a "partnership" between China and the beneficiary country, emphasizing the idea of mutual benefit and cooperation. The two papers also note that China, different to other partners, has participated in infrastructure ventures on a project-by-project basis; in practice, this approach has limited deliberations over proposed projects and provided for speedier approvals as well as reduced consultations during the implementation phase.

While the two papers are important in terms of understanding some of the basic differences between the diverse types of partners, the comparisons have been ad-hoc and without a systematic framework or clear benchmarks that make explicit on which aspects the different financing models are being compared. In contrast, this dissertation takes a more holistic approach and compares the different financing models using a framework that assesses infrastructure financing in the context of the wider process of infrastructure investments. As such, the range of differences is explored across the "lifecycle" of an infrastructure investment– from the planning stage to the monitoring and upkeep of the facility once it has been built. Similarly, the tradeoffs associated with each of the financing models are compared along this framework.

Methodology and data

The methodology adopted is primarily qualitative. To compare Chinese bilateral financiers of infrastructure on the continent with other traditional bilateral and multilateral financiers, a standardized framework for making the comparisons is developed. The framework uses a holistic approach and considers the lifecycle of an infrastructure investment to identify the relevant features and standards. The framework is then used to assess how each financier performs along these established characteristics.

The research relies on publically available data, including literature, newspaper articles, websites, and blogs published between 2007 and 2012. In addition, the analysis is informed by informal conversations with people on the field, mainly in Ethiopia, as well as academics and infrastructure experts in multilateral organizations, in Washington D.C. and in the Ethiopia country office (see full list of sources in Appendix A).

Defining a framework for the analysis

A simplified framework representing the lifecycle of an investment in an infrastructure facility is first developed to identify the relevant factors for assessing financing models. The underlying rational is that the way in which an infrastructure facility is financed and who finances it affects the whole process of an infrastructure investment, starting from the planning stage (i.e., decisions on what and where to invest in, understanding the costs, the externalities, etc.) to the monitoring and upkeep of the facility once it is built.

In effect, the lifecycle of an investment in infrastructure is depicted as a linear process (Figure 3). I identify five stages: (1) planning, (2) financing, (3) procurement, (4) construction, and (5) monitoring and upkeep. The framework also takes into account cross-cutting elements, i.e., those factors that are present in all or several stages of the process, including the level of flexibility in project requirements at each of the stages, the transparency of the process, and the susceptibility to corruption and/or undue influence. Certainly, in reality, the process is not as linear—there are a number of feedback loops between some of the stages, in particular between financing, planning, and procurement. The goal of the framework, however, is to provide a schematic of the main elements of an investment in infrastructure in order to understand the factors needed to assess the intervention and compare alternatives.

Figure 2 The lifecycle of an infrastructure investment
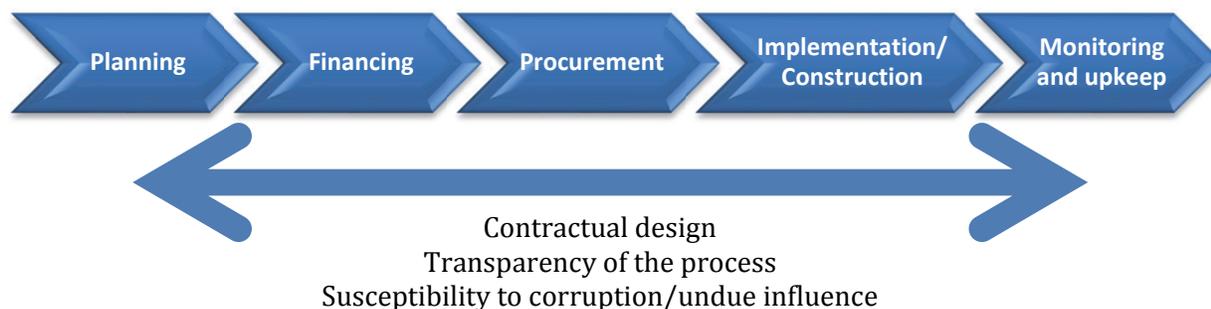
Planning: What goes into the planning for an infrastructure facility investment?

The planning of an infrastructure facility investment entails the assessment of investment priorities and the identification of projects that would fit these priorities, followed by the appraisal of these projects.

Priorities are often determined based on multi-stakeholder discussions within countries (or across countries for cross-country infrastructure needs) and are driven by multiple factors. Typically, these factors include demand-side considerations such as infrastructure required to support population needs and economic growth as well as political considerations. The latter includes, for example, the objective of satisfying certain constituencies who would benefit from the new infrastructure facility or the desire to stimulate growth in an economically depressed region/area with investments in infrastructure. In some cases, infrastructure investment priorities can be driven by the pursuit of prestige projects.

Once a public entity has decided on investment priorities, it starts considering specific projects. Due to their inherent riskiness and their long term planning horizons, these have to be appraised *a priori* (Flyvbjerg 2005). The appraisal process generally consists of estimating direct costs and benefits of building the facility and assessing the potential negative externalities. The latter include social impact analyses to gauge the potential disruptions to human lives of the proposed facility, and environmental assessments to evaluate the potential harm to the environment.

Financing: What types of financing mechanisms does a public entity have at hand?

Various mechanisms for financing infrastructure exist, with funds coming from either public or private sectors, or some combination of the two (OECD 2012; Kigombe 2011; Søreide 2006; Estache 2004; World Bank 1994). Public sources include government tax revenues and foreign aid in the form of grants or concessional loans. A government can also borrow funds at market rate from a bilateral partner, a private bank, and/or a multilateral bank (e.g., the World

Bank or the African Development Bank), as well as combine concessionary financing with debt finance from market sources. Governments can negotiate export credits from bilateral partners' export credit agencies, which grant loans at somewhat concessional rates to finance specific procurement associated with an infrastructure facility. In addition, resource backed loans— loans tying repayment to national resource or primary commodity exports or preferential access to natural resource exploitation rights are sometimes used to finance infrastructure in some developing countries.

Private funds for infrastructure come mostly from private equity firms that invest in certain industries (e.g., telecommunications, roads, airports) in anticipation of steady returns over the long period of time. However, because most investments in SSA's infrastructure are considered high-risk, SSA countries have not attracted much of this type of funding, with the exception of telecommunications (Kigombe 2011). Nevertheless, public entities, particularly development finance institutions (DFIs) have been increasingly using innovative mechanisms to leverage public funds to increase private financing for infrastructure in SSA. Indeed, both bilateral (e.g., the German investment corporation and France's PROPARCO) and multilateral (the International Finance Corporation) DFIs have, for example, set up investment funds managed by private companies to invest in funds targeted towards African infrastructure projects. These funds then provide capital directly to private investors (in the form of equity or loan)[7] for specific infrastructure projects. In addition, DFIs provide a range of risk management products such as guarantees to private firms interested in investing in African infrastructure.

Other sources of finance include sovereign wealth funds which are government owned and funded through foreign currency reserves (Schubert 2011) and quid pro-quo arrangements, whereby a government negotiates the building of an infrastructure facility with a private firm in exchange for the firm being able to operate in the country.

Procurement: How does a public entity chose a builder for the facility?

There are essentially two ways by which a public entity chooses the contractor to build an infrastructure facility: Most commonly the selection happens through a tender process, but sometimes also by responding to unsolicited proposals (Hodges 2003; Søreide 2006).

In principle, tenders introduce competition among potential contractors to guarantee the optimal combination of price and quality as well as on-time delivery (i.e., "best quality, lowest cost and timely delivery" [Hertogh et al. 2008, p.113]). In order to ensure that the process is truly competitive, tender rules and procedures are often very elaborate. However, in practice, the procedures often leave room for undue influence in the tendering process through for example marketing activities to influence decision makers, and, in some cases, even promote illegal practices (e.g., weak sanctions against firms bribing public officials to win contracts). The type

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[7] DFIs can also allocate the funds through intermediary financial institutions that offer the funding to private investors.

of funding that the public entity secures to build the infrastructure facility can also impose restrictions on the tendering process; for example, donor funds are sometimes "tied,"[8] i.e., restricted to firms from the donor's countries (Søreide 2006).

For unsolicited proposals, the basic premise is that allowing such proposals would promote innovative ideas from the private sector (Hodges 2003). Some countries do not allow unsolicited proposals, as it is perceived as a way for a private firm to bypass the competitive tender process and/or a way to argue for exclusive negotiations under the rational that the firm owns the intellectual property of the idea. Those countries that do allow unsolicited proposals generally do not have formal policies or procedures for handling these proposals (Hodges 2003). Thus, given that the use of unsolicited proposals is very country and context specific, the discussion on procurement will focus mostly on the tender process.

Construction: What are the common issues that can arise during construction?

Once the project has been decided on, the contractor selected, and all the approvals and consents fulfilled, the contractor can begin the construction of the facility. From the policymaker's perspective, a number of issues are pertinent during this phase.

The first relates to the extent to which contractors use locally available materials and labor ("local content"). This is important as increasing local content in infrastructure projects can stimulate the local economy through employment, increased demand for construction materials and equipment produced domestically, and the associated multiplier effects. Furthermore, using local labor can facilitate skill-transfer which, in-turn, enhances the ability to operate and maintain the facility locally. However, in practice, similar to procurement, the source of funding sometimes dictates who the suppliers should be (i.e., often nationals of the financier country) and thus constrains the ability of the public entity to use the investment in infrastructure to stimulate economic growth (Shwartz et al. 2009; OECD undated; Wells and Hawkins 2008).

The second consideration is cost growth and the length of construction. Infrastructure projects, especially the larger and more complex ones, are commonly associated with significant delays and cost overruns (Flyvbjerg et al. 2002 and 2004; Iimi 2009). Delays are due to a number of factors including natural factors during construction (e.g., floods, unforeseen geological complications at the site of construction), bureaucratic delays (e.g., land acquisition), adjustments to terms of reference post award of the contract, disbursement issues, and any conflict between contractor and public entity. Cost overruns are partly due to overly optimistic engineering cost estimates as well as delays encountered during construction. For the latter, post-award adjustment in particular can impose adaptation costs to contractors. In addition, delays are associated with increased material costs, especially in developing countries where exchange rate

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[8] The formal definition of tied aid is as follows: "official or officially supported Loans, credits or Associated Financing packages where procurement of the goods or services involved is limited to the donor country or to a group of countries which does not include substantially all developing countries" (OECD 2003, webpage).

fluctuations are common and a depreciation of the local currency over time entails an increase in the price of imported materials. The public entity may be able to minimize some of the delays and cost overruns *a priori* by reducing the possibility of post-award modifications to the terms of reference and by introducing risk-sharing mechanisms and cost incentives within the contracts.

For donor funded projects, delays can be triggered by disbursement issues. Typically, financiers release funds in chunks based on successful completion of interim checks, including financial and technical audits which aim to ensure that the funds are being expended for their intended purpose as well as goods being delivered in the quantity and quality specified (Paterson and Chaudhuri 2007). If projects do not perform adequately in these audits, further disbursement of funds may be delayed, which may in turn affect costs of the project negatively.

Monitoring and upkeep: What comes after construction?

Once the infrastructure project has been delivered, the financing agency in conjunction with the implementing agency undertakes *ex-post* cost-benefit evaluation (measuring outputs, outcomes, and impacts), as well as post-procurement oversight. If the facility was paid for through a loan, the public entity has to start repaying the loan (typically there is a grace period) and is required to put forward a plan for the operation of the facility as well as a strategy for long-term upkeep and maintenance of the facility.

Cross-cutting issues: Contractual design, transparency and corruption

Generally, infrastructure procurement contracts are not completely binding at the onset (Iimi 2009). This is because projects, especially the larger and more complex ones, often need to be adjusted as complications arise. However, there is also a fair amount of political discretion in decision-making, especially in the planning and procurement stages (Paterson and Chaudhuri 2007). In combination with the monopolistic nature of most infrastructure sectors, these factors foster an environment prone to corruption. Effectively, construction is one of the most corrupt sectors in the world (Kenny 2011), and "favoritism, fraud, cronyism, patronage, embezzlement, bribes, and state capture are all concepts that have long been associated with the delivery of infrastructure services in many countries" (Estache 2004, p. 21).

Nevertheless there are often "large grey zones between legal and illegal business practices" when it comes to infrastructure (Søreide 2006, p.5), so corruption is not always easily detectible. For instance, in the planning stage, there is commonly deliberate overestimation of benefits and underestimation of costs to facilitate the authorization of the project (Flyvbjerg 2002); in the procurement phase, potential bidders may try to influence tender documents, there may be collusion among bidders to manipulate the procurement process, or even outright rigging of the process (Paterson and Chaudhuri 2007); at the implementation stage, the introduction of modifications and amendments can introduce scope for corruption, especially in the context where there is political discretion in decision making (Iimi 2009).

Research has shown that corruption or undue influence is most prominent in large scale procurement, where procedures and processes are unclear, or in the context of low institutional capacity, low accountability, and weak governance in public procurement systems (Flyvbjerg 2004).

Transparent practices throughout the lifecycle of the infrastructure investment can, to some extent, reduce the scope for corruption. Indeed, the more transparent the process is, the less room there is for irregular practices and the more accountable policymakers involved in the negotiation processes will be. In effect, transparent practices entail laying out clear objectives and priorities at the planning stage, clear eligibility criteria as well as rules and regulations at the procurement stage, and mechanisms to allow for transparent negotiations with contractors in the implementation stage. For the latter, the funder could for example mandate third party monitoring, i.e., the oversight of a third entity responsible for the monitoring of procurement and implementation of the project (Paterson and Chaudhuri 2007).

Summary: Benchmark questions to compare alternatives

Following the framework outlined above, I have identified the most pertinent questions within each of the infrastructure lifecycle stages to distinguish the characteristics of infrastructure projects financed through different entities and mechanisms. Table 2 below summarizes these questions which ultimately allow for the description and comparison of alternative forms of financing.

Table 2 Relevant questions for the comparison among financiers

Infrastructure lifecycle stage	Relevant questions
Planning	• How are investment priorities set? • How are projects assessed? • To what extent are social and environmental externalities considered?
Financing	• What are the sources of financing? • What are the financial terms attached to the sources of financing (e.g., repayment terms)? • To what extent is coordination needed among the different sources of finance?
Procurement	• What are the rules and regulations attached to tender processes? • What types of restrictions do these rules impose (e.g., nationality of bidders, tied aid)?
Construction	• What is the level of local content in the construction phase? • Are there any contingencies to minimize delays and cost overruns? • What types of interim-checks do projects have to undergo (e.g., financial, technical audits)?
Monitoring & upkeep	• What do the ex-post evaluations and post-procurement oversights look at? • How much burden does the repayment of the investment impose? • What is the long-term strategy for upkeep of the facility?
Contractual design, transparency & corruption	• How flexible are contracts? • What is the level of political discretion in decision-making? • How clear and transparent are the rules and regulations around procurement? • How transparent are the negotiations with contractors? • What types of monitoring tools are in place?

Identifying the main foreign financiers of SSA's infrastructure

In order to make the analysis more tractable, the comparison groups are limited to the five largest financiers of infrastructure in 2010. As shown in Figure 4 below, China is the largest with US$ 9 billion, closely followed by the World Bank with US$ 8.8 billion. The other large multinational funder is the African Development Bank (AfDB), while the most prominent bilateral financiers are Japan, France, and Germany.

Figure 3 Commitments to African* infrastructure in 2010 (in millions of US$)
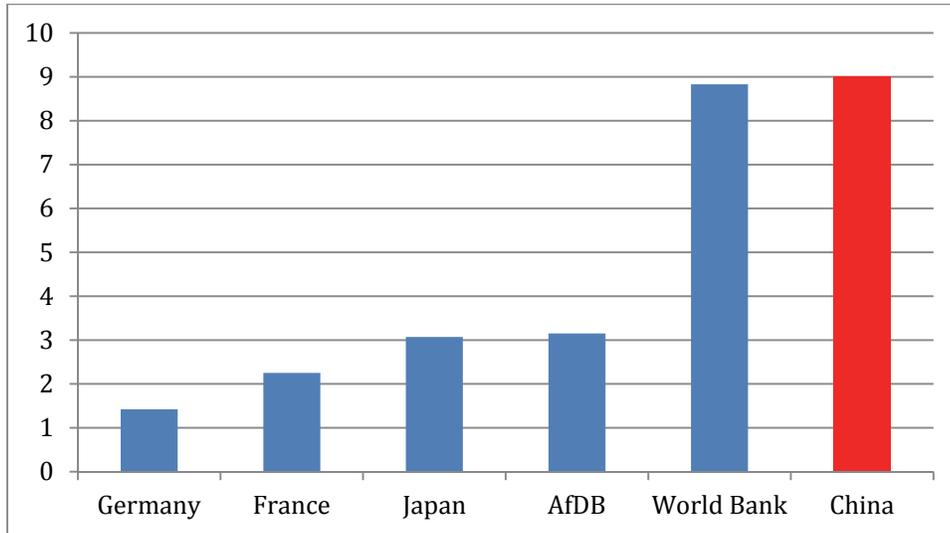
*Includes North Africa
Source: ICA (2011)

Chinese actors

A number of governmental organizations are involved in providing funds for infrastructure in SSA (Table 3). The central actor is the Export-Import Bank of China (China EXIM Bank), one of China's three policy banks[9] whose aim is "to facilitate the export and import of Chinese mechanical and electronic products, complete sets of equipment as well as new and high-tech products, assist Chinese companies with comparative advantages in their offshore contract projects and outbound investment, and promote Sino-foreign relationship and international economic and trade cooperation" (China EXIM Bank 2012, webpage). Effectively, the main objective of the China EXIM Bank is to promote Chinese enterprise and exports, while at the same time advancing more social objectives in recipients' countries by funding projects with "good social benefit." China EXIM Bank administers several instruments for engagement in SSA's infrastructure (see Appendix B, Table 1) including concessional loans, preferential export buyer's credit, export seller's credit, and resource backed loans, in addition to "package financing mode," which mixes several of these instruments. Each of these instruments has different objectives and in some cases different types of recipients.

The China Development Bank (CDB), the second of China's three policy banks, is also active in financing infrastructure projects in SSA. While its mission is primarily domestic, i.e., to "provide medium- to long-term loan facilities that assist in the development of a robust economy and a healthy prosperous community" (China Development Bank 2005, webpage), as of 2007 it

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[9] The three policy banks- the Agricultural Development Bank of China, the China Development Bank, and the Export-Import Bank of China were created in 1994; all the three are responsible for financing government expenditures for economic and trade development in different areas: The first one agricultural projects in rural areas, the second infrastructure projects, and the last one trade facilitation projects.

also manages the China-Africa Development Fund, the largest Chinese equity fund focusing on investments on the continent (ICA 2010; China-Africa Development Fund 2012).

The Ministry of Commerce (MOFCOM) is the main entity in charge of implementing Chinese development assistance through its Department of Aid to Foreign Countries. In that capacity, it administers most of the soft loans and grants targeting infrastructure in SSA. However, a number of other ministries, including the ministries of foreign affairs, agriculture, health, science and technology, have international cooperation departments and may at some level fund development projects, including infrastructure projects with grants (Grimm et al. 2011).

Table 3 Chinese financiers of SSA infrastructure

Institution	Description
Export-Import Bank of China (EXIM Bank)	• Established in 1994, as a government policy bank under the direct leadership of the State Council of China aims to implement the state policies in industry, foreign trade, diplomacy, economy and finance • Sole institution authorized by the Chinese government to provide concessional loans • Almost 80 percent of the projects financed by the Bank have been infrastructure projects • Currently supporting around 300 infrastructure projects (79 percent infrastructure) in Africa
China Development Bank (CDB)	• Largest amongst China's three policy banks- operates mainly in China but is playing a growing role in Africa • Lends on commercial terms • In 2007 designated to manage the $ 5bn China-Africa Development Fund
Government ministries	• Ministry of Commerce of the People's Republic of China (MOFCOM) is the "lead" entity charged with managing foreign aid • Other ministries; foreign affairs, health, science and technology, etc. also have departments for development cooperation • All engage in some form in financing development projects (incl. infrastructure) through grants and soft loans

Source: Compiled by author using ICA 2010, 2007; Bräutigam 2010; Grimm et al. 2011.

Traditional financiers of SSA infrastructure

The traditional financiers of infrastructure in SSA, summarized in Table 4, are bilateral aid agencies and multilateral governmental organizations. Each of these institutions has a similar structure with a public sector arm that provides grants and loans (concessional and market rate) to developing country governments, and a private sector arm that invests equity and/or lends to companies and projects. The bilateral institutions are integrated within their respective country's foreign affairs ministries and are tasked with implementing their country's ODA. Further, with

the exception of France,[10] they have a separate group dedicated to promoting their own country's exports and foreign investments in developing countries.

Typically, the missions of both the bilaterals and multilaterals revolve around poverty reduction, economic growth, and private sector development. The lending instruments utilized reflect these missions (see Appendix B, Table 2 for more details on financing instruments). Indeed, the public sector focused arms of these institutions generally adjust their terms on the basis of the income level of the recipient country— most have a financing window that provides funds either as grants or loans at concessional rates for the poorest and/or most indebted countries, and market rate or near market rate loans for the higher income countries. Further, the private sector windows focus on making financial resources and instruments available to private firms and projects either directly or through intermediaries such as banks and equity funds.

Similar to China, the bilaterals often also include the desire to provide their own companies with opportunities abroad in their missions, and provide instruments such as export credits and guarantees specifically designed for that purpose in their offerings.

Table 4 Traditional financiers of SSA infrastructure

Partner	Responsible agency	Description
World Bank	International Bank for Reconstruction and Development (IBRD)	• The original lending arm of the World Bank Group. • "Aims to reduce poverty in middle-income countries and creditworthy poorer countries by promoting sustainable development through loans, guarantees, risk management products, and analytical and advisory services" (World Bank 2013a, webpage) • Raises funds from international financial markets. • Provides non-concessional loans to middle-income and poor credit worthy countries.
	International Development Association (IDA)	• "Aims to reduce poverty by providing loans and grants for programs that boost economic growth, reduce inequalities, and improve people's living conditions." (World Bank 2013b, webpage). • Raises funds through member countries/donor contributions, as well as income generated from IBRD and IFC activities, and borrower's repayments of earlier IDA loans. • Provides concessional loans and grants to low-income countries and countries "at risk of debt distress".
	International Finance Corporation (IFC)	• Aims "to create opportunity for people to escape poverty and improve their lives by: (1) Mobilizing other sources of finance for private enterprise development; (2) Promoting open and competitive markets in developing countries; (3) Supporting companies and other private sector partners where there is a gap; (4) Helping generate productive jobs and deliver essential services to the poor and the vulnerable" (IFC 2013, webpage). • Provides loans and equity investments to commercial projects.

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[10] France's equivalent organization, Compagnie Française d'Assurance pour le Commerce Extérieur (COFACE), was privatized in 1994. It now operates as a private commercial company.

Partner	Responsible agency	Description
AfDB	African Development Bank	• Aims "to promote the investment of public and private capital in projects and programs that are likely to contribute to economic and social development" (AfDB 2011). • Raises funds from capital markets, as well as from income generated from the AfDB lending activities. • Provides non-concessional loans to African governments.
	African Development Fund (ADF)	• "Main objective is to reduce poverty in Regional Member Countries (RMCs) by providing loans and grants" (AfDB 2013a, webpage). • Raises funds through member countries/donor contributions. • Provides zero-interest loans to African governments.
	Nigeria Trust Fund (NTF)	• Aims "to assist the development efforts of the Bank's low-income regional member countries whose economic and social conditions and prospects require concessional financing" (AfDB 2013b, webpage). • Funding is provided by the Nigerian government. • Provides concessional loans (interest rates between 2 and 4%) to both private and public sector operations and can also co-finance operations with the ADB and the ADF, as fund stand-alone operations, in both the public and the private sector.
	Private Sector Window	• Responsible for "making the Bank responsive to the private sector's needs and extend appropriate technical and financial support, within the general framework of assisting RMCs shifting from State-controlled economies to Private-led economies" (AfDB 2013c, webpage). • Provides financing to corporate entities and projects either directly or through intermediaries such as private equity and venture capital funds.
Japan[11]	Japan International Cooperation Agency (JICA)	• Main government agency coordinating Japanese ODA • Aims to " to contribute to the peace and development of the international community, and thereby to help ensure Japan's own security and prosperity" (Ministry of Foreign Affairs (Japan) 2003, p1). • Provides grant aid and concessional loans to low-income country governments.
	Japan Bank for International Cooperation (JBIC)	• Government owned policy-based financial institution administered by the Ministry of Finance. Akin to an export-import bank. • Aims to (1) promote overseas development of strategically important natural resources to Japan; (2) support Japanese industry efforts to develop international business operations; (3) prevent financial disorder in the international economy; (4) maintain and improve the international competitiveness of Japanese industries; and (5) promote projects for conserving global environment. • Provides buyer's credit (market rate loans) to foreign buyers and financial institutions, as well as loans to Japanese joint ventures, foreign governments, or banks. The latter requires substantial benefit for Japanese companies and that project "preserve the global environment" (JBIC 2012, webpage).

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[11] The Japanese Ministry of Foreign Affairs also provides grants for economic and social development projects to Japanese non-governmental organizations (NGOs) operating in developing countries. These funds support small scale projects, including in the infrastructure, e.g., small scale water and sanitation projects (Ministry of Foreign Affairs (Japan) 2007).

Partner	Responsible agency	Description
France	Agence Française du Développement (AFD)	• Main government agency coordinating France's ODA. • ODA aims to "(1) contribute to shared and sustainable growth; (2) fight against poverty and reduce inequality; (3) preserve global public goods; (4) promote stability and the rule of law as factors of development" (Ministry of Foreign and European Affairs (France) 2011, p. 13). • Provides grants and concessional loans to African governments and for "high impact projects (…) that do not generate sufficient profit over the short or medium term to pay back market-rate loans" (AFD 2012, webpage).
	Promotion et participation pour la Coopération (Proparco)	• Subsidiary of AFD in addition to private shareholders from "the North and South". • Aims to "be a catalyst for private investment in developing countries which targets growth, sustainable development and reaching the Millennium Development Goals (MDGs)" (Proparco 2012, webpage). • Provides private companies with loans and equity finance.
Germany	KfW Entwicklungsbank (KfW)	• Government owned development bank- It implements Germany's ODA on behalf of the Bundesministerium für wirtschaftliche Zusammenarbeit und Entwicklung (BMZ), the Federal Ministry for Economic Cooperation and Development • ODA aims to help "(1) ensure that scarce resources are more equitably shared and that our environment is preserved for coming generations, and (2) reduce global poverty" (BMZ 2012, webpage) • Provides grants and concessional loans (at zero interest) to Least Developed Country (LDC) governments, market and near-market rate loans to middle and high income developing country governments.
	Bundesministerium für wirtschaftliche Zusammenarbeit und Entwicklung (BMZ)	• Federal Ministry for Economic Cooperation and Development • As an instrument for foreign trade promotion, a separate arm of the BMZ provides export credits (called Hermes guarantees) to German exporters and banks to cover risks of non-payment.
	Deutsche Investitions- und Entwicklungsgesellschaft (DEG)	• German Investment and Development Corporation; subsidiary of the KfW • Aim is "to promote private enterprise initiative in developing and transition countries as a contribution to sustainable growth and a lasting improvement in the living conditions of the local population" (KfW 2013, webpage) • Provides German and European firms with market rate financing to invest in developing country projects

Source: Compiled using World Bank 2013a,b; IFC 2013, AfDB undated, 2013a,b,c, 2011; Ministry of Foreign Affairs (Japan) 2003, 2007; JBIC 2012; Ministry of Foreign and European Affairs (France) 2011; AFD 2012; Proparco 2012; BMZ 2012, and KfW 2013.

Identifying the range of practices along the infrastructure investment lifecycle

Planning

In planning, variation among practices of financiers relates to how early in the process and how much the financier gets involved in the determination of investment priorities and in the appraisal of potential projects. In theory, all financiers support "country-led approaches" to infrastructure development and therefore consider projects that are planned by recipient country governments. However, in practice, financiers get involved in the planning process at varying degrees, especially in the case of large projects because most of the countries in SSA lack the technical and governance capacity to determine demand and priorities for specific infrastructure facilities, as well as to conduct project appraisals and risk assessments.

Traditional financiers have a high level of involvement from the very beginning. In order to increase "country ownership" of proposed projects,[12] they require the recipient country to devise a growth and development strategy as well as a multi-year budget plan through a consultative framework with relevant in-country stakeholders, within which proposed infrastructure projects have to fit. However, "ownership" of the proposed project may be diminished in practice, as a number of issues can dilute the level of control the recipient government has. For one, due to the lack of capacity, the financiers often end up playing an important role early in this process by providing technical assistance and capacity building, and in some cases, assist countries in conducting feasibility studies for proposed projects. This is especially the case for the larger and more complex projects (de Renzio et al. 2008; Garnett et al. 2009; OECD 2006). Second, traditional financiers generally cooperate to fund large projects and, despite recent efforts to harmonize their policies and coordinate their activities on the ground,[13] redundant policies and sometimes discordance between their different requirements imposed by the individual funders can be a challenge for recipient countries. In addition, the program that is agreed upon by the co-financiers may only be a second best option for the recipient government (Garnett et al. 2009). Third, many of the traditional financiers impose value-based as well as economic conditionalities

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[12] The 2005 Paris Declaration, which was negotiated under the auspices of the OECD Development Assistance Committee (DAC), outlines the "five core principles" for effective development assistance (OECD undated, webpage)

> "1. Ownership: Developing countries set their own strategies for poverty reduction, improve their institutions and tackle corruption.
> 2. Alignment: Donor countries align behind these objectives and use local systems.
> 3. Harmonisation: Donor countries coordinate, simplify procedures and share information to avoid duplication.
> 4. Results: Developing countries and donors shift focus to development results and results get measured.
> 5. Mutual accountability: Donors and partners are accountable for development results."

[13] Following up on the 2005 Paris Declaration on Aid Effectiveness, traditional donors have been moving towards harmonization of their activities. The 2008 Accra Agenda devised an agreement to "deepen implementation of the Paris Declaration". The 2011 Busan Agreements attempted to take stock of the progress achieved.

around certain issues such as human rights, military expenditures, democratization efforts, and fiscal reform, in order to fund any project in developing countries, which may further dilute ownership of the project if those conditionalities are not in line with government policies (de Renzio et al. 2008).

In contrast, China negotiates project involvement on a case by case basis, and imposes few conditionalities except for the recognition of "One China Policy" and adherence to the "One China Principle"[14] (CIDA et al. March 27-28, 2008; Fletcher 2010). Chinese entities frame these negotiations in the context of a "partnership" between China and the beneficiary country, and the idea of mutual benefit and cooperation. Nevertheless, the type of financing instrument considered to finance a proposed project determines to some extent the requirements for funding. For example, on the one hand, loans are allocated to projects with the potential of economic returns in the medium to long run; therefore, to qualify for funding, governments have to show that the projects have the "ability to generate profit." In addition, the proposed projects undergo a review process, which include risk analyses in order to determine the overall risks involved. On the other hand, grant funding is usually provided for turnkey projects,[15] entirely managed by the financier; i.e., the Chinese government contracts with a Chinese company (through competitive bidding) to lead the process of building an infrastructure project— from planning all the way through construction and delivery of the facility (Grimm et al. 2011; Jacobs 2011; Corkin, Burke, and Davies 2008).

All financiers require some form of social and environment assessments in order to approve the project. The level of stringency of these assessments varies however. Traditional financiers have a relatively arduous process which can be costly, time consuming, and bureaucratic. Typically, the bilaterals (France, Germany, and Japan) conduct the environmental and social assessments and devise a "risk mitigation plan" with the beneficiary government (AFD 2012; KfW 2013). The multilaterals provide budgetary support to the beneficiary governments to conduct these assessments, but generally these funds tend to be small, increasing the cost for the beneficiary (EIC 2012).

Chinese financiers' requirements with respect to social and environmental assessments are perceived to be more lax, as their social and environmental standards, which follow their own domestic standards, are far lower than those imposed by traditional donors (Woods 2008).

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[14] The one-China Policy is the view that there is only one state called China and requires by default that the recognition of either the People's Republic of China or The Republic of China (i.e., Taiwan) as "sole legal government" of China. This is separate from the one-China principle, which sees Taiwan as a province of China (Chiang 2004).

[15] A turnkey project is one where the builder takes charge of the entire process- from the design to the construction of the facility- and turns it over to the procurer when the facility is ready for operation.

Financing

Funders of infrastructure in SSA use a variety of instruments- similar across funders- to finance specific projects. Indeed, all financiers use grants, concessional loans, market-rate loans, and some form of equity financing. Germany, Japan, and China also negotiate export credits with beneficiary countries to promote their own exports there. Furthermore, in all cases, equity financing—administered through DFIs for traditional financiers and through the China-Africa Development Fund (CADF) for China— has not yet made substantial headway in providing funds for infrastructure in SSA (Kigombe et al. 2011): The traditional partners DFIs have mostly made loans available to private sector firms, while the CADF, an equity fund capped at US$ 5bn which can invest in "stocks, convertible bonds, and other quasi-equity types of investments," has invested an initial US$ 1bn in approximately 30 projects but mostly concentrated in the natural resource sector (Yan 2010; Massa 2011).

In terms of differences across financiers, first, the level of concessionality of subsidized loans varies widely. Some have very low interest rates (close to zero percent) as in the case of the World Bank's IDA loans, the AfDB's zero-interest loans, and the KfW's subsidized loans. Other loans, such as the JICA's ODA loans and AFD's soft loans, with interest rates between zero and 1.7 percent, are negotiated with the recipient government based upon the nature of the project, while those provided by the China EXIM Bank are only mildly below market rate (in the order of 1.5 to 2 percent). The repayment periods for concessional loans can also vary: Typically, traditional financiers allow for long repayment periods, ranging from 15 to 50 years, with grace periods of 5 to 20 years, while those of China are relatively short with repayment periods between 15 and 20 years and grace period of 5 years (Appendix B, Tables 1 and 2).

Second, China uses one distinct loan type: The resource backed loan. The main goal of this instrument is to secure natural resources for China, while providing loans with competitive interest-rates to countries that would otherwise not be able to obtain such loans. In essence, the EXIM Bank negotiates an agreement with the recipient country whereby it lends the country funds for building an infrastructure facility and the country repays the loan through natural resource exports or by providing preferential access to natural resource exploitation rights. In these agreements, the China EXIM Bank retains all disbursements and control of the project, i.e., it chooses and contracts directly with the firms that are awarded the contract to build the infrastructure facility. Amongst the prominent deals of this type is the 2004 agreement signed with Angola for over US$ 1bn worth of infrastructure construction and rehabilitation in exchange for oil exports. Another such deal was signed with the Democratic Republic of Congo (DRC) in 2008 for US$ 6bn worth of infrastructural works in exchange for copper and cobalt exploitation rights (Massa 2011; Jacobs 2011). While most of the commodities in these agreements have been oil and minerals (e.g., copper, bauxite, iron, chromium), over time, China has diversified into other commodities, including cacao (2007 agreement with Ghana) as well as

sesame seeds and goat skins (2011 agreement with Ethiopia) (Bräutigam 2011; Shinn and Brown 2012; Foster et al. 2009).

A third and important difference in the financing practices has to do with how the financing for a specific project is arranged. Traditional financiers tend to co-finance projects; in particular, the European bilateral agencies (AFD and KfW) along with their DFIs (Proparco and DEG) coordinate their investments with each other and those of the World Bank and the IFC. As noted above, this can be challenging to manage for recipient governments as the various institutions tend to have different requirements to approve financing (Garnett et al. 2009). China, in contrast, does little co-financing with other partners, but often mixes a number of instruments to fund a specific project.

Procurement

Two issues arise with the procurement process; who is responsible for managing the procurement process and therefore the bidding process, and second, who is allowed to participate in the bidding. In recent years, recognizing that to improve aid effectiveness, donor countries had to reform some of their practices, traditional donors pledged to undertake several changes under two OECD sponsored agreements - the 2005 Paris Declaration on Aid Effectiveness and the 2008 Accra Agenda, including using local institutions and procedures for procurement as well as untying aid. China has not signed onto either of the agreements and uses its own procurement system when funding projects (contracting directly with the construction firms) as well as ties much of its financing to the use of Chinese contractors and materials. Indeed, one requirement for project financed through concessional loans is that a Chinese company must be awarded the construction and in addition, at least 50 percent of the equipment and materials needed must be procured in China (Jacobs 2011; Corkin et al. 2008).

In the past, traditional financiers were intricately involved in the procurement process and used their own procurement systems - parallel implementation units (PIUs) - to deliver their aid and financing. Under the Paris Declaration and the Accra Agenda donors committed to using beneficiary procurement systems and to better align their policies and practices to beneficiaries systems as the first step while developing countries agreed to strengthen their procurement systems (Ellmers 2011; OECD undated).The implementation of this has however been slow, especially with larger projects, partly because beneficiaries' systems do not have the capacity to conduct bidding processes (particularly those that require International Competitive Bidding (ICB)). But even in cases where country systems could conduct such processes, traditional donors are sometimes reluctant to use these countries' systems because of the high level of corruption within these governments as well as the lack of transparency (Garnett et al. 2009; Ellmers 2011). Indeed, in conducting a series of case studies on donor financed infrastructure in several developing countries, Garnett et al. (2009) found that in most cases beneficiary countries' procurement systems were not being used as these did not have the capacity or the accountability systems to conduct the process. The authors also found that "donors were less likely to align with

government procurement systems for large-scale infrastructure projects" and that "alignment is less likely where large scale procurement involving International Competitive Bidding (ICB) is required" (p. iii).

Furthermore, multilateral financing requires ICB and, most of the time, the tenders are evaluated primarily on the lowest price, as well as the capability and resources of the bidder (EIC 2012; Wells and Hawkins 2008).

As for the untying of aid, many of the traditional bilateral financiers have made substantial progress: The AFD's ODA is now completely untied, as is 95 percent of JICA's ODA. Nevertheless, the KfW still ties about 50 percent of its aid, and most of the technical assistance provided by many of the bilaterals (including China) is tied. On the latter, one important difference between China and the other bilaterals is that the traditional donors are perceived to be using expatriate staff with very high salaries compared to the local standards, while those funded by China pay their engineers according to local pay scales (Corkin, Burke, and Davies 2008; Fletcher 2010).

Construction

In construction, variation among financiers comes from the way control is exercised over the process, the level of risk taken by the financier (and by the same token, the beneficiary), and the incidence of delays and cost overruns. There is however little variation with respect to the extent of "local content" in the construction in that many of the projects in SSA use mostly imported (as opposed to locally available) materials and skilled labor. The only link to the local economy in most case is the use of unskilled labor, which is also not always guaranteed – particularly with Chinese-funded projects (Michel and Beuret 2009). Indeed, as noted earlier, the level of "local content" is associated with the beneficiary government's laws and regulations but also the requirements imposed by the financiers. The World Bank for example prohibits any mandatory requirements that an international contractor enter into a joint venture with a local contractor to undertake construction, as well as any restrictions related to local use of skilled labor and materials; China requires the use of Chinese contractors and that at least 50 percent of the equipment and materials be imported from China (Wells and Hawkins 2008; Jacobs 2011; Corkin, et al. 2008).

In terms of how financiers control the process, traditional financiers have done so with the use of performance monitoring systems, imposing a number of reporting requirements and delaying disbursements if these are not met. The World Bank for example imposes performance benchmarks for each of the projects and withholds disbursements if these are not met. Similarly, ADF monitors compliance with the contract as well as with the risk mitigation action plan during construction. For the beneficiary countries, extensive monitoring requirements can add significant transaction costs, as their implementing agencies have to be equipped to undertake some of this monitoring, or at the very least, coordinate donor monitoring. Furthermore, the requirements add volatility and uncertainty to the process: In his study of donor financed

infrastructure in Mali, Fletcher (2011) found that "the irregularity of disbursements is just one of a number of risks faced by recipient governments when implementing aid-funded infrastructure projects" (p. 11). Chinese funds function very differently; they come with streamlined requirements and the contracts are often very flexible; renegotiations and adjustments of the contractual terms are not unusual, even once the construction has begun (Fletcher 2010; Jacobs 2011). Furthermore, the responsible agency (e.g., EXIM Bank) often contracts directly with the construction firms and can therefore negotiate incentive-based contracts with the firms themselves, addressing some of the potential delays (Jacobs 2011).

In terms of who bears the risks in the construction phase, in the Chinese case, the contracts themselves do not stipulate clearly who bears the risk in terms of price fluctuations and unforeseen events, but at least in the case of Mali, as Fletcher (2010) found, the Chinese authorities would meet with the recipient government and discuss how to jointly deal with the risk once it has happened. This introduces some unknown level of risk—-particularly in the long run— for the recipient government, as the Chinese counterparts may explicitly or implicitly ask for higher repayment or preferential treatment on other issues in the future. In contrast, traditional funders include clauses within the initial contract negotiated with the beneficiary government. In general the latter bears much of the cost of delays including currency and price shocks (e.g., oil prices)—the full cost with the multilaterals and the majority of it (80 to 90 percent) with the bilateral funders (Fletcher 2010).

In case of dispute between the contractor and beneficiary government, the World Bank requires that this be settled in international commercial arbitration in order to guarantee a neutral setting. While this is in theory the fairest way to resolve dispute, in practice it can also lead to delay of the project as arbitrators have to be appointed. Real-time dispute settlement options are not readily available, as beneficiary governments would have to set them up, and often, the funds for that area do not exist (EIC 2012).

For the incidence of delays and cost overruns, projects financed by traditional financiers are more prone to delays. For one, they are more likely to incur delays very early on at the planning stage as a result of the stringent and bureaucratic processes for environmental approvals, particularly acute for hydropower. Furthermore, during construction, there is some uncertainty and legal insecurity around the fact that the environmental rules agreed upon in the planning phase are being adhered to (EIC 2012). Secondly, as mentioned earlier, larger projects tend to be funded by multiple traditional financiers, and harmonizing and coordinating their many requirements may be challenging, time consuming, and costly. As noted by Woods, "the result is that scarce personnel and other resources in poor countries are used up in maintaining and strengthening external relations with donors and undertaking externally demanded actions, many of which are contradictory" (p.1219).

Monitoring and upkeep

In general, the focus of traditional financiers has also been demonstrating the value of the project at hand through ex-ante and ex-post cost benefit evaluations, while that of China has been the delivery of projects (CIDA et al. March 27-28, 2008; Fletcher 2010). Thus, traditional funders have both project and program level evaluation of results (Garnett et al. 2009).

At the project level, ex-post assessments are almost always conducted. JICA for example, conducts "a post-project evaluation that measures the relevance, the impact, efficiency and sustainability of the project". Similarly, AFD conducts a post-project performance evaluation at the end of each project, while the KfW conducts an assessment of the project a year after completion to see if it is operational and if the "resources were used in accordance with the contractual agreements." The DFIs, in particular the JBIC, the IFC, and DEG, also have their own assessments mostly focusing on the profitability of the project as well as its development effects and its impact on the environment.

None of the financiers have paid much attention to the maintenance and upkeep of the infrastructure. As noted by Garnett et al. (2009), while traditional financiers provide funding for capacity building in the planning stage, they do not do so consistently across developing countries for maintenance and upkeep. Similarly, Chinese actors focus on the delivery of the facility and rarely on its maintenance (Jacobs 2011).

For the burden that repayment imposes on the beneficiary countries, as illustrated in the *financing* section, the terms vary across financiers, but in general, traditional financiers generally provide more generous terms under their ODA windows, both in terms of interest rates, maturity, and length of the grace period. This is pertinent because many SSA countries are already heavily indebted (33 out of the 39 Highly Indebted Poor Countries (HIPC) are from SSA), and taking on additional debt can become unsustainable and negatively impact development in these countries. Nevertheless, it is important to note that in the Chinese case, while the loans stipulate a specified grace period and maturity, the terms can sometimes be flexible. As described by Fletcher (2010), "loans may become grants, terms can be adjusted," but these adjustments/ gifts "may elicit large payments in the future" (p. 12).

Cross-cutting issues

Corruption in the public sector is a pervasive problem across the SSA continent; according to Transparency International, "aid resources provided by multilateral and bilateral agencies have not been immune to corruption and misuse" and "the institutions that are intended to provide checks and balances within the system are generally under-resourced and lack independence" (Transparency International, webpage). This suggests a setting where politicians have a high level of discretion in policymaking and a lack of transparency and accountability in many of the stages of the infrastructure lifecycle, particularly procurement. Traditional funding agencies have introduced conditionalities around good governance and increased transparency, as well as

stringent monitoring and evaluation tools to counterbalance this environment and to improve the allocation of funds to projects.

However, the financing agencies themselves have questionable levels of transparency – to varying degrees – when it comes to the funding they make available to developing countries in the form of development assistance. According to the International Aid Transparency Initiative (IATI),[16] the multilaterals are the most transparent (the World Bank ranked 2nd and the AfDB 8th among 72 development agencies) systematically publishing recipient country level information as well as project level information. The bilaterals are much less transparent, as they do not disclose as much of their country project-levels activities. JICA is the most transparent among them (ranked 25th), followed by AFD (ranked 44th) and the KfW (ranked 55th). The DFIs (PROPARCO and DEG) are even less transparent than their public sector counterparts, including the IFC; in general none of them has an explicit Policy on Disclosure of Information, and DEG is required by law to uphold the German Banking Secrecy Law. However, Chinese agencies under the Ministry of Commerce are the least transparent, ranking second to last, as it discloses very little about its agencies, or about its country-level interactions and projects (Publish What You Fund 2013).

By the same token, as noted earlier, Chinese contracts with beneficiary institutions also tend to be the most flexible. Indeed, important clauses around dispute resolution or risk distribution across parties are not explicitly outlined. Additionally, renegotiations are not uncommon, even once the construction has started. In light on the lack of transparency around these funds, the flexibility of contractual terms provides an environment where corruption can thrive and the risk of misallocation of funds can be high.

Discussion: How do Chinese actors compare to other financiers?

The analysis above has shown that there are some similarities between the way Chinese and traditional financiers operate but the differences predominate. I highlight these here and explore the tradeoffs associated with the different types of financing options, before concluding with the policy implications for SSA governments in the next section.

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[16] The IATI, launched in 2008, is a "voluntary, multi-stakeholder initiative that seeks to improve the transparency of aid in order to increase its effectiveness in tackling poverty" (IATI 2013, webpage). As part of the Accra Agenda in 2008 and the 2011 Busan Agreements, 33 signatory donor country governments along with civil society organizations agreed on a set of common standards for transparency of development assistance and agreed to publish that information to IATI. Based on these, since 2010, IATI has been monitoring the transparency levels of donor organizations under the Publish What You Fund Initiative. In 2011, using primary data collected in partnership with 49 civil society organizations, the initiative successfully piloted its Aid Transparency Index rating donor agencies on the transparency their overall organization, recipient country level information, and activity (project) levels (Publish What You Fund 2013). The ratings discussed here are those of 2012.

Some similarities

The financing instruments are very closely aligned across financiers. Indeed, both Chinese and traditional partners provide a mix of market-rate and concessional loans, as well as grant financing for infrastructure financing in SSA countries. Furthermore, very similar to other bilaterals, notably Germany and Japan, China uses instruments such as export credits to promote its own exports of materials and equipment for the construction of the facilities. As of 2007, similar to other DFIs, China also has the CADF which intends to provide equity and quasi-equity financing to infrastructure projects on the continent. However, China does use one financing instrument that is not utilized by other financiers; resource-backed loans.

The terms associated with the financing instruments are also not that different, especially those accorded to middle income countries. Indeed, Chinese funding for infrastructure on the continent is mostly made up of loans at mildly concessional rates, while traditional donors provide similar loans to middle income and non-debt distressed countries.

In terms of procurements, while traditional donors have committed to using recipient country systems under the Paris Declaration, in effect, they still use their own as a result of capacity and reliability issues on the recipient country side. Chinese entities similarly rely on their own systems, albeit for different reasons, as they exercise full control over procurement.

But differences stand out

To start with, the guiding outlook to financing infrastructure in SSA is very different. The missions and principles of Chinese actors highlight the idea of partnership, "South-South cooperation," and mutual benefit, while traditional donors take a more paternalistic approach, highlighting development goals, knowledge transfer, and the protection of the environment. To that effect, Chinese agencies appear to be more "hands-off" in the planning process. They also do not impose any conditionality to their funds, with the exception of the recognition of the "One China Principle." In contrast, despite their expressed desire to have "strong country ownership", in addition to imposing conditionalities around human rights, democratic governance, as well as economic conditionalities, the traditional bilateral and multilateral agencies are involved from the very beginning, requiring that proposed projects fit overall country growth strategies, and at the same time providing technical assistance and capacity building to prepare country strategies and project feasibility studies. The result in some cases is that country ownership is so weak that the agenda is mostly donor driven. This is also reflected in the construction/implementation phase of the infrastructure lifecycle, where traditional financiers use extensive monitoring and evaluation standards and even condition the disbursement of funds on strict performance benchmarks.

Another facet to the differences in missions and guiding principles is that Chinese funding is tied whereas other financiers have started progressively untying their aid; under the 2005 Paris Declaration and 2008 Accra Agenda, traditional donors have committed to fully untie their

development assistance, while China has stated that it will only do so on a "voluntary basis" during the 2011 Busan agreements. Perhaps more importantly, Chinese funding terms seem to be less generous (in terms of interest levied, length of the grace period, and maturity of the loan) than traditional donors that generally calibrate their terms to the income and debt levels of recipient countries. It is nevertheless important to note here that China has also cancelled a number of debts owed by SSA countries in recent years.

The way China undertakes its development assistance is also fundamentally different: Chinese aid is conducted on a project-by-project basis, and each project is entirely funded by Chinese agencies. In contrast, traditional financiers aim to finance projects that fit into the overall country growth strategy. They also tend to work with each other and jointly fund projects, particularly if the projects are large. For example, France's AFD often works with the European Investment Bank (EIB) and Germany's KfW, as well as the respective private sector arms (DEG and PROPARCO to fund a project). Multilateral agencies also co-finance projects; in particular, the World Bank and the African Development Bank. The IFC, by policy, funds at most 25 percent of project, as it endeavors to attract other sources of (private) finance for projects. For the recipient country, multiple co-sponsors can add to the transaction and coordination costs, as each of the funders has specific requirements that can sometimes be contradictory.

Yet another distinction between Chinese and traditional funders is the level of flexibility throughout the infrastructure lifecycle. Chinese agencies typically negotiate vague contracts and allow for the renegotiation of terms during the whole lifecycle including repayment terms, whereas traditional financiers have more robust contracts stipulating a number of the requirements, risk mitigation strategies, responsibilities in case of delays and cost overruns, dispute settlement mechanisms etc. Likewise, traditional funders have extensive environmental and social assessment requirements before agreeing to fund a project, while the requirements for Chinese agencies are minimal. Furthermore, Chinese agencies tend to be a lot less transparent in their dealings than the traditional financiers, although the latter group is not homogeneous in the disclosure of its practices.

Lastly, in assessing their respective levels of success, traditional financiers focus on the impact, efficiency and sustainability of the project, and therefore conduct a multitude of ex-post evaluation, while their Chinese counterparts focus on the delivery of the facility on time.

One of the implications of these differences is that Chinese funded projects are associated with fewer delays than those funded by traditional financiers. They also impose fewer transaction costs, are more predictable, and have lower short-term risks. On the flip side, however, Chinese funds are associated with higher long-term costs given the less generous terms, as well as higher long-term risk in that the contracts are not very elaborate, and given the lack of transparency, could imply implicitly a number of costly future commitments such as preferential access to natural resources, or higher debt servicing costs.

Policy implications

In sum, the main finding of this chapter is that Chinese financing provides a real alternative to traditional financing of infrastructure on the continent. For African policymakers, this provides a portfolio of possible financing sources for the much needed infrastructure, as well as more leverage to negotiate better deals. In order to take advantage of these however, it is important that African policymakers understand the differences and tradeoffs around the various financing mechanisms. In effect, the various financiers present several tradeoffs around the following key issues:

1. Ownership of the infrastructure project versus a donor-driven agenda
2. Direct cost of the financing both in the short-term and the long run; the terms of the financing, the level of future debt burden the financing option imposes
3. The amount of short term and long-term risk that the SSA government takes on
4. The transaction costs involved
5. Speed of delivery and the potential for delays and cost overruns

In broad strokes however, the advantages of Chinese funds relative to those from traditional financiers are that they enable countries to fund projects of their choosing, are associated with fewer delays, they impose fewer transaction costs, are more predictable, and have lower short-term risks. The disadvantages are that Chinese funds are associated with higher long-term costs given the less generous terms, as well as higher long-term risk in that the contracts are not very elaborate and, given the lack of transparency, could entail implicitly a number of costly future commitments such as preferential access to natural resources, or higher debt servicing costs.

Ultimately, the choice of the financing really depends on the individual recipient country government as well as on the specific project based on the environment in the country, governance capacities, experience with the specific financiers, and the needs on the ground. The framework established here provides a clear guide on what factors should be taken into consideration throughout the lifecycle of an infrastructure investment.

While the discussion here assumes a welfare maximizing SSA policymaker, it is important to note that this may not always be the case. Indeed, the strongest criticisms of the Chinese way of financing infrastructure (and more generally of providing assistance to SSA countries) is that (1) because it does not impose conditionalities around good governance and human rights issues, China supports "rogue states" and does not demand adequate environmental and social protection in the projects it funds, and (2) the lack of transparency in its dealing promotes corrupt practices in countries that already have low levels of political governance. In so doing, it sets back the efforts of traditional donors who have worked for decades to promote good governance and sustainable growth (Woods 2008).

This is all the more important as a separate recent trend is that the Chinese involvement is driving a rising interest from other emerging economies, in particular Turkey and Brazil, to invest in African infrastructure. The mechanisms that they employ are very similar to those of

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China; i.e., providing support to Turkish/ Brazilian firms to engage in infrastructure provision in SSA on the one hand, and providing competitive loans to countries to enable them to build the needed infrastructure (Özkan 2008; The Economist 2010, 2012).

4. Determinants of Private Participation in Infrastructure

The main aims of this chapter are to investigate the determinants of private participation in infrastructure in LMICs and SSA countries and explore how SSA countries compare to the other LMICs. The guiding research questions are whether SSA countries differ from other LMICs in how they attract private investment in infrastructure, and if they do, what policy implications these findings entail. The underlying premise is that SSA countries may indeed be different from other developing countries (and therefore require unique policies), as there is consistent evidence from the macroeconomic literature that SSA countries differ from other developing countries with regards to factors influencing macroeconomic trends such as growth and FDI (e.g., Asiedu (2002) and Morrisset (2000) for FDI receipts, and Tsangarides (2005) and Block (2001) for economic growth).

A quantitative approach is taken to address these questions, using a cross-country panel regression framework. The outcome variables of interest are (1) whether a country received any PPI in any given year between 1995 to 2008, and (2) the amount of PPI received (in constant 2005 US$) contingent on receiving PPI. I test if factors such as government fiscal stance, political and business environment, and market size affect whether or not a country attracts private funds for infrastructure, and for those countries that do in fact attract PPI, whether these factors have an impact on the amount received.

The chapter is structured as follows: In the next section, I provide a brief background and discuss the related research as well as my own contributions; subsequently, the methodology is outlined, followed by the data and the results. The chapter then concludes with a discussion of the findings.

Background and related research

Formally defined, an infrastructure project is considered a PPI "if a private company or investor bears a share of the project's operating risk" (World Bank 2013, webpage). In the most basic sense, PPIs entail some sort of partnership between the public and private sectors through a long-term contractual agreement which aims to facilitate the involvement of the private sector in infrastructure provision so as to increase the infrastructure stock as well as its quality and performance. Thus, a PPI can exist only in the event that there are complementarities between the public and private sectors and, typically, the contract involves a risk-sharing mechanism between the two entities.

Effectively, for a given infrastructure project the private sector can bring financing and management expertise and, as it is profit-driven, efficiency and self-sustainability of utilities (resulting from stronger incentives for tariff discipline) and improved quality of services (resulting from consumers' higher willingness to pay for better services). In exchange, the public sector can provide a conducive business environment, access to credit, as well as investor protection (de Bettignies and Ross 2004, Kirkpatrick et al. 2006a, Linder 1999).

By the same token, PPIs may not be viable in some cases. For one, certain infrastructure sectors, such as water and electricity, are inherently more "public" than others, and therefore (in most cases) benefit from subsidies which can result in highly distorted tariffs. This may in turn translate in strong opposition to any form of privatization on the moral ground that these infrastructure services represent basic needs, ultimately leading to difficulties for the private sector to rationalize tariffs and making PPIs non-viable. Furthermore, because some infrastructure sectors require substantial upfront investments (e.g., construction of the physical network) with profits spread out over the long run and low rates of return to investment, in the absence of strong credit markets providing debt financing opportunities for the private sector, PPIs may not be feasible without credit enhancement or guarantees from governments and/or multilateral agencies (Dubash 2002, Shirley 2007, Tenenbaum and Izaguirre 2007). Additionally, since infrastructure sectors have natural monopoly features, a good regulatory environment is central to the success of PPIs (Grimsey and Lewis, 2002, Pragal 2003, Kirkpatrick et al. 2006a).

Given these considerations, three relevant areas to assess the determinants of PPI are distinguished: (1) the motivations of governments to engage the private sector in infrastructure financing, (2) the motivations of the private sector to enter a public-private partnership (PPP) with the government, and (3) the underlying context in terms of the institutional and macroeconomic environment, which drives to some extent the respective motivations of the public and private sectors. I briefly discuss the factors included in each of the three categories and summarize them in Table 5 below.

Table 5 Factors potentially affecting the level of PPI received

Category	Factors identified in the literature
Government motivations	• Ability of government to finance infrastructure • Improved efficiency and tariff discipline in infrastructure sectors
Private firm motivations	• Adequate regulatory framework and proper enforcement of laws • Independence of regulatory institutions and processes • Access to credit • Consumers' ability to pay for services • Government effectiveness and responsiveness • Political stability and public opinion on private provision of infrastructure services
Enabling environment	• Macroeconomic environment • Institutional capacity to regulate PPPs • Structural characteristics of country

The literature on PPIs identifies two key factors which can affect governments' motivations to engage the private sector: The ability of the government to finance infrastructure on its own; its desire to increase access to infrastructure and introduce improved efficiency and tariff discipline in infrastructure provision; and its desire to reduce its own investment risks. In a series of case studies of PPIs across eight countries,[17] Sanghi et al. (2007) find that initially the principal motivation for governments to enter into a PPP contract was to attract private financing for infrastructure, but as countries built experience with PPPs, governments started considering the optimal risk allocation and the net present value of money under a PPP contract relative to a situation where the government provides infrastructure by itself (Sanghi, et al. 2007). Harris (2003), through a qualitative study of the historical trends of PPI in developing countries, suggests similar motives for government involvement in PPPs: The governments that sought out PPIs in the early 1990s were those experiencing severe budget strains as a result of their inability to impose commercial and financial discipline to publically owned utility sectors, which, as a result, experienced declining performance and were finding themselves unable to meet the increasing demand.

Private firms investing in infrastructure face a different set of incentives. Lamech and Saeed (2003), who undertook a survey of firms investing in PPIs in the power sector in developing countries, find that firms prioritize the existence of a regulatory framework that adequately defines investors' rights and responsibilities, as well as the ability to enforce them, in their decision on whether or not to invest in a developing country. Additionally, firms valued the independence of public regulatory institutions from political government entities and arbitrary interference. Market size, consumers' ability to pay for services, administrative efficiency of the government and its responsiveness to private investors, and access to credit also influenced

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[17] These are Bangladesh, Jamaica, South Korea, the Philippines, Portugal, South Africa, the United Kingdom and The state of Victoria in Australia.

firms' decisions. Furthermore — although to a lesser extent than the other factors — public opinion on the provision of infrastructure services by the private sector and "tenure and stability of elected officials in the political process," mattered in firms' decisions to invest (Lamech and Saeed 2003, p 15). Similarly to the latter point, Foster and Briceño-Garmendia (2010) find that in SSA, politically unstable countries on average tend to attract less private capital into infrastructure than their more stable counterparts.

Outside of the respective government and private sector motivations to engage in an infrastructure PPP, other factors can also influence the level of PPI received by countries. One that is often cited in the literature is the macroeconomic environment. Indeed, inflation and variability in the exchange rate have been shown to be detrimental to PPI (Banerjee et al. 2006). Furthermore, when looking at PPI trends over time, sharp drops in PPI have been noted in times of macroeconomic crises, such as the financial crises in Asian in 1997 and in Argentina in 1999 (Harris 2003). Another factor mentioned in the literature (and referred to earlier) is the institutional capacity of the government to regulate and manage a PPP contract.

A whole host of other factors related to the structural characteristics of the PPI receiving country may also matter. For example, the legal tradition in the country can influence the regulatory environment in which PPPs operate (La Porta et al. 1997, 1998). Additionally, a number of empirical studies have shown that openness to trade is positively associated with increased FDI (Asiedu 2002, Morrisset 2000); and, since in many developing countries firms investing in infrastructure tend to be foreign (due to the high level of investment required), openness could in turn affect PPI.

The empirical evidence on determinants of PPIs is sparse and, to my knowledge, no study has looked at the specific case of SSA. Among the few papers that have explored the question, most use a cross-country panel regression approach, looking at whether indicators of macroeconomic stability, measures of institutional and regulatory quality, and a variety of other controls impact the total amount of PPI received by a country. For example, Pargal (2003) and Kirpatrick et al. (2006) look at the importance of the regulatory framework as a determinant of PPI respectively for Latin America and the Caribbean (LAC) and the broader set of developing countries. Pargal (2003) finds that the most significant determinant of PPI is the passage of legislation liberalizing the investment regime, while Kirpatrick et al. (2006) find that institutional framework and regulation matter most. Similarly, Banerjee et al. (2006) look at the question of whether institutions matter for PPI. While their results indicate that property rights and bureaucratic quality play a significant role in promoting PPI, they also find that countries with higher levels of corruption attract more PPIs.

This dissertation contributes to the existing literature in several ways. For one, as stated earlier, only a handful of studies have empirically investigated the determinants of PPI in developing countries and, to my knowledge, none has centered in on SSA. Further, where the other studies have considered the trends in PPI up until 2005, I extend the analysis to 2008. More substantively the empirical strategy taken here yields more robust results than earlier research in

that it controls for unobserved time characteristics through time fixed effects models, controls for a wide number of country-level characteristics, and accounts for heteroskedasticity in the model. For the latter, previous papers have relied on generalized least squares method of estimation, which implicitly assumes a general distributional form for the error terms. This assumption cannot be tested, and in the event of misspecification, it can lead to incorrect standard errors and biased coefficients. In contrast, I cluster the standard errors on countries, allowing for arbitrary heteroskedasticity across countries and autocorrelation within countries. Furthermore, unlike much of the previous research, I separately estimate the determinants of getting PPI and the amount of PPI given that a country has received PPI.

Methodology

The main methodology adopted here is a cross-country regression framework. In essence, I estimate the predictors of PPI receipts for all LMICs and for SSA countries separately to compare the two groups and identify if and how SSA countries differ from LMICs.

The outcome variable of interest, the amount of PPI received by a country in a given year (financial closure year), has a left-skewed distribution with a substantial number of observations clumped at zero as some countries did not receive private capital in infrastructure during certain years (see Appendix D). Initially, following the literature (e.g., Kirpatrick et al. 2006), I specify a "benchmark" model using a random effects ordinary least squares (OLS) estimation with a log transformation of the outcome variable (so that the PPI numbers are more normally distributed—see Appendix D),[18] and the three groups of independent variables discussed above, such that X represents the factors influencing government motivations, Y the factors influencing the private sector motivations, and Z the factors influencing the enabling environment. In addition, I include the total level of investment in the economy, I, as a control to normalize PPI data,[19] and time fixed effects to account for unexpected events that may have affected PPI (e.g., financial crises).[20] In terms of the standard errors used, because I have panel data, there is a high likelihood of heteroskedasticity and autocorrelation within the model. Therefore, I cluster the

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[18] As described in Appendix D, I take the ln(PPI+1) so that all the observations where PPI is equal to zero are not dropped from the analysis when I take the natural logarithm. I recognize however that adding 1 to the outcome variable is somewhat arbitrary and could therefore bias the results.

[19] I use the gross fixed capital formation (in constant 2005 US$) defined as the total expenditure on "land improvements; plant, machinery, and equipment purchases; and the construction of roads, railways, and the like, including schools, offices, hospitals, private residential dwellings, and commercial and industrial buildings" (World Bank, World Development Indicators website)

[20] I selected a random effects model in part because the differences across countries may influence the level of PPI received by a country. I ran a Hausman test to see whether a random effects or a fixed effects model is preferred. The null hypothesis that that the coefficients estimated by the random effects model are the same as the ones estimated by the fixed effects model cannot be rejected , therefore it is safe to use a random effects model(p= 0.1033).

standard errors on countries, and allow for arbitrary heteroskedasticity across countries and for autocorrelation within countries.

$$\text{Model 1:} \quad \ln(\text{PPI}+1)= \beta_0 + \beta_1 + I_{it} + X_{it} + \beta_2 Y_{it} + \beta_3 Z_{it} + \vartheta_t + \mu_{it} + \varepsilon_{it}$$

To better account for the particularities of the outcome variable (see Appendix D), I specify an alternate model that I compare to the "benchmark." This alternate model explicitly accounts for the fact that a country may not receive PPI in all years by undertaking the estimation of the determinants of PPI in two parts: The first part estimates the likelihood of a country receiving PPI in a given year using a logit regression, and the second part the amount of PPI given that there was a positive level of PPI in that year using an OLS framework (Model 2).[21] As in Model 1, the three groups of potential determinants in both regressions are included, as are the control for the total level of investment and the time dummies.

Model 2

Part 1: $\Pr(PPI_{it}>0)= \alpha_0 + I_{it} + \alpha_1 X_{it} + \alpha_2 Y_{it} + \alpha_3 Z_{it} + \vartheta_t + \mu_{it} + \varepsilon_{it}$

Part 2: $\Pr(PPI_{it}|PPI_{it}>0)= \gamma_0 + I_{it} + \gamma_1 X_{it} + \gamma_2 Y_{it} + \gamma_3 Z_{it} + \vartheta_t + \mu_{it} + \varepsilon_{it}$

The empirical strategy attempts to take into account some of the known limitations of cross-country regression frameworks (Levine and Renelt 1992). In response to autocorrelation and potential heteroskedasticity, other studies have used generalized least squares methods but this is somewhat problematic because it imposes an assumed distribution on the error terms which is not testable and, in the event of misspecification, it can lead to incorrect standard errors and biased coefficients. In order to avoid this, the standard errors are clustered by country, which allows for arbitrary heteroskedasticity across countries and autocorrelation within countries.

Furthermore, to minimize the omitted variable bias, time fixed effects are used to control for time-specific shocks. A number of country-level controls are also included to account for other possible determinants of PPI. Further, the potential problem of mutlicollinearity is addressed in the final chosen model ("the streamlined model"): To minimize mutlicollinearity among the independent variables, bivariate correlation coefficients between the independent variables are calculated, and in the event of high coefficients (greater than 0.5) between two variables, one of the two is excluded from the model. While the existence of other potentially relevant unobserved country-level variables cannot be ruled out, a range of checks are conducted to make sure that the results are robust. In particular, alternative proxies are used for the independent variables to see if the specific proxies drive the results. Additionally, when conducting the analysis for the

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[21] Similarly to the benchmark model, I ran a Hausman test to determine the appropriateness of a random effects model, and find that the null hypothesis cannot be rejected (p values of 0.9815).

SSA sample, potential outlier countries are identified in the sample and excluded from the analysis to ensure that these are not driving the results.

Data

Private participation in infrastructure

The World Bank maintains a database containing time-series project level data, spanning from 1984 to 2008. The database compiles information on large PPI projects in 133 LMICs for the four infrastructure sectors of interest. It includes information on the level of PPI received (in millions of current US$) by project, sector, and country in which the project is located, and the contractual arrangements used in each project. Of note, the database registers private sector commitments to invest in public infrastructure (rather than actual disbursements) and therefore tracks private sector intentions to invest. Furthermore, portfolio investments in infrastructure through the stock market are not reflected in the database. This is not necessarily a problem since the focus here is SSA countries, which typically do not have a vibrant stock exchange, with the exception of South Africa (Andrianaivo and Yartey 2010, Yartley and Adjasi 2007). To account for this, in the robustness checks, South African PPIs are excluded from the sample of SSA countries to see if the results are sensitive to the inclusion of a possible outlier.

One limitation of the database is that since the data is collected from major news sources, databases, and government websites, it may miss out on smaller projects not reported in these sources and therefore not capture the entirety of PPI within the country. The database is nevertheless the most complete source of PPI data across developing countries.

For the analysis, PPI numbers are adjusted for inflation using the consumer price index (base year 2005), obtained from the World Bank's World Development Indicators (WDI), thus, the primary outcome variable used is the total PPI in constant 2005 US$. In addition, because of the lack of data for explanatory variables in certain countries for earlier years (1984-1994), the time period is limited to 1995-2008.

As shown in Table 6 below, the average PPI received by an LMIC in a year over the period was a little over US$1 billion, with a minimum of US$ 0 and the maximum of US$ 101.24 billion. In contrast, the numbers are much more modest for SSA; there were 616 PPI projects during the period, the average annual receipt was around US$ 162 million, and the maximum amount of PPI received in a year was just over US$ 6.1 billion. Furthermore, as stated earlier, an important characteristic of the outcome variable is that its distribution is highly skewed towards zero, as a number of countries did not receive any private capital in infrastructure in some years. To that effect, 39 percent of the observations in the LMICs sample are zeros compared to 47 percent in the SSA sample.

Table 6 Private Participation in Infrastructure Summary statistics

Group	LMICs	SSA
# of countries	133	44
Mean (millions of constant 2005 US$)	1,010.12	162.43
Std. Dev.	4568.86	570.51
Min (millions of constant 2005 US$)	0	0
Max (millions of constant 2005 US$)	101,236.70	6,106.45
# of observations	1862	616

Explanatory variables

The proxies used for the explanatory variables are discussed following the structure described in the background section and summarized in Table 1 above. The full list of variables, their definitions, and their sources are provided in Appendix E.

Factors affecting the government's motivations to enter a public-private partnership (PPP)

To proxy the government's ability to finance infrastructure on its own, two indicators are used: The level of *aid received as a percentage of gross capital formation* from the World Bank's WDI database and an *index capturing government size* from the Heritage Foundation's Index Economic Freedom (IEF) database. The rationale behind the first indicator is that to the extent to which the government is able to attract other sources of capital for investment purposes through, for example, foreign aid, it may not necessarily be pursuing PPI. I therefore expect aid to be negatively correlated with PPI. As for the index of government size, which captures the level of government expenditures with respect to consumption, transfers, and provision of public services, it indicates (albeit imperfectly) how involved the government is in the financing of public services, including the provision of infrastructure services. Effectively, because a higher index entails a smaller government (and therefore a lower level of expenditures), I expect the index to be negatively correlated with PPI.

The need for improved efficiency and tariff discipline in infrastructure sectors could be proxied by indicators of government debt. Unfortunately, complete data on this across countries are not readily available; the only indicator found, central government debt as a percentage of GDP from the WDI, is missing the vast majority of the observations.

Factors affecting the private sector's motivations to enter a public-private partnership (PPP)

To proxy for the regulatory framework and the extent of enforcement of laws, as well as the independence of regulatory institutions and processes, I use two indices from the IEF: *Freedom from corruption* and *property rights protection*. These indices capture different aspects of the regulatory framework; while the property rights index indicates the existence of laws protecting

investors and how well they are enforced, the corruption index measures the level of unlawfulness and impropriety that exists within the system. In both cases, a higher value of the index indicates a better environment (i.e., the higher the property rights index, the better the protection and the higher the freedom from corruption index, the less corruption there is). I expect both to be positively correlated with PPI.

Domestic credit to the private sector as a percentage of GDP, *population size*, and *GDP per capita* (in constant 2005 international $)—all from the WDI— are used to proxy respectively for the availability of domestic credit, market size, and consumers' ability to pay. I expect all three to be positively correlated with PPI as greater access to credit, a large population, and high GDP per capita all entail better prospects for the private firm investing in an infrastructure facility.

For government effectiveness and responsiveness to the private sector, indices of *fiscal, investment, and business freedom* from the IEF are used, respectively measuring tax burden imposed by government on private sector, constraints on the flow of investment capital, and the efficacy of the government in the regulatory process in terms of the ability to start, operate, and close a business. For all three measures, as the index rises, the level of "freedom" increases (i.e., a high fiscal freedom index suggests a low tax burden on the private sector, a high investment index corresponds to a situation where there is little constraints on the movement of capital in and out of the country, and a high business freedom suggests low regulatory burden/high government efficiency to start, operate, and close a business). I expect the three indices to be positively correlated with PPI. In addition, a dummy indicating whether or not the country is a *democracy* is used; arguably, responsiveness to private sector may be stronger in democracies and therefore, I would expect democracies to have more PPI.

Political stability is measured primarily through a variable of *regime duration*. Frequent regime changes can entail a volatile business environment with recurrent policy changes as they relate to the private sector. Particularly for PPI, being a sensitive area, there is the risk that a regime change could dramatically alter government policies towards PPI. Conversely, longer regime duration brings stability with respect to government policies, which in turn provides private firms with a more predictable business environment. In the same vein, a dummy variable for *civil war* is added (obtained from Hadenius and Teorell 2007) to control for specific years in which there was disruptions due to civil war, Clearly, I expect PPI to be negatively associated with civil war. Furthermore, in order to get at the potential for political instability, I use an indicator developed by Roeder (2001), which provides "*the probability that two randomly selected people in a given country will not belong to the same ethnolinguistic group*" (as cited in Hadenius and Teorell 2012, p. 45). The idea here is that a higher level of ethnic fractionalization is associated with increased instability and therefore reduced PPI.

Factors affecting the enabling environment

Annual consumer price inflation (from the WDI) is used as a measure of macroeconomic stability. High and volatile inflation rates are detrimental to business through their impact on

costs of inputs and on prices, and may negatively affect the level of investment a private firm decides to undertake.

Openness, defined as imports and exports as a fraction of GDP, is used as a measure of the country's receptiveness to foreign investment. To the extent that PPI is undertaken by mostly foreign firms, I expect openness to be positively correlated with PPI.

Other factors related to the structural characteristics of the PPI receiving country may also matter. For example, the *legal tradition* in the country can influence the regulatory environment in which PPIs happen (La Porta et al. 1997, 1998). I control for legal traditions directly by using a dummy for countries that follow common law.[22] In addition, several indicators of the structural characteristics of the host economies are controlled for, including the *value added of agriculture, industry and services to GDP*, as well as an indicator of *natural resource dependence*.

Results

Appendix F outlines the full results discussed here. In general, the "benchmark" model yields similar results to the two-part model with a few exceptions, but I discuss the latter in more detail, as it enables me to separately identify possible determinants of PPI, as well as the level of PPI given that a country receives PPI.

As described in the methodology section, I start with a broad set of independent variables that were found to be relevant for PPI in the literature (Appendix F, Table 1). Acknowledging however that these results may be biased due to multicollinearity, I streamline the model by dropping the explanatory variables that are correlated with each other (correlations shown in Appendix F, Table 2). Effectively, I drop GDP per capita (highly correlated with structural indicators of the economy, in particular value added of agriculture, services and industry to the economy, as well as the level of aid received by the country), and the index for property rights (highly correlated with the freedom from corruption as well as with the investment and business freedom indices).

The final results, as described in Figure 3 below, suggest that for LMICs as a whole the largest predictor of getting PPI has to do with recipients' economic structure, in particular, countries with larger service sectors (as a percentage of GDP) are more likely to receive PPI. Countries more open to trade, countries with larger populations, and democracies, are also more likely to receive PPI, as are countries with higher levels of fiscal freedom (lower tax burden). The results for SSA countries differ slightly; while countries with larger service sectors, larger populations, and lower tax burdens, are similarly significantly and positively associated with PPI receipts, being a democracy or having an open trade regime do not appear to affect the

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[22] Common law is defined by Tetley (1999) as follows "legal tradition which evolved in England from the eleventh century onwards. Its principles appear for the most part in reported judgments, usually of the higher courts, in relation to specific fact situations arising in disputes which courts have adjudicated. The common law is usually much more detailed in its prescriptions than the civil law" (p. 684).

probability of getting PPI in SSA. In contrast, SSA countries with common law regimes are significantly more likely to get PPI.

Figure 3 Factors associated with positive levels of PPI- SSA compared to LMICs

LMICs   SSA countries

Variable	Odds ratio (LMICs)
fiscal freedom	1.03
democracy	2.55
ln (population)	2.93
openness	6.67
ln (services)	19.45

Variable	Odds ratio (SSA)
fiscal freedom	1.04
ln (population)	2.05
common law	3.51
ln (services)	57.69

Odds ratios   Odds ratios
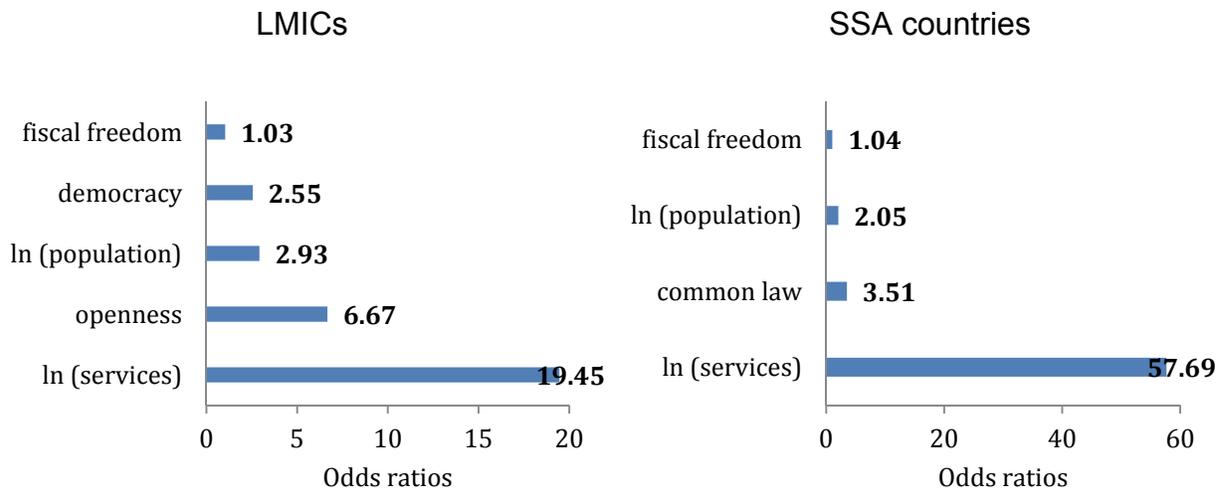
Notes: The bars represent the coefficient estimates (converted into odds ratios) on the independent variables that were significantly (at the 0.05 level) associated to the outcome variable (a dummy variable indicating whether or not the country got PPI that year). Both regressions include the following explanatory variables: Government size index, amount of aid received (% of gross capital formation), value added of services, industry, and agriculture (% of GDP), natural resource rents (% of GDP), freedom from corruption index, fiscal freedom index, availability of domestic credit, regime duration (in years), dummy variable indicating whether the country is a democracy, level of ethnic fractionalization, dummy indicating if the country is undergoing a civil war, dummy indicating whether the country follows common law traditions, level of inflation in consumer prices, and the country's openness to international trade (measured as trade as a percentage of GDP).

Contingent on receiving PPI, for all LMICs, the amount of PPI received is positively and significantly correlated with higher levels of industrialization, greater market size (as proxied by the population) and greater availability of domestic credit. Further, countries following common law appear to receive significantly less PPI than non-common law countries. Aid and inflation are also significantly and negatively associated to the amount of PPI received, but the coefficients on both are very small (so not practically significant).

Results for SSA again differ in some aspects. Similar to all LMICs, the amount of PPI received by SSA countries that get PPI is positively and significantly correlated with higher levels of industrialization, market size, and greater availability of domestic credit. However, and arguably more concerning, the amount of PPI received is positively and significantly correlated with the political instability (as measured ethnic fractionalization), and negatively (significantly so) correlated with higher levels of corruption and lower government efficiency in the regulatory process.

Figure 4 Factors associated with the amount of PPI received- SSA compared to LMICs

LMICs

SSA
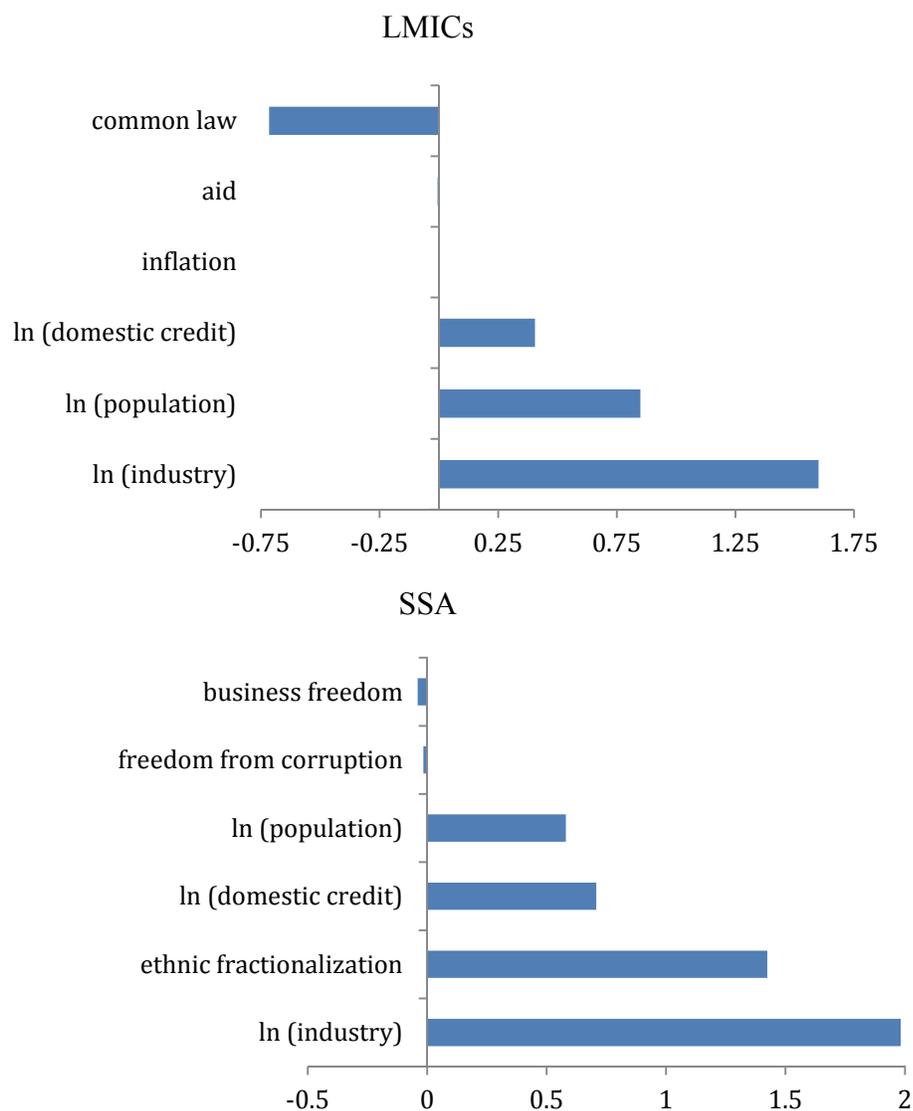
Notes: The bars represent the coefficient estimates on the independent variables that were significantly (at the 0.05 level) associated to the outcome variable (the amount of PPI received in 2005 constant US$). Both regressions include the following explanatory variables: Government size index, amount of aid received, value added of services, industry, and agriculture (% of GDP), natural resource rents (% of GDP), freedom from corruption index, fiscal freedom index, availability of domestic credit, regime duration (in years), dummy variable indicating whether the country is a democracy, level of ethnic fractionalization, dummy indicating if the country is undergoing a civil war, dummy indicating whether the country follows common law traditions, level of inflation in consumer prices, and country's openness to international trade (measured as trade as a percentage of GDP).

Robustness checks

Several alternative specifications are estimated to check the robustness of these results. In a first set of checks, I reintroduce the explanatory variables that were dropped because of

multicollinearity and dropped those variables that were kept. In a second set, different proxies for the explanatory variables that are more perception-based measures (e.g., various indices of business environment and political stability) are used to make sure that the results are not driven by specific proxies. Finally, the SSA regressions are conducted without South Africa to ensure that the results are not biased due to the inclusion of a possible outlier. In effect, using the streamlined model established above as the starting point, I ran the following alternative specifications (see Appendix G for full results):

- *Regression (1):* Indicators of structural aspects of the country's economy (value added of services, industry, and agriculture) and the level of aid received are substituted with the GDP per capita.
- *Regression (2):* In addition to substitutions made in (1), the indices of business and investment freedom are dropped, and the index of property rights protection from the IEF is added.
- *Regression (3):* Alternative measures from the World Bank's World Governance Indicators (WGI) are used to proxy for political stability, as well as government effectiveness and rule of law. Thus, the indicators for civil war, regime durability, and ethnic fractionalization are replaced by the WGI's index for political stability and absence of violence, and the indices for business and investment freedom, and freedom from corruption are replaced by the WGI government effectiveness index, the WGI regulatory quality index, the WGI rule of law index, and the WGI index for control of corruption.
- *Regressions (4) and (5):* I use alternative political stability measures in each regression. In (4), I replace political stability measures from the "streamlined model" (civil war, regime durability, and ethnic fractionalization) with the US State Department's Political Terror Scale (PTS) measure of political violence and terror. In (5), I replace them with the WGI political stability and absence of violence index.
- *Regression (6)*: I substitute the business and investment freedom indices with an overall quality of government index from the International Country Risk Guide (ICRG).
- *Regression (7):* For the SSA regressions, I run the streamlined model without South Africa.

For the overall sample of LMICs, the robustness checks generally support the main results. The level of GDP per capita, the extent of the service sector in the economy, tax burden on the private sector, and openness to trade, are all consistently significantly (and positively) correlated with a country getting PPI. Similarly, GDP per capita, population size, and industry value added are all positively and significantly correlated with the amount of PPI received given a non-zero level of PPI while following common law legal tradition is (mostly) consistently significant and negatively correlated. The only coefficient that is not consistently significantly associated with getting PPI is the form of government (whether or not the country is a democracy). Indeed, in three of the regressions where alternate measures of political stability and/or government effectiveness are used, democracy becomes insignificant. However, this may be due to a reduced sample size as the WGI, PTS, and ICRG measures have more restricted availability over time; the number of observation drops to 742 when using WGI and ICRG measures and to 501 when using PTS measures.

For the SSA sample, the robustness checks suggest that in addition to the size of the population, the burden of taxes on the private sector, and whether a country follows common law traditions, other factors including the level of GDP per capita and the level of openness to trade may also be important determinants of whether a country gets PPI. Further, the robustness checks reveal that the effect of the extent of the service sector is somewhat ambiguous, as its coefficient loses its significance in the regressions where alternate proxies are used. For the determinants of the amount of PPI contingent on a country receiving PPI, the robustness checks generally support the main findings with the exception of ethnic fractionalization, which becomes non-significant in the alternate specifications. Of note, corruption stays significantly and positively associated with the amount of PPI received given a non-zero PPI even when using alternative measures for corruption. Similarly, the coefficient on business freedom remains negatively and significantly correlated with the amount of PPI received. Finally, the robustness checks also suggest that taking South Africa out of the SSA sample does not change the results— the only difference is that the magnitude on the coefficient on the extent of the service sector in the economy is larger.

Discussion

The analysis shows that for both LMICs and SSA countries, the size of the service sector in the economy is the largest predictor of the probability that a country gets PPI, with the effect being even more pronounced for SSA countries. Given that the contribution of the service sector increases as a country develops and matures (Noland et al. 2012), this finding suggests that the more developed LMICs are the ones receiving PPI. This may be because consumers in these countries have higher ability to pay for infrastructure goods— a hypothesis supported by the robustness checks where GDP per capita was significantly and positively associated with PPI receipts, and/or that these countries have the needed regulatory environment, manpower, and

expertise to support the often complex contracting mechanisms that PPIs entail. Other consistent predictors of PPI receipts in all LMICs including SSA countries are larger market size (as proxied by population) and lower tax burdens on the private sector.

Where SSA differs is that SSA countries with common law legal origins are significantly more likely to get PPI compared to non-common law countries. There is evidence in the literature that suggests that common law countries are associated with more developed financial markets (La Porta et al. 1997, 1998; Mahoney 2001), better property contract rights, and limited government (Mahoney 2001), and perhaps, these factors are more important in the SSA context to attract potential private investors in infrastructure.

In terms of the amounts of PPI received given non-zero PPI, the results indicate that in both cases (LMICs and SSA) more industrialized countries (i.e., larger contribution of industry to GDP) receive higher amounts of PPI. This is most likely reflective of the fact that more industrialized countries attract larger infrastructure projects and therefore require more financing from diverse sources, including the private sector. For similar reasons, larger market size and higher consumers ability to pay is also significantly associated with larger amounts of PPI.

Furthermore, reflecting that larger projects require substantial upfront investments with profits spread out over the long run and low rates of return to investment, the availability of domestic credit is significantly and positively correlated with larger PPI amounts. Of note, for LMICs as a whole, common law legal origin is negatively correlated with the amount of PPI. This may be due to the fact that common law countries typically have smaller governments and fragmented governmental structures (compared to civil law countries), making larger scale projects with high government involvement less likely as well as harder to coordinate (Mahoney 2001).

The separate analysis of SSA countries reveals a more troubling finding: Higher regulatory burden, lower government efficiency in the regulatory process, as well as higher corruption are positively (and statistically significantly) associated with amounts of PPI received, suggesting that among the SSA countries receiving PPI, the more corrupt and least efficient governments attract larger amounts of PPI. This finding is similar to what Banerjee et al. (2006) find for the overall sample of developing countries; they hypothesize that this result may be driven by the fact that corrupt countries may also be the ones with important location-specific advantages that attract PPI in the first place. Another hypothesis is that corruption and weak government efficiency may be promoting large PPI deals with large private gains at the expense of public interest.

In sum, a key finding of the analysis is that while PPI investments in LMICs seem to be, in principle, determined by the expected factors (i.e., larger, open, more developed democracies with lower tax burden and more stable macroeconomic environment receive more PPI), PPI into SSA countries is sub-optimally allocated. In particular, when it comes to larger PPI investments the findings suggest that corrupt countries with inefficient governments seem to attract more PPI

in infrastructure. The risk here is that private funds going into infrastructure that may not necessarily be socially optimal projects but rather projects that serve only private interests.

In light of these findings, SSA governments and international policymakers should revise their policies around PPI so as to stimulate investments that provide more long-term potential for growth in environments with efficient regulatory regimes in place. In part, the findings here may also be a function of the fact that SSA countries are just starting to build experience with PPI, and relative to other developing countries, have very little experience with this financing mechanism. As SSA countries build this experience, the focus should therefore be on building institutional capacity and improving the regulatory process in order to attract higher quality PPI (i.e., PPI that contributes to economic growth and development).

5. Determinants of the Extent of Private Participation in SSA

While in the previous chapter, PPI is discussed as a homogeneous form of investment, it is important to recognize that PPI can come in many forms and projects can entail varying degrees of private involvement. Indeed, the level of private investment and risk are a function of the PPP contracts that are negotiated between the private and public entities when a project is considered. The main aim of this chapter is to explore these contracting mechanisms and assess the determinants of the extent of private involvement in PPIs in SSA as compared to LMICs. The chapter begins with some background and a synopsis of the existing research. The methodology and data are subsequently outlined, followed by the results and the robustness checks. The chapter then concludes with a discussion of the findings.

Background and related research

In order to maximize the benefits for both the public and private sectors, a number of contracting mechanisms have been devised varying the levels of private investment and risk depending on the expected profitability, the political sensitivity of the specific infrastructure domain and its inherent riskiness (Table 7)[23]: These range from simple management contracts, where the private entity takes over the management of the state-owned infrastructure facility for a certain period of time but does not commit any of its own capital nor assumes any commercial risk, to full or partial divestiture (or privatization), where the government sells parts or all of the state owned firm to private entities. There are also intermediate arrangements such as greenfields and concessions where the private entity builds a new facility or rehabilitates an existing one with its own capital at its own risk and the infrastructure reverts to the public sector after a period of time.

Table 7 PPI contract types by level of private sector engagement

Contract type	Private management and operation	Private sector assumes full commercial risk	Private entity commits new investment capital	Specified contract period	Full or partial private ownership
Management	X			X	
Lease	X	X		X	
Greenfield	X	X	X	X	
Concession	X	X	X	X	
Divestiture	X	X	X		X

Source: Adapted from Kerf and Smith (1996).

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[23] Table 1 in Appendix H provides the formal definition for each contract type.

The empirical evidence on contract choice in public-private agreements is very limited. Two papers have looked directly at the contractual determinants of PPIs. Albalate et al. (undated) use municipal and state data from 1985 to 2008 to explore the extent of private involvement in PPI in the United States, while Hammami et al. (2006) use data from 1990 to 2003 from the World Bank's PPI database to explore the same question in the context of developing countries. The papers adopt a similar approach whereby they assign an ordered categorical value to each contract type based on the extent of private participation (i.e., lowest value for a management contract and highest value for full divestiture) and use an ordered multinomial logistic model to investigate the impact of economic, fiscal, political, and infrastructure-type variables on the degree of private participation.

Both papers find that low fiscal performance (e.g., high levels of public debt) is positively associated with a higher degree of private participation. However, most likely due to the different settings, the findings differ somewhat when it comes to the most important determinants. Albalate et al. (undated) find that the most important determinants are infrastructure related variables – in particular whether or not the infrastructure is part of a network, while Hammami et al. (2006) find that it is the rule of law. Indeed, in the case of Albalate et al. (undated) private involvement is less pronounced for infrastructure with network characteristics (e.g., water, road and railroad transportation) relative to those that do not have network characteristics (e.g., ports, airports, housing facilities). They hypothesize that this may be due to the fact that network infrastructure is associated with large sunk investments, as well as larger transaction costs and lower levels of competition. In contrast, Hammami et al. (2006) find that in the context of developing countries, the rule of law (proxied by the control of corruption and common law origin) is an important driver of the extent of PPI. They suggest that investor protection is important to attract PPI and that in general common law systems tend to do better in that respect. Similarly, they hypothesize that control of corruption is important for private investors as it protects them from "opportunistic behavior associated with corrupt government officials" (p. 18). This chapter adds to the existing knowledgebase by extending the analysis period to 2008, but most importantly by exploring how PPIs work in the context of SSA.

Methodology

Following the literature, the dependent variable, *contracttype*, is first constructed from project-level data by assigning an ordinal variable ranking to the contract type based on four categories of increasing levels of private involvement. Effectively, management and lease contracts[24] are assigned a value of 1, greenfield projects a value of 2, concessions a value of 3, and divestitures a value of 4. An important caveat is that in reality, because contracts are

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[24] Management and lease contracts are aggregated into one category because of the relatively low numbers of such contracts.

negotiated on a case-by-case basis, the extent of private participation within each of these contract types is not uniform and the difference in the level of private involvement between each category of contracts is also not equal - that is, the difference in the level of private involvement in a management and a lease contract is not the same as the difference between a lease and greenfield contract.

In terms of explanatory variables, along the same logic applied in the previous chapter, three groups of independent variables are identified such that X represents the factors influencing government motivations, Y the factors influencing private sector motivations, and Z the factors influencing the enabling environment. In addition, following the findings of Albalate et al. (undated) that the infrastructure sectors themselves could be important determinants of the extent of private participation in infrastructure, sector-level dummies, S, are introduced as potential explanatory variables in the model.

For the specification of the model an ordered logit model is used due to the nature of the dependent variable. Thus, as described in Model 3 below, the specified regression estimates how country-level characteristics such as government fiscal stance, political and business environment, and market size, as well as the type of infrastructure project affects the level of private involvement in each PPI. To ensure robustness of results, a similar procedure to the one conducted in the previous chapter is followed: Time fixed effects are introduced to control for time-specific shocks, as are country-level controls to minimize the potential for omitted variable bias. Furthermore, potential multicollinearity is addressed by excluding collinear variables from the model, and in the robustness checks for the SSA regressions, South Africa is excluded as it represents a potential outlier.

Model 3: $$Contracttype_{nit} = \theta_0 + \theta_1 X_{it} + \theta_2 Y_{it} + \theta_3 Z_{it} + S_{nit} + \alpha_t + \vartheta_{nit}$$

Data

Extent of private participation in infrastructure

The dependent variable, *contracttype*, is constructed using the information on the contractual arrangements of each project available from the World Bank's PPI database. In looking at the data, for the whole set of LMICs, the majority—over 60 percent of the PPI contracts negotiated between 1995 and 2008 have been greenfield projects, followed by divestitures (23 percent). Conversely, management and lease contracts represented only about 3 percent of the contracts, while concessions represented 13 percent. Projects in SSA are similarly distributed, although greenfield projects are even more prominent (77 percent all of PPI) while concessions and divestitures are not utilized as much (Figure 5).

Figure 5 PPI contracts negotiated in LMICs and SSA 1995-2008 (% of all PPI contracts)
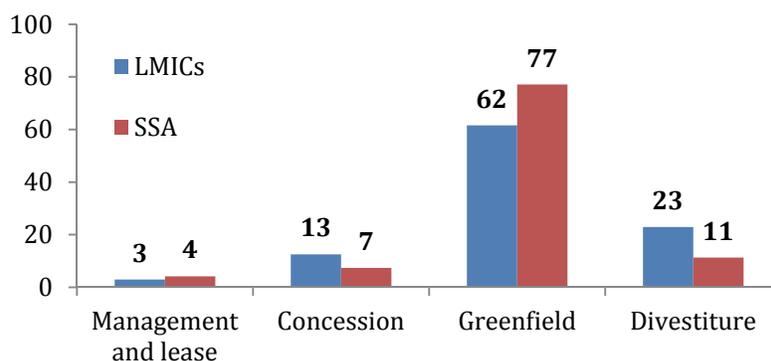
When taking into account the infrastructure sector in which the project is undertaken, the data suggests the contractual arrangements noticeably vary. Indeed, as shown in Table 8 , both LMICs in general and SSA in particular, use greenfield and divestiture contracts predominantly for telecommunication projects, concessions for transport, and management and lease contracts for water &sanitation projects. Where SSA differs from LMICs is in energy projects: On average 52 percent of all divestitures negotiated in LMICs were in the energy sector while that number was only 5.6 percent in SSA.

Table 8 PPI contracts negotiated in LMICs and SSA by sector 1995-2008 (% of all PPI contracts)

		Management and lease	Concession	Greenfield	Divestiture
Energy	LMICs	12.68	11.26	20.79	52.33
	SSA	19.57	27.16	7.21	5.65
Telecom	LMICs	6.57	2.18	67.46	41.77
	SSA	6.52	0.00	91.02	92.74
Transport	LMICs	25.35	62.54	6.84	3.88
	SSA	23.91	70.37	1.54	1.61
Water & sanitation	LMICs	55.40	24.03	4.91	2.02
	SSA	50.00	2.47	0.24	0.00

Explanatory variables

As described in the methodology section, the independent variables included in the model are the same as those used to explore the determinants of PPI in Chapter 4. The list of variables, their definitions, and their sources are provided in Appendix E.

Results

The full results are provided in Appendix I. Here I discuss the results with respect to the model that accounts for multicollinearity. The most salient finding for both LMICs and SSA is that the type of infrastructure sector that is receiving the private funds is the largest predictor of the extent of PPI. For LMICs, if the project is in energy and telecommunication (compared to water &sanitation) the odds that the contracting arrangement is a divestiture versus the combined other contractual mechanisms are respectively 59 and 34 times higher. The numbers are even more pronounced for SSA countries – the odds that the contracting arrangement is a divestiture versus the combined other contractual mechanisms is 7,739 times higher for a telecommunication project, 352 times higher for an energy project, and 45 times higher for a transportation project as compared to projects in water &sanitation. Of note, on average for LMICs, the extent of PPI is not significantly different between transportation and water &sanitation (Tables 9 and 10).

The other variables that appear to explain the extent of PPI in SSA countries are quite different from those in LMICs. For the latter, the availability of domestic credit, a larger market size, and the reduced overall burden of regulation and efficiency of government in the regulatory process are positively associated with increased private involvement, while being a common law country, having a smaller government, and higher levels of inflation are associated with less private involvement. In contrast, for SSA, countries with larger service sectors (as a percentage of GDP) are more likely to use PPP contracts with greater private involvement, while countries with larger resource rents (as a percentage of GDP) are more likely to have higher public involvement in PPPs in infrastructure (Tables 8 and 9).

Table 9 Determinants of the extent of PPI- LMICs

	odds ratio
government size	0.987***
	(-5.5)
ln (population)	1.09**
	(-2.70)
ln (domestic credit)	1.24***
	(4.16)
common law	0.572***
	(-6.49)
business freedom	1.014***
	(3.93)
inflation	0.998*
	(-2.29)
energy	59.306***
	(32.14)

telecom	33.681***
	(27.85)
N	6521

Table 10 Determinants of the extent of PPI- SSA

	odds ratio
ln (services)	9.925**
	(2.50)
ln (resource rents)	0.654**
	(-2.90)
energy	351.664***
	(7.47)
telecom	7739.439***
	(11.06)
transport	45.2957***
	(5.21)
N	602

Robustness checks

As in Chapter 4, alternative specifications are estimated to check the robustness of the results
obtained above. Given that the explanatory variables included in model 3 are the same as those
used in models 1 and 2 in the previous chapter, the alternative specifications explored here are

the same with the starting point being the model which accounts for multicollinearity. The models used for robustness checks are as follows:

- *Regression (1):* Indicators of structural aspects of the country's economy (value added of services, industry, and agriculture) and the level of aid received are substituted with the GDP per capita.

- *Regression (2):* In addition to substitutions made in (1), the indices of business and investment freedom are dropped, and the index of property rights protection from the IEF is added.

- *Regression (3):* The indicators for civil war, regime durability, and ethnic fractionalization are replaced by the WGI's index for political stability and absence of violence, and the indices for business and investment freedom, and freedom from corruption are replaced by the WGI's government effectiveness, regulatory quality, and rule of law, and control of corruption indices.

- *Regressions (4) and (5):* I use alternative political stability measures in each regression. In (4), I replace political stability measures from the "streamlined model" (civil war, regime durability, and ethnic fractionalization) with the US State Department's Political Terror Scale (PTS) measure of political violence and terror. In (5), I replace them with the WGI political stability and absence of violence index.

- *Regression (6)*: I substitute the business and investment freedom indices with an overall quality of government index from the International Country Risk Guide (ICRG).

- *Regression (7):* For the SSA regressions, I run the streamlined model without South Africa.

In general, the robustness checks support the findings with some exceptions. For LMICs, in all the specifications, the sectoral dummies for energy and telecommunications remain significant and positively associated with higher levels of private involvement. Likewise, for SSA, the sectoral dummies for energy, telecommunications, and transportation remain significant across most specifications.[25] In addition, for LMICs, smaller government size, being a common law country, and having a higher inflation remain significantly and negatively associated with higher levels of private involvement, while greater availability of domestic credit and reduced overall burden of regulation and efficiency of government remain significantly and positively associated with higher levels of private involvement across all alternate specifications. The latter finding is further corroborated by the fact that the WGI rule of law indicator is

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[25] When excluding South Africa from the SSA sample, because of the small sample size, the base sector was changed from water and sanitation to energy in order to be able to achieve convergence. This changed the results slightly in that relative to energy, the telecommunications sector is still positively and significantly associated with higher levels of private involvement but the transportation sector is negatively and significantly associated with higher levels of private involvement. The water and sanitation sector is negatively associated but insignificantly so. This may be due to the fact that all but one of the 21 projects are under lease and management contracts.

significantly correlated with higher levels of private involvement. For SSA, the only variable that stays consistently significant (and negatively) across most specifications is the level of resource rents of the country.

The robustness checks, however, suggest that some of the variables identified earlier as potentially important determinants of the extent of PPI may not be as relevant. For LMICs, the market size (as measured by population and GDP per capita) only comes out as being significantly correlated with the contract type in two out of the six alternative specifications. Likewise for SSA, the share of services in the economy is significantly correlated with the contract type in only one regression – the one where South Africa is excluded.

Conversely, the robustness checks identify potentially important determinants that did not come out as significant in the initial regressions, particularly for LMICs. In five out of the six alternative specifications, openness to trade is significantly and negatively correlated with higher levels of private involvement. Furthermore, where included, higher levels of investment freedom, i.e., lower levels of constraints on investment capital flows, is positively correlated with higher levels of private involvement, but the coefficient estimates remain very low (odds ratios of 1.005 and 1.01) suggesting that the impact (if any) is small.

Discussion

The findings of this chapter corroborate the overall findings in the literature. Indeed, as Albalate et al. (undated) found in the US, infrastructure sectors are the strongest determinants of the contractual mechanisms used for PPI throughout the developing world, with telecommunications and energy sectors having higher levels of private involvement in all LMICs, and transportation in SSA, and water&sanitation having the least amount of private involvement. In the next chapter, these sectoral aspects of contractual mechanisms will be explored in more detail. In short however, the infrastructure sector is an important determinant of the extent of private involvement as different sectors present different levels of market failures, which necessitate government intervention in the provision of infrastructure.

The robustness checks also validate the Hammami et al. (2006) findings that rule of law is an important determinant of the extent of private involvement in PPPs for infrastructure in developing countries. However, in contrast to Hammami et al. (2006), my results suggest that relative to non-common law countries, common law countries have lower levels of private involvement. This is nevertheless consistent with the findings in Chapter 4 that common law countries receive on average less PPI than non-common law countries.

Other important findings emerging from the analysis include that on average for LMICs the availability of domestic credit, reduced burden of regulation and more efficient governments, and lower inflation are associated with higher levels of private involvement in PPPs for infrastructure. Further, smaller governments are negatively associated with higher levels of

private involvement, perhaps suggesting that larger governments are more adept at negotiating PPP contracts where the private entity takes on more risk and invests more.

None of these variables, however, seem to matter when looking at SSA countries separately. Besides the sectoral distribution of projects, the only other factor that appeared to affect the extent of private involvement in PPPs is the amount of resource rents that the government receives; the higher the amount of resource rents, the lower the level of private involvement. This may be because the more resource endowed SSA countries have the means to invest public resources in large infrastructure projects and therefore prefer to engage the private sector for the management expertise rather than for the capital investments.

6. Determinants of the Optimal Contract

The main finding of the previous chapter is that the extent of private participation in infrastructure in developing countries, as manifested in the various contracting mechanisms of PPPs, is largely determined by the characteristics of the infrastructure sector itself. Historically, infrastructure services have been provided by the public sector because they present some form of market failure. The relatively recent participation of the private sector provides some advantages (e.g., additional financing, management expertise, production efficiency and self-sustainability of infrastructure facilities) and, in theory, the contractual mechanisms employed to enable PPIs should overcome the market failures associated with infrastructure sectors allowing for the optimal allocation of investment and risk between private and public entities. A well-developed theoretical literature on the broader topic of private delivery of public services generates useful results with respect to what that optimal allocation should be in the context of different types of market failures. However, there is little empirical evidence looking at the country-level determinants of the adoption of the optimal type of contract. The main aim of this chapter is to start looking into this question, and – building on the theoretical literature-empirically explore the country-level factors that affect the adoption of the optimal contract given the inherent market failures of the various infrastructure sectors. The chapter starts by outlining the underlying framework. Subsequently, the data, the empirical estimation methodology, and the results are presented. The chapter then concludes with a discussion of the findings.

Underlying framework

The starting point for the framework is that government intervention is needed where there are market failures. According to Stiglitz (1988) there are at least 8 types of market failures. Gomez-Barroso and Perez-Martinez (2005) categorize these into four groups, three of which I use to build the framework for my analysis. As shown in Table 11, the first group describes market failures related to the attribute of the good, including whether it is a public good[26] and whether its production and/or usage generates externalities.[27] The second group encompasses market failures related to the competitive state of the market in which the good is produced

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[26] A pure public good is one that is non-excludible (i.e., one cannot exclude an individual from consuming the good) and non-rivalous (i.e., the consumption of the good by one individual does not reduce the availability for others, or the marginal cost of an additional unit is very low).

[27] An externality is an unintended cost or benefit to others generated by an individual's consumption of a good. The cost/benefit generated by the externality is however not reflected in the price that the individual pays to consume the good.

and/or provided, in effect referring to the extent to which the production/provision of the good exhibits natural monopoly features, the presence of adequate competition in the production and/or provision of the good, as well as that of information asymmetries with respect to production costs. The third group denotes market failures associated with society's valuation of the good, i.e., whether society values access of the good to all regardless of ability to pay. The final group refers to goods that a government chooses to support for macroeconomic reasons (e.g., a government may perceive the production/provision of a good as being critical for growth and can decide to explicitly support its production/provision as the market by itself may not be able to provide enough to achieve the growth rate desired). The type of good can however vary from country to country, and given that the overall aim of this dissertation is to produce generalizable policy recommendations broadly applicable to a number of countries, I will abstract from this last group in my analysis.

Table 11 Types of market failures

Type of failure	Description
Inherent characteristic of the good	• Public good: The good is non-excludible and non-rivalrous. • Externalities: The production and/or usage of the good generates negative and/or positive externalities.
Market situation	• Scope for competition: A natural monopoly is required to generate economies of scale. • Information failures: Asymmetric information • Existence of providers
Equity considerations	• Merit good: Society values access for all (regardless of ability to pay)
Macroeconomic reasons	• A government may push investment in the provision of specific goods for reasons of influence on economic growth and economic development.

Source: Adapted from Gomez-Barroso and Perez-Martinez (2005).

The infrastructure sectors of interest in this dissertation – telecommunications, power (electricity), transportation, and water &sanitation - display to varying degrees the three types of market failures. In what follows, the theoretical microeconomic literature on managing market failures in terms of the optimal arrangement between private and public entities is reviewed. Subsequently, the market failures exhibited by each of the infrastructure sectors is outlined and compared (in terms of the severity). Then, using the theory, each infrastructure sector is assigned an "optimal" contract type based on the inherent market failures that characterize it.

Economic theory on public sector interventions

In the simplest setup, public ownership is defined as a firm which is run by a government employee ("a bureaucrat") whose main aim is to maximize social welfare, and private ownership

involves a management entity interested in maximizing profit (Vickers and Yarrow 1991). However, the delimitation between public and private ownership is not always clear. As noted by Sappington and Stiglitz (1987), private and public entities can be very similar in terms of how they are organized and how they function: Both have managers (bureaucrat or private manager) responsible to a higher authority—politicians for publicly owned companies and shareholders for privately owned firms—who delegates the responsibility of running the firm to the managers, and therefore gives them the ability to influence the day-to-day operation of the firm. As such, the critical differentiation between a public firm and a private one is that under public ownership, the government can intervene in production decisions directly if it deems it necessary, but can only do so in a limited fashion under private ownership through regulation. Thus, the difference lies in the control of residual rights, i.e., the right to make direct decisions concerning the firm which are not included in the initial contract (Hart, Shleifer, and Vishny 1997; Sappington and Stiglitz 1987; Hart 2003).

In their analysis, Sappington and Stiglitz (1987) focus on transaction costs incurred by the government when deciding to intervene. They argue that these costs are lowest under public ownership but this, according to them, entails costs and benefits that have to be weighed against each other before deciding on the optimal ownership structure. In their model, the government weights between achieving economic efficiency in production (i.e., productive efficiency) and equity in allocation of goods (i.e., allocative efficiency). In the ideal setting where firms are risk neutral and competition in bidding is developed, even under asymmetric information on production costs between the government and firms (where all firms have full knowledge on the least costly production technology and the government does not), privatization is optimal. However, when one introduces firm risk-aversion and limited competition, the government would have to pay a risk premium to the firms and absorb some of the risk, which may in-turn reduce firms' incentives to produce efficiently. In addition, paying a risk premium may incentivize less risk-averse firms to bid for the work rather than the most efficient. Depending on the risk premium, it may therefore be optimal to have public ownership.

Rather than transaction costs, Hart et al. (1997) and Hart (2003) focus on the role of incomplete contracts in determining whether to privatize or not. In their framework, the allocation of residual control rights serves as an incentive for private entities to produce efficiently in the presence of moral hazard and adverse selection. They develop a model where the government can either own a facility and contract with an employee to manage it or can contract with a firm to run the facility. In addition, the employee and the firm can either invest in quality-improving and efficiency-enhancing ideas or cut costs which in-turn reduces the quality of services provided. Hart et al. (1997) and Hart (2003) argue that the bureaucrat does not have an incentive to do either because first, he/she would need approval to implement the investment (since the government retains the residual rights over the facility) and second, the employee would get very little in return in terms of increased compensation because he/she is replaceable. In contrast, the firm could be incentivized through the transfer of residual rights to do either.

Indeed with residual rights, the firm would not need approval from the government and would gain from cutting costs or could be incentivized to invest in quality-enhancing ideas by negotiating a higher price for the service with the government. The authors conclude that private ownership is preferable in areas where quality innovations are important, where quality benchmarks can be negotiated and contracted on (or the market is competitive enough to provide quality-enhancements), and where patronage inside the government is strong. In contrast, public ownership is desirable when quality is non-contractible or unimportant and where corruption in government procurement is a problem.

The theoretical literature also investigates the optimal contracting mechanism taking into account the nature of the public good in terms of how "pure" it is (i.e., non-excludability and non-rivalry of benefits). Besley and Ghatak (2001) suggest that under incomplete contracts, ownership should lie with the party that has a relatively higher value for benefits generated by the public good (i.e., "the party that cares most about the project"). Francesconi and Muthoo (2004) find a similar result but also find that the valuation of the public good is a function of how pure the good is. Further, as in Hart et al. (1997) and Hart (2003), they find that the optimal ownership allocation is a function of the level of innovation required (what they call "technology structure") for the public good.

Market failures of infrastructure sectors

<u>Inherent characteristic of the good</u>

All four sectors exhibit some characteristics of a public good and can be ranked on a spectrum from pure private to pure public good (Figure 6). The telecommunications and electricity sectors are closest to private goods, while transportation and water & sanitation have relatively more public goods features. Government intervention is further justified because each of these sectors generate externalities (both positive and negative), albeit at varying degrees.

The literature has generally described the telecommunications and electricity as "mixed" goods (e.g. Gomez-Barroso and Feijoo 2010; Jaccard 1995) on the premise that access is excludable but use is non-rivalrous. In terms of externalities, telecommunications is associated with significant positive externalities; as individuals obtain access, the network of connected individuals expands, in turn making the network more valuable to the individuals already using the product as well as those thinking about joining (Gomez-Barroso and Perez-Martinez 2005; Gomez-Barroso and Feijoo 2010; Economides and Himmelberg 1995). While electricity is equally associated with some positive externalities (e.g., hydroelectric generation provides for irrigation and flood control), its generation has overwhelmingly negative environmental externalities. For example, hydroelectric dams negatively affect the aquatic ecosystems, hydroelectric reservoirs can flood large land areas and destroy wildlife habitats and agricultural land, combustion fossil fuels are associated with air pollution, and nuclear power plants are associated with safety concerns (Kessides 2004, Jaccard 1995). The extent of the externalities of

electricity as compared to telecommunications suggest a larger role for government in electricity, thus electricity is ranked more "public" than telecommunications.

While most countries only recognize water use rights and not private water ownership rights, water & sanitation as a network infrastructure is both excludible and rivalrous (Kessides 2004, Roger et al. 2002, Jooste 2008). However, it is associated with significant externalities (both positive and negative), providing a strong rationale for government intervention. Indeed, water supply is location specific and limited; as such sustainability of water resources is an important consideration. At the same time, water &sanitation infrastructure is associated with improved health and wellbeing (from access to greater quantities and better quality water as well as improved sanitation), time savings (i.e., individuals no longer have to spend time collecting water), and increased economic activity with greater access of water for activities such as livestock rearing and vegetable production (Jooste 2008, Rijsberman and Zwane 2008).

Transportation infrastructure has traditionally been considered a public good in that it is mostly non-excludible and non-rivalous. There are however noted exceptions; for example, a toll road is excludible while a congested road is rivalrous. Similarly to the other sectors, it is also associated with externalities. For example, road infrastructure is associated with positive externalities such as the development of the area around the road, as well as a number of negative externalities including air and noise pollution, accidents, congestion, and safety and/or social issues during construction (Jimenez 1995, Amos 2004).

Figure 6 Infrastructure sectors along the private to pure public good continuum
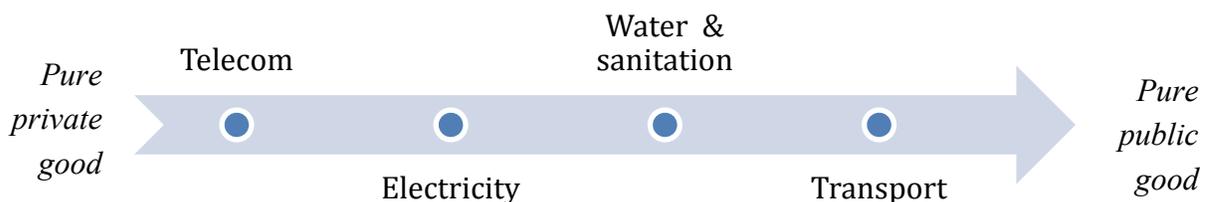
Market situation

Two facets of the market failures have to be considered. The first has to do with the structure of the sector itself in terms of the scope for competition in the provision of the good. The second is related to procurement and the level of competition among potential suppliers/operators to produce the good (i.e., potential private sector bidders).

For the first facet, a common feature among the four sectors is the scope for large economies of scale from market concentration. However, the degree to which it constrains competition differs across sectors and also "within" sectors, as many of these sectors have components which have natural monopoly features and others that are more favorable to competition (Kessides

2004). Again here, the four infrastructure sectors can be placed on a continuum from competitive market structure to natural monopoly (Figure 7).

While parts of the network still have natural monopoly features, the telecommunications sector is the most conducive to competition among all the sectors. Over the years due to technological innovation, the sector has become even more favorable to competition; according to Kessides (2004) "innovations have radically altered the industry's cost structure and resulted in large, continuous increases in productivity.(…) Technological change has almost eliminated the natural monopoly in interexchange markets" (p. 39). Similarly, technological advancements have enabled more scope for competition in parts of the electricity network, in particular for generation (e.g., thermal generation). Nevertheless, certain forms of generation (e.g., hydroelectric and nuclear) remain natural monopolies. In addition, transmission and distribution maintain their natural monopoly features as electricity is expensive to store and electricity rights transmissions are difficult to define (Rosellón 2003). For transportation, the building of infrastructure facilities has natural monopolistic features but the operation of the physical network is more conducive to competition, especially in the presence of intermodal competition[28] (Kessides 2004). Water & sanitation has the least scope for competition as most of the functions along the water delivery and waste disposal "chain" have natural monopolistic features (Rees 1998, Kessides 2004).

Figure 7 Scope for competition in infrastructure sectors
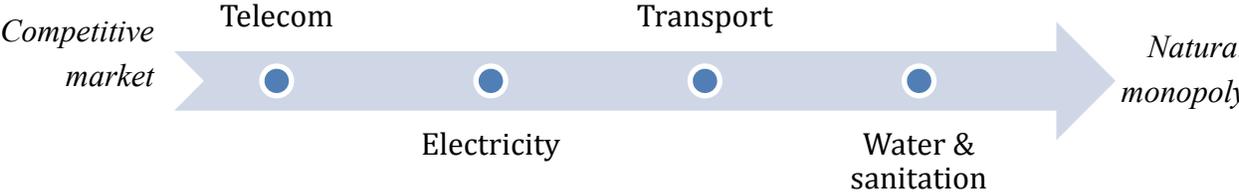
For the second facet, the barriers to potential new entrants as well as the number of potential suppliers are important considerations (Figure 8). All four of the sectors are associated with large fixed costs upfront (sunk costs) and thus present substantial risks to potential new entrants in the market, but, as stated in the previous paragraph, technological advancements in telecommunications and power generation industries are reducing those costs substantially (Kessides 2004). The level of private firm concentration for the provision of infrastructure services is also of concern, particularly in the transportation and water & sanitation sectors. Estache and Serebrisky (2004) note that for transportation projects in developing countries the competition is very limited; for example, there are typically only about two to three serious bidders for concessions or greenfield projects. Similarly, for water & sanitation, four large

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[28] Refers to competition among the different types of transportation; e.g. trucking versus freight or railways.

multinationals account for about 80 percent of the developing country market (Budds and McGranahan 2003).

Figure 8 Level of competition in procurement

Adequate competition in procurement → Telecom ● Electricity ● ● Water & sanitation transport ● → *Limited competition in procurement*
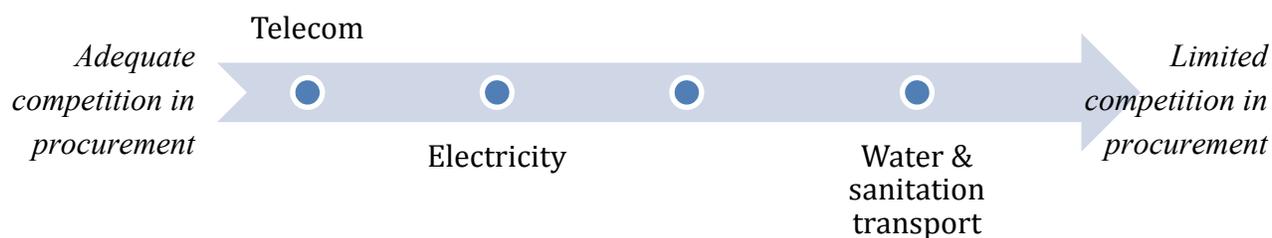
Equity considerations

For each of the sectors government provision of services has been justified at one point or another on the basis that the services provided are "essential to a broad range of users" (Kessides 2004, p. 30). In practice, in many countries, government monopolies failed to meet these goals. The primary issue was that the public utilities, because of political pressures, imposed tariffs that were not cost reflective on consumers and subsidy schemes did not make up for the difference. The cumulative impact over time was that many of these utilities saw the quality of their services decline, and could also not meet rising demand. In addition, many often suffered from mismanagement (e.g. overstaffing, corruption) and internal inefficiencies (Harris 2003).

Nowadays, the rationale of public provision to enable universal access is least pronounced in telecommunications; in both developed and developing countries where universal access is an increasingly a priority, it is "assumed that private companies will carry out most of the tasks required to reach this objective" (Gomez-Barroso and Feijoo 2010, p. 490). Similarly for electricity, while access to all is widely perceived as desirable, it is now mostly accepted (albeit to a lesser extent) that social equity concerns do not necessarily entail public ownership of the utility but can also be addressed for through regulation in the context of private ownership (Jaccard 1995).

The situation is vastly different for water &sanitation; access to these services is viewed as a "human right," with many believing that it should be provided regardless of ability to pay. It is also viewed as being critical to poverty reduction; One of the Millennium Development Goals (MDGs) is to "halve, by 2015, the proportion of the population without sustainable access to safe drinking water and basic sanitation" (UN, webpage). Furthermore, a number of highly visible water & sanitation PPI projects failed in the late 1990s/early 2000s has led to some skepticism around private involvement in that sector.

For transportation it is more mixed. As described by Amos (2004), on the one hand, "there is a deeply held perception of transport infrastructure as a part of the public estate which should be provided for the common good, and not as a business for commercial gain," and therefore the

majority of the basic infrastructure is publicly owned and operated across the world, but on the other hand, the private sector is "widely involved as designers and contractors, for both construction and maintenance" (p.4 - 5).

Figure 9 Level to which public provision of services is important for equity reasons

Public provision is not important for equity reasons — Telecom — Electricity — Transport — Water & sanitation — *Public provision is important for equity reasons*
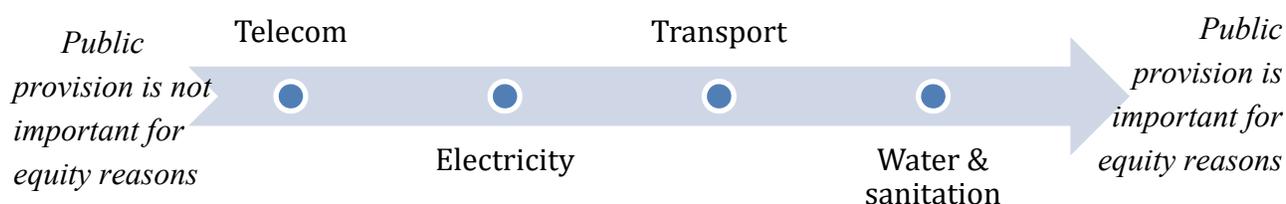
Optimal contracts suggested by theory

Bringing together the market failures in each of the infrastructure sectors and microeconomic theory on optimal contracting, I match the individual sectors with the respective "optimal" contract. According to the analysis of the degree of market failures in each infrastructure sector above, I find that the telecommunications sector exhibits the least need for public intervention/procurement, followed by the electricity sector. Transportation as well as water & sanitation on the other hand call for more public sector involvement due to the public sensitivity and perception when it comes to equity considerations, the significant externalities, and the limited competition in contracting. The optimal private participation for each of these sectors would thus suggest different contractual arrangements.

Effectively, given the relatively minor need for government intervention (beyond regulation), divestiture seems to be the most appropriate for telecommunications. With respect to electricity concession or greenfield arrangement s (e.g. ROT, BOT type contracts) may be more appropriate, as temporary "privatization" could soothe public concerns around equity issues, and substantial amounts of private capital can be mobilized to ensure the expansion of the power generation facilities and the distribution of the network (in particular with a greenfield arrangements). Transportation- particularly the building of the facilities- and water &sanitation seem to be the sectors that require the most government intervention. Therefore keeping the ownership rights with the government and having private entities take on the management risk seems optimal as such an arrangement could bring to bear private sector management expertise to the project (which is often missing in the public domain in SSA countries), while ensuring that equity concerns are addressed by the public sector (e.g., public investment in new networks to expand access).

It is important to note that a whole host of other considerations should be taken into account when deciding on the "optimal" contracting for a PPI project. The capacity to manage complex contracting mechanisms as well as experience with different types of mechanisms for example could affect what is considered "optimal." However, these are issues that require a country-specific analysis which is outside the scope of this dissertation. Thus, this analysis is intended to provide a starting point to the exploration of these issues and should inform future research efforts in this complex issue.

Data

The project level World Bank PPI data indicate that in practice developing countries do not adopt "optimal" contracts. Indeed, between 1995 and 2008, about 54 percent of the PPI contracts negotiated in the electricity sector in developing countries were in the "optimal" contract form. For telecommunications and water &sanitation, it was approximately 19 and 18 percent respectively, while for transportation it was only about 4.72 percent. As elaborated in Chapter 5, greenfield contracts tend to dominate (62 percent of all PPI contracts). However, when exploring the sectoral breakdown (Figure 10), we see that greenfields dominate mostly in telecommunications, while for electricity projects the amount of greenfield contracts is almost equal to the amount of divestitures, for water &sanitation projects it is almost equal to the amount of concessions, and for transportation, concession contracts are actually the dominant form of contracting. The SSA specific data also indicates some potential differences across developing regions. Particularly for water &sanitation, SSA countries are adopting more "optimal" contracts in that management and lease contracts are used almost exclusively. These countries are also using more greenfield contracts and less divestiture for electricity projects (Figure 10).

Figure 10 Types of PPI contracts negotiated in LMICs by sector 1995-2008 (% of all PPI contracts)
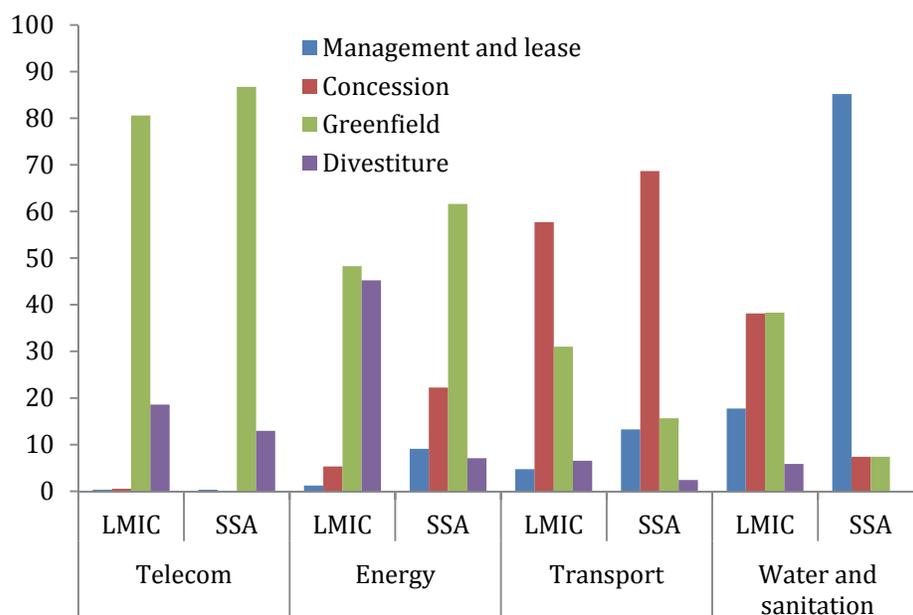
Methodology

Using the project level World Bank PPI data, a binary dependent variable— *Optimal*— is first created for each project to indicate whether or not the specific project is in the optimal type of contract. In effect, the variable takes a value of 1 if the project uses the optimal contracting mechanism and zero otherwise, and a logit regression is used to estimate the model. In terms of potential determinants of the adoption of the optimal contract, similarly to what was done in Chapters 4 and 5, and as described in Model 4 below, three groups are identified such that X represents the factors influencing government motivations, Y the factors influencing private sector motivations, and Z the factors influencing the enabling environment. In addition, a dummy variable identifying the developing region in which the project is located (East Asia and Pacific, South Asia, Europe and Central Asia, Sub-Saharan Africa, and the Middle East and North Africa) is added in order to see how the developing regions compare to each other. To ensure robustness of results, time fixed effects and country-level controls are also introduced, and several alternative specifications are estimated in order to control for potential multicollinearity in the model.

Model 4: $Optimal_{nit} = \delta_0 + \delta_1 X_{it} + \delta_2 Y_{it} + \delta_3 Z_{it} + \delta_4 R_{nit} + \alpha_t + \varepsilon_{nit}$

Results

Tables 1- 3 in Appendix K provide the results respectively for the telecommunications, electricity, and water &sanitation sectors. Because of a small number of projects in the "optimal" contract type for transportation (N=54 for a total of 1,145 transportation projects), the estimations did not yield meaningful results and are therefore not discussed here. For the other sectors, the explanatory variables that are significantly correlated with the optimal contract type across most of the specifications are reported in Table 12 below.

In effect, developing countries with greater availability of domestic credit to the private sector are significantly more likely to adopt divestitures for PPI in telecommunications, while countries with smaller government expenditures, those more open to trade, and those experiencing inflation are significantly less likely to adopt divestitures. For electricity, the presence of inflation actually works in the opposite direction: Countries experiencing inflation are more likely to adopt concessions or greenfield contracts. Population size and the regulatory burden also appear to matter: Countries with larger populations are significantly less likely to adopt concessions or greenfields, as are countries with larger regulatory burden and less efficient governments. For water &sanitation, the most salient explanatory variables are the political regime duration (i.e., the number of years since the most recent regime change or the end of transition period) and the freedom from corruption. The former is significantly and positively correlated with adopting a lease and management contract while the latter is significantly and negatively correlated with the adoption of a lease and management contract.

Table 12 Summary of results

Sector	Significant and positive impact on the adoption of the "optimal" contract	Significant and negative impact on the adoption of the "optimal" contract
Telecommunications	Availability of domestic credit	Smaller government
		Presence of inflation
		Trade openness
Electricity	Presence of inflation	Large market size(as measured by population size)
		Overall burden of regulation and efficiency of government in the regulatory process (as measured by the index of business freedom and regulatory quality index)
Water &sanitation	Regime duration	Freedom from corruption

When comparing developing regions, relative to Latin America and the Caribbean - the continent with the most experience with PPIs- South Asian countries are significantly less likely to negotiate divestitures for telecommunications. For electricity projects, South Asia, Sub-Saharan Africa, and the Middle East and North Africa are significantly more likely to negotiate concessions or greenfields, while Europe and Central Asian countries are significantly less likely to adopt these contractual forms. Furthermore, South Asia and Sub-Saharan Africa are significantly more likely to adopt management and lease contracts for water &sanitation projects.

Discussion

For the interpretation of the results it is important to note that the actual distribution of contract types across the infrastructure sectors is fairly dichotomous (see Figure 10): In the telecommunications sector, 97 percent of the negotiated contracts are either greenfields or divestitures, in electricity 99 percent are either divestitures or greenfields/concessions, and in water &sanitation 94 percent are either greenfields/concessions or management and lease contracts. Thus, the results of the empirical estimations provide insights on the determinants of the contract type that dominates and is not optimal. So, for example, one of the findings is that countries more open to trade are significantly less likely to privatize their telecommunications infrastructure, and because of the distribution of the contract types for telecommunications, this also means that open countries are significantly more likely to negotiate greenfield projects.

For telecommunications, the results indicate that the availability of domestic credit for the private sector is an important determinant of divestitures (over greenfields/concessions). This may be due to the fact that under divestitures the private entity purchases all or parts of the public utility, which requires substantial resources upfront. Conversely, the presence of inflation is significantly associated with the adoption of greenfields/concessions over divestitures. This may be a function of private sector preferences; indeed, there is some evidence that in riskier environments, BOT type contracts tend to be attractive in that they are more flexible than divestitures, and risks can be allocated in a variety of ways between private and public entities (Guislain and Kerf 1995). Another result is that smaller governments are significantly more likely to negotiate greenfields/concessions. While it is not immediately clear why that is, one hypothesis is that smaller countries may have traditionally not invested as much in telecommunications infrastructure, and therefore prefer to negotiate greenfield projects rather than divestitures as greenfield projects give them the ability to contract-in the types of new investments desired. The aforementioned result that less open countries are significantly more likely to divest their telecommunications infrastructure is counterintuitive and would require more research. Especially in light of evidence suggesting that when investing in foreign countries, multinational firms prefer to engage in BOT-type contracts rather than divestitures in culturally remote countries, i.e., countries with different values systems from that of the home

country of the investing firm (Barkema and Vermeulen 1998).[29] Consequently, one would expect more telecommunications divestitures in more open countries, given that the majority of PPI in developing countries comes from multinational firms, and while cultural distance is not necessarily equal to restricted trade flows, the argument could be made that extensive international trade and participation in globalization align – at least with respect to business practices – the value systems or create at some familiarity with a foreign approach through experience in trade.

For electricity, as in telecommunications, the presence of inflation is significantly correlated with negotiating concessions/greenfields over divestitures. Conversely countries with a large market size are more likely to divest their electricity related infrastructure, reflecting the attractiveness of a large market for the private sector. Furthermore, countries with larger regulatory burdens and less efficient governments are more likely to negotiate divestitures. This is perhaps due to the complexity of the electricity market, making the negotiation of a BOT or ROT type contracts difficult in the sector.

For the water &sanitation sector, the results suggest that longer government tenure is significantly associated with management and lease contracts. This is likely reflective of the fact that such contracts require the public and private sectors to work closely with each other during a specified amount of time (usually three to five years). The results also indicate that corrupt governments are significantly more likely to adopt management and lease contracts over greenfields/concessions. It is not clear why that is but it is somewhat concerning given that this suggests that the adoption of the optimal contract is driven by an undesirable country characteristic.

The framework provided here is simple but provides a starting point for future research. There are a number of avenues in which the framework can be expanded. For example, the last point on corruption, and more generally the political aspect of PPI, is one area of possible expansion. There is some theoretical literature exploring this. For example, Shapiro and Willig (1990) highlight the political perspective of the private versus public ownership debate. In their model, the public firm is ran by a bureaucrat who would like to maximize social welfare and his own agenda, which can diverge from that of the public if he/she is malevolent (he/she maximizes the weighted average of the two). The private firm in contrast is run by a profit maximizing manager. Under public ownership, since the government has residual rights, a malevolent bureaucrat has full information on cost and can extract rents from having this information. As

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[29] Cultural remoteness is measured using an index of cultural distance, which was originally developed by Hofstede (1991), cultural distance takes into account five dimensions: (1) Power distance- "the extent to which the less powerful members of institutions and organizations within a country expect and accept that power is distributed unequally," (2) Uncertainty avoidance— "the extent to which the members of a culture feel threatened by uncertain or unknown situations," (3) Individualism versus collectivism—the extent to which "societies in which the ties between individuals are loose," (4) Masculinity versus femininity— the extent to which "societies in which social gender roles are clearly distinct," and (5) long-term orientation.

such, in the presence of a malevolent bureaucrat, private ownership can serve as a way of limiting the information available to him/her.

In sum, the analysis presented in this chapter is exploratory and the main contribution is to provide a framework that sets the stage for future research on the important aspects of optimal contracting in infrastructure finance. The present analysis is constrained by data availability, as well as the lack of granularity on contract types. In parallel further research should go into solidifying the initiated analysis of which contractual mechanisms is the optimal choice. This is in particular important in light of local particularities that might suggest an optimal contract mechanism different from the one suggested by the simplified theory.

7. Conclusions and Policy Implications

The main message emerging from this research is that unlike in the past, SSA countries have a more competitive landscape for infrastructure finance through access to a portfolio of possible financing instruments coming from a variety of sources— bilateral, multilateral and the private sector. Given that each instrument is associated with its own benefits and costs, these alternative forms of financing provide real choices for policymakers on the continent. However, in order to make the (societally) optimal choices, policymakers need to understand the range of possible financing sources as well as the tradeoffs associated with them. The main aim of this dissertation was to understand what these different sources are and shed light on the factors that policymakers should take into consideration to ultimately enable policymakers to make the most out of the infrastructure investments.

What are these new sources of infrastructure investment?

The new sources of finance come from both the public and private sectors.

On the public side, the emergence of new donor countries, in particular China (and more recently Brazil and Turkey), has enlarged the number of actors that participate in infrastructure finance on the continent. While the financing instruments used by these are generally closely aligned to those of traditional financiers – i.e., a mix of market-rate and concessional loans as well as grant financing – the delivery of these funds is very different. For one, the guiding philosophy of the new funders articulates the idea of equal partnership and mutual benefit with recipient countries where traditional donors have pursued a more paternalistic rapport. Secondly, the way of doing business varies dramatically in many respects. For example, as opposed to their western counterparts, Chinese agencies typically negotiate vague contracts with recipient governments. While the level of transparency in these negotiations is minimal, the understanding is that the stipulations of these contracts are often open for renegotiation throughout the lifecycle of the investment. In terms of process, traditional financiers typically co-fund infrastructure projects, while Chinese agencies tend to finance the entirety of the project. For recipient governments, this means less coordination among multiple donors (each of whom may have slightly different requirements). Finally, post-construction, China has focused on on-time delivery of the facility in contrast to traditional financiers whose focus has been on efficiency and sustainability of the project.

On the private side, SSA countries are increasingly attracting private funds for infrastructure through public-private partnerships. The analysis in this dissertation shows that this is particularly true for the more developed countries (with larger markets and more developed

financial markets) on the continent. Additionally, industrialized countries and those with larger market size and higher consumer ability to pay attract larger amounts of PPI.

Further, private funds for infrastructure are flexible in that for each project, the level of private involvement can be calibrated with respect to the private sector risk assumed and new capital investment committed through the type of PPP agreements negotiated by the public and private entities. In SSA the level of private investment seems to be driven mostly by the type of infrastructure and the amount of resource rents that the government receives; the higher the amount of resource rents, the lower the level of private involvement. The latter suggests that the more resource endowed SSA countries have the means to invest public resources in large infrastructure projects and therefore prefer to engage the private sector for the management expertise rather than for the capital investments. The "optimal" contract type depends partly on the infrastructure sector and the different types of market failures embedded in the production and provision of the good. These are associated with the inherent characteristics of the good (how pure of a public good it is), the competitiveness of the market for its provision, and the extent to which equity of access is viewed as important.

What are the benefits and the risks?

The analysis points to both the benefits and risks of the new sources of infrastructure finance for African policymakers. Arguably one of the biggest advantages of the Chinese funds is that they offer a real alternative to traditional donors. As noted by Woods (2008), "the rise of emerging donors is occurring against a background of disaffection among poor countries with the established development assistance regime." On the project level, Chinese funded projects are also associated with fewer delays than those funded by traditional financiers. They impose fewer transaction costs, are more predictable, and have lower short-term risks. In terms of disadvantages, Chinese funds are associated with higher long-term costs given the less generous terms, as well as higher long-term risk in that the contracts are not very elaborate and, given the lack of transparency, could entail implicitly a number of costly future commitments such as preferential access to natural resources, or higher debt servicing costs. More systematically, the risks may be that in the context of non-benevolent recipient country policymakers, the lack of transparency as well as the lack of conditionalities around human rights, good governance, environmental and social protection, the availability of Chinese financing may be propelling corrupt governments that may not channel the new funds in a socially optimal way.

For PPI, the key benefits noted in the literature, besides increased access to financing for infrastructure, is access to management expertise, production efficiency and self-sustainability of infrastructure facilities. The risk is that the PPI received is not adequately channeled or does not optimally (from society's perspective) distribute risks and new capital commitments between the private and public sectors. Indeed, the analysis in this dissertation points to the fact that this may be happening. Higher regulatory burden, lower government efficiency in the

regulatory process, as well as higher corruption are positively (and statistically significantly) associated with amounts of PPI received. This finding raises serious concerns that among the SSA countries receiving PPI, the more corrupt and least efficient governments attract larger amounts of PPI. It may be that corruption and weak government efficiency may be promoting large PPI deals with large private gains at the expense of public interest.

What are the policy implications?

The research points to several policy implications for recipient countries primarily but also for the donor countries and private sector stakeholders. For recipient countries, the analysis showed that the diverse sources of public finance are associated with both benefits and costs, and understanding these tradeoffs is important to adopt policies that maximize the gains from the new capital inflows in terms of accelerated economic growth and improved social outcomes. To that effect, a holistic view of infrastructure investments, from the planning to the post-construction stages (as proposed in this dissertation), can help policymakers identify more clearly the factors that should be taken into consideration when evaluating alternatives.

Additionally, the research shows that private sector funds are attainable, and that SSA policymakers can attract positive types of PPI by promoting prudent macroeconomic policies, and implementing policies that are conducive to private sector activities. Nevertheless, it is important for policymakers to recognize that contracting mechanisms for PPI can be complex and that the optimal level of private involvement depends on the infrastructure sector itself and its inherent market failures and the political sensitivities. Thus, it is important for SSA countries to build institutional capacity to select the right type of contract for PPIs, as well as to manage PPPs with private firms, and improve the regulatory process to better regulate the sectors that have newly been received private funds.

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Appendix A List of sources for the comparative analysis

Type of information	Specific source
Literature	Peer-reviewed journals including African Studies Review, European Journal of Development Research, Journal of Contemporary African Studies, Journal of Infrastructure Development, Journal of International Development, Politikon: South African Journal of Political Studies, South African Journal of Economics, Sustainable Development Law & Policy, Third World Quarterly.
	Reports & white papers (World Bank, African Development Bank, UNECA, OECD, Center for Global Development, Hong Kong Institute for Monetary Research, Overseas Development Institute, European Commission, South African Institute for International Affairs, SAIS Working Papers in African Studies, The Heritage Foundation's China Global Investment Tracker)
	Conference proceedings
	Theses and dissertations
Government sources	MOFCOM (China-Africa Research Center, Statistical Bulletin)
	The Export-Import Bank of China
	China-Africa Development Fund
Websites	China in Africa website from the Carter Center
	Chine-Afrique: Seminaire d'Economie de la Chine (EHSS)
	African Economic Research Consortium
	South African Institute of International Affairs' China in Africa project
	Centre for Chinese Studies at Stellenbosch University
	The China Africa project
Blogs	China in Africa blog: Connecting the dots
	China in Africa: The real story – digging into the myths and realities (Maintained by Dr. Deborah Bräutigam)
News	Google news alerts on China and infrastructure in Africa
	China Africa News
	All Africa News
Informal conversations	Government officials at Ethiopian Road Authority and Ethio Telecom, World Bank Infrastructure Experts (Ethiopia and Washington D.C.), prominent scholar on the issue of China in Africa

Appendix B Financing Mechanisms for Infrastructure

Table 1 Chinese instruments for engagement in SSA's infrastructure

Entity responsible for infrastructure financing	Financing mechanism	Beneficiary	Objective
EXIM Bank	Concessional loans	African governments	Mix of diplomacy, development, and business objectives
	Preferential export buyer's credits	African governments	Promote Chinese exports to SSA
	Export seller's credit	Chinese companies operating in SSA	Promote Chinese exports
	Resource-backed loans	African governments	Secure access to natural resources or gain preferential access to exploitation rights
	Mixed credit/package finance	African governments and Chinese companies operating in SSA	Mix of above objectives
CDB	China-Africa Development Fund (CADF)	Chinese and African companies working together	Support Chinese firms operating in SSA or interesting in doing so, and encourage business partnerships between African and Chinese firms
Government ministries	Grants	African governments	Diplomacy and influence
	Zero-interest loans	African governments	Diplomacy and influence

Source: Compiled using Bräutigam 2010; Davies 2011; Corkin et al. 2008; Jacobs 2011.

Table 2 Traditional financiers' instruments for funding SSA infrastructure[30]

	Responsible entity	Financing mechanism	Beneficiary	Objective & descriptions
WORLD BANK GROUP	IBRD	IBRD Flexible Loan	African governments	• Promote sustainable development in middle income and creditworthy poorer countries • Provides favorable market terms and customized repayment terms (e.g. grace period) according to project needs or debt management requirements. • Interest rates slightly higher than those available to AAA-rated borrowers.
		Local currency loans	African governments	• Similar terms as IBRD Flexible Loans • Borrowers have access to local currency at disbursement or at any time during the life of the loan to reduce future vulnerabilities to foreign exchange risk.
		Financing for subnationals with sovereign guarantee	State/ provincial/ local governments	• Loans to subnational governments at with the same terms as national governments (national governments required to provide guarantee)
	IDA	Subsidized loans ("credits")	African governments	• Support a range of development activities (including infrastructure) in low-income countries and countries that lack the creditworthiness to borrow from IBRD • Zero and very low interest loans with repayments over 25 to 40 years and 5 to 10 years grace period
		Grants	African governments	• Same goals as IDA loans • Allocated on the basis of a country's risk of debt distress.
	IFC	Loans	Private sector firms and projects	• Encourage private enterprise and mobilize other financing for private enterprise development • Finances up to 25 percent of the total cost of a project to ensure participation from other investors/ private sector lenders.
		Subnational Finance	State/ provincial/ local governments	• Provides funds for infrastructure to creditworthy subnational governments without needing sovereign guarantee
AFRICAN DEVELOPMENT BANK	African Development Bank	Sovereign and non-sovereign guaranteed loans	African governments or public sector enterprise	• Promote economic growth and enhance social and economic well-being • Non-concessional loans • Sovereign guaranteed loans must be guaranteed by the borrowing country government
		Local Currency Loans	African governments; public or private firms	• Reduce borrowing countries foreign exchange risks, contribute to local capital markets and make available long term financing in borrowing countries' currencies • Non-concessional terms • Can be sovereign guaranteed or not

[30] Most of these institutions offer a range of financial products. I have not included them all here- in particular, risk management products have been left out. Furthermore, part of the main functions of these institutions is also providing advisory services and technical assistance. These have also been left out of the analysis.

	Responsible entity	Financing mechanism	Beneficiary	Objective & descriptions
	African Development Fund	Zero-interest loans	African governments	• Provides loans to low income and "blend" countries (those eligible for both concessional and non-concessional financing) • 50 year maturity with 10 year grace period.
		Grants	African governments	• Provides grants to low income countries at high or moderate risk of debt distress (high receive 100% grants and moderate 50% grants) • Linked to expenditures that aim to address specific operational priorities, e.g. education, health, water and sanitation, HIV/AIDS programs, post-conflict reconstruction, and natural disaster assistance.
	Nigeria Trust Fund	Concessional loans	Public or private sector projects	• Zero interest loans with long term (20 years, + 7 years grace period) and short term maturities (15 years +5 year grace period) • Funding ceiling of US$ 10 million per project
	Private sector window	Equity and Quasi-Equity	Public or private sector enterprises	• Promote the emergence of a dynamic private sector and attract other investors and lenders to projects • Invest in equities either directly or indirectly - through appropriate funds and other investment vehicles.
		Non-Sovereign Guaranteed Loans	Public or private sector enterprises	• Similar terms to the sovereign guaranteed loans
JAPAN	JICA	Grants	African governments	• Support for projects implemented for basic human needs, education, etc. (e.g. the construction of hospitals, schools and roads, or the procurement of materials and equipment for public transport vehicles, etc.)
		ODA loans	African governments	• Provide low-interest, long-term and concessional funds to finance development efforts
	JBIC	Buyer's Credit	African governments, firms (buyers of Japanese goods)	• Promote Japanese exports (machinery and equipment produced in Japan) • Direct loans to foreign buyers and financial institutions
		Loans	Japanese joint ventures, governments or banks	• Loans to promote Japanese exports and investments • To be eligible, project has to have substantial benefit for Japanese companies and also preserve the global environment
		Overseas investment loans	Japanese firms	• Meet long term needs of Japanese firms for international business development
		Equity participation	Japanese firms and overseas projects	• Support overseas investment projects undertaken by Japanese firms
FRANCE	AFD	Grants	African governments	• Support economic and social development • Fund high-impact projects that do not generate sufficient profit over the short or medium term to pay back market-rate loans
		Subsidized or soft loans	National and local governments;	• Underlying project must "present an additional nature (Does the operation make it possible to go further than usual practices or the national regulations in the

	Responsible entity	Financing mechanism	Beneficiary	Objective & descriptions
			State-owned companies, or NGO	relevant sector?" (ADF 2011, webpage) • Can be sovereign or non-sovereign loans
		Market rate loans	African governments	• Market rate loans for countries with low levels of debt • Can be sovereign or non-sovereign loans
	PROPARCO	Private equity	Private firms	• Minority investment stake to promote capital development
		Non sovereign loans	private sector companies	• Provided directly to investors with or without bank guarantees or restricted covenants • Project loans co-financed with other financiers (e.g. multilateral loans or other bilateral loans) • Loan maturity of up to 15 years with grace period when appropriate.
GERMANY	KfW	Grants	African governments	• Provided to Least Developed Countries (LDC) and for special projects (e.g. targeting climate protection or poverty reduction)
		Subsidized loans	African governments	• Provided to developing countries for the financing of development projects • Similar terms as the World Bank IDA loans
		Development loans	African governments	• Provided for financing infrastructure projects in developing countries that are deemed particularly important from a developmental perspective • Provided to countries not granted favorable lending terms by the World Bank • Low interest rates (significantly lower than those on the capital markets) and flexible maturity • Borrowers are usually states or implementing agencies in developing countries backed by a state guarantees
		Promotional loans	African governments	• Provided to middle income developing countries for projects which are both commercially cost-effective and valuable in terms of development policy • Near market rate interest rates
	BMZ	Export credits (Hermes guarantees)	Exporters and banks	• Foreign trade promotion instrument- cover risks of non-payment for economic and political reasons in the export sector • Specially targeted at small and medium-sized German businesses
	DEG	Market rate loans	German and European firms	• Provide capital to firms interested in investing in developing countries and "support all kinds of long-term intercompany cooperation, particularly with German and European enterprises " (KfW 2013b, webpage)

Source: Compiled using World Bank 2013d, IFC 2013c; JICA 2013a,b; JBIC 2012, 2013; BMZ 2013; ADF 2011, 2012; Proparco 2012; KfW 2013a,b.

Appendix C Historical Context of China-Africa Relations and Motivations of Chinese Involvement in SSA Infrastructure

Historical context

China-Africa relations post-World War II date back to the late 1950s and early 1960s when African countries gained independence. The drivers behind the Chinese engagement at the time were ideological and related to the political positioning of China in the new global system. Chiefly, the "One China Policy" and the associated competition with the Republic of China (i.e., Taiwan) to be recognized as the sole legitimate government of China on the international arena motivated China (i.e., the People's Republic of China or PRC) to woo the newly independent African countries. Other foreign policy considerations included competition with the Soviet Union for influence in the Communist bloc, as well as China's desire to appeal to countries in the non-allied movement during the Cold War (Large 2008).

China's engagement with African countries during that time consisted of political exchanges, sometimes including donations of highly visible "prestige" projects such conference halls and stadiums, and project-by-project aid in the healthcare, agriculture, manufacturing and infrastructure sectors, emphasizing production, self-reliance, and the provision of technical expertise and social services. For the latter, most of the aid involved building state-owned factories and turnkey infrastructure projects, providing training for the management of the new factories, and sending teams of medical doctors modeled on the "barefoot" doctors to serve rural populations.

At the time too infrastructure was a central feature of China's involvement in SSA. Indeed, the largest project undertaken was an infrastructure project: The Tazara Railway project (also known as the Tan-Zam railway), a 1,860 km long system that linked Zambia's Copperbelt region to the Dar es Salaam Port in Tanzania, costing about US$ 500 million to build. The project was especially notable as it had been deemed too expensive to build by Western financiers and the World Bank, but China agreed to build it in 1967, and managed to do so, even finishing two years ahead of schedule (Bräutigam 2008; Large 2008; Bräutigam 2009; Davies 2010).

In the 1980s and 1990s, amid concerns for its own domestic economy, China turned more inward and curtailed its engagements and programs in SSA. The focus became the restructuring of domestic firms and attracting foreign direct investments (FDI) into China, with the main aim of preparing for entry in to the World Trade Organization (WTO) and improving domestic firms' competitiveness on the global arena (Bräutigam 2008). The "Going Global Strategy" of the Chinese government in the next period was a natural progression of the two decades spent on strengthening Chinese firms. In essence, the strategy entailed the expansion of "the international operations of capable Chinese firms with a view to improving resource allocation and enhancing their international competitiveness." In practice, strategic industries were identified, and firms

within these industries were provided with incentives such as export tax rebates, financial assistance and foreign exchange assistance to be more outward looking. The main considerations in terms of the selection of industries were as follows: The potential to increase access to natural resources in the context of a growing China with increasing needs for raw materials; the potential to increase foreign exchange receipts through exports of Chinese products and labor, as well as to promote Chinese technologies abroad; the potential to increase access to foreign advanced technologies and managerial skills; and the potential to increase Chinese firm penetration in foreign markets (Salidjanova 2011).

The "Going Global Strategy" was accompanied by increased government outreach to foreign countries through diplomacy, trade promotion, and, in the case of developing nations, development assistance. For the latter, China's aid comes in a different format than the traditional OECD-country bilateral assistance. Often, Chinese aid is given in the context of an overall engagement in a country, featuring Chinese government backed investment projects in addition to concessional loans, which sometimes are linked to in-kind payments, as well as grants and debt cancellations (Lum et al. 2009).

While these are some of the central features of the Chinese re-engagement in SSA in the early 2000s, the re-engagement was also formalized through highly visible political events, most notably the launch of the Forum on China and Africa Cooperation (FOCAC) in Beijing on October 10-12, 2000. The conference, whose goal was to "promote both political dialogue and economic cooperation and trade, with a view to seeking mutual reinforcement and common development," brought together Chinese and African leaders, and several representatives of international and regional organizations (Jansson 2009). Since, FOCAC has been hosted every three years and throughout, the rhetoric and dialogue have centered on promoting equality, south-south cooperation, mutual benefit, and sovereignty, in line with China's eight principles of development assistance.

Effectively, the motivations underlying the current extensive Chinese outreach in Africa are mainly commercial and attempt to find a "win-win" through commercial exchange between China and the individual African countries. In essence, while Chinese engagement is not tied politically (with the exception of the adherence to the "One China Principle"), it is tied economically, directly supporting Chinese companies in their "going global" strategy- i.e., in search of new markets as well as access to abundant natural resources, and at the same time providing the continent with new sources of financing, and access to new products, technologies and expertise.

Motivations

Infrastructure is one of the key areas of the China-Africa engagement. The existing literature has extensively investigated the motives behind China's involvement in Africa's infrastructure. As noted by Bräutigam (2009), the focus on infrastructure mirrors China's own development path.

In principle, infrastructure provides the opportunity to abide by the FOCAC philosophy, in terms of "south-south cooperation" and "mutual benefit." Practically, there is a strong commercial interest: In line with the "Going Global Strategy", the vibrant Chinese construction industry has found an opportunity in the infrastructural gap in Africa. Furthermore, infrastructural investments have served to increase China's access to the much needed African natural resources, either directly through in-kind contracts (e.g., the construction of a road paid for by an oil contract or guarantee of future access to oil), or through the building of transport routes that facilitate the exports of natural resources to China (Centre for Chinese Studies 2007; Corkin, Burke, and Davies 2008). Besides the economic interests, as in the previous post- World War II engagement, there is also an element of winning and expanding influence on the continent by building prestige projects, which include major infrastructural projects.

New market opportunities for Chinese construction firms

China has a vibrant construction industry. Indeed, after World War II, the Chinese government embarked on rebuilding the country, focusing on bridges, hydroelectric power plants and heavy industry, and to support this, state-owned engineering and construction firms were created. The firms gained experience and expertise domestically, and over the years the industry grew to become an important component of the Chinese economy with its contribution to GDP rising from 3.8 percent in 1978 to 7 percent in 2003, and the number of construction related firms growing from 6,604 in 1980, employing about 6.5 million, to close to 50,000 in 2003, employing 24 million (Cheah, Kang, and Chew 2007). Some of these firms have also become global powerhouses; In 2012, according to the Engineering News Records (ENR), the top three contractors in the world – ranked in terms of construction revenue generated outside of home country—were Chinese,[31] as were 7 out of the top 20 (ENR 2012).

In the 1980s, the construction industry was one of the benefactors of reform with the state owned enterprises (SOEs) being restructured and some even privatized. It was also one of the first industries elected to look beyond the domestic market in the context of 'Going Global Strategy." As such, both private construction firms and SOEs were allowed to operate in foreign markets and awarded favorable assistance to enable them to better compete abroad (Centre for Chinese Studies 2007). At the same time, as elaborated in the first section of this paper, SSA's infrastructure in the 2000s was in dire need of rehabilitation and expansion. The traditional financiers of infrastructure were more focused on other issues, and SSA countries themselves had not built internal capacity to take on such projects. The vacuum thus provided Chinese firms— assisted with subsidies from the Chinese government— room to expand their operations on the continent.

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[31] The companies are: China Railway Group Ltd., China Railway Construction Corp. Ltd. and China State Construction Engineering Corp. Ltd.

In relatively few years, Chinese firms have become big players on the continent. As shown in Figure 1 below, their share of the market rose from 7 percent in 2000 to almost 39 percent in 2010, while during the same time, that of European and American firms fell from 53 and 18 percent respectively to 37 and 7 percent respectively (Figure 1). Chinese firms occupy an even greater share of the market depending on the region; Business Monitor International estimates that in 2011, Chinese firms accounted for almost 56 percent of the Eastern African market, where they feature prominently in the Sudan for example (where they occupy 72 percent of the market share), compared to 42 percent in Southern and Western Africa (BMI 2012).

Figure 1 African* market share of the top international contractors by nationality
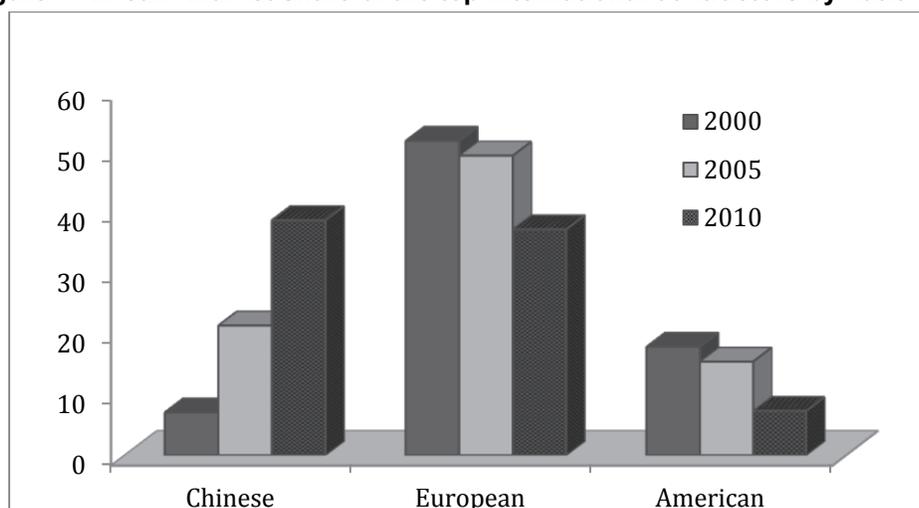
Note: *Includes North Africa

Source: Chen et al. (2007); Reina and Tulacz (2011)

Chinese companies were able to gain such large market shares in a relatively small amount of time for several reasons. For one, similar to other donors, Chinese concessional loans to African countries are tied to Chinese enterprises. Thus, Chinese firms are generally awarded the projects that are funded through Chinese loans. However, notwithstanding this advantage, Chinese firms also tend to be quite competitive. Indeed, on competitive bids, they can sometimes undercut the competition's prices by 50 percent, and as a result win a number of such bids. For example, in 2010, Chinese firms won 35 percent of the civil engineering projects funded through the AfDB. Part of the reason is that because of the funds available to Chinese firms through the Chinese government (see next section), the firms are able to operate on lower profit margins than others; while typically foreign firms operate on a profit margin of 15 to 25 percent, Chinese firms are able to operate on profit margins lower than 10 percent, and in some cases, even as low as 3 to 5 percent (Corkin, Burke, and Davies 2008). Secondly, because of the vast number of Chinese construction firms in SSA — around 800 in 2007— they tend to be very competitive with each other, driving down prices even further. Chinese firms also have access to cheaper material and labor, and pay their engineers close to local rates, unlike other foreign firms, whose engineers get

very high expatriate rates (Schiere and Rugamba 2011; Corkin, Burke, and Davies 2008; Chen et al. 2007).

Ensuring long-term access to natural resources

China's rapid economic growth has meant a growing need for natural resources, and SSA countries have become a principal source for minerals and oil; on average between 2007 and 2011, 91 percent of Chinese cobalt imports came from SSA, as did, respectively, 44 and 39 percent of manganese and chromium imports. In addition, 20, 6 and 7 percent of Chinese crude oil, copper and iron ores imports respectively came from SSA (Figure 2).

Figure 2 Chinese imports of African minerals and crude oil as a percentage of total imports of minerals and crude oil
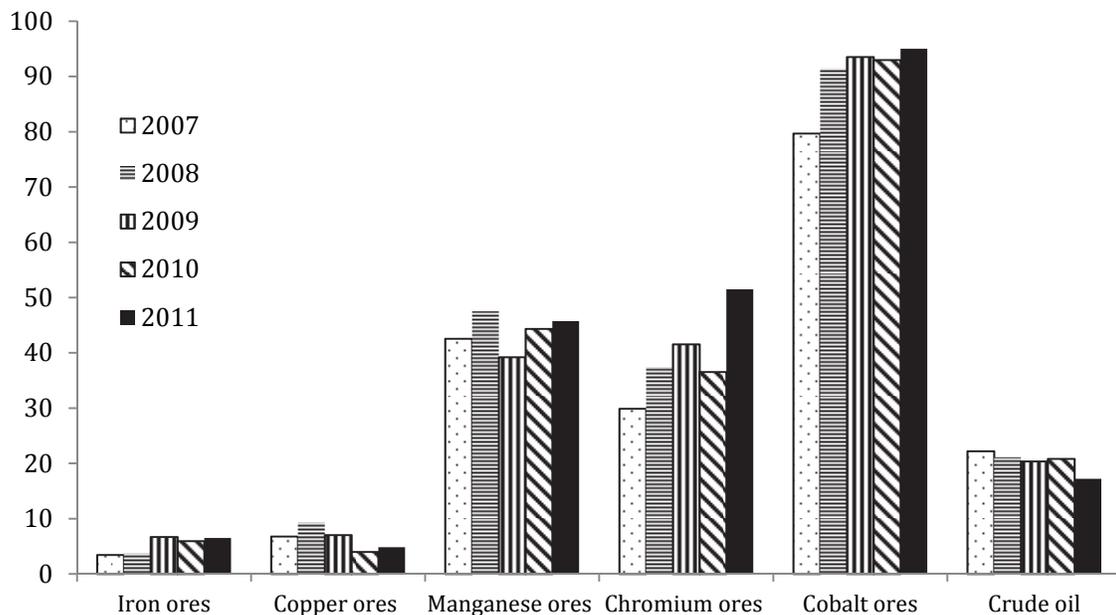
Source: World Bank (2012)

The intersection between the Chinese role in African infrastructure and access to natural resources plays out in two ways; (1) the use of resource-backed loans for the financing of key infrastructure (also known as the "Angola mode"), and (2) the focus on infrastructure that facilitate the transport of resources from extraction sites to ports (Farooki 2012; Foster et al. 2009).

For the latter, because mining and oil resources—particularly in Africa— are located in underdeveloped areas or offshore, and since most of the resources are destined for exports, the exploitation requires the development of transport infrastructure, particularly ports, roads and railroads. In addition, power plants are necessary for the operation of mines. As such, Chinese investments in natural resources are often bundled with investments in infrastructure facilities (Farooki 2012; Foster et al. 2009). A good example of this is the Belinga Iron Ore project in

Gabon, for which the Belinga-Santa Clara railway and the Poubara hydropower dam were proposed as part of the project in exchange for iron exploration rights to the China Machinery Engineering Corporation (CMEC), a Chinese engineering and trade firm.[32] Other examples include the rehabilitation of key transport routes such as the Benguela railways, which links the copper mines in Zambia and DRC to the port of Lobita in Angola, and the construction of a 1000 MW capacity hydropower plan in Chad in exchange of four oil blocks in the Lake Chad Basin and the Niger Delta (Executive Research Associates 2009). Nevertheless, as stated earlier, according to estimates from the World Bank, only about 10 percent of Chinese infrastructure investments can be directly linked to natural resource exploitation (Foster et al. 2009).

As for resource-backed loans, these have become a prominent feature of the bilateral relations of China with natural resource-rich countries on the continent such as Angola, the Democratic Republic of Congo (DRC), and the Sudan, but also more recently with primary commodities exporters like Ethiopia (loans in exchange for sesame seed exports for example). The mechanism, which I review in more detail in the next section of the paper, is a way for China to grant a credit line to a resource-rich country which does not necessarily have sufficient financial guarantees to obtain a loan (Christensen 2010).

Prestige infrastructural projects

There are essentially two ways that Chinese investments contribute to funding prestige projects. The first is direct and comes in the form of a bilateral gift from China to a recipient country or regional organization. The intention is to build goodwill or "political capital" in SSA using "aid as a vehicle to gain influence on the African continent" (Gernot 2007). A recent example is the funding and construction of the new African Union (AU) headquarter building in Addis Ababa, worth US$ 200 million, which was inaugurated in early 2012 (BBC 2012).

The second way is more indirect and linked to China's aid policy of non-interference and the associated provision of unconditional loans. Some authors (e.g., Christensen(2010), Mold (2012)), drawing a parallel to what happened in SSA in the 1960s and 1970s with respect to investments in infrastructure, have expressed concern these types of loans which do not take into consideration economic returns, may enable some governments to invest in "white elephant" projects, i.e., large, expensive, highly visible but non-productive investments that do not necessarily contribute to the growth of the local economy, and ultimately lead to unsustainable levels of debt.

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[32] The deal was later revoked by the Gabonese government due to "concerns about the environmental impact of the project and then over whether CMEC would be able to deliver" (Reuters Africa, Gabon's Belinga iron ore deal to be awarded as late as 2014, 2012).

Appendix D Exploring the Outcome Variable: PPI

Figure 1 below depicts the distribution of the outcome variable, the amount of private participation in infrastructure (PPI) received by a country in a given year. The distribution is left-skewed, with a 39 percent of the observations clumped at zero, as a number of countries did not receive any private capital in infrastructure in some years.

Figure 1 Distribution of outcome variable: PPI (in constant 2005 US$)
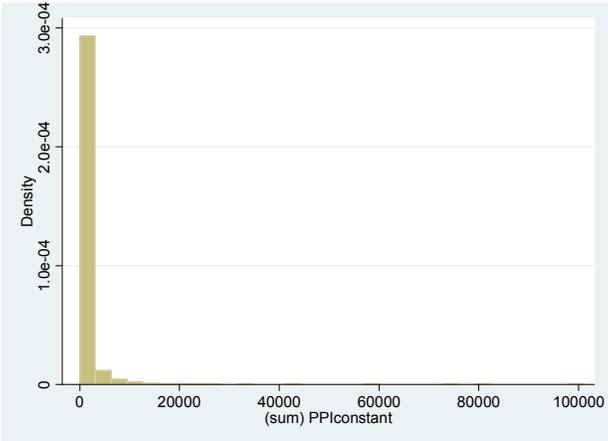
In a first cut of the analysis, in order to get the outcome variable to be more normally distributed I take the natural logarithm of it PPI after I have added 1 to it so that all the observations where PPI is equal to zero are not dropped from the analysis when I take the natural logarithm. As shown in Figure 2 below, ln(PPI+1) is not normally distributed.

Figure 2 Distribution of the transformed outcome variable: ln(PPI +1)
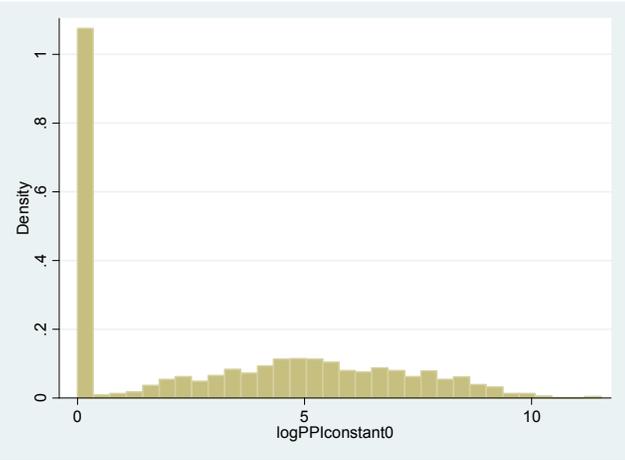
A two part model would be more appropriate to explicitly take into account the clustering of PPI around zero. In a first part, using a logit regression, I can explicitly model whether or not I

get a zero outcome (i.e., whether the country received PPI that specific year). I can then model the level of PPI conditional on the country having received PPI that year in a second part using an OLS specification, as I get a fairly normal distribution (figure 3 below).

Figure 3 Distribution of ln (PPI) conditional on having received PPI
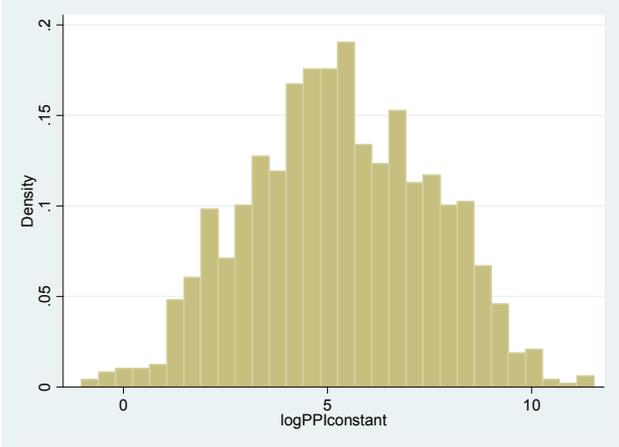
Appendix E Explanatory Variables- Determinants of PPI

<table>
<tr><th></th><th>Factor</th><th>Proxy indicator</th><th>Definition</th><th>Source</th></tr>
<tr><td rowspan="2">Government motivations</td><td rowspan="2">Ability of the government to finance infrastructure</td><td>Aid (% of gross capital formation)</td><td>Aid includes both official development assistance (ODA) and official aid. Gross capital formation consists of outlays on additions to the fixed assets of the economy plus net changes in the level of inventories.</td><td>World Development Indicators (WDI) 2009 (World Bank)</td></tr>
<tr><td>Index of government size</td><td>Indicator of the size of government expenditures. The range is between 0 and 100, and the higher the score, the smaller the government.</td><td>Index of Economic Freedom (IEF) 2010 (Heritage Foundation)</td></tr>
<tr><td rowspan="6">Private firm motivations</td><td rowspan="2">Adequate regulatory framework and proper enforcement of laws</td><td>Freedom from corruption index</td><td>Measures the extent of corruption. Ranges from 0-100, 100= very little corruption</td><td rowspan="2">IEF 2010</td></tr>
<tr><td>Index of property rights protection</td><td>Measures degree to which country protects private property rights and the degree to which its government enforces those laws. Range from 0-100, 100= private property fully protected by government.</td></tr>
<tr><td>Access to credit</td><td>Domestic credit to private sector (% of GDP)</td><td>Financial resources provided to the private sector, such as through loans, purchases of nonequity securities, and trade credits and other accounts receivable, that establish a claim for repayment.</td><td rowspan="3">WDI 2009</td></tr>
<tr><td rowspan="2">Market size and consumers' ability to pay for services</td><td>GDP per capita (constant 2005 international $)</td><td>Gross domestic product divided by mid-year population.</td></tr>
<tr><td>Total Population</td><td>Counts all residents regardless of legal status or citizenship--except for refugees not permanently settled in the country of asylum, who are generally considered part of the population of their country of origin. The values are midyear estimates</td></tr>
<tr><td rowspan="2">Government effectiveness and responsiveness</td><td>Index of investment freedom</td><td>Measure of the level of constraints on the flow investment capital (in and out). Range 0-100, 100= little constraints</td><td rowspan="2">IEF 2010</td></tr>
<tr><td>Index of business freedom</td><td>Measure of the ability to start, operate, and close a business- represents the overall burden of regulation and efficiency of government in the regulatory process. Range 0-100, 100= best business environment</td></tr>
</table>

	Factor	Proxy indicator	Definition	Source
		Index of fiscal freedom	Fiscal freedom is a measure of the tax burden imposed by government. It includes both the direct tax burden in terms of the top tax rates on individual and corporate incomes and the overall amount of tax revenue as a percentage of GDP.	
	Political stability and public opinion on private provision of infrastructure services	Democracy	Dummy variable (1 if democracy and 0 otherwise) constructed from the variable "Regime type" in Hadenius and Teorell (2007)	Hadenius and Teorell 2007
		Civil War	Dummy variable (1 if civil war and 0 otherwise) constructed from the variable "Regime type" in Hadenius and Teorell (2007)	
		Ethnic fractionalization	Probability that two randomly selected people from a given country will not belong to the same ethnolinguistic group	Roeder 2001
		Regime durability	The number of years since the most recent regime change or the end of transition period defined by the lack of stable political institutions.	Polity IV database 2008
Enabling environment	Macroeconomic environment	Annual inflation in consumer prices (%)	Reflects the annual percentage change in the cost to the average consumer of acquiring a basket of goods and services that may be fixed or changed at specified intervals, such as yearly.	WDI 2009
		Openness	Constructed as follows: (Total Imports + total exports)/GDP	
	Economic structure	Total natural resources rents (% of GDP)	Total natural resources rents are the sum of oil rents, natural gas rents, coal rents (hard and soft), mineral rents, and forest rents.	
			Value added is the net output of a sector after adding up all outputs and subtracting intermediate inputs. It is calculated without making deductions for depreciation of fabricated assets or depletion and degradation of natural resources.	
		Agriculture, value added (% of GDP)	Agriculture includes forestry, hunting, and fishing, as well as cultivation of crops and livestock production.	
		Industry, value added (% of GDP)	Industry includes mining, manufacturing, construction, electricity, water, and gas	

	Factor	Proxy indicator	Definition	Source
		Services, value added (% GDP)	Services includes value added in wholesale and retail trade (including hotels and restaurants), transport, and government, financial, professional, and personal services such as education, health care, and real estate services. Also included are imputed bank service charges, import duties, and any statistical discrepancies noted by national compilers as well as discrepancies arising from rescaling.	

Appendix F Determinants of PPI- Results

Table 1 outlines the initial results where I include all the potential explanatory variables identified. The two estimated models are as follows. X represents the factors influencing government motivations, Y the factors influencing the private sector motivations, Z the factors influencing the enabling environment, I the total level of investment in the economy, and ϑ_t time fixed effects.

Model 1 $\ln(\text{PPI}+1) = \beta_0 + \beta_1 + I_{it} + X_{it} + \beta_2 Y_{it} + \beta_3 Z_{it} + \vartheta_t + \mu_{it} + \varepsilon_{it}$

Model 2

Part 1: $\Pr(PPI_{it}>0) = \alpha_0 + I_{it} + \alpha_1 X_{it} + \alpha_2 Y_{it} + \alpha_3 Z_{it} + \vartheta_t + \mu_{it} + \varepsilon_{it}$

Part 2: $\Pr(PPI_{it}|PPI_{it}>0) = \gamma_0 + I_{it} + \gamma_1 X_{it} + \gamma_2 Y_{it} + \gamma_3 Z_{it} + \vartheta_t + \mu_{it} + \varepsilon_{it}$

Table 1 Results with all the relevant indicators considered

	LMICS			SUB SAHARAN AFRICA		
	Model 1	Model 2		Model 1	Model 2	
	ln (PPI+1)	Part 1	Part 2	ln (PPI+1)	Part 1	Part 2
gfcfconstant	1.33E-12	2.09E-13	1.52e-12**	6.70E-13	2.69E-12	1.84E-11
	(1.65)	(0.2)	(3.24)	(0.37)	(0.31)	(0.79)
aid	-0.000771	-0.00141	-0.00296	0.000425	-0.00288	-0.00309
	(-0.41)	(-0.42)	(-1.23)	(0.18)	(-0.86)	(-0.84)
government size	0.000214	0.016	-0.00574	0.0062	0.0179	0.00833
	(0.03)	(1.39)	(-1.25)	(0.45)	(1.03)	(0.7)
ln (agriculture)	-0.0104	0.094	-0.178	-0.295	-0.785	0.119
	(-0.04)	(0.16)	(-0.83)	(-0.66)	(-1.05)	(0.28)
ln (industry)	0.329	-0.665	0.801	0.577	-0.998	2.135***
	(0.62)	(-0.74)	(1.5)	(0.81)	(-0.99)	(3.66)
ln (services)	0.678	1.903	0.154	1.426	2.952*	0.713
	(0.8)	(1.58)	(0.21)	(1.66)	(2.24)	(0.73)
ln (resource rents)	-0.084	-0.0231	-0.099	0.00782	0.161	-0.132
	(-0.80)	(-0.15)	(-1.30)	(0.08)	(1.08)	(-1.13)
ln (GDP per Capita)	0.981***	1.044*	0.498*	0.504	0.607	0.0179
	(3.34)	(2.33)	(2.56)	(1.51)	(1.05)	(0.05)
ln (population)	1.145***	1.185***	0.912***	1.030***	1.067***	0.552*
	(13)	(5.12)	(12.19)	(3.79)	(3.38)	(2.56)
corruption	-0.0119	-0.0117	-0.00528	-0.00038	-0.00512	-0.0143
	(-1.17)	(-0.91)	(-0.79)	(-0.03)	(-0.31)	(-1.65)

	LMICS			SUB SAHARAN AFRICA		
	Model 1	**Model 2**		**Model 1**	**Model 2**	
	ln (PPI+1)	Part 1	Part 2	ln (PPI+1)	Part 1	Part 2
property rights	0.0108	0.00784	0.00803	0.00141	-0.0113	-0.00663
	(0.96)	(0.56)	(1.11)	(0.1)	(-0.69)	(-0.45)
common law	-0.24	0.559	-0.577*	0.904*	1.411**	0.323
	(-0.88)	(1.13)	(-2.54)	(2.04)	(2.7)	(0.83)
ethnic fractionalization	0.0889	-1.004	0.451	0.715	-1.116	1.406**
	(0.18)	(-1.06)	(1.36)	(1.06)	(-0.98)	(2.91)
regime duration	-0.0101	-0.00835	-0.00763	-0.0103	0.00567	-0.0113
	(-1.25)	(-0.63)	(-1.52)	(-0.62)	(0.31)	(-0.86)
democracy	0.289	0.811*	0.154	-0.237	-0.452	0.365
	(1.43)	(2)	(1.14)	(-0.85)	(-1.02)	(1.05)
civil war	1.420***	23.74	-0.226	0.776	29.44	-0.665
	(3.86)	(0.0)	(-0.49)	(1.34)	(0.0)	(-1.34)
ln (domestic credit)	0.275	-0.366	0.312***	0.451*	-0.218	0.697**
	(1.51)	(-1.42)	(3.34)	(2.34)	(-0.65)	(3.12)
fiscal freedom	0.0241	0.0293*	0.00953	0.0145	0.0367*	0.0145
	(1.87)	(2.18)	(1.11)	(1.1)	(2.3)	(1.05)
business freedom	-0.00103	-0.0154	0.00525	-0.0379*	-0.04	-0.0376**
	(-0.10)	(-0.94)	(0.64)	(-2.26)	(-1.95)	(-2.77)
investment freedom	0.0124	0.00496	0.00705	0.00421	0.00935	0.00693
	(1.6)	(0.44)	(1.65)	(0.44)	(0.63)	(0.57)
inflation	-0.00193	-0.00253	-0.00135**	-0.00336	-0.0236	0.0056
	(-1.08)	(-1.13)	(-2.72)	(-0.39)	(-1.89)	(0.67)
openness	0.324	2.083**	-0.179	0.252	1.526*	-0.659
	(1.03)	(3.05)	(-0.69)	(0.51)	(2.1)	(-1.19)
_cons	-28.67***	-31.63***	-18.15***	-24.47***	-27.68*	-16.32*
	(-5.53)	(-3.40)	(-3.83)	(-4.02)	(-2.52)	(-2.41)
N	1051	1051	854	340	340	225

Notes:
(1) t statistics in parentheses
*(2) * p<0.05, ** p<0.01, *** p<0.001*
(3) Standard errors clustered on countries
(4) The estimations include year fixed effects (not shown here)

One potential problem in this set up is mutlicollinearity among the explanatory variables. Thus, to minimize mutlicollinearity among the independent variables, I calculate bivariate correlation coefficients between the independent variables and, in the event of high coefficients (greater than 0.5) between two variables, I exclude one of the two from the model. Table 2 below shows the bivariate correlation coefficients between the different independent variables and highlights the potentially problematic explanatory variables.

Table 2 Correlation tables indicate the potential for multicollinearity

	aid	government size	ln (agriculture)	ln (industry)	ln (services)	ln (resource rents)	ln (GDP per capita)	ln (population)	freedom from corruption
aid	1								
government size	0.0676	1							
ln (agriculture)	0.5846	0.2292	1						
ln (industry)	-0.3899	-0.1557	-0.5889	1					
ln (services)	-0.3685	-0.1142	-0.5078	-0.2102	1				
ln (resource rents)	0.119	0.0513	0.0588	0.3141	-0.4425	1			
ln (GDP per capita)	-0.709	-0.2594	-0.8543	0.505	0.5155	-0.1143	1		
ln (population)	-0.1313	0.2129	-0.0199	0.0812	0.0134	0.2376	-0.0362	1	
freedom from corruption	-0.2452	-0.2919	-0.4329	0.1352	0.3789	-0.2591	0.457	-0.0812	1
property rights	-0.1747	-0.202	-0.3041	0.0033	0.3198	-0.3207	0.286	-0.0636	0.6342
ethnic fractionalization	0.3902	0.1128	0.1645	-0.2297	-0.1688	0.2643	-0.345	0.0556	-0.209
regime duration	-0.2224	0.0391	-0.1569	0.2146	0.0532	-0.1042	0.2359	0.0366	0.2719
Democracy	-0.2624	-0.1617	-0.4083	0.0778	0.3669	-0.309	0.4582	-0.1899	0.4248
civil war	0.0494	-0.0109	-0.0944	0.2354	-0.294	0.2178	-0.0225	-0.0842	-0.1073
ln (domestic credit)	-0.4576	-0.0287	-0.4325	0.1444	0.5259	-0.2422	0.4555	0.2448	0.363
Fiscal freedom	-0.0218	0.2839	-0.0221	-0.1416	0.1625	-0.2101	0.0742	-0.1466	0.0222
business freedom	-0.281	-0.1049	-0.4172	0.0806	0.3747	-0.2593	0.4466	-0.0802	0.5069
investment freedom	-0.0424	-0.081	-0.1721	-0.2128	0.4415	-0.3914	0.2152	-0.1217	0.4704
Inflation	0.1046	-0.2362	0.0489	0.0666	-0.0909	-0.0023	0.007	0.0068	-0.0488
Openness	-0.1126	-0.2839	-0.0971	0.2816	-0.1052	-0.0054	0.1296	-0.4085	0.0451

Table 2 Correlation tables indicate the potential for multicollinearity (ctd.)

	property rights	ethnic fractionalization	regime duration	democracy	civil war	ln (domestic credit)	fiscal freedom	business freedom	Investment freedom	inflation	openness
property rights	1										
ethnic fractionalization	-0.0741	1									
regime duration	0.0779	-0.2959	1								
democracy	0.4211	-0.1963	0.1356	1							
civil war	-0.1573	0.1786	-0.0552	-0.0848	1						
ln (domestic credit)	0.2719	-0.2787	0.2998	0.321	-0.2047	1					
fiscal freedom	0.0307	-0.1894	-0.0108	0.1434	-0.0935	0.0703	1				
business freedom	0.6226	-0.0895	0.158	0.4383	-0.1169	0.3052	0.1018	1			
investment freedom	0.5248	-0.0838	0.1085	0.409	-0.155	0.2273	0.1502	0.5185	1		
inflation	-0.0545	-0.0523	-0.0792	-0.0605	-0.0309	-0.174	-0.0964	-0.1007	-0.1169	1	
openness	-0.0513	-0.2074	0.1168	0.0928	0.1062	0.1349	0.0121	0.0262	-0.15	0.0637	1

Taking into account these correlations, I streamline the model-- I drop GDP per capita which is highly correlated with structural indicators of the economy (value added of agriculture, services and industry to the economy) and the level of aid received by the country, as well as the index for property rights which is highly correlated with the freedom from corruption and the indices for investment and business freedom. Table 3 outlines the new results.

Table 3 Results accounting for multicollinearity

| | LMICS | | | SUB-SAHARAN AFRICA | | |
| | OLS | Two- part model | | OLS | Two- part model | |
	ln (PPI+1)	Part 1	Part 2	ln (PPI+1)	Part 1	Part 2
gfcfconstant	1.49E-12	2.96E-13	1.70e-12***	9.84E-13	2.89E-12	1.78E-11
	(1.76)	(0.31)	(4.24)	(0.51)	(0.59)	(1.18)
aid	-0.00361	-0.00445	-0.00574*	-0.00102	-0.0054	-0.00266
	(-1.80)	(-1.38)	(-2.29)	(-0.48)	(-1.75)	(-0.94)
government size	-0.00464	0.0107	-0.00746	0.007	0.014	0.00823
	(-0.72)	(0.95)	(-1.58)	(0.58)	(0.94)	(0.77)
ln (industry)	1.414***	0.353	1.600***	1.531***	0.773	1.982***
	(3.58)	(0.59)	(4.27)	(3.68)	(1.42)	(5.88)
ln (services)	1.836**	2.968**	1.042	1.741*	4.055***	0.515
	(2.62)	(3.15)	(1.75)	(2.49)	(3.66)	(0.66)
ln (resource rents)	-0.0673	0.00938	-0.1	-0.00857	0.145	-0.13
	(-0.63)	(0.06)	(-1.30)	(-0.09)	(1.03)	(-1.11)
ln (population)	1.069***	1.074***	0.849***	0.852**	0.719**	0.581***
	(11.05)	(4.81)	(10.29)	(3.16)	(2.96)	(3.44)
freedom from corruption	-0.00306	-0.00408	0.000417	0.00832	0.00272	-0.0160*
	(-0.30)	(-0.33)	(0.07)	(0.68)	(0.18)	(-2.20)
common law	-0.548*	0.279	-0.716***	0.970*	1.255*	0.281
	(-2.13)	(0.6)	(-3.39)	(2.2)	(2.54)	(0.75)
ethnic fractionalization	-0.0324	-1.211	0.492	1.203	-0.482	1.424**
	(-0.06)	(-1.31)	(1.35)	(1.41)	(-0.45)	(3)
regime duration	-0.00808	-0.00489	-0.00648	-0.00696	0.013	-0.0116
	(-0.93)	(-0.37)	(-1.15)	(-0.40)	(0.74)	(-0.94)
democracy	0.425*	0.937*	0.228	-0.111	-0.338	0.302
	(2.05)	(2.33)	(1.64)	(-0.43)	(-0.78)	(0.97)
civil war	1.580***	23.77	-0.021	0.866	29.91	-0.685

	LMICS			SUB-SAHARAN AFRICA		
	OLS	Two- part model		OLS	Two- part model	
	ln (PPI+1)	Part 1	Part 2	ln (PPI+1)	Part 1	Part 2
	(3.53)	(0.0)	(-0.04)	(1.6)	(0.0)	(-1.60)
ln (domestic credit)	0.418*	-0.255	0.405***	0.575**	-0.245	0.708***
	(2.27)	(-1.01)	(4.3)	(2.61)	(-0.84)	(3.94)
fiscal freedom	0.0270*	0.0325*	0.0129	0.0133	0.0394**	0.0124
	(2.15)	(2.45)	(1.46)	(1.06)	(2.64)	(1.02)
business freedom	0.0101	-0.00427	0.0108	-0.0297*	-0.0315	-0.0397**
	(1.05)	(-0.27)	(1.29)	(-2.01)	(-1.72)	(-3.14)
investment freedom	0.0131	0.0046	0.0075	-0.000604	-0.00274	0.0064
	(1.88)	(0.43)	(1.84)	(-0.07)	(-0.21)	(0.55)
inflation	-0.00159	-0.00191	-0.00101*	-0.00457	-0.0217	0.00592
	(-0.85)	(-0.87)	(-1.99)	(-0.48)	(-1.73)	(0.71)
openness	0.174	1.898**	-0.276	-0.0263	0.882	-0.621
	(0.49)	(2.86)	(-0.99)	(-0.06)	(1.34)	(-1.44)
_cons	-28.27***	-29.31***	-19.84***	-23.88***	-30.26***	-13.43***
	(-7.75)	(-5.13)	(-6.07)	(-4.67)	(-5.21)	(-3.39)
N	1051	1051	854	340	340	225

Notes:
(1) t statistics in parentheses
(2) * p<0.05, ** p<0.01, *** p<0.001
(3) Standard errors clustered on countries
(4) The estimation includes year fixed effects (not shown here)

Appendix G Determinants of PPI- Robustness Checks

For the robustness checks, using the streamlined model established above as the starting point, I run the following alternative specifications:

- *Regression (1):* I substitute indicators of structural aspects of the country's economy (value added of services, industry, and agriculture) and the level of aid received with the GDP per capita.
- *Regression (2):* In addition to substitutions made in (1), I also substitute the indices of business and investment freedom with the index of property rights protection from the IEF.
- *Regression (3):* I use alternative measures from the World Bank's World Governance Indicators (WGI) to proxy for political stability (i.e., I substitute the indicators for civil war, regime durability and ethnic fractionalization with the WGI's index for political stability and absence of violence), as well as for business and investment freedom and freedom from corruption (i.e., I substitute the IEF's indices for business and investment freedom as well as freedom from corruption with the WGI's government effectiveness, regulatory quality and rule of law, and control of corruption indices).
- *Regressions (4) and (5):* I use two different measures of political stability respectively substituting civil war, regime durability, and ethnic fractionalization with the US State Department's Political Terror Scale (PTS) measure of political violence and terror and the WGI political stability and absence of violence index.
- *Regression (6)*: I substitute the business and investment freedom indices with an overall quality of government index from the International Country Risk Guide (ICRG).
- *Regression (7):* For the SSA regressions, I run the streamlined model without South Africa

Table 1 below gives definitions and sources for the alternate proxies used in (4), (5), and (6). Tables 2 – 5 provide the respective two-part model results for regressions (1) through (6) for all LMICs and SSA countries. Finally, Table 6 provides the results for regression (7).

Table 1 Alternative proxies for perception-based measures

Alternative measure for	Measure	Definition	Source
Civil war, regime durability, ethnic fractionalization	Political stability and absence of violence	Measures perceptions of the likelihood that the government will be destabilized or overthrown by unconstitutional or violent means, including politically-motivated violence and terrorism.	Worldwide Governance Indicators (WGI), World Bank
	Political violence and terror	Measures levels of political violence and terror that a country experiences in a particular year based on a 5-level "terror scale."	US State Department data
Business freedom, fiscal freedom and investment freedom	Government effectiveness	Captures perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies.	WGI, World Bank
	Regulatory Quality	Captures perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development.	WGI, World Bank
	Quality of government	Mean index of the ICRG variables "Corruption", "Law and Order" and "Bureaucracy Quality", scaled 0-1. Higher values indicate higher quality of government.	International Country Risk Group (ICRG) ratings
Property rights protection	Rule of Law	Captures perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence.	WGI World Bank
Corruption	Control of corruption	Captures perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests	WGI World Bank

Table 2 Robustness checks for all LMICs – Part 1

	(1)	(2)	(3)	(4)	(5)	(6)
gfcfconstant	2.96E-15	-5.07E-14	2.57E-11	4.13E-12	-1.01E-13	2.25E-11
	(0.00)	(-0.05)	(-1.73)	(-0.51)	(-0.11)	(-1.44)
government size	0.0166	0.0152	0.0147	-0.000408	0.0155	0.0186

	(1)	(2)	(3)	(4)	(5)	(6)
	(-1.53)	(-1.40)	(-1.36)	(-0.03)	(-1.22)	(-1.59)
ln (resource rents)	-0.166	-0.185	0.0448	-0.0512	-0.0201	0.0229
	(-1.27)	(-1.37)	(-0.34)	(-0.29)	(-0.11)	(-0.16)
ln (GDP per capita)	1.045***	1.001***				
	(-3.75)	(-3.64)				
	1.244***	1.261***	1.007***	1.050***	1.075***	1.138***
ln (population)	(-5.41)	(-5.43)	(-4.87)	(-4.12)	(-4.28)	(-5.00)
	0.267	0.339	0.576	0.0656	-0.0107	0.621
common law	(-0.56)	(-0.68)	(-1.47)	(-0.12)	(-0.02)	(-1.41)
ethnic fractionalization	0.0459	0.0238			-0.00325	
	(-0.05)	(-0.03)			(-0.00)	
	-0.0075	-0.00595			-0.00454	
regime duration	(-0.57)	(-0.44)			(-0.32)	
democracy	0.899*	0.945*	0.417	1.221	1.048*	0.721
	(-2.31)	(-2.40)	(-1.04)	(-1.95)	(-2.33)	(-1.68)
civil war	23.75	23.91			24.21	
	(0.00)	(0.00)			(0.00)	
ln (domestic credit)	0.0319	0.033	-0.529*	-0.551	0.00951	-0.511
	(-0.13)	(-0.14)	(-2.08)	(-1.53)	(-0.03)	(-1.86)
business freedom	-0.0186			-0.0438		
	(-1.27)			(-1.88)		
investment freedom	-0.00109			0.0172		
	(-0.11)			(-1.11)		
fiscal freedom	0.0434***	0.0426***	0.0508***	0.0757***	0.0567***	0.0553***
	(-3.57)	(-3.48)	(-4.00)	(-4.02)	(-4.02)	(-4.05)
inflation	-0.00355	-0.00345	-0.0117	-0.0223*	-0.00187	-0.0172
	(-1.63)	(-1.58)	(-1.25)	(-2.21)	(-0.81)	(-1.82)
openness	2.004**	2.031**	2.507***	2.300**	1.879*	2.682***
	(-3.25)	(-3.25)	(-3.76)	(-2.7)	(-2.44)	(-3.68)
property rights		-0.016				
		(-1.38)				
aid			-0.00602	-0.00682	-0.00582	-0.00598
			(-1.57)	(-1.47)	(-1.47)	(-1.53)

	(1)	(2)	(3)	(4)	(5)	(6)
ln (industry)			-0.129	1.003	0.809	0.0469
			(-0.22)	(-1.36)	(-1.15)	(-0.08)
ln (services)			2.095*	2.606*	2.583*	2.657**
			(-2.33)	(-2.06)	(-2.23)	(-2.73)
WGI political stability			0.0112			0.0213
			(-0.04)			(-0.07)
WGI govt. effectiveness			0.23			
			(-0.33)			
WGI reg. quality			1.331**			
			(-2.75)			
WGI rule of law			-0.664			
			(-0.93)			
WGI corruption			-0.418			-0.0629
			(-0.75)			(-0.14)
freedom from corruption				-0.0119	-0.00632	
				(-0.68)	(-0.47)	
PTS political stability				-0.512		
				(-0.77)		
ICRG quality of government					-0.702	
					(-0.42)	
_cons	-31.16***	-31.43***	-27.28***	-31.52***	-34.20***	-32.89***
	(-6.73)	(-6.75)	(-4.69)	(-4.20)	(-5.01)	(-5.37)
lnsig2u _cons	0.648	0.713*	-0.62	0.217	0.46	0.0481
	(1.78)	(2.07)	(-0.88)	(0.38)	(1.11)	(0.1)
N	1088	1088	742	501	855	742

Notes:
(1) The dependent variable is the dummy variable equal 1 when PPI is positive and 0 when PPI is zero
*(2) t statistics in parentheses; * p<0.05, ** p<0.01, *** p<0.001*
(3) Standard errors clustered on countries
(4) The estimation includes year fixed effects (not shown here)

Table 3 Robustness checks for all LMICs- Part 2

	(1)	(2)	(3)	(4)	(5)	(6)
gfcfconstant	1.55e-12**	1.57e-12**	1.59E-12	9.67E-13	1.75e-12***	1.89E-12
	(-3.03)	(-2.89)	(-1.38)	(-0.74)	(-3.90)	(-1.67)
government size	-0.0044	-0.00463	-0.00603	-0.0108	-0.00451	-0.00403
	(-0.95)	(-0.99)	(-1.07)	(-1.61)	(-0.89)	(-0.70)
ln (resource rents)	-0.0705	-0.0725	-0.0508	0.0106	-0.170*	-0.0672
	(-1.10)	(-1.08)	(-0.58)	(0.13)	(-2.29)	(-0.69)
ln (GDP per capita)	0.883***	0.895***				
	(-6.67)	(-7.24)				
ln (population)	0.986***	0.972***	0.767***	0.722***	0.765***	0.766***
	(-16.04)	(-15.73)	(-8.76)	(-6.38)	(-8.63)	(-8.38)
common law	-0.448*	-0.531**	-0.486*	-0.637*	-0.471	-0.552*
	(-2.27)	(-2.64)	(-2.11)	(-2.39)	(-1.92)	(-2.36)
ethnic fractionalization	0.238	0.276			0.525	
	(-0.78)	(-0.90)			(-1.23)	
regime duration	-0.00733	-0.00721			-0.00849	
	(-1.55)	(-1.50)			(-1.51)	
democracy	0.174	0.163	0.252	0.427*	0.212	0.279
	(-1.31)	(-1.20)	(-1.71)	(-2.13)	(-1.32)	(-1.74)
civil war	0.104	0.0673			-0.0712	
	(-0.35)	(-0.23)			(-0.17)	
ln (domestic credit)	0.275**	0.279**	0.334***	0.537***	0.373***	0.388***
	(-3.02)	(-2.97)	(-3.47)	(-3.88)	(-3.85)	(-3.78)
business freedom	0.00659			0.00735		
	(-0.79)			(-0.70)		
investment freedom	0.00885*			0.0108		
	(-2.15)			(-1.73)		
fiscal freedom	0.0056	0.00713	0.00668	0.01	0.0202*	0.0144

	(1)	(2)	(3)	(4)	(5)	(6)
	(-0.64)	(-0.79)	(-0.70)	(-1.15)	(-2.29)	(-1.43)
inflation	-0.00206***	-0.00209***	0.00993*	0.0025	-0.000671	0.00829
	(-3.36)	(-3.91)	(-2.13)	(-0.46)	(-1.38)	(-1.65)
openness	0.0719	0.0127	-0.367	-0.784*	-0.229	-0.357
	(-0.33)	(-0.06)	(-1.26)	(-2.41)	(-0.77)	(-1.17)
property rights		0.0108				
		(-1.46)				
aid			-0.00801*	-0.00863*	-0.00606*	-0.00774*
			(-2.49)	(-2.31)	(-2.26)	(-2.42)
ln (industry)			1.444***	0.875*	1.751***	1.535***
			(-3.79)	(-1.99)	(-4.09)	(-3.91)
ln (services)			1.051	0.555	1.537*	1.370*
			(-1.79)	(-0.74)	(-2.28)	(-2.37)
WGI political stability			0.103			0.143
			(-0.59)			(-0.86)
WGI gvt. effectiveness			0.233			
			(-0.73)			
WGI reg. quality			0.803**			
			(-3.18)			
WGI rule of law			-0.423			
			(-1.16)			
WGI corruption			-0.294			-0.00656
			(-0.92)			(-0.03)
freedom from corruption				-0.00126	0.00295	
				(-0.15)	(0.47)	
PTS political stability				-0.476		
				(-1.35)		

	(1)	(2)	(3)	(4)	(5)	(6)
ICRG quality of government					0.0188	
					(-0.02)	
_cons	-19.63***	-19.18***	-16.72***	-13.40**	-20.46***	-19.12***
	(-15.00)	(-14.40)	(-4.58)	(-3.08)	(-5.50)	(-5.36)
N	886	886	616	415	719	616

Notes:
(1) The dependent variable is ln(PPI constant)
*(2) t statistics in parentheses; * p<0.05, ** p<0.01, *** p<0.001*
(3) Standard errors clustered on countries
(4) The estimation includes year fixed effects (not shown here)

Table 4 Robustness checks for SSA- Part 1

	(1)	(2)	(3)	(4)	(5)	(6)
gfcfconstant	1.71E-12	1.21E-12	3.79E-10	4.55E-11	5.76E-13	4.08E-10
	(-0.15)	(-0.10)	(-1.10)	(-0.25)	(-0.12)	(-1.18)
government size	0.00675	0.00719	0.0322	-0.0406	0.029	0.0332
	(-0.48)	(-0.49)	(-1.66)	(-1.13)	(-1.45)	(-1.72)
ln (resource rents)	-0.0326	-0.0394	0.14	-0.21	0.118	0.174
	(-0.27)	(-0.31)	(-0.71)	(-0.58)	(-0.43)	(-0.93)
ln (GDP per capita)	0.901***	0.820**				
	(-3.51)	(-3.04)				
ln (population)	1.275***	1.266***	0.632*	1.268*	0.592*	0.669*
	(-4.81)	(-4.61)	(-2.08)	(-2.17)	(-2.12)	(-2.17)
common law	1.165*	1.101*	1.434*	0.83	1.268*	1.488*
	(-2.48)	(-2.20)	(-2.38)	(-0.72)	(-2.31)	(-2.51)
ethnic fractionalization	-0.685	-0.792			-0.991	
	(-0.69)	(-0.76)			(-0.39)	
regime duration	-0.00139	-0.00228			0.0111	
	(-0.08)	(-0.13)			(-0.45)	
democracy	-0.258	-0.349	-0.443	1.201	-0.858	-0.489
	(-0.64)	(-0.86)	(-0.77)	(-0.80)	(-1.80)	(-0.86)
civil war	28.63	22.49			29.66	
	(0.00)	(0.00)			(0.00)	
ln (domestic credit)	0.0912	0.0734	-0.46	-0.238	0.00895	-0.427
	(-0.34)	(-0.27)	(-1.17)	(-0.26)	(-0.03)	(-1.07)
business freedom	-0.0295			-0.0854		
	(-1.69)			(-1.69)		

	(1)	(2)	(3)	(4)	(5)	(6)
investment freedom	-0.00697 (-0.58)			0.00773 (-0.25)		
fiscal freedom	0.0328* (-2.33)	0.0342* (-2.45)	0.0363 (-1.79)	0.114** (-2.78)	0.0514** (-2.88)	0.0366 (-1.79)
inflation	-0.0218 (-1.93)	-0.02 (-1.75)	-0.0198 (-1.14)	-0.111* (-2.22)	-0.0114 (-0.83)	-0.0205 (-1.20)
openness	1.477** (-2.58)	1.608** (-2.59)	2.071* (-2.15)	1.31 (-0.61)	1.03 (-1.01)	2.067* (-2.13)
property rights		-0.0162 (-1.21)				
aid			-0.00295 (-0.69)	-0.00759 (-1.06)	-0.00475 (-1.22)	-0.00261 (-0.63)
ln (industry)			-0.339 (-0.40)	1.532 (-1.06)	0.876 (-1.21)	-0.312 (-0.37)
ln (services)			1.916 (-1.51)	1.457 (-0.53)	2.63 (-1.85)	2.011 (-1.62)
WGI political stability			0.0732 (-0.16)			0.027 (-0.07)
WGI gvt. Effectiveness			0.36 (-0.36)			
WGI reg. quality			0.208 (-0.24)			
WGI rule of law			-0.558 (-0.52)			
WGI corruption			0.672 (-0.87)			0.727 (-1.13)
freedom from corruption				-0.0245 (-0.67)	0.00498 (-0.29)	
PTS political stability				-2.294 (-1.37)		
ICRG quality of government					-1.563 (-0.68)	

	(1)	(2)	(3)	(4)	(5)	(6)
_cons	-27.60***	-28.28***	-20.84*	-27.67	-26.73***	-22.08**
	(-5.54)	(-5.46)	(-2.44)	(-1.77)	(-3.80)	(-2.82)
lnsig2u	-12.39	-3.104	-2.544	-0.363	-11.89	-1.934
_cons	(-0.38)	(-0.74)	(-0.56)	(-0.21)	(-0.33)	(-0.78)
N	344	344	237	145	255	237

Notes:
(1) The dependent variable is the dummy variable equal 1 when PPI is positive and 0 when PPI is zero
*(2) t statistics in parentheses; * p<0.05, ** p<0.01, *** p<0.001*
(3) Standard errors clustered on countries
(4) The estimation includes year fixed effects (not shown here)

Table 5 Robustness checks for SSA- Part 2

	(1)	(2)	(3)	(4)	(5)	(6)
gfcfconstant	6.08E-12	1.71E-13	3.25E-11	6.38E-12	2.69E-11	2.81E-11
	(-0.34)	(-0.01)	(-1.64)	(-0.24)	(-1.39)	(-1.67)
government size	-0.00104	-0.00554	-0.00448	0.02	0.0258	-0.00258
	(-0.10)	(-0.47)	(-0.40)	(-0.99)	(-1.95)	(-0.26)
ln (resource rents)	-0.00635	0.00624	0.0253	-0.101	-0.509***	0.0227
	(-0.06)	(-0.06)	(-0.18)	(-0.41)	(-3.32)	(-0.17)
ln (GDP per capita)	0.651***	0.605**				
	(-3.81)	(-2.83)				
ln (population)	0.745***	0.803***	0.757***	0.835**	0.529*	0.733***
	(-4.01)	(-4.11)	(-4.25)	(-3.25)	(-2.51)	(-4.68)
common law	0.135	-0.101	-0.304	0.602	0.0202	-0.269
	(-0.33)	(-0.24)	(-0.90)	(-0.85)	(-0.04)	(-0.88)
ethnic fractionalization	1.152	1.212			1.231	
	(-1.88)	(-1.80)			(-0.87)	
regime duration	-0.0132	-0.00834			-0.0171	
	(-1.08)	(-0.73)			(-1.09)	
democracy	0.0998	-0.000793	0.509	0.808	-0.531	0.497
	(-0.32)	(-0.00)	(-1.37)	(-1.25)	(-1.49)	(-1.25)
civil war	-0.0764	-0.387			-1.144*	
	(-0.20)	(-1.05)			(-2.32)	
ln (domestic credit)	0.663***	0.651**	0.666*	0.451	0.745**	0.656**
	(-3.54)	(-3.06)	(-2.54)	(-1.51)	(-2.64)	(-2.83)

	(1)	(2)	(3)	(4)	(5)	(6)
business freedom	-0.0368**			-0.0689**		
	(-2.97)			(-3.05)		
investment freedom	0.0103			0.0193		
	(-0.90)			(-0.89)		
fiscal freedom	0.00791	0.0149	0.0119	-0.00384	0.0198	0.0162
	(-0.62)	(-1.02)	(-0.66)	(-0.26)	(-1.52)	(-1.00)
inflation	0.000615	0.00507	0.00317	0.00947	0.0125	0.002
	(-0.09)	(-0.67)	(-0.38)	(-0.19)	(-1.00)	(-0.26)
openness	0.167	0.212	-0.932*	-2.002	-0.0632	-0.985***
	(-0.42)	(-0.48)	(-2.42)	(-1.74)	(-0.07)	(-3.29)
property rights		-0.0153				
		(-0.96)				
aid			-0.00371	-0.00289	-0.000892	-0.00442
			(-1.01)	(-0.46)	(-0.32)	(-1.27)
ln (industry)			1.545***	3.085***	2.574***	1.548***
			(-3.51)	(-4.09)	(-5.61)	(-3.59)
ln (services)			0.574	2.087	-0.192	0.545
			(-0.65)	(-1.49)	(-0.20)	(-0.58)
WGI political stability			0.273			0.282
			(-1.13)			(-1.38)
WGI govt effectiveness			-0.524			
			(-0.64)			
WGI reg. quality			0.447			
			(-0.56)			
WGI rule of law			0.186			
			(-0.37)			
WGI corruption			-1.165			-1.175**
			(-1.80)			(-2.97)
freedom from corruption				-0.0374	-0.0266**	
				(-1.92)	(-3.08)	
PTS political stability				0.467		
				(-0.37)		

	(1)	(2)	(3)	(4)	(5)	(6)
ICRG quality of government					-0.00565	
					(-0.00)	
_cons	-12.86***	-14.62***	-17.09**	-24.64**	-14.99**	-16.91**
	(-3.60)	(-4.04)	(-2.97)	(-2.58)	(-2.70)	(-3.00)
N	226	226	166	105	180	166

Notes:
(1) The dependent variable is ln(PPI constant)
(2) t statistics in parentheses; * p<0.05, ** p<0.01, *** p<0.001
(3) Standard errors clustered on countries
(4) The estimation includes year fixed effects (not shown here)

Table 6 Results for SSA without South Africa

	Part 1	Part 2
gfcfconstant	1.80E-12	3.79e-10***
	(-0.16)	(-4.09)
aid	-0.00543	0.0024
	(-1.77)	(-0.75)
government size	0.0157	0.00867
	(-1.06)	(-0.74)
ln (industry)	0.745	1.851***
	(-1.38)	(-4.9)
ln (services)	4.134***	0.957
	(-3.71)	(-1.02)
ln (resource rents)	0.135	-0.149
	(-0.95)	(-1.33)
ln (population)	0.671**	0.314
	(-2.76)	(-1.57)
freedom from corruption	0.00244	-0.0306**
	(-0.16)	(-3.10)
common law	1.204*	0.357
	(-2.45)	(-0.88)
ethnic fractionalization	-0.504	1.390**
	(-0.47)	(-2.95)

	Part 1	Part 2
regime duration	0.0159	-0.0101
	(-0.90)	(-0.90)
democracy	-0.365	0.37
	(-0.84)	(-1.27)
civil war	30.36	-0.717
	(0.00)	(-1.68)
ln (domestic credit)	-0.368	0.559**
	(-1.18)	(-2.92)
fiscal freedom	0.0424**	0.00253
	(-2.80)	(-0.20)
business freedom	-0.0337	-0.0308*
	(-1.82)	(-2.38)
investment freedom	-0.00283	0.00949
	(-0.21)	(-0.78)
inflation	-0.0204	-0.00325
	(-1.63)	(-0.35)
openness	0.936	-0.558
	(-1.42)	(-1.30)
_cons	-29.67***	-10.54**
	(-5.15)	(-2.65)
lnsig2u _cons	-12.42	
	(-0.37)	
N	327	212

Notes:
(1) The dependent variable in Part 1 is the dummy variable equal 1 when PPI is positive and 0 when PPI is zero; the dependent variable in Part 2 is ln(PPI constant)
(2) t statistics in parentheses
(3)* $p<0.05$, ** $p<0.01$, *** $p<0.001$
(4) Standard errors clustered on countries
(5) The estimations include year fixed effects (not shown here)

Appendix H PPP Contracts for PPI- Definitions

The table below summarizes the types of PPP contracts that have been used to facilitate PPI. As described, the level of private involvement in each of the PPP contract varies in terms of capital invested by the private sector as well as the level of risk assumed.

Contract type	Description
Management	Government pays a private operator to manage the facility. The operational risk remains with the government (private entity does not assume full commercial risk for tariff collection or other things).
Lease	The government leases the assets to a private operator for a fee. The private operator takes on the operational risk (no obligation for the private entity to invest in infrastructure but private entity operates and maintains the facility at its own commercial risk with income derived directly from tariffs).
Greenfield project (BLT, BOO, BOT)*	Private entity or a public-private joint venture builds and operates a new facility for the period specified in the project contract. The facility may return to the public sector at the end of the concession period.
Concession (ROT, RLT, BROT)**	Private entity takes over the management of a state-owned enterprise for a given period during which it also assumes significant investment risk (private entity has investment obligations to build, expand and/or rehabilitate facilities).
Divestiture (can be full or partial)	Private entity buys an equity stake in a state-owned enterprise through an asset sale, public offering, or mass privatization program.

*Build-Lease- Transfer; Build-Operate-Own; Build-Own-Operate-Transfer

** Rehabilitate-Operate-Transfer; Rehabilitate-Lease-Transfer; Build-Rehabilitate-Operate- Transfer

Source: PPI database glossary(World Bank 2012)

Appendix I Determinants of the Extent of PPI- Results

Model 3 below describes the model specification used to estimate the determinants of the extent of private participation in infrastructure. The dependent variable, *contracttype*, is constructed from project-level data by assigning an ordinal variable ranking to the contract type such that management and lease contracts are assigned a value of 1, greenfield projects a value of 2, concessions a value of 3, and divestitures a value of 4. For the independent variables, along the same lines as in Chapter 4, X represents the factors influencing government motivations, Y the factors influencing private sector motivations, and Z the factors influencing the enabling environment. In addition, sector-level dummies (S) are introduced as potential explanatory variables, and time fixed effects are included to control for time-specific shocks.

An ordered logit is used to estimate the model, and the results are outlined in the table below. The results on the left hand side include all the relevant explanatory variables, and those on the right hand side address the potential multicollinearity in the model specifications by excluding the variables that may be collinear with each other.

Model 3: $$Contracttype_{nit} = \theta_0 + \theta_1 X_{it} + \theta_2 Y_{it} + \theta_3 Z_{it} + S_{nit} + \alpha_t + \vartheta_{nit}$$

Table 1 Determinants of the Extent of PPI

	Results with all the relevant indicators considered		Results accounting for multicollinearity	
	LMICs	SSA	LMICs	SSA
gfcfconstant	2.79E-14	-4.21E-11	8.37E-14	1.01E-12
	(0.16)	(-1.64)	(0.50)	(0.82)
aid	0.00115	0.00106	0.000426	-0.0006
	(0.62)	(0.26)	(0.26)	(-0.20)
government size	-0.0136***	0.00554	-0.0131***	0.00179
	(-5.53)	(0.4)	(-5.50)	(0.15)
ln (agriculture)	0.208	-0.554		
	(1.71)	(-1.08)		
ln (industry)	0.27	0.622	-0.051	0.999
	(1.03)	(0.79)	(-0.25)	(1.75)
ln (services)	0.868*	1.982	0.381	2.295*
	(2.31)	(1.84)	(1.52)	(2.50)
ln (resource rents)	0.036	-0.386*	0.0431	-0.425**
	(1.04)	(-2.46)	(1.30)	(-2.90)

ln (GDP per Capita)	0.0589	-0.0635		
	(0.58)	(-0.12)		
ln (population)	0.114**	0.653*	0.0894**	0.378
	(3.27)	(2.20)	(-2.70)	(1.87)
corruption	0.00635	0.0183	-0.00144	0.0156
	(1.76)	(1.06)	(-0.47)	(1.01)
property rights	-0.0129***	0.00762		
	(-4.23)	(0.46)		
common law	-0.472***	-0.154	-0.558***	-0.199
	(-4.90)	(-0.41)	(-6.49)	(-0.56)
ethnic fractionalization	-0.0143	-0.496	-0.0242	-0.0787
	(-0.09)	(-0.40)	(-0.15)	(-0.07)
regime duration	-0.00188	-0.00476	0.000149	0.000676
	(-0.79)	(-0.30)	(0.07)	-0.05
democracy	0.0973	-0.604	0.0215	-0.6
	(1.39)	(-1.49)	(0.32)	(-1.63)
civil war	0.121	0.725	-0.0507	0.659
	(0.22)	(0.78)	(-0.10)	-0.76
ln (domestic credit)	0.219***	-0.00671	0.226***	-0.0889
	(4.00)	(-0.02)	(4.16)	(-0.41)
fiscal freedom	0.00239	-0.016	0.0027	-0.011
	(0.69)	(-1.00)	(0.78)	(-0.75)
business freedom	0.0178***	-0.0177	0.0141***	-0.0203
	(4.62)	(-0.98)	(3.93)	(-1.20)
investment freedom	0.00799**	-0.0119	0.00502	-0.0092
	(2.84)	(-0.90)	(1.88)	(-0.72)
inflation	-0.00282**	-0.0266*	-0.00227*	-0.00739
	(-2.58)	(-1.98)	(-2.29)	(-1.90)
openness	-0.181	0.0855	-0.176	-0.0569
	(-1.52)	(0.13)	(-1.50)	(-0.10)
energy	4.087***	5.999***	4.083***	5.863***
	(32.09)	(7.46)	(32.14)	(7.47)
telecom	3.527***	9.225***	3.517***	8.954***

	(27.82)	(11.05)	(27.85)	(11.06)
transport	0.0289	4.023***	0.023	3.813***
	(0.25)	(5.33)	(0.20)	(-5.21)
cut1				
_cons	6.157*	18.59	1.818	18.71**
	(-2.47)	(1.77)	(1.15)	(3.28)
cut2				
_cons	8.835***	20.70*	4.485**	20.76***
	(3.54)	(1.97)	(2.84)	(3.64)
cut3				
_cons	13.02***	26.77*	8.671***	26.80***
	(5.20)	(2.53)	(5.47)	(4.63)
N	6472	585	6521	602

Notes:
(1) t statistics in parentheses
(2) * p<0.05, ** p<0.01, *** p<0.001
(3) The estimations include year fixed effects (not shown here).
(4) Water &sanitation dummy excluded.

Appendix J Robustness Checks

For the robustness checks, using the model accounting for multicollinearity as the starting point, I run the following alternative specifications:

- *Regression (1):* I substitute indicators of structural aspects of the country's economy (value added of services, industry, and agriculture) and the level of aid received with the GDP per capita.
- *Regression (2):* In addition to substitutions made in (1), I also substitute the indices of business and investment freedom with the index of property rights protection from the IEF.
- *Regression (3):* I substitute the indicators for civil war, regime durability and ethnic fractionalization with the WGI's index for political stability and absence of violence, as well the IEF's indices for business and investment freedom and freedom from corruption with the WGI's government effectiveness, regulatory quality and rule of law, and control of corruption indices.
- *Regressions (4) and (5):* I use two different measures of political stability respectively substituting civil war, regime durability, and ethnic fractionalization with the US State Department's Political Terror Scale (PTS) measure of political violence and terror and the WGI political stability and absence of violence index.
- *Regression (6)*: I substitute the business and investment freedom indices with an overall quality of government index from the International Country Risk Guide (ICRG).
- *Regression (7):* For the SSA regressions, I run the streamlined model without South Africa

Table 1 in Appendix G gives definitions and sources for the alternate proxies used in (4), (5), and (6). Tables 1 and 2 provide the respective robustness check results for all LMICs and SSA countries for regressions (1) – (6). Finally, Table 3 provides the results for regression (7).

Table 1: Robustness checks LMIC sample

	(1)	(2)	(3)	(4)	(5)	(6)
gfcfconstant	7.77E-14	5.89E-14	-1.46E-13	1.53E-13	4.76E-14	-1.15E-13
	(0.47)	(0.35)	(-0.73)	(0.49)	(0.28)	(-0.58)
government size	-0.0134***	-0.0115***	-0.0106***	-0.00926*	-0.0115***	-0.00920**
	(-5.85)	(-5.10)	(-3.63)	(-2.10)	(-4.70)	(-3.28)
ln (resource rents)	0.0159	-0.00836	-0.0201	-0.0791	0.0636	0.0055
	(0.56)	(-0.30)	(-0.52)	(-1.43)	(1.75)	(0.15)

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	(1)	(2)	(3)	(4)	(5)	(6)
ln (GDP per Capita)	0.0338 (0.61)	0.184*** (3.65)				
ln (population)	0.104*** (3.39)	0.0415 (1.48)	0.0386 (1.06)	-0.00696 (-0.12)	0.0417 -1.27	0.0267 -0.75
common law	-0.548*** (-6.25)	-0.401*** (-4.39)	-0.257* (-2.21)	-0.476** (-2.82)	-0.544*** (-5.98)	-0.431*** (-4.34)
ethnic fractionalization	0.0344 (0.23)	0.0079 (0.05)			-0.115 (-0.68)	
regime duration	-0.00111 (-0.51)	-0.00188 (-0.85)			-0.00122 (-0.52)	
democracy	0.019 (0.29)	0.126 (1.86)	0.0657 (0.76)	-0.262* (-2.03)	0.109 (1.52)	-0.00771 (-0.09)
civil war	-0.29 (-0.58)	-0.469 (-0.94)			-0.184 (-0.35)	
ln (domestic credit)	0.196*** (4.01)	0.244*** (4.97)	0.288*** (4.36)	0.331*** (3.51)	0.301*** (5.09)	0.279*** (4.24)
business freedom	0.0144*** (4.1)			0.0163** (2.58)		
investment freedom	0.00525* (2.03)			0.00997* (2.12)		
fiscal freedom	0.00406 (1.26)	0.0056 (1.76)	-0.00212 (-0.51)	-0.00779 (-1.21)	0.00308 -0.82	-0.00074 (-0.19)
inflation	-0.00272* (-2.53)	-0.00272* (-2.54)	-0.00480* (-2.15)	-0.0160* (-2.56)	-0.00212* (-2.07)	-0.00428* (-1.98)
openness	-0.203 (-1.89)	-0.357*** (-3.44)	-0.398** (-2.74)	-0.590** (-2.81)	-0.348** (-2.95)	-0.439** (-3.16)
energy	4.219*** (33.77)	4.214*** (33.77)	3.960*** (27.08)	4.504*** (18.16)	4.055*** (31.6)	3.966*** (27.15)
telecom	3.618*** (29.26)	3.600*** (29.16)	3.467*** (23.67)	3.667*** (15.16)	3.495*** (27.38)	3.453*** (23.61)
transport	0.15 (1.34)	0.168 (1.50)	-0.0565 (-0.43)	-0.302 (-1.39)	0.07 (0.61)	-0.0686 (-0.52)
property rights		-0.00395				

		(-1.64)				
aid			-0.00052	0.00209	-0.00056	-0.00027
			(-0.29)	(0.76)	(-0.28)	(-0.15)
ln (industry)			0.221	0.163	-0.219	0.238
			(0.96)	(0.49)	(-0.96)	-1.05
ln (services)			0.884**	0.441	0.224	1.080***
			(2.96)	(1.04)	(0.82)	(3.94)
WGI political Stability			0.183*			0.148
			(2.23)			(1.84)
WGI government effectiveness			0.166			
			(0.86)			
WGI regulatory Quality			0.0472			
			(0.33)			
WGI rule of law			-0.562**			
			(-3.09)			
WGI corruption			0.148			-0.116
			(0.88)			(-1.16)
freedom from corruption				-0.0179**	0.00582	
				(-2.89)	(1.78)	
PTS political Stability				0.243		
				(1.09)		
ICRG quality of government					-0.514	
					(-1.30)	
cut1 _cons	1.249	0.274	2.149	-0.536	-1.199	2.902
	(1.60)	(0.38)	(1.11)	(-0.19)	(-0.66)	(1.59)
cut2 _cons	3.819***	2.842***	4.840*	2.443	1.525	5.590**
	(4.90)	(3.90)	(2.50)	(0.87)	(0.84)	(3.06)
cut3 _cons	7.993***	7.010***	9.049***	7.124*	5.664**	9.797***
	(10.14)	(9.51)	(4.66)	(2.53)	(3.13)	(5.33)
N	6816	6816	4818	2258	6162	4818

Notes:
(1) t statistics in parentheses
(2) * p<0.05, ** p<0.01, *** p<0.001
(3) The estimations include year fixed effects (not shown here).
(4) Water &sanitation dummy excluded.

Table 2 Robustness checks SSA sample

	(1)	(2)	(3)	(4)	(5)	(6)
gfcfconstant	-1.79E-11	-1.97E-11	8.63E-13	2.37E-12	2.38E-12	1.17E-12
	(-0.82)	(-0.92)	(0.67)	(0.10)	(1.72)	(0.95)
government size	-0.00782	-0.0088	-0.0135	0.0126	0.0222	-0.0128
	(-0.66)	(-0.76)	(-0.95)	(0.61)	(1.42)	(-0.97)
ln (resource Rents)	-0.489***	-0.454***	-0.396*	-0.166	-0.598*	-0.464**
	(-4.00)	(-3.84)	(-2.37)	(-0.57)	(-2.51)	(-2.94)
ln (GDP per Capita)	0.427	0.363				
	(1.73)	(1.47)				
ln (population)	0.489*	0.550*	0.17	-0.388	0.31	0.163
	(2.08)	(2.31)	(0.82)	(-1.09)	(1.44)	(0.83)
common law	-0.0991	-0.295	-0.48	-0.229	-0.413	-0.281
	(-0.28)	(-0.86)	(-1.24)	(-0.42)	(-1.13)	(-0.86)
ethnic fractionalization	-0.054	-0.221			1.482	
	(-0.05)	(-0.21)			(0.80)	
regime duration	-0.0075	-0.00653			0.0104	
	(-0.50)	(-0.44)			(0.62)	
democracy	-0.458	-0.618	-0.483	-1.086	-0.727	-0.254
	(-1.28)	(-1.69)	(-1.06)	(-1.40)	(-1.82)	(-0.59)
civil war	0.235	0.452			0.212	
	(0.31)	(0.60)			(0.23)	
ln (domestic credit)	0.0894	0.0822	0.221	0.0591	0.135	0.216
	(0.36)	(0.33)	(0.83)	(0.13)	(0.56)	(0.89)
business freedom	-0.0157			-0.00931		
	(-0.94)			(-0.34)		
investment freedom	0.00365			-0.00262		
	(0.30)			(-0.12)		
fiscal freedom	-0.0221	-0.0235	-0.0212	-0.0011	-0.00559	-0.0213
	(-1.64)	(-1.75)	(-1.12)	(-0.03)	(-0.33)	(-1.22)
inflation	-0.0266*	-0.0257*	-0.00791	-0.0305	-0.00231	-0.00634
	(-2.08)	(-2.01)	(-1.50)	(-1.02)	(-0.49)	(-1.58)
openness	0.112	0.00753	-0.529	-1.159	-0.53	-0.589
	(0.21)	(0.01)	(-0.83)	(-0.95)	(-0.73)	(-0.96)

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energy	5.623***	5.659***	6.564***	8.561***	5.963***	6.499***
	(7.23)	(7.26)	(5.48)	(6.80)	(7.39)	(5.44)
telecom	8.865***	8.887***	9.888***	9.771***	8.946***	9.760***
	(10.96)	(10.94)	(8.05)	(8.31)	(10.79)	(8.00)
transport	3.693***	3.727***	4.904***	4.272***	3.937***	4.815***
	(5.05)	(5.07)	(4.20)	(4.27)	(5.30)	(4.14)
property rights		0.00978				
		(0.66)				
aid			-0.000273	-0.000173	0.000755	-0.000193
			(-0.09)	(-0.03)	(0.22)	(-0.06)
ln (industry)			0.774	0.0536	1.058	0.866
			(1.23)	(0.06)	(1.51)	(1.53)
ln (services)			1.157	2.912	0.194	1.195
			(1.22)	(1.73)	(0.17)	(1.38)
WGI political Stability			-0.211			0.0492
			(-0.68)			(0.19)
WGI government effectiveness			0.643			
			(0.77)			
WGI regulatory Quality			-0.735			
			(-0.96)			
WGI rule of law			1.035			
			(1.29)			
WGI corruption			-0.924			-0.402
			(-1.53)			(-0.88)
corruption				0.0419	0.024	
				(1.43)	(1.43)	
PTS political Stability				-0.169		
				(-0.10)		
ICRG quality of government					-2.609	
					(-1.27)	
cut1						
_cons	10.48*	11.77**	10.53	7.647	13.50*	10.12
	(2.33)	(2.63)	(1.51)	(0.75)	(2.18)	(1.74)
cut2						

_cons	12.59**	13.87**	12.68	9.9	15.70*	12.28*
	(2.78)	(3.09)	(1.82)	(0.97)	(2.54)	(2.11)
cut3						
_cons	18.60***	19.88***	18.88**	16.64	21.61***	18.45**
	(4.07)	(4.37)	(2.69)	(1.62)	(3.45)	(3.14)
N	601	601	478	295	520	478

Notes:
(1) t statistics in parentheses
*(2) * p<0.05, ** p<0.01, *** p<0.001*
(3) The estimations include year fixed effects (not shown here).
(4) Water &sanitation dummy excluded.

Table 3 Robustness checks- SSA sample excluding South Africa

	(7)
gfcfconstant	1.01E-12
	(0.79)
aid	-0.00154
	(-0.49)
government size	-0.000803
	(-0.06)
ln (industry)	1.056
	(1.7)
ln (services)	2.413*
	(2.49)
ln (resource rents)	-0.444**
	(-2.79)
ln (population)	0.391
	(1.79)
corruption	0.0139
	(0.86)
common law	-0.376
	(-0.98)
ethnic fractionalization	-0.288
	(-0.25)
regime duration	-0.00496
	(-0.30)
democracy	-0.785
	(-1.91)

civil war	0.617
	(0.67)
ln (domestic credit)	-0.129
	(-0.46)
fiscal freedom	-0.00621
	(-0.39)
business freedom	-0.00943
	(-0.49)
investment freedom	-0.0161
	(-1.15)
inflation	-0.00933*
	(-2.23)
openness	-0.25
	(-0.40)
telecom	3.740***
	(7.24)
transport	-1.968***
	(-4.10)
water &sanitation	-37.58
	(-0.00)
cut1	
_cons	13.40*
	(2.18)
cut2	
_cons	15.61*
	(2.55)
cut3	
_cons	22.09***
	(3.55)
N	534

Notes:
(1) t statistics in parentheses
(2) * p<0.05, ** p<0.01, *** p<0.001
(3) The estimations include year fixed effects (not shown here).
(4) Energy dummy excluded.

Appendix K Determinants of the Optimal Contract

Tables 1-3 outline the results discussed in Chapter 6. The base model is described in Model 4 below. X represents the factors influencing government motivations, Y the factors influencing private sector motivations, and Z the factors influencing the enabling environment. In addition, a dummy variable, R, identifying the developing region in which the project is located (East Asia and Pacific, South Asia, Europe and Central Asia, Sub-Saharan Africa, and the Middle East and North Africa) is added along with time fixed effects.

$$\underline{\text{Model 4}}: \ Optimal_{nit} = \delta_0 + \delta_1 X_{it} + \delta_2 Y_{it} + \delta_3 Z_{it} + \delta_4 R_{nit} + \alpha_t + \varepsilon_{nit}$$

Table 1 Results for telecommunications

	(1) Divestiture =1	(2) Divestiture =1	(3) Divestiture =1	(4) Divestiture =1	(5) Divestiture =1	(6) Divestiture =1
gfcfconstant	2.08e-12***	2.48e-12***	2.60e-12***	3.31e-12***	2.34e-12***	3.31e-12***
	(4.33)	(4.59)	(4.75)	(5.33)	(4.78)	(5.33)
aid	-0.000854			-0.000564	0.00151	-0.000686
	(-0.36)			(-0.21)	-0.52	(-0.26)
government size	-0.0193***	-0.0192***	-0.0192***	-0.0197***	-0.0149**	-0.0197***
	(-4.41)	(-4.70)	(-4.73)	(-3.61)	(-3.04)	(-3.71)
ln (industry)	-0.21			0.31	-1.076**	0.267
	(-0.67)			(0.85)	(-2.92)	(0.74)
ln (services)	1.001			1.718**	0.825	1.757**
	(1.91)			(2.74)	(1.39)	(2.94)
ln (resource rents)	-0.0281	-0.0645	-0.111*	-0.0996	0.0761	-0.0927
	(-0.51)	(-1.40)	(-2.39)	(-1.55)	(1.22)	(-1.51)
ln (population)	-0.0748	-0.0352	-0.0548	-0.199**	-0.201**	-0.204**
	(-1.21)	(-0.59)	(-0.96)	(-2.73)	(-2.97)	(-2.83)
freedom from corruption	-0.00531				0.0140*	
	(-0.90)				(2.08)	
common law	-0.137	-0.185	-0.0416	-0.0253	0.033	-0.0878

	(-0.64)	(-0.89)	(-0.20)	(-0.10)	(0.14)	(-0.36)
regime duration	0.00729	0.00184	0.0019		0.00873	
	(1.37)	(0.37)	(0.38)		(1.61)	
democracy	-0.350**	-0.378**	-0.209	-0.161	-0.279	-0.214
	(-2.58)	(-2.85)	(-1.60)	(-0.96)	(-1.93)	(-1.31)
ln (domestic credit)	0.116	0.222*	0.273**	0.260*	0.241*	0.236
	(1.08)	(2.32)	(2.85)	(2.04)	(1.98)	(1.87)
fiscal freedom	0.00991	0.0131*	0.0132*	0.00883	-0.006	0.0109
	(1.58)	(2.17)	(2.2)	(1.2)	(-0.84)	(1.5)
business freedom	-0.00106	0.00372				
	(-0.16)	(0.6)				
investment freedom	0.00824	0.00503				
	(1.77)	(1.13)				
inflation	-0.0125***	-0.0140***	-0.0138***	-0.0309***	-0.0132***	-0.0330***
	(-3.53)	(-3.87)	(-3.79)	(-3.44)	(-3.59)	(-3.79)
openness	-1.112***	-1.101***	-1.119***	-1.673***	-1.872***	-1.670***
	(-4.31)	(-4.42)	(-4.59)	(-5.33)	(-6.40)	(-5.34)
East Asia and Pacific	0.226	-0.16	-0.24	0.587	0.931**	0.442
	(0.82)	(-0.65)	(-0.99)	(1.75)	(2.98)	(1.39)
South Asia	-1.473***	-1.520***	-1.578***	-0.945*	-1.288***	-1.255**
	(-4.03)	(-3.96)	(-4.12)	(-2.11)	(-3.52)	(-3.21)
Sub Saharan Africa	-0.174	-0.242	-0.179	0.0314	-0.785**	-0.0398
	(-0.69)	(-0.93)	(-0.70)	(0.11)	(-2.66)	(-0.14)
Europe and Central Asia	-0.3	-0.234	-0.337*	-0.117	0.016	-0.229
	(-1.67)	(-1.44)	(-2.07)	(-0.52)	(0.08)	(-1.13)
Middle East & North Africa	-0.224	-0.33	-0.329	0.28	0.0238	0.012
	(-0.78)	(-1.16)	(-1.17)	(0.74)	(0.08)	(0.04)
ln (GDP per capita)		-0.0586	0.074			
		(-0.51)	(0.69)			

	(1)	(2)	(3)	(4)	(5)	(6)
property rights			-0.0167***			
			(-3.67)			
WGI political stability				0.0358		-0.0596
				(0.23)		(-0.42)
WGI government effectiveness				-0.164		
				(-0.45)		
WGI regulatory quality				0.297		
				(1.11)		
WGI rule of law				-0.475		
				(-1.23)		
WGI corruption				-0.204		-0.420*
				(-0.63)		(-2.16)
ICRG quality of government					-3.370***	
					(-4.62)	
_cons	-2.477	-0.175	0.379	-5.291	5.083	-5.08
	(-0.93)	(-0.12)	(0.27)	(-1.59)	(1.64)	(-1.63)
N	3106	3308	3308	2311	2823	2311

Notes:
(1) t statistics in parentheses
(2) * p<0.05, ** p<0.01, *** p<0.001
(3) The estimations include year fixed effects (not shown here).
(4) Latin America and the Caribbean dummy excluded.

Table 2 Results for electricity

	(1) concession or greenfield=1	(2) concession or greenfield=1	(3) concession or greenfield=1	(4) concession or greenfield=1	(5) concession or greenfield=1	(6) concession or greenfield=1
gfcfconstant	3.65e-12***	3.53e-12***	3.82e-12***	3.95e-12***	3.91e-12***	3.62e-12***
	(6.01)	(5.77)	(6.25)	(5.63)	(6.18)	(5.58)
aid	-0.0138*			0.0134	-0.0157*	0.0134
	(-2.22)			(1.44)	(-2.41)	(1.48)
government size	0.0118	0.0181**	0.0150*	0.01	0.011	0.0143
	(1.6)	(2.66)	(2.2)	(1.03)	(1.38)	(1.59)

	(1)	(2)	(3)	(4)	(5)	(6)
ln (industry)	-0.134			0.756	-0.326	0.774
	(-0.23)			(1.03)	(-0.53)	(1.05)
ln (services)	-1.889*			-1.589	-1.877*	-0.572
	(-2.38)			(-1.52)	(-2.27)	(-0.60)
ln (resource rents)	-0.17	-0.118	-0.108	-0.281*	-0.127	-0.295*
	(-1.77)	(-1.61)	(-1.50)	(-2.33)	(-1.20)	(-2.47)
ln (population)	-0.319**	-0.420***	-0.291**	-0.189	-0.359***	-0.157
	(-3.01)	(-4.18)	(-3.07)	(-1.61)	(-3.34)	(-1.39)
corruption	0.0118				0.00276	
	(1.76)				(0.39)	
common law	0.618	0.177	-0.0374	0.562	0.558	0.234
	(1.84)	(0.51)	(-0.11)	(1.43)	(1.63)	(0.64)
regime duration	-0.00764	-0.00197	-0.000864		-0.00645	
	(-1.63)	(-0.44)	(-0.19)		(-1.34)	
democracy	0.125	0.0772	-0.168	0.176	0.067	0.0769
	(0.82)	(0.51)	(-1.09)	(0.82)	(0.4)	(0.4)
ln (domestic credit)	-0.244	-0.135	-0.336*	-0.481*	-0.196	-0.384*
	(-1.66)	(-1.01)	(-2.47)	(-2.52)	(-1.27)	(-2.11)
fiscal freedom	-0.00944	-0.00813	-0.0174*	-0.0218	-0.0132	-0.00852
	(-1.06)	(-0.94)	(-2.11)	(-1.94)	(-1.42)	(-0.83)
business freedom	-0.0278***	-0.0397***				
	(-3.48)	(-4.67)				
investment freedom	0.00375	0.00201				
	(0.6)	(0.32)				
inflation	0.0249**	0.0261**	0.0320***	0.0279*	0.0301***	0.0175
	(2.85)	(3)	(3.63)	(2.29)	(3.31)	(1.54)
openness	0.501	0.119	0.624	0.404	0.419	0.709

	(1.41)	(0.33)	(1.82)	(0.99)	(1.18)	(1.78)
East Asia and Pacific	0.514 (1.19)	1.796*** (4.25)	1.364*** (3.38)	0.695 (1.29)	0.687 (1.49)	0.399 (0.79)
South Asia	1.170* (2.25)	2.852*** (4.48)	2.139*** (3.5)	1.585* (2.16)	1.414** (2.62)	1.161 (1.82)
Sub Saharan Africa	1.222* (2.35)	2.504*** (4.11)	1.812*** (3.33)	1.219* (2.11)	1.502** (2.6)	1.400* (2.38)
Europe and Central Asia	-1.691*** (-4.90)	-1.380*** (-5.25)	-1.513*** (-5.62)	-1.711*** (-3.95)	-1.393*** (-3.49)	-1.612*** (-4.02)
Middle East	2.616*** (3.34)	3.541*** (4.5)	3.246*** (4.16)	3.285*** (3.69)	2.733*** (3.46)	2.348** (2.86)
ln (GDP per Capita)		0.725*** (3.31)	0.0205 (0.11)			
property rights			0.0167** (2.95)			
WGI political stability				0.0115 (0.05)		-0.231 (-1.13)
WGI government effectiveness				-0.431 (-0.97)		
WGI regulatory quality				1.648*** (4.71)		
WGI rule of law				-0.588 (-1.10)		
WGI corruption				0.0194 (0.05)		0.463 (1.87)
ICRG quality of government					-0.0862 (-0.10)	
_cons	14.94** (2.99)	2.182 (0.88)	4.595 (1.92)	8.23 (1.25)	14.78** (2.77)	2.328 (0.37)
N	1888	1943	1943	1365	1830	1365

Notes:
(1) t statistics in parentheses
(2) * p<0.05, ** p<0.01, *** p<0.001

(3) The estimations include year fixed effects (not shown here).
(4) Latin America and the Caribbean dummy excluded.

Table 3 Results for water &sanitation

	(1) Management & lease=1	(2) Management & lease=1	(3) Management & lease=1	(4) Management & lease=1	(5) Management & lease=1	(6) Management & lease=1
gfcfconstant	1.17E-13	-1.74E-12	-1.64E-12	1.51E-10	-8.36E-13	4.04E-10
	(0.06)	(-1.37)	(-1.32)	(0.02)	(-0.45)	(0.13)
aid	0.0276			1.667	0.00983	1.212
	(0.69)			(0.01)	(0.26)	(0.02)
government size	0.00309	-0.0091	-0.0198	2.089	0.00372	3.777
	(0.09)	(-0.35)	(-0.82)	(0.02)	(0.08)	(0.03)
ln (industry)	0.462			-77.33	-0.714	91.56
	(0.15)			(.)	(-0.19)	(.)
ln (services)	0.253			-147.8	0.154	-185.7
	(0.07)			(.)	(0.04)	(-0.05)
ln (resource rents)	0.44	0.299	0.381	48.59	0.239	87.88
	(0.94)	(1.04)	(1.35)	(0.03)	(0.45)	(0.03)
ln (population)	-0.755	-0.869*	-0.687	-15.36	-0.911	-185.5
	(-1.24)	(-2.06)	(-1.77)	(-0.01)	(-1.49)	(-0.12)
corruption	-0.120*				-0.146*	
	(-2.15)				(-2.14)	
common	2.174	1.356	1.378	29.04	2.752	27.49
	(1.06)	(0.85)	(0.85)	(0.0)	(1.14)	(0.01)
regime duration	0.105*	0.0921**	0.103**		0.116*	
	(1.98)	(3.13)	(3.24)		(1.97)	
democracy	-0.9	-2.006**	-2.287**	0.93	-1.405	-45.37
	(-0.91)	(-2.69)	(-2.93)	(0.0)	(-1.20)	(-0.05)
ln (domestic credit)	0.363	0.353	0.0314	65.84	0.38	299.9
	(0.33)	(0.63)	(0.06)	(0.02)	(0.3)	(0.09)

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fiscal freedom	0.06 (1.04)	0.0604 (1.6)	0.0643 (1.68)	-0.0828 (-0.00)	0.0851 (1.35)	14.23 (0.13)
business freedom	0.018 (0.35)	-0.0289 (-0.74)				
investment freedom	-0.0118 (-0.38)	-0.0195 (-0.78)				
inflation	-0.0532 (-1.06)	0.00527 (0.25)	0.00899 (0.42)	-2.677 (-0.02)	-0.032 (-0.53)	-1.319 (-0.03)
openness	0.212 (0.1)	-0.606 (-0.42)	-0.203 (-0.15)	79.91 (.)	-0.2 (-0.10)	-126.7 (-0.02)
East Asia and Pacific	-2.426 (-1.12)	-2.511 (-1.58)	-2.382 (-1.53)	-81.76 (.)	-1.555 (-0.68)	-400.7 (-0.11)
South Asia	0.1 (0.03)	-0.333 (-0.11)	-1.242 (-0.38)	237.6 (.)	-1.167 (-0.26)	621.8 (0.06)
Sub Saharan Africa	6.022* (2.48)	5.192** (2.82)	5.468** (2.86)	174.7 (0.02)	6.940** (2.65)	412 (.)
Europe and Central Asia	4.077** (2.9)	3.349*** (3.76)	3.625*** (3.79)	88.64 (0.01)	4.550** (3.15)	-196.3 (-0.07)
Middle East	2.612 (1.3)	1.604 (1.16)	1.201 (0.94)	94.75 (0.02)	3.325 (1.42)	125.8 (0.07)
ln (GDP per Capita)		-0.822 (-1.09)	-1.306 (-1.78)			
property rights			0.0158 (0.68)			
WGI political stability				64.62 (0.02)		324.6 (0.1)
WGI government effectiveness				-190.2 (-0.04)		
WGI regulatory quality				224.5 (0.03)		
WGI rule of law				-108.3 (.)		

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WGI corruption				-36.78 (.)		-727.6 (.)
ICRG quality of government					2.227 (0.3)	
_cons	3.407 (0.15)	15.81 (1.78)	16.61 (1.93)	478.1 (.)	10.12 (0.42)	1096.2 (.)
N	536	557	557	424	534	424

Notes:
(1) t statistics in parentheses
(2) * p<0.05, ** p<0.01, *** p<0.001
(3) The estimations include year fixed effects (not shown here).
(4) Latin America and the Caribbean dummy excluded.

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