INFRASTRUCTURE IN AFRICA

How Institutional Reforms Can Attract More Private Investment

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Creating Markets, Creating Opportunities

ABSTRACT

The World Bank estimates that the Sub-Saharan Africa region needs to invest approximately 7.1 percent of GDP each year in infrastructure if it is to meet its Sustainable Development Goals. However, investment is currently running at around 3.5 percent of GDP. Boosting private investment in infrastructure has become more urgent than ever as African governments find themselves in increasingly dire fiscal situations due to the impact of the COVID-19 pandemic and, more recently, the global economic slowdown. In that context, this paper examines the determinants of Private Participation in Infrastructure (PPI) in a sample of 36 African countries, using a panel data econometric model. The study finds that the quality of institutions is the most important driver of PPI, while the cost of lending, the size of the economy, macroeconomic stability, and openness to trade are also significant determinants. Moreover, the study finds that four years of continuous improvements in reforms related to the regulatory framework would generate an additional 0.8 percent of GDP above the baseline of no reforms. The study also highlights that institutional reforms have, on average, higher payoffs for low-income countries than for middle-income countries.

A. INTRODUCTION

Infrastructure is a crucial driver of development, through its role in stimulating private investment and productivity growth, facilitating domestic, regional, and international trade, and protecting the environment.[1] Despite the crucial importance of infrastructure, developing countries continue to have large infrastructure gaps. According to the World Bank, the Sub-Saharan Africa (SSA) region needs to spend 7.1 percent of GDP annually until 2030 to close its infrastructure gap, but has only been spending about half that amount.[2]

Over recent years (2015–18), SSA governments have shouldered the bulk (90 percent) of infrastructure financing from their own resources (38 percent) or external borrowing (53 percent) from concessional or commercial sources, leaving just 10 percent to the private sector.[3] But SSA governments are now running out of fiscal space. Average public debt over GDP was estimated at 71 percent in 2021 (up from 43 percent in 2013), increasing debt service obligations (at the expense of other expenditures, including investment in infrastructure) and reducing countries' attractiveness for creditors, given heightened debt distress risks.[4] Recovery from COVID, including for governments' capacity to mobilize domestic resources, will take time.

Given high debt levels and reduced fiscal space, there is now more than ever a need to create favorable conditions for the private sector to assume a greater role in infrastructure financing in Sub-Saharan Africa. But how much private sector financing can realistically be mobilized, and what needs to be done to mobilize more? This paper attempts to address these questions by applying an econometric model to 36 SSA countries for the period 2008–2019, to project the infrastructure financing that could be mobilized from the private sector by improving regulatory frameworks and other institutions that are associated with the investment climate.

As such, this study can contribute to informing IFC on the magnitude and pace at which it can implement its strategy to engage proactively with governments to mobilize private capital at scale through improved institutional and regulatory frameworks. To our knowledge, such an assessment of the impact of institutional and regulatory frameworks on private sector participation in infrastructure in all SSA countries does not exist in the recent empirical literature. Much of the focus of previous studies on the region has been on the determinants of private sector participation in the broader economy.[5] Furthermore, in combining for the first time data from two sets on infrastructure projects, we believe that we are better able to capture the universe of private infrastructure financing data, and thus produce robust results.

The remainder of this note is organized as follows. Section B describes the data, section C discusses the methodology, and section D presents the key results of our econometric model at the aggregate level. Country-specific results are reported in the Annex.

B. DEFINITION AND DATA

Definition of Infrastructure

The study uses IJGlobal's broad definition of infrastructure, which includes investments in physical structures, systems, and facilities in both extractive and non-extractive sectors of the economy. The World Bank's Private Participation in Infrastructure (PPI) database focuses only on infrastructure in non-extractive sectors, including energy, information and communications technology, transport, water, and municipal solid waste.[6] Our analysis suggests that the objective determinants of PPI, particularly those related to institutional quality do not statistically differ between extractive and non-extractive sectors.

Data

The data on private sector infrastructure financing were sourced from the World Bank's PPI[7] and the IJGlobal[8] databases, and cover the period 2008–2019. The two databases report infrastructure project commitments by country, sector, year, and who financed them. The databases were merged to ensure that transactions missed by either were considered. Some of the transactions involve government and public sector entities, in part or in full. Therefore, we identified projects that were fully financed by the private sector. For projects that were jointly financed by the private and the public sectors, we disregarded the public sector share and only considered the private sector.

Specifically, the identification of private financing was as follows. For equity-financed projects, we identified whether the equity holders were a private or public entity, and where the two were combined, the percentage share of private financing that was available. For debt-financed projects (in full or in part), we identified whether the borrower was a private or public entity (including national and subnational governments, and state-owned enterprises). Projects financed by multilateral development organizations or development partners were considered public sector projects unless there was clear information suggesting that the borrower was a private entity. Based on this exercise, we identified 477 transactions involving the private sector across 36 countries, totaling $107.3 billion. The average number of PPI transactions per country is 14, but the number varies widely across countries, with South Africa showing the highest number at 137 projects, while other countries (including Cape Verde, Madagascar, and Mauritania) recorded just one. The average transaction size is $183 million, but values also vary widely, with the largest being $6.15 billion recorded in Nigeria in 2013, while the smallest transaction was $1.2 million in Tanzania in 2019.

C. METHODOLOGY

To determine the drivers of PPI financing, the study uses a panel data regression (1) below.

$$\rho\rho i^*_{i,t} = \beta_0 + \beta_1 \rho\rho i^*_{it-4} + \beta_2\, GOV_{i,t-4} + \beta_k\, X_{i,tk} + \gamma\_iCountryEffects_i + \delta_t\, Time\ Effect_t + \mu_{i,t}\ (1)$$

where $\mu_{i,t}$ is an error term.

Note that the study uses a truncated specification, i.e., $\rho\rho i = \rho\rho i^*_{i,t}$ is only observable if $\rho\rho i^*_{i,t} \geq 0$. The truncated specification addresses two biases that result when a standard regression specification is applied on truncated data. The first bias is that of inflated standard errors of estimates, which creates a bias towards not rejecting the null hypothesis.[9] The second is that of downward-biased and inconsistent parameter estimates.[10]

In regression (1) $\rho\rho i$ is private participation in infrastructure as a percentage of GDP. *GOV* is a measure of institutional quality. We primarily use the World Bank's World Governance Indicators (WGI) as proxies of institutional quality. Our main interest was particularly the WGI's measure of the quality of countries' regulatory systems, which captures the ability of governments to formulate and implement sound policies and regulations that permit and promote private sector development. However, we also use five additional WGIs, each of which has a bearing on the investment climate, including the control of corruption, government effectiveness, the rule of law, political stability, and voice & accountability. All the WGI measures range from -2.5 to 2.5, with a high value reflecting better institutional quality. We expect that there is a positive relationship between institutional quality and PPI (i.e., $\beta_2 > 0$). $X_{it,j}$ represents other determinants of PPI, including real GDP (a proxy for market size), global lending rates (a proxy for the cost of funds), inflation (a proxy for macroeconomic instability), and trade openness.

Regression (1) includes time- and country-fixed effects to capture the influence of the independent variables on PPI over time within countries, as opposed to inferring the differences in the impact between countries, which are likely permanent and not actionable.

To address endogeneity resulting from reverse causality from changes in the level of PPI within countries to within-country changes in institutional quality, the study uses two approaches. First, it uses four-year lagged values of the institutional variables (i.e., $GOV_{i,t-4}$) instead of contemporaneous values ($GOV_{i,t}$). Second, it simultaneously controls for lagged PPI ($\rho\rho_{i,t-4}$). In this regard, the coefficients of the institutional variables show how, for a given level of PPI, better quality institutions can enhance PPI in the future. In estimating regression (1), this study uses robust standard errors, rather than clustered standard errors as tests suggest that there is no evidence of time-fixed effects (see Table A2 in the Annex).

D. RESULTS AND PREDICTIONS

How can African countries attract more PPI?

Our results show that institutions are a strong positive driver of private participation in infrastructure financing. Using a panel of 36 SSA countries, for the period 2008–2019, we estimated regression (1), and the results are reported in Table 1. The coefficients of all the institutional quality variables are positive, and four out of the six of these coefficients are statistically significant, including those of regulatory quality, control of corruption, the rule of law, and voice & accountability. The sizes of the significant coefficients of institutional quality variables range from 0.039 percent of GDP to 0.063 percent of GDP. The coefficient of regulatory quality, which is the variable of our main interest is 0.053 percent of GDP and is statistically significant.

Regarding the other determinants, the study shows that the global cost of lending (or financing conditions), and macroeconomic instability have a negative impact on PPI. On the other hand, market size (as reflected in the size of real GDP) and trade openness have a positive impact on PPI (Table 1). The results also suggest that, on average, resource-rich countries receive more PPI than resource-poor countries. However, further analysis shows that the impact of institutional quality on PPI does not differ between these two groups of countries.

Robustness checks based on an alternative proxy of institutional quality suggest that governance is indeed a positive driver of PPI. We use the World Bank's Country Policy Institutional Assessment (CPIA) as a proxy of institutional quality for a sample of 33 International Development Association (IDA) member countries and the results are reported in Table A1 in the Annex.[11] The results show that all the coefficients of the CPIA variables are positive, but only three out of the nine coefficients of these variables are statistically significant, that is, those of CPIAs for the business regulatory environment, fiscal management, and financial policy. A possible reason why few coefficients are statistically significant might be due to the exclusion of five non-IDA countries whose aggregate PPI accounts for 30 percent of total PPI.

The study was also able to identify private investors' biases — that is preferences granted to countries (based on intertemporal characteristics) after objective factors are controlled for. The size of the bias depends on the institutional quality variables controlled for. The positive bias reaches a maximum of 0.688 percent of GDP, while the negative bias reaches a maximum of 0.662 percent of GDP (Table A2). A better understanding of these biases could be a subject for further investigation.

Table 1. The Drivers of PPI: Truncated Panel Regression Model, Dependent Variable: PPI as % of GDP

	(1)	(2)	(3)	(4)	(5)	(6)
Lagged Dependent Variable	-0.403*** (0.0574)	-0.409*** (0.0596)	-0.390*** (0.0599)	-0.409*** (0.0581)	-0.390*** (0.0574)	-0.405*** (0.0532)
Control of Corruption (Lagged)	0.0387* (0.0208)					
Government Effectiveness (Lagged)		0.0000820 (0.0296)				
Political Stability (Lagged)			0.0243 (0.0193)			
Regulatory Quality (Lagged)				0.0534** (0.0259)		
Rule of Law (Lagged)					0.0580* (0.0307)	
Voice & Accountability (Lagged)						0.0626** (0.0299)
U.S. Real Lending Rate	-0.0233*** (0.00627)	-0.0235*** (0.00618)	-0.0220*** (0.00633)	-0.0219*** (0.00626)	-0.0256*** (0.00670)	-0.0246*** (0.00630)
Real GDP ($ 2010 Prices)	0.00136*** (0.000440)	0.00116*** (0.000421)	0.00117*** (0.000402)	0.00116*** (0.000384)	0.00113*** (0.000396)	0.00105** (0.000427)
Consumer Price Inflation	-0.0000534 (0.0000677)	-0.0000271 (0.0000748)	-0.0000981 (0.0000876)	-0.0000774 (0.0000679)	-0.000138 (0.0000898)	-0.0000835 (0.0000697)
Trade Openess	0.0419* (0.0229)	0.0361 (0.0223)	0.0313* (0.0180)	0.0463** (0.0226)	0.0445* (0.0232)	0.0350 (0.0215)
Credit to The Private Sector	0.000957 (0.00169)	0.000681 (0.00170)	0.00140 (0.00180)	0.000212 (0.00169)	0.00145 (0.00188)	0.000775 (0.00169)
Resource-Rich Dummy	0.0184 (0.0145)	0.0327*** (0.00965)	0.0287** (0.0114)	0.0338*** (0.0125)	0.0198 (0.0134)	0.0607*** (0.0154)
Low-Income Countries Dummy	0.0254* (0.0138)	0.0125 (0.00965)	0.0419 (0.0266)	-0.000576 (0.0133)	0.00522 (0.00880)	0.0627** (0.0275)
Time Effects	Not significant	Not significant	Not significant	Not significant	Not significant	Not significant
Country Effects	Significant	Significant	Significant	Significant	Significant	Significant
Constant	0.0134 (0.0316)	-0.000331 (0.0340)	-0.0188 (0.0384)	0.0221 (0.0343)	0.0202 (0.0323)	-0.0133 (0.0352)
Sigma	0.0197*** (0.00237)	0.0200*** (0.00253)	0.0196*** (0.00222)	0.0196*** (0.00238)	0.0195*** (0.00220)	0.0192*** (0.00213)
Number of Observations	108	108	108	108	108	108

Standard errors in ( ), p-value [ ]   Note: * p<0.10, *** p<0.05, *** p<0.01
Source: Authors' own calculations based on data from IJGlobal and World Bank PPI databases.

How much additional PPI could institutional reform yield?

Using the first model, where the proxy of institutional quality is based on the WGI, we estimated the PPI commitments that SSA countries would attract if they made four years of continuous progress or reversal aligned to the same trend experienced between 2008 and 2019 (Figure 1). The model estimates that, with four years of continuous progress (or reversal) in regulatory reforms within the mean standard deviation of the changes experienced between 2008 and 2019, the SSA region has the potential to increase PPI commitments by an additional 0.8 percentage points of GDP, on average, rising up to more than 1.5 percentage points in countries such as Gabon, Liberia, Madagascar, Mauritania, and Rwanda. At the aggregate regional level, it would mean an additional $20 billion of private sector investment commitments in infrastructure by 2025 compared with a situation of unchanged regulatory quality.
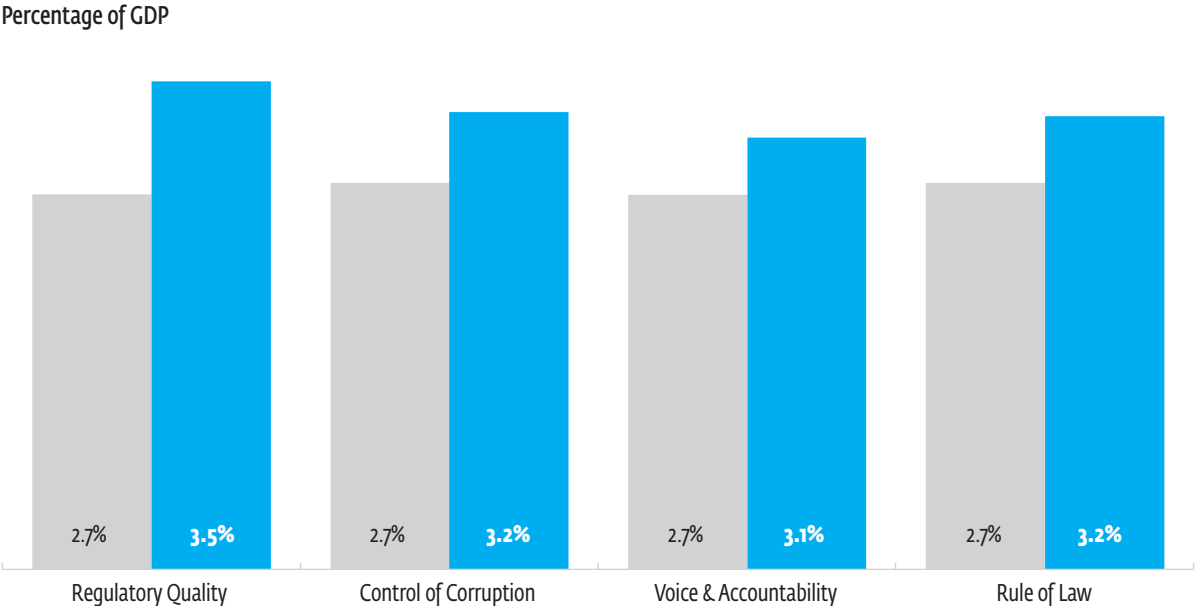
Progress in the other three institutional quality indicators that are related to the investment climate is associated with an increase in PPI commitments of an additional 0.4 to 0.5 percentage points of GDP over four years (Figure 1). For example, a four-year cumulative progress in institutions that enhance the control of corruption and reduce the capture of the state by elites and private interests would lead to an increase in PPI commitments in SSA of 0.5 percentage points of GDP, or in absolute terms, $12.5 billion.[12] Progress in institutions that enhance the ability of citizens to hold government accountable would trigger additional PPI commitments of a similar magnitude. Four-year cumulative progress in institutions that enhance the rule of law would result in an increase in PPI commitments in SSA of 0.4 percentage points of GDP, or in absolute terms, $10 billion, on average, rising up to 1.5 percentage points for Cote d'Ivoire, Madagascar, Mali, and Rwanda.

The payoff from reforms relating to regulatory quality and the control of corruption is incremental, while the payoff from reforms relating to the rule of law and voice & accountability is subject to diminishing returns. The study examined the relationship between initial institutional quality and the additional PPI associated with reforms using correlation plots. The results (see Figure A1) suggest that there is a negative correlation between the additional PPI which is received with reforms and the initial institutional quality related to the rule of law and voice & accountability. This implies that reforms to such institutions are subject to diminishing returns — given a similar reform effort, countries whose initial rule of law, and voice & accountability is poor will get higher PPI commitments than those whose initial rule of law, and voice & accountability is already good. The opposite is true for institutional reforms relating to the control of corruption and improved regulatory quality — they are subject to increasing returns.

The study also analyses whether the impact of institutional reforms on additional PPI differs between low-income countries (LICs) and non-LICs. This is important because, with market size being among the key drivers of PPI receipts, countries with lower GDP would receive less PPI. The study finds that LICs receive more additional PPI with institutional reforms, particularly those reforms related to improving the quality of the regulatory environment, rule of law, and voice & accountability. Specifically, other things being constant, LICs would receive 0.05 percent of GDP in additional PPI higher than non-LICs with reforms to improve the regulatory environment, 0.30 percent of GDP in additional PPI higher than non-LICs with reforms to the rule of law, and 0.24 percent of GDP more than non-LICs with reforms to enhance voice & accountability.

As an illustrative example of the compensatory value of institutional reforms for countries with smaller markets, the study considers two countries in the same region, and that are not resource-rich, Rwanda and Kenya. Kenya's market size (proxied by real GDP) is almost eight times larger than that of Rwanda. As a result, Kenya receives more PPI under the baseline of no institutional reforms than Rwanda (i.e., Kenya receives an average of 2.6 percent of GDP versus 1.9 percent of GDP for Rwanda). However, with four years of continuous regulatory reforms aligned to past progress, Rwanda would receive 2.6 percentage points of GDP in additional PPI higher than Kenya. Since investment in infrastructure can help to lay a foundation for growth, Rwanda and other small markets can boost their future market size by continuously improving the quality of their institutions to attract more PPI.

Figure 1. **Potential Cumulative PPI Over Four Years with One Absolute Mean Deviation in Institutional Quality**

Percentage of GDP

2.7%	**3.5%**	2.7%	**3.2%**
Regulatory Quality	Control of Corruption	Voice & Accountability	Rule of Law

NO REFORM
REFORM

Source: Authors' own calculation used the Econometric model and IJGlobal and WBG PPI data.

E. CONCLUSION

The study has examined the drivers of PPI financing in a panel of 36 SSA countries for the period 2008–2019, with specific attention to the role of regulatory and institutional frameworks. The study also estimated potential infrastructure financing that could be mobilized from the private sector with four years of continuous progress on regulatory and other institutional reforms that enhance the investment climate. The study finds that the quality of regulatory frameworks and institutions is positively associated with higher private participation in infrastructure financing. In addition, market size and trade openness are also positively associated with private participation, while global financing conditions and macroeconomic instability are negatively associated. Using the panel econometric model, the study estimates that the SSA region has the potential to attract 0.8 percentage points of GDP (or $20 billion) in additional private infrastructure financing with four years of continuous improvement in the quality of regulatory frameworks. Progress in other institutions related to a good investment climate (e.g., those that enhance the control of corruption and state capture, foster the rule of law, and enhance the ability of citizens to hold governments accountable) would lead to additional private investment in infrastructure of 0.4–0.5 percentage points of GDP above the baseline of no reforms. We also find that regulatory and institutional reforms have a larger payoff for LICs and countries with smaller markets.

ANNEX. RESULTS

Table A1. The Drivers of PPI: Truncated Panel Regression Model, Dependent Variable: PPI as % of GDP

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Lagged Dependent Variable	-0.392*** (0.0600)	-0.381*** (0.0648)	-0.399*** (0.0595)	-0.398*** (0.0602)	-0.388*** (0.0581)	-0.407*** (0.0559)	-0.401*** (0.0609)	-0.400*** (0.0575)	-0.401*** (0.0589)
CPIA Property Rights (Lagged)	0.00826 (0.0126)								
CPIA Trade (Lagged)		0.0334 (0.0396)							
CPIA Corruption Control (Lagged)			0.00647 (0.0219)						
CPIA Structural Policies (Lagged)				0.0110 (0.0358)					
CPIA Financing Rating (Lagged)					0.0571** (0.0231)				
CPIA Fiscal Management (Lagged)						0.0289** (0.0139)			
CPIA Macroeconomic Management (Lagged)							0.00690 (0.0182)		
CPIA Policy & Institutions (Lagged)								0.000442 (0.0232)	
CPIA Business Regulatory Environment (Lagged)									0.0266* (0.0145)
U.S. Real Lending Rate	-0.0276*** (0.00734)	-0.0295*** (0.00875)	-0.0275*** (0.00718)	-0.0273*** (0.00725)	-0.0335*** (0.00797)	-0.0214*** (0.00718)	-0.0267*** (0.00825)	-0.0274*** (0.00606)	-0.0284*** (0.00727)
Real GDP ($ 2010 Prices)	0.00127*** (0.000412)	0.00131*** (0.000404)	0.00132*** (0.000423)	0.00129*** (0.000415)	0.00133*** (0.000412)	0.00127*** (0.000409)	0.00126*** (0.000454)	0.00129*** (0.000416)	0.00132*** (0.000433)
Consumer Price Inflation	-0.0000892 (0.0000928)	-0.000100 (0.0000939)	-0.0000665 (0.0000931)	-0.0000751 (0.000105)	0.000138 (0.000112)	-0.000132 (0.000101)	-0.0000730 (0.0000931)	-0.0000580 (0.0000920)	-0.0000666 (0.0000830)
Trade Openess	0.0541** (0.0267)	0.0644*** (0.0245)	0.0536* (0.0290)	0.0547** (0.0253)	0.0386* (0.0210)	0.0580** (0.0255)	0.0510** (0.0254)	0.0515* (0.0263)	0.0590** (0.0259)
Credit to The Private Sector	0.00253 (0.00271)	0.00201 (0.00244)	0.00194 (0.00253)	0.00185 (0.00243)	0.00295 (0.00255)	0.000451 (0.00287)	0.00148 (0.00307)	0.00193 (0.00274)	0.00171 (0.00251)
Resource-Rich Dummy	0.0298*** (0.0114)	0.0273** (0.0120)	0.0329** (0.0158)	0.0284** (0.0122)	0.0429*** (0.0110)	0.0364*** (0.00962)	0.0316** (0.0134)	0.0294*** (0.0113)	0.0298*** (0.0113)
Low-Income Countries Dummy	0.0181 (0.0130)	0.0122 (0.0149)	0.0274 (0.0316)	0.0162 (0.0165)	0.0325** (0.0130)	-0.00506 (0.0161)	0.0172 (0.0144)	0.0193 (0.0143)	0.00700 (0.0144)
Time Effects	Not significant	Not significant	Not significant	Not significant	Not significant	Not significant	Not significant	Not significant	Not significant
Country Effects	Significant	Significant	Significant	Significant	Significant	Significant	Significant	Significant	Significant
Constant	-0.0606 (0.0732)	-0.164 (0.174)	-0.0492 (0.0980)	-0.0650 (0.142)	0.164* (0.0868)	-0.114 (0.0713)	-0.0462 (0.0732)	-0.0263 (0.0751)	-0.117* (0.0710)
Sigma	0.0208*** (0.00259)	0.0206*** (0.00282)	0.0209*** (0.00258)	0.0209*** (0.00265)	0.0200*** (0.00230)	0.0200*** (0.00217)	0.0208*** (0.00253)	0.0209*** (0.00263)	0.0207*** (0.00260)
Number of Observations	99	99	99	99	99	99	99	99	99

Standard errors in ( ), p-value [ ]   Note: * p<0.10, *** p<0.05, *** p<0.01
Source: Authors' own calculations based on data from IJGlobal and World Bank PPI Databases.
Notes: Governance measures are proxied by CPIA indicators. Note that only 33 countries have CPIA data.

Table A2. Results with Coefficients of Country- and Time-Fixed Effects

	(1)	(2)	(3)	(4)	(5)	(6)
Lagged dependent variable	-0.409*** (0.0581)	-0.403*** (0.0574)	-0.409*** (0.0596)	-0.390*** (0.0599)	-0.390*** (0.0574)	-0.405*** (0.0532)
Regulatory Quality	0.0534** (0.0259)					
Control of corruption		0.0387* (0.0208)				
Government effectiveness			0.0000820 (0.0296)			
Political stability				0.0243 (0.0193)		
Rule of Law					0.0580* (0.0307)	
Voice & Accountability						0.0626** (0.0299)
U.S. Real Lending Rate	-0.0219*** (0.00626)	-0.0233*** (0.00627)	-0.0235*** (0.00618)	-0.0220*** (0.00633)	-0.0256*** (0.00670)	-0.0246*** (0.00630)
Real GDP (U.S. $ 2010 prices)	0.00116*** (0.000384)	0.00136*** (0.000440)	0.00116*** (0.000421)	0.00117*** (0.000402)	0.00113*** (0.000396)	0.00105** (0.000427)
Consumer Price Inflation	-0.0000774 (0.0000679)	-0.0000534 (0.0000677)	-0.0000271 (0.0000748)	-0.0000981 (0.0000876)	-0.000138 (0.0000898)	-0.0000835 (0.0000697)
Trade Openness	0.0463** (0.0226)	0.0419* (0.0229)	0.0361 (0.0223)	0.0313* (0.0180)	0.0445* (0.0232)	0.0350 (0.0215)
Credit to the Private Sector	0.000212 (0.00169)	0.000957 (0.00169)	0.000681 (0.00170)	0.00140 (0.00180)	0.00145 (0.00188)	0.000775 (0.00169)
Resource-Rich Dummy	0.0338*** (0.0125)	0.0184 (0.0145)	0.0327*** (0.00965)	0.0287** (0.0114)	0.0198 (0.0134)	0.0607*** (0.0154)
Low-Income Countries Dummy	-0.000576 (0.0133)	0.0254* (0.0138)	0.0125 (0.00965)	0.0419 (0.0266)	0.00522 (0.00880)	0.0627** (0.0275)
Benin	0 (.)	0 (.)	0 (.)	0 (.)	0 (.)	0 (.)
Botswana	-0.0937** (0.0440)	-0.0975* (0.0513)	-0.0415 (0.0527)	-0.0648* (0.0390)	-0.117* (0.0599)	-0.0830** (0.0417)
Burkina Faso	0.0171 (0.0222)	-0.0130 (0.0275)	0.0122 (0.0209)	-0.00746 (0.0273)	0.00216 (0.0248)	-0.00643 (0.0238)

	(1)	(2)	(3)	(4)	(5)	(6)
Cameroon	0.0533*** (0.0148)	0.0579*** (0.0135)	0.0396*** (0.0149)	0.0659*** (0.0202)	0.0635*** (0.0156)	0.118*** (0.0393)
Cabo Verde	-0.0450 (0.0818)	-0.124 (0.0966)	-0.0490 (0.0900)	-0.0947 (0.0885)	-0.148 (0.109)	-0.0937 (0.0882)
Central African Republic	0.183*** (0.0397)	0.134*** (0.0314)	0.128*** (0.0451)	0.156*** (0.0376)	0.191*** (0.0439)	0.167*** (0.0331)
Chad	0.0171 (0.0287)	0.00590 (0.0259)	-0.0253 (0.0349)	-0.00462 (0.0225)	0.0484 (0.0463)	-0.00139 (0.0242)
Côte d'Ivoire	-0.0153 (0.0193)	-0.0270 (0.0178)	-0.0276 (0.0200)	0.0108 (0.0317)	-0.00582 (0.0162)	0.0441 (0.0335)
Democratic Republic of Congo	0.00308 (0.0344)	-0.0310 (0.0206)	-0.0568 (0.0352)	-0.0170 (0.0324)	0.0289 (0.0494)	-0.0282 (0.0219)
Equatorial Guinea	0.0106 (0.0229)	0.0167 (0.0267)	-0.0304 (0.0329)	-0.0185 (0.0124)	0.0241 (0.0316)	0.0781 (0.0539)
Gabon	0.00334 (0.00977)	0.0163 (0.0149)	-0.00360 (0.0107)	0.00332 (0.00961)	0.00676 (0.0113)	0.0404 (0.0246)
The Gambia	0.0161 (0.0165)	0.000403 (0.0167)	0.00807 (0.0184)	-0.00873 (0.0230)	0.0225 (0.0215)	0.0474 (0.0301)
Ghana	-0.00350 (0.0242)	-0.00231 (0.0269)	0.0274 (0.0265)	0.0347** (0.0174)	-0.00769 (0.0295)	0.0183 (0.0206)
Guinea	0.0553 (0.0468)	0.0365 (0.0439)	0.0169 (0.0489)	0.0390 (0.0403)	0.0892 (0.0583)	0.0204 (0.0422)
Guinea-Bissau	0.0602** (0.0273)	0.0264 (0.0179)	0.0105 (0.0277)	0.00791 (0.0131)	0.0678* (0.0357)	0.0331 (0.0228)
Kenya	-0.0229 (0.0419)	-0.0171 (0.0411)	-0.0182 (0.0430)	0.00520 (0.0475)	-0.0183 (0.0428)	0.0151 (0.0417)
Lesotho	-0.0143 (0.0183)	-0.0445 (0.0291)	-0.0114 (0.0191)	-0.00613 (0.0175)	-0.0395 (0.0256)	0.00305 (0.0173)
Liberia	0.0509 (0.0348)	0.0186 (0.0274)	0.0160 (0.0357)	0.0162 (0.0297)	0.0546 (0.0359)	-0.0309 (0.0341)
Madagascar	0.0131 (0.0146)	-0.0210 (0.0166)	-0.00659 (0.0187)	-0.0105 (0.00967)	0.0152 (0.0160)	0.00196 (0.0108)
Malawi	-0.0218 (0.0310)	-0.0547 (0.0360)	-0.0333 (0.0311)	-0.0457 (0.0323)	-0.0541 (0.0347)	-0.0554 (0.0351)
Mali	0.0252 (0.0220)	-0.00918 (0.0231)	0.00423 (0.0201)	-0.000505 (0.0270)	0.00374 (0.0230)	-0.0267 (0.0307)
Mauritania	0.0104 (0.0116)	0.0107 (0.0132)	-0.00689 (0.0142)	0.0227 (0.0249)	0.0196 (0.0170)	0.0377 (0.0239)

	(1)	(2)	(3)	(4)	(5)	(6)
Mozambique	0.688*** (0.0469)	0.653*** (0.0520)	0.677*** (0.0486)	0.639*** (0.0581)	0.671*** (0.0470)	0.653*** (0.0487)
Namibia	-0.0794 (0.0864)	-0.112 (0.0908)	-0.0713 (0.0951)	-0.117 (0.0932)	-0.147 (0.105)	-0.114 (0.0897)
Niger	-0.0123 (0.0238)	-0.0273 (0.0194)	-0.0320* (0.0191)	-0.0220 (0.0208)	-0.00683 (0.0269)	-0.0702*** (0.0217)
Nigeria	-0.487*** (0.157)	-0.557*** (0.173)	-0.502*** (0.165)	-0.448*** (0.171)	-0.442*** (0.156)	-0.425** (0.174)
Rwanda	0.00394 (0.0155)	-0.0405 (0.0354)	0.0138 (0.0267)	-0.00624 (0.0251)	-0.000415 (0.0185)	0.0570** (0.0270)
Senegal	0.0145 (0.0244)	0.00196 (0.0278)	0.0197 (0.0238)	0.0214 (0.0239)	-0.00609 (0.0299)	0.0377 (0.0258)
Sierra Leone	0.0760 (0.0482)	0.0684 (0.0471)	0.0558 (0.0524)	0.0481 (0.0473)	0.0961* (0.0510)	0.00892 (0.0494)
South Africa	-0.499 (0.329)	-0.662* (0.361)	-0.516 (0.361)	-0.609* (0.346)	-0.648* (0.370)	-0.508 (0.345)
Togo	0.0848 (0.0526)	0.0283 (0.0509)	0.0392 (0.0480)	0.00428 (0.0567)	0.0491 (0.0493)	0.0612 (0.0493)
Tanzania	-0.0398*** (0.0150)	-0.0635*** (0.0220)	-0.0436*** (0.0154)	-0.0594*** (0.0215)	-0.0435*** (0.0149)	-0.0639*** (0.0209)
Uganda	0 (.)	0 (.)	0 (.)	0 (.)	0 (.)	0 (.)
Zambia	0 (.)	0 (.)	0 (.)	0 (.)	0 (.)	0 (.)
Zimbabwe	0.0932** (0.0436)	0.0324* (0.0170)	0.00393 (0.0265)	0.0358 (0.0275)	0.0730** (0.0349)	0.114** (0.0518)
2011–2015	0 (.)	0 (.)	0 (.)	0 (.)	0 (.)	0 (.)
2016–2019	0 (.)	0 (.)	0 (.)	0 (.)	0 (.)	0 (.)
Constant	0.0221 (0.0343)	0.0134 (0.0316)	-0.000331 (0.0340)	-0.0188 (0.0384)	0.0202 (0.0323)	-0.0133 (0.0352)
Sigma	0.0196*** (0.00238)	0.0197*** (0.00237)	0.0200*** (0.00253)	0.0196*** (0.00222)	0.0195*** (0.00220)	0.0192*** (0.00213)
Number of observations	108	108	108	108	108	108

Standard errors in ( ), p-value [ ]   Note: * p<0.10, *** p<0.05, *** p<0.01
Source: Authors' own calculations based on data from IJGlobal and World Bank PPI Databases.
Notes: Governance measures are proxied by World Bank's World Governance Indicators.

**Table A3.** Potential Cumulative PPI Over Four Years with a One Absolute Mean Deviation in Institutional Quality

	LIC	Resource Rich	REGULATORY QUALITY			CONTROL OF CORRUPTION			VOICE & ACCOUNTABILITY			RULE OF LAW		
			Baseline	Scenario 1	Additional PPI	Baseline	Scenario 1	Additional PPI	Baseline	Scenario 1	Additional PPI	Baseline	Scenario 1	Additional PPI
Angola	No	Yes	9.9%	10.5%	0.6%	11.0%	11.1%	0.2%	9.2%	9.9%	0.7%	9.3%	9.8%	0.5%
Benin	No	No	0.0%	0.7%	0.7%	0.0%	0.2%	0.2%	0.0%	0.3%	0.3%	0.0%	0.4%	0.4%
Botswana	No	Yes	1.9%	2.6%	0.7%	1.9%	2.1%	0.2%	1.9%	2.2%	0.3%	1.9%	2.4%	0.5%
Burkina Faso	Yes	No	1.8%	2.3%	0.5%	1.8%	2.2%	0.4%	1.8%	2.6%	0.8%	1.8%	2.2%	0.4%
Cameroon	No	No	2.9%	3.3%	0.4%	2.9%	3.1%	0.2%	2.9%	3.3%	0.4%	2.8%	3.0%	0.1%
Cape Verde	No	No	0.0%	0.6%	0.6%	0.0%	0.5%	0.4%	0.0%	0.0%	0.0%	0.0%	0.9%	0.9%
Central Africa Republic	Yes	No	8.7%	9.2%	0.6%	8.6%	9.1%	0.5%	8.7%	9.8%	1.1%	8.7%	9.7%	1.1%
Chad	Yes	Yes	1.0%	1.3%	0.3%	1.0%	1.2%	0.2%	1.0%	1.6%	0.6%	1.0%	1.1%	0.1%
Côte d'Ivoire	No	No	1.0%	1.9%	1.0%	1.0%	2.2%	1.2%	1.0%	2.7%	1.8%	1.0%	2.9%	2.0%
Congo, DRC	Yes	Yes	0.4%	1.2%	0.8%	0.4%	0.6%	0.3%	0.3%	0.4%	0.0%	0.3%	0.4%	0.0%
Equatorial Guinea	No	Yes	0.0%	0.1%	0.1%	0.0%	0.3%	0.3%	0.0%	0.5%	0.5%	0.0%	0.7%	0.7%
Gabon	No	Yes	2.0%	3.9%	1.9%	2.0%	2.6%	0.6%	2.0%	2.2%	0.2%	2.0%	2.1%	0.1%
Gambia	Yes	No	0.0%	0.2%	0.2%	0.0%	0.1%	0.1%	0.0%	1.0%	1.0%	0.0%	1.5%	1.5%
Ghana	No	No	4.2%	4.7%	0.5%	4.2%	4.5%	0.2%	4.2%	4.5%	0.3%	4.2%	4.8%	0.6%
Guinea	Yes	Yes	5.8%	6.0%	0.2%	5.8%	6.1%	0.3%	5.8%	6.3%	0.5%	5.8%	6.7%	0.9%
Guinea_Bissau	Yes	No	0.3%	0.6%	0.3%	0.3%	0.8%	0.5%	0.3%	1.0%	0.7%	0.3%	1.7%	1.4%
Kenya	Yes	No	2.6%	3.2%	0.6%	2.6%	2.8%	0.2%	2.7%	3.6%	0.8%	2.7%	3.4%	0.7%
Lesotho	No	No	0.2%	0.8%	0.6%	0.2%	0.6%	0.4%	0.2%	0.5%	0.2%	0.2%	0.8%	0.6%
Liberia	Yes	Yes	1.7%	3.5%	1.8%	1.7%	2.2%	0.6%	1.7%	2.4%	0.8%	1.7%	2.6%	1.0%
Madagascar	Yes	No	0.4%	1.8%	1.5%	0.4%	1.5%	1.2%	0.4%	1.9%	1.5%	0.4%	2.5%	2.2%
Malawi	Yes	No	0.5%	1.5%	1.0%	0.5%	0.9%	0.4%	0.5%	1.0%	0.5%	0.5%	1.3%	0.8%
Mali	Yes	No	1.3%	1.6%	0.3%	1.3%	1.8%	0.5%	1.3%	2.9%	1.6%	1.3%	3.2%	1.9%
Mauritania	No	Yes	1.1%	2.6%	1.5%	1.1%	1.6%	0.5%	1.1%	1.8%	0.7%	1.1%	1.2%	0.2%
Mozambique	Yes	No	14.0%	14.8%	0.8%	14.0%	14.4%	0.4%	14.0%	14.7%	0.7%	14.0%	14.7%	0.7%
Namibia	No	Yes	0.9%	1.4%	0.5%	1.0%	1.2%	0.3%	0.9%	1.4%	0.5%	1.0%	1.2%	0.3%
Niger	Yes	Yes	0.0%	0.9%	0.9%	0.0%	0.3%	0.3%	0.0%	0.5%	0.5%	0.0%	0.9%	0.9%
Nigeria	No	Yes	1.7%	2.0%	0.3%	1.7%	2.0%	0.2%	1.9%	2.1%	0.1%	1.9%	2.4%	0.5%
Rwanda	Yes	No	1.9%	5.1%	3.2%	1.9%	3.8%	1.9%	1.9%	3.7%	1.8%	1.9%	2.2%	0.3%
Senegal	No	No	2.1%	2.4%	0.3%	2.1%	3.1%	1.0%	2.1%	2.9%	0.8%	2.1%	3.3%	1.2%
Sierra Leone	Yes	Yes	1.4%	2.2%	0.8%	1.4%	1.5%	0.2%	1.4%	1.8%	0.5%	1.4%	1.9%	0.6%
South Africa	No	No	2.9%	4.2%	1.4%	2.8%	3.8%	1.0%	2.7%	3.0%	0.2%	3.0%	3.2%	0.2%
Togo	Yes	No	5.3%	5.7%	0.4%	5.3%	5.5%	0.2%	5.2%	5.6%	0.4%	5.3%	6.3%	1.0%
Tanzania	Yes	No	0.5%	0.9%	0.4%	0.5%	1.1%	0.6%	0.5%	0.9%	0.4%	0.5%	1.0%	0.5%
Uganda	Yes	No	0.5%	0.6%	0.1%	0.5%	0.9%	0.5%	0.5%	0.7%	0.2%	0.5%	0.7%	0.2%
Zambia	No	Yes	3.6%	4.2%	0.6%	3.6%	4.1%	0.4%	3.6%	4.2%	0.6%	3.6%	4.2%	0.6%
Zimbabwe	Yes	No	0.3%	1.1%	0.9%	0.3%	0.4%	0.1%	0.3%	1.2%	0.9%	0.3%	1.0%	0.8%
Weighted Average			**2.7%**	**3.5%**	**0.8%**	**2.7%**	**3.2%**	**0.5%**	**2.7%**	**3.1%**	**0.4%**	**2.7%**	**3.2%**	**0.5%**

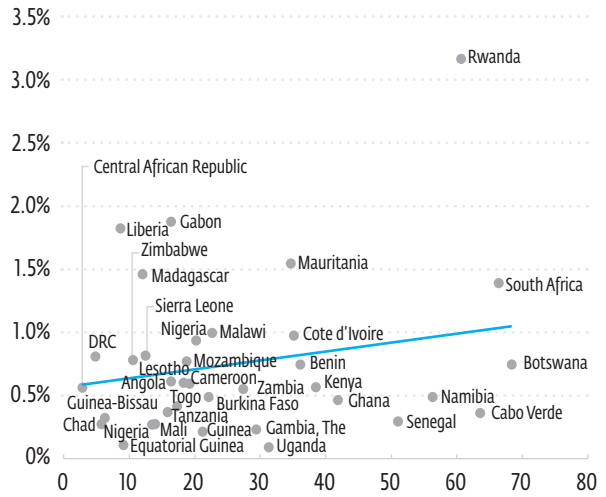Source: Authors' own calculations used the econometric model and IJGlobal and WBG PPI data.

Figure A1. The Relationship Between Initial Institutional Quality and Additional PPI After Reforms

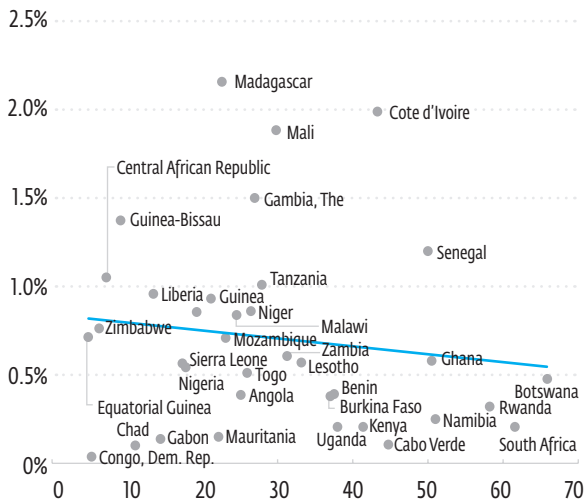**Estimated potential additional financing with four years of reforms**

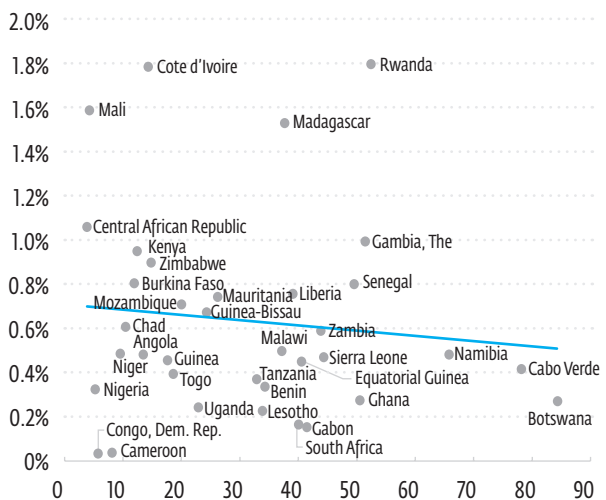Control of corruption rank: 2019
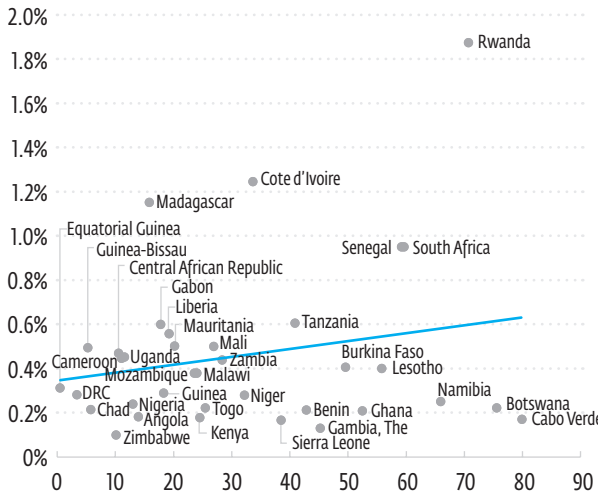
Regulatory Quality rank: 2019

Voice & Accountability rank: 2019

Rule of Law rank: 2019

Source: Authors' own calculations used the Econometric model and data from IJGlobal, WBG PPI and WBG WGI.

NOTES

1   See Cavallo and DaPPude (2011) and Bougheas et al. (1999)

2   World Bank (2019)

3   Infrastructure Consortium for Africa and African Development Bank (2015–2018)

4   By end-2021, 21 SSA countries (out of 49) were either at high risk of debt distress or in debt distress, compared to only four in 2014

5   See Mengistu, T. M. (2013) as one of the most recent efforts to fill this knowledge gap, but with a focus on both private financing and financing from the global South, particularly China (some of which is government-financed).

6   Among these non-extractive sectors, 'energy' includes electricity generation, transmission, and distribution as well as natural gas transmission and distribution. 'Information and communications technology' includes land-based and submarine cables, fiber optic cables while 'transport' covers airport runways and terminals, railways, roads, bridges, highways, tunnels and port infrastructure. 'Water' represents activities including water generation and distribution, sewerage collection and treatment, while 'municipal solid waste' includes collection and transport, treatment and disposal systems, and integrated municipal solid waste.

7   World Bank (2020). PPI Database. https://ppi.worldbank.org/en/ppi.

8   IJGlobal (2020), 'Project Finance & Infrastructure Journal Database', https://ijglobal.com/.

9   Grogger, J.T. and Carson, R.T. (1991).

10 Ibid.

11 We only use a sample of IDA countries because the CPIA scores for IBRD countries are not published.

12 Cote d'Ivoire, Madagascar, and Rwanda would attract an above average PPI (of more than 1.2 percentage points of GDP in additional PPI) with similar reforms in institutions that control corruption.

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