Dynamics of PPP investment in energy and country governance: evidence from Sub-Saharan Africa

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Abstract

Purpose – This paper intends to investigate the empirical link between governance and energy investment in PPP. To succinctly account for biases in the fixed effects (FE) model, the authors adopted different bias-corrected techniques. The majority of these techniques provided evidence that PPP investments in energy are boosted by increasing the desire for accountability, prioritising the voice of the masses and disabusing the rule of laws. This study could not find any positive influence from the control of corruption to PPP investment in energy.

Design/methodology/approach – The acute shortage of power supply in SSA has attracted PPP investments in the energy subsector of the economy, leading to the recent debate on governance and public, private investment. The authors contributed to this argument by examining the impact of country governance on PPP investment in energy using a sample of countries in SSA.

Findings – Therefore, the authors concluded that low control of corruption is responsible for the inadequate volume of PPP investments. In the light of this, the government should redefine the anti-corruption bill of their sovereignty to accommodate severe sanctions when necessary.

Originality/value – This paper uses the fixed effects (FE) model by introducing batteries of nonlinear panel models to capture the relationship between the impacts of country governance on PPP investment in energy.

Keywords Public-private partnerships, PPP structure, Dynamics of PPP, Investment in energy, Sub-Saharan Africa

Paper type Research paper

1. Introduction

There are still misconstrued and on-going debatable explanations on the public-private partnerships (PPP) investment-country governance nexus. Especially in Sub-Saharan Africa (SSA), where there is an urgent need for PPP investments of all types, governance is a serious issue.

Therefore, an attempt to link governance to investment in PPP is an insight with diverse comments. Persuasive findings based on the study of Casady *et al.* (2019) revealed that good governance explicitly drives many investments in PPP. This finding is strongly akin to theory and rationality, given the common argument behind the decaying infrastructure in Africa corresponding to ill-fated governance in all layers. May not be able to debunk the theme of Panayides *et al.* (2015), Pusok (2016), Osei-Kyei and Chan (2017), Sergi *et al.* (2019) and World Bank (2017) that awake institutions create landmark impetus to the private sectors to increase their investments in PPP.

Torchia and Calabrò (2018) pointed out that PPPs are procured, acquired and managed effectively when the government enforces the principle of fairness, accountability, transparency and culpability in all spheres for the public interest. This accounts for the possible reason for some countries to receive more significant investments in PPP than others. For example, 2018s records showed that Brazil, Russia, India, China and South Africa (BRICS) countries have the largest share of PPP investments Hodge and Greve (2018). The question here is, apart from South Africa, why is Sub-Saharan African countries are not overly endowed with these resources to augment the domestic insufficiency to trigger development? The answer is a lack of good governance, which is necessary and sufficient condition for receiving PPP's assistance (Debela, 2019). SSA countries are with the lowest amount of PPP's investments and are amongst the world's poorest countries (Leigland, 2018). Thus, investigating the impact of good governance on the PPP investment in energy is imperative in Africa, where this insight has been discussed literally but not empirically. Muhammad and Johar (2019) and Keping (2018) emphasised that countries with good governance are more effective in administrating PPP projects because their institutional structure permits them to make reforms that govern the outcome of PPP progression and lead to a better outcome of the PPP investment.

The central leitmotif of this study is explaining how causations run from good governance to PPP's investment in energy. Here the concern is a particular aspect of PPP's projects, not the traditional public procurement (TPP) and financing, which is gradually outlived now due to the overwhelming flexibility and risk diversification characteristics of PPP. According to Soliño and Gago de Santos (2010), every rational country has shown practical willingness to drop TPP or reduce its involvement, just because the risk emanating from conventional financing is approximately not well diversified. From the normative viewpoint, good governance has the potential and capacity to revolutionise PPP with proportionately appropriate risk. This is why Wibowo *et al.* (2012) suggested that the contractual party with the most considerable ability to manage PPP retains each risk, while the exogenous risks are absorbed by the group best fitted to control them.

In the context of this research, the expression of good governance is based on government effectiveness, political stability, the rule of law, fragility and contempt for corruption. These factors are classified as predictors of Granger cause investment in PPP energy projects. Therefore, this is a new insight or phenomenon tracing the poor PPP's investment in energy from the combination of these factors. The study has a more general econometric expression to define the poor performance of the energy sector in SSA. In this context, this study intends to contribute and to expand literature differently from the studies of EIU (2017), OECD (2013) and Kirikkaleli and Adebayo (2021) that focussed on the general principle of the PPP framework. However, this study is similar to Koala (2020), who provided an expression to link PPP's investment in transportation to good governance. But unlike Koala, the definition of good governance in this study is more general, and focusses on the energy sector, not transportation.

The study is organised as follows: Section 2 is based on a literature review, Section 3 focusses on data and method, results are presented in Section 4 and the conclusion and policy implication is in Section 5.

2. Literature review

Conceptually, Koala (2020) said, "Good governance refers to the strengths of the institutions in a country with regards to government actions and concerns for accountability, political stability, effectiveness, the rule of law, and corruption". This means the term good governance is a broad concept that explains the collective attitude of both the governed and the government. The governed are free to express their will according to the rule of law. The government is accountable to the public to provide utilities and amenities with the publicly generated funds to serve the citizenry's needs. The government is responsible for providing a working system that endears the people to obey the law. Is this true in Africa? Where hardship is commonly associated with government mismanagement and corruption, yet such government wants the rule of law to be upheld (Andersen and Piccone, 2019). By definition, good governance is virtually absent in Africa. Parker *et al.* (2018) conceptualised good governance as an effective method of formulating and implementing policies, law and order and plans which are simultaneously premeditated to simulate people's welfare. Graham *et al.* (2003) admitted that the concept of good governance is characterised by effectiveness and efficiency, accountability and transparency, equity, the rule of law, and voice legitimacy, performance, fairness and direction.

In the light of this conceptual underpinning, the study provides an empirical stance for the interaction between some of the components of good governance and PPP's investment/output. For example, political uncertainty as one of the indicators of good governance constitutes interruptions and changes in political administrations, which consequently influences the spread of investments in countries such as Nigeria (Eberhard and Gratwick, 2013). Osei-Kyei and Chan (2017) found that political stability is a susceptible factor attracting investments in developing countries and concluded that political support has a positive attitude towards private sector investments. Chou *et al.* (2012) provided evidence supporting political stability as a critical positive determinant of PPP investments.

Another factor of good governance is government effectiveness. Alam *et al.* (2017) said international organisations, donor countries and multilateral development banks appraise government effectiveness when allocating foreign aid. Government effectiveness concerning improved governance and anti-corruption leads to aiding effectiveness in developing countries (Paterson *et al.*, 2019). No doubt, such aid could come in the form of investment in PPP. Koala (2020) affirmed that developed countries demand that recipient countries build procurement capacities and meet requisite standards on efficiency and probity as necessary conditions for disbursing foreign aid. Quality of bureaucracy significantly influences PPP outcome; equally effectiveness of developing country's governments shrinks the negative nexus between risk allocation and private investment (Lee *et al.*, 2018). Simeon and Nicaise (2018) and Lubbad (2019) claimed that bureaucratic efficiency and independence as quantum components of good governance institutions Granger cause PPP performance to increase, consequently leading to a positive effect on investments. Unit (2017) found that countries characterised by effective government finances, subsidies and effective financial facilities such as highly liquid money/capital markets enhance their capacity to meet their obligation to deepen the private sector participation in investment.

Wang *et al.* (2019) said the quality of regulation in developing nations could reduce the negative relationship between risk allocation and private investment. PPP investment in infrastructure is highly sensitive to regulatory quality (Moszoro *et al.*, 2015). Acemoglu and Robinson (2010) found that the growth and development of countries are based on the quality of institutions, which is a reflection of good practices manifesting through property rights protection; and then decreases the impact of investment on economic growth. Mudassaar *et al.* (2019) argued that ineffective institutions with very weak governance lack property rights protection and protection from human and physical capital investment. Panayides *et al.* (2015) asserted that quality of regulation is a determinant of PPP investment in ports

that attracts private bidders and the market competitiveness of the ports, while Baker (2016) documented that regulatory quality has a positive impact on PPP private investor markets irrespective of the level of uncertainty in the exchanged environment. Pérez-D'Oleo *et al.* (2015) found that countries with sound regulatory quality attract a reasonable proportion of investment through PPP projects. Countries characterised by the high quality of regulation gain a 3% increase in infrastructure investments (Moszoro *et al.*, 2015).

Moszoro *et al.* (2015) argued that there is a possibility that the private sector would invest 4% more in infrastructure if there is continuous enforcement of the rule of law in countries. Wang *et al.* (2019) said that proper enforcement of the rule of law in developing countries declines the negative association between risk allocation and private investment. Law and order have a direct impact on PPP outcomes (Lee *et al.*, 2018). Moszoro *et al.* (2015) concluded that PPP investment in infrastructure is highly sensitive to restrictions on corruption. Osei-Kyei and Chan (2019) insisted that rampant corruption is one of the reasons for transportation projects failure across Nigeria, Mozambique and South Africa. Countries that attract a large proportion of investment in PPP projects may likely have zero tolerance for corruption (Pérez-D'Oleo *et al.*, 2015).

2.1 The negative impact of infrastructure shortfall in Sub-Saharan Africa

The lack of serviceable infrastructure has had a debilitating effect on citizens' social and economic lives at the sectoral level (Kodongo and Ojah, 2016). In the same vein, Kodongo and Ojah (2016) reported that SSA has consistently been unable to reach its growth potential due to the absence of crucial infrastructure supporting growth. The World Bank estimates that Africa's infrastructure deficit holds back its economic growth by 2% each year (WEF, 2019). There is a general lack of access to clean and safe domestic water supply in the water supply subsector, making SSA the region with the highest Diarrhoea deaths of children below five years. In 2015, out of about 5.9 million children under five who died, SSA had the highest percentage at 81 per 1,000 live births (Producer, 2016). SSA remains the region with the highest number of people without access to good drinking water (WaterAid, 2011, p. 10). In the energy subsector, the World Bank reports that the combined generation capacity of the 48 countries (800 million people) in the region is roughly the same as that of Spain (45 million people) (World Bank, 2013).

Another study in Africa shows that electricity is a key factor in the fight against poverty and in eliminating inequalities (Hall and Niekerk, 2013, p. 3). Entire SSA can only provide electricity for about 31.7% (290 out of 915 million people) of its population, and the number without access is rising (IEA, 2014). The IEA report above further asserts that the "severe shortage of essential electricity infrastructure is undermining efforts to achieve more rapid social and economic development, necessitating widespread and costly private use of backup generators running on diesel or gasoline". These diesel and gasoline generators, including wood and biomass, have adverse health and environmental impacts on the population, with whole families dying due to toxic fumes' inhalation (Oguntoke and Adeyemi, 2017).

In the road transportation subsector, the poor conditions of roads in SSA reduce the useful lifespan of vehicles, reduce the life of tyres, reduce fuel efficiency and increase maintenance costs of vehicles (Teravaninthorn and Raballand, 2008, pp. 80–81); thereby resulting in higher cost of goods and services as manufacturers transfer these costs to consumers. The rural-urban trade, which would have benefited the rural population and helped stem the rural-urban migration tide, is also affected by poor transport infrastructure. Furthermore, Inland transport costs and time delays are a much larger share of total export costs and time for landlocked countries in SSA (Christ and Ferrantino, 2009). These characteristics impact the ability of the population to benefit from the export potential in the region.

2.2 Data and empirical model

In the methodology employed in this study, the researcher introduces batteries of nonlinear panel models to capture the relationship between the impacts of country governance on PPP investment in energy using quantitative panel data. Two strands of data were adopted in this study, namely data relating to PPP investment in energy and those collected with the proxies for good governance. The PPP energy investment data are sourced from private participation in infrastructure (PPI), reported by the Independent Evaluation Group (Independent Evaluation Group, 2016). IEG provides outcomes for different rating sectors, including energy and mining, transport, agriculture and rural development, social protection, environment, water, global communication technology, financial and private sector development. Recently, many studies such as Baker (2016), Durakoğlu (2011), Moszoro *et al.* (2015), Somma and Rubino (2016) and Koala (2020) employed these data. However, the study focuses on energy investment data collected on 13 countries in SSA from 2015 to 2020. In respect to this study, this variable was used as the response variable, while in the studies of Baker (2016) and Koala (2020), investment in transportation was the dependent variable. These studies looked at the absolute value of the investment, but this research has a different perspective by examining investment in the real form and as well, in the growth rate form. This adjustment enables us to provide additional information on the inconsistency in the energy investment participation by the private sector.

In analogous to Koala (2020), though with a different sample size, good governance was proxied with six indicators: voice and accountability, the rule of law, control of corruption, government effectiveness, political stability and regulatory quality. Since SSA countries are poorly rated in all these indicators, it has become a phenomenon to envisage the extent to which these indices have influenced PPI in energy in the empirical history. In the nearest past, Pérez-D'Oleo *et al.* (2015) and Wang *et al.* (2019) employed these data to examine the causality of the institutional environment to PPP investments in 80 middle- and low-income countries from the period 1996–2011. This infers that the choice of variables in this research work is overwhelmingly consistent with the existing literature. Data were sourced from the Worldwide Governance Indicators (WGI) database over the period 2015 to 2020 on thirteen SSA countries with the largest size of energy supply. However, sample size would have been increased, but data on some countries were either scanty or not readily available. This is because SSA countries are seemingly experiencing an acute shortage in the flow of investment to their energy subsector (Ackah-Baidoo, 2016). Based on the descriptive statistic results, these variables are described in Table 1 as follows:

The average investment in energy for all of these countries is the United States (US) \$41,200,000,000 (41 billion, two hundred million US dollars). This is rather too small for a population size of approximately 499,251,753 (Four hundred and ninety nine million, two

Variable	Observation	Mean	Standard deviation	Minimum	Maximum
Invenergy	78	4.12e+08	7.56e+08	567,000	4.31e+09
Control of corruption	78	−0.59	0.55	−1.45	0.64
Government effectiveness	78	−0.60	0.50	−1.30	0.72
Political stability	78	−0.44	0.60	−2.00	0.21
Regulatory quality	78	−0.49	0.40	−1.25	0.28
Rule of law	78	−0.48	0.43	−1.28	0.25
Voice and accountability	78	−0.36	0.58	−1.29	0.75

Table 1.
Output of the descriptive statistics

Note(s): Our sampled countries are Angola, Gabon, Ghana, Madagascar, Mozambique, Nigeria, Rwanda, Senegal, South Africa, Sudan, Tanzania, Togo and Uganda, with a total population of 499,251,753 in 2020
Source(s): Output of STATA 16

hundred and fifty onethousand and seven hundred and fifty-three). Meaning that for the six
years (2015–2020), the average PPP investment in energy per head is about $83. Though this
investment increased during the period, the standard deviation is too high, suggesting a high
rate of uncertainty in the flow of PPI in energy to these countries. The negative average value
of the country governance factors shows that none of these countries has strong governance.
A correlation matrix to show if collinearity exists is presented in Table 2 hereunder.

In view of the correlation matrix, there is evidence of a weak correlation between each pair
of the country governance factors, which are used as the explanatory variables for this study.
This suggests that there is no potential multicollinearity problem. However, other
endogeneity problems and biasness may be due to unobserved heterogeneity and a small
number of the time dimension. In this study, the time dimension is less than 25 observations,
which allows the fixed effects (FE) model and the associated Within Group (WG)
transformation that eliminates the heterogeneity. In the spirit of Koala (2020), with
modification to panel setting and under the FE assumption, the specification can be
defined as:

$$invenergy_{it} = \alpha_0 + \alpha_1 ccrpt_{it} + \alpha_2 goveff_{it} + \alpha_3 polstb_{it} \\ + \alpha_4 regqlt_{it} + \alpha_5 rlaw_{it} + \alpha_6 voiacbt_{it} + \mu_i + w_{it} \tag{1}$$

$$< invenergy_{it} = a_0 + a_1 cc()rpt_{it} + a_2 goveff_{it} + a_3 polstb_{it} \\ + a_4 regqlt_{it} + a_5 rlaw_{it} + a_6 voiacbt_{it} + v_i + u_{it} \tag{2}$$

where, invenergy-investment in energy, $<$ invenergy- growth rate of investment in energy,
ccrpt-control of corruption, govef-government effectiveness, polstb-political stability,
regqlt-regulation quality, rlaw-rule of law, voiacbt-voice and accountability μ-unobserved
heterogeneity, and w-unobserved white noise. It is assumed that the white noise term is
normally distributed with zero mean and constant variance ($w \approx N(0, \delta^2)$), while the specific
error is correlating with the covariates, a potential endogeneity, which was removed by the
WG transformation. The result of the WG method is summarised in Table 3.

3. Results
The focus of this paper is to test whether the existing phenomenon that country governance
has a positive impact on investment. To confirm this assertion, fixed effects model was first
ran for the six-country governance indicators, but to increase the degree of the model fitness,
three of the indicators were removed, control of corruption, government effectiveness and
political stability, which have a negative impact on PPP energy investment. After this
preliminary adjustment, the model's absolute fitness has improved and become statistically
significant at 10%. The results of the well-fitted model reveal positive coefficients for voice

Variable	Corruption	Effectiveness	Politics	Regulation	Law	Voi/acct	Cons
Corruption	1.00						
Effectiveness	0.43	1.00					
Politics	0.08	−0.04	1.00				
Regulation	0.43	0.28	−0.22	1.00			
Law	−0.54	−0.24	−0.06	−0.42	1.00		
Voi/acct	−0.39	−0.57	−0.17	−0.22	−0.10	1.00	
Cons	0.71	0.63	−0.01	0.63	−0.16	−0.37	1.00
Source(s): Output of STATA 16							

Table 2.
Pairwise correlations
output

Response variable	(1) Investment in energy	(2) Investment in energy
Control of corruption	−0.07 (0.06)	−
Government effectiveness	−0.03 (0.04)	−
Political stability	−0.01 (0.02)	−
Regulatory quality	−0.06 (0.05)	−0.04 (0.04)
Rule of law	0.06 (0.06)	0.01 (0.05)
Voice and accountability	0.14*** (0.06)	0.11*** (0.05)
Cons	0.89** (0.04)	0.93** (0.03)
Observation	78	78
R-squared	0.11	0.14
F-stat (p-value)	1.51 (0.19)	2.56* (0.06)
Number of panels	13	13

Note(s): [a]standard error in parentheses; *$p<10\%$; **$p<5\%$; ***$p<1\%$; FE Fixed Effects
Source(s): Output of STATA 16

Table 3.
Invenergy (investment in Energy)[a] FE model results

and accountability, the rule of law and the negative coefficient for regulation quality. This means that energy investment can be boosted through improvement in the rule of law, accountability and recognition of the voice of the people. The inflow of investment to the energy sector and the participation of private firms in engaging with the government in this sector is directly influenced by country governance in the selected SSA countries. Less of regulation is required to increase the inflows of investments to the energy sector. Over repressed system is an upshot of expansionary regulation, which is capable of offsetting the volume of investment in the energy subsector. Therefore, it was confirmed that excessive regulation is counterproductive to economic reality in the energy sector of the SSA countries. It may lead to delays in inflows or outright impediments, thereby lowering the volume of investments.

Unlike Koala (2020), this study subsequently examines the impact of these indicators on the investment growth rate. Meaning that the tractability to provide additional information already unexploited in the literature. The poor growth rate of investments in this sector, particularly in SSA countries where many countries do not receive any PPP investments in energy, urgently requires this investigation. The results of this study investigation are reported in Table 4.

Response variable	Growth rate of investment in energy
Control of corruption	−0.10 (0.10)
Government effectiveness	0.08 (0.16)
Politicalstability	0.09 (0.08)
Regulatory quality	−0.15 (0.19)
Rule of law	−0.06 (0.22)
Voice and accountability	0.02 (0.22)
Cons	−0.06 (0.16)
Observation	77
R-squared	0.01
F-stat (p-value)	0.56 (0.76)
Number of panels	13

Note(s): [a]standard error in parentheses; FE Fixed Effects
Source(s): Output of STATA 16

The energy investment growth rate FE model fitted for the selected SSA countries apparently shows different results. This has clarified a puzzle on the link between the volume of investment and governance, the growth rate of investment and governance. These results show that government effectiveness, political stability and voice/accountability directly correlate with PPP investment in energy. Thus, an increase in government effectiveness, political stability, voice and accountability projects the possibility of attracting investment inflows to the energy sector. On the contrary, it was established that the rule of law in SSA countries does not positively influence the growth rate of investment in energy. With the laggard rate of development in SSA, the rule of law and regulation quality are not-significant and positive factors in determining investment growth rate.

The FE model adopted in this study does have the potential to deal with reverse simultaneity or endogeneity; meaning that it is subjected to omit variable bias. According to Kiviet (1995), FE suffers from small sample bias. This is why Kiviet initiated the least squares dummy variable (LSDV) bias-corrected method for small T. In 2021, Breitung, Kripfganz and Hayakawa identified the bias-corrected method for Nickell bias (Nickell, 1981), also known as dynamic panel data bias. This method systematically corrects the first-order condition of the FE estimator. The second merit of this technique is that formula of the asymptotic variance-covariance matrix for the calculation of standard errors is readily available, unlike the bias-corrected estimator by Kiviet (1995) that depends on the command developed by Bruno (2005). In this study, the Kiviet bias-corrected method and the dynamic panel bias-corrected technique of Breitung *et al.* (2021) were adopted to deal with the FE model's small sample bias and Nickell bias. Finally, this study employed the bootstrap-based bias correction for FE. Thus, the estimation model follows a first-order autoregressive equation with a vector of covariate defined as:

$$invenergy_{it} = a_0 + a_1 invenergy_{it-1} + a_2 cc()rpt_{it} + a_3 goveff_{it} + a_4 polstb_{it}$$
$$+ a_5 regqlt_{it} + a_6 rlaw_{it} + a_7 voiacbt_{it} + u_i + v_{it}$$

(3)

This equation is estimated based on the Kiviet bias correction method using the initialisation of Anderson and Hsiao (AH), Arellano and Bond (AB) and Blundell and Bond (BB), the dynamic panel bias correction and the bootstrap-based bias correction techniques. The results are reported in Table 5 below:

The Sargan test and autocorrelation test results yielded by the BBC method reveal that the instruments are exogenous and linearly independent. The coefficients of the BBBC are closer to those of AH, AB and DPBC than the BBC. The BBC method yielded the smallest coefficients for the regressors. While all other methods report positive signs for voice and accountability, it provides negative signs. This means there is overwhelming evidence that a government with highly accountable dominance and that listens to the voice of the people attracts PPP investment in energy. The higher the dominance and listening preference, the more the volume of investments and the degree of participation in PPP investments by private firms. The rule of law is another component of the country's governance that consistently has a positive sign for the five methods. The findings of this study cannot debunk the seemingly established evidence that the rule of law positively determines PPP investment. The five bias-corrected methods consistently hold the ground that control of corruption, government effectiveness and regulatory quality does not have *a priori* sign since they fail to support the argument that country governance positively drives PPP investment in energy. The descriptive statistics show that these indicators are too low in SSA countries, so there is no way they can positively contribute to PPP investment. For example, in most SSA countries, all media put in place to checkmate corruption are also corrupt, resulting in very low control of the corruption index, which cannot positively influence investment.

Regressors	AH	AB	Kiviet-bias correction		
			BB	DPBC	BBBC
Log invenergy(−1)	0.02 (0.15)	0.02 (0.15)	0.96*** (0.03)	−0.11 (0.11)	−0.13 (0.23)
Control of corruption	−3.30*** (1.31)	−3.29*** (1.31)	−0.11 (0.44)	−3.19*** (1.00)	−2.10 (6.75)
Government effectiveness	−2.05** (1.00)	−2.05** (1.00)	0.19 (0.56)	−0.90 (1.00)	−0.65 (2.3)
Political stability	−0.004 (0.47)	−0.005 (0 0.47)	−0.09 (0.21)	−0.09 (0.13)	0.09 (2.11)
Regulatory quality	−2.57** (1.23)	−2.57** (1.22)	−0.60 (0.70)	−3.00*** (0.78)	−2.26 (7.67)
Rule of law	2.7** (1.49)	2.74* (1.48)	0.23 (0.65)	3.40*** (1.12)	2.60 (2.30)
voice and accountability	4.40*** (1.5)	4.41*** (1.54)	−0.04 (0.20)	4.23*** (1.02)	4.23 (6.18)
Observation	65	65	65	65	65
AR2 (p-value)			−0.28 (0.17)		
Sargan (p-value)			9.15 (0.42)		
Number of panels	13	13	13	13	13

Note(s): [a]Standard error in parentheses; FE Fixed Effects; *p < 10%; **p < 5%; ***p < 1%; DPBC Dynamic Panel Bias Correction; BBBC Bootstrap-Based Bias Correction

Source(s): Output of STATA 16

Table 5.
invenergy (investment in Energy)[a] bias correction to FE model results

4. Conclusion and policy implication

In this study, six methods were employed to confirm the existing empirical findings on the impact of governance on PPP investment. With this, a better explanation of this phenomenon than some existing studies can be established. For example, Koala's (2020) study is based on cross-sectional regression, which definitely lacks the information provided by the panel model. Even those studies that adopted panel data models, such as Alshubiri *et al.* (2019), did not account for bias correction to FE. Conversely, bias correction methods have been applied, particularly the recent DPB correction technique introduced by Breitung *et al.* (2021). A conclusion-based on the outputs of these techniques is made. First, it was concluded that the media used in controlling corruption in SSA countries are, on average, very weak, and consequence of this low standard of controlling corruption, PPP investments cannot be attracted to a considerable magnitude to foster development. This position was conceived in the study of Osei-Kyei and Chan (2019). They established that rampant corruption has led to failure in transportation projects in Nigeria, Mozambique and South Africa. Second, a high degree of preference for the rule of laws through appropriate enforcement measures provides a benchmark for effective mobilisation of investments in SSA countries' energy sector. This conclusion is in tandem with the studies of Moszoro *et al.* (2015), and Wang *et al.* (2019) said that accurate enforcement of the rule of laws in developing countries declines the negative association between risk allocation and private investment. Therefore, private entities intend to participate with the governments that have regard for the rule of laws.

Furthermore, it was also concluded that Africa has a poor quality of regulation, which cannot enhance the attraction of a large volume of PPP investments continuously. This accedes to Pérez-D'Oleo *et al.* (2015), which argued that countries with sound regulatory quality attract a reasonable proportion of investment, and Moszoro *et al.* (2015) claimed that high quality of regulation makes countries gain a 3% increase in infrastructure investments. Finally, the findings of this research concluded that voice and accountability are potent factors in SSA countries, and to a considerable extent, it facilitates the attraction of PPP investment. It is commendable that the governments of SSA countries should know the major problem is not the poor state of infrastructure, which ranges from severe starvation to bad road network, absence of pipe borne water, joblessness and inadequate power supply is lack of zero tolerance for corruption. All the anti-corruption systems are grossly dysfunctional and manipulated by minority god-fathers in the political palace. The governments need to introduce a new anti-corruption policy that will disentangle the anti-corruption agents from external control and be an independent government organ whose members should be selected from the patriotic citizens with landmark traits of sincerity. Meaning that recruitment to this organ should not be limited to people looking for jobs but to people who have jobs. There is evidence that they had served are serving meritoriously, with an unabated degree of passion. The column for hate speech should be abolished, people's voices should be heard and government should stop expropriating the media through which people's voices could be heard; they should accommodate protect and freedom of speech in respective of the personality. On a regular basis, a serving government should give an account of its stewardship while still in office, and such should be in the gazette for public scrutiny. Therefore, the judicial arm should stop celebrating the self-centred policy that allows an offer for funds, with a little amount, to an individual who drains the government purse and condemns the poor criminals to jail without an offer for funds. This policy is counterproductive and only designed to enrich the unscrupulous members of the judicial system.

References

Acemoglu, D. and Robinson, J.A. (2010), "Why is Africa poor?", *Economic History of Developing Regions*, Vol. 25 No. 1, pp. 21-50.

Ackah-Baidoo, P. (2016), "Youth unemployment in resource-rich Sub-Saharan Africa: a critical review", *The Extractive Industries and Society*, Vol. 3 No. 1, pp. 249-261.

Alam, M.R., Kiterage, E. and Bizuayehu, B. (2017), "Government effectiveness and economic growth", *Economic Bulletin*, Vol. 37 No. 1, pp. 222-227.

Alshubiri, F., Jamil, S.A. and Elheddad, M. (2019), "The impact of ICT on financial development: empirical evidence from the Gulf Cooperation Council countries", *International Journal of Engineering Business Management*, Vol. 11, pp. 1-14.

Andersen, E. and Piccone, T. (2019), "The meaning, measuring, and mattering of the rule of law", *United States Attorneys' Bulletin*, Vol. 67, p. 103.

Baker, N.B. (2016), "Transaction costs in public–private partnerships: the weight of institutional quality in developing countries revisited", *Public Performance and Management Review*, Vol. 40 No. 2, pp. 431-455.

Breitung, J., Kripfganz, S. and Hayakawa, K. (2021), "Bias-corrected method of moments estimators for dynamic panel data models", *Econometrics and Statistics*, (2021).

Bruno, G.S.F. (2005), "Estimation and inference in dynamic unbalanced panel-data models with a small number of individuals", *Stata Journal*, Vol. 5 No. 4, pp. 473-500.

Casady, C.B., Eriksson, K., Levitt, R.E. and Scott, W.R. (2019), "(Re) assessing public–private partnership governance challenges: an institutional maturity perspective", *Public–Private Partnerships for Infrastructure Development*, Edward Elgar Publishing.

Chou, J.S., Tserng, H.P., Lin, C. and Yeh, C.P. (2012), "Critical factors and risk allocation for PPP policy: comparison between HSR and general infrastructure projects", *Transport Policy*, Vol. 22, pp. 36-48.

Christ, N. and Ferrantino, M.J. (2009), *Land Transport for Exports: The Effects of Cost, Time, and Uncertainty in Sub-saharan Africa*, US International Trade Commission, Washington, DC.

Debela, G.Y. (2019), "Critical success factors (CSFs) of public–private partnership (PPP) road projects in Ethiopia", *International Journal of Construction Management*, Vol. 22 No. 3, pp. 489-500.

Durakoğlu, S.M. (2011), "Political institutions of electricity regulation: the case of Turkey", *Energy Policy*, Vol. 39 No. 9, pp. 5578-5587.

Eberhard, A. and Gratwick, K. (2013), "Investment power in Africa: where from and where to", *Georgetown Journal of International Affairs*, Vol. 14, p. 39.

Economist Intelligence Unit (2017), *Global Food Security Index 2017: Measuring Food Security and the Impact of Resource Risks*, The Economist Intelligence Unit, London.

Graham, J., Plumptre, T.W. and Amos, B. (2003), *Principles for Good Governance in the 21st Century*, Institute on governance, Ottawa.

Hall, D. and Niekerk, S.V. (2013), *Overview of Energy in Africa*, Public Services International Research Unit (PSIRU), Business School, University of Greenwich, London.

Hodge, G. and Greve, C. (2018), "Contemporary public–private partnership: towards a global research agenda", *Financial Accountability and Management*, Vol. 34 No. 1, pp. 3-16.

IEA (2014), *Africa Energy Outlook: A Focus on Energy Prospects in Sub-saharan Africa*, The International Energy Agency (IEA), France.

Independent Evaluation Group (2016), *World Bank Group Engagement in Situations of Fragility, Conflict, and Violence*, World Bank, Washington, DC.

Keping, Y. (2018), "Governance and good governance: a new framework for political analysis", *Fudan Journal of the Humanities and Social Sciences*, Vol. 11 No. 1, pp. 1-8.

Kirikkaleli, D. and Adebayo, T.S. (2021), "Do public-private partnerships in energy and renewable energy consumption matter for consumption-based carbon dioxide emissions in India?", *Environmental Science and Pollution Research*, Vol. 28 No. 23, pp. 30139-30152.

Kiviet, J.F. (1995), "On bias, inconsistency, and efficiency of various estimators in dynamic panel data models", *Journal of Econometrics*, Vol. 68 No. 1, pp. 53-78.

Koala, K. (2020), "Governance impact on public-private partnerships for member countries of the World Bank Group", Doctor of Philosophy (PhD), Dissertation, School of Public Service, Old Dominion University, Norfolk, VA, doi: 10.25777/dmzz-gf28.

Kodongo, O. and Ojah, K. (2016), "Does infrastructure really explain economic growth in SubSaharan Africa?", *Review of Development Finance*, Vol. 6 No. 2, pp. 105-125.

Lee, M., Han, X., Quising, P. and Villaruel, M.L. (2018), "Hazard analysis on public–private partnership projects in developing Asia", Asian Development Bank Economics Working Paper Series, (548).

Leigland, J. (2018), "Public-private partnerships in developing countries: the emerging evidence-based critique", *The World Bank Research Observer*, Vol. 33 No. 1, pp. 103-134.

Lubbad, M.M.M. (2019), "The impact of official development assistance, foreign direct investment, and remittances on economic growth in selected MENA countries", Doctoral Dissertation.

Moszoro, M.W., Araya, G., Ruiz Nunez, F. and Schwartz, J. (2015), "Institutional and political determinants of private participation in infrastructure", available at: SSRN 2508474.

Mudassaar, K., Khan, R.E.A. and Aziz, B. (2019), "Corruption and economic growth nexus: do institutions matter?", *Pakistan Journal of Social Sciences*, Vol. 39 No. 2, pp. 627-638.

Muhammad, Z. and Johar, F. (2019), "Critical success factors of public–private partnership projects: a comparative analysis of the housing sector between Malaysia and Nigeria", *International Journal of Construction Management*, Vol. 19 No. 3, pp. 257-269.

Nickell, S.J. (1981), "Biases in dynamic models with fixed effects", *Econometrica*, Vol. 49, pp. 1417-1426.

OECD (2013), "Renewable energies in the Middle East and north Africa: policies to support private investment, MENA-OECD task force on energy and infrastructure (Ania thiemann)".

Oguntoke, O. and Adeyemi, A. (2017), "Degradation of urban environment and human health by emissions from fossil-fuel combusting electricity generators in Abeokuta metropolis, Nigeria", *Indoor and Built Environment*, Vol. 26 No. 4, pp. 538-550.

Osei-Kyei, R. and Chan, A.P. (2017), "Implementing public–private partnership (PPP) policy for public construction projects in Ghana: critical success factors and policy implications", *International Journal of Construction Management*, Vol. 17 No. 2, pp. 113-123.

Osei-Kyei, R. and Chan, A.P. (2019), "Model for predicting the success of public–private partnership infrastructure projects in developing countries: a case of Ghana", *Architectural Engineering and Design Management*, Vol. 15 No. 3, pp. 213-232.

Panayides, P.M., Parola, F. and Lam, J.S.L. (2015), "The effect of institutional factors on public–private partnership success in ports", *Transportation Research Part A: Policy and Practice*, Vol. 71, pp. 110-127.

Parker, D.W., Dressel, U., Chevers, D. and Zeppetella, L. (2018), "Agency theory perspective on public-private-partnerships: international development project", *International Journal of Productivity and Performance Management*, Vol. 67 No. 2, pp. 239-259.

Paterson, A.S., Changwony, F. and Miller, P.B. (2019), "Accounting control, governance and anti-corruption initiatives in public sector organisations".

Pérez-D'Oleo, J., Castro, C., Herraiz, I. and Carpintero, S. (2015), "The influence of the institutional environment on public–private partnership transport projects", *WIT Transactions on the Built Environment*, Vol. 146, pp. 399-410.

WHO (Producer) (2016), *Global Health Observatory (GHO) Data: Under-five Mortality*, World Health Organisation (WHO), Washington, DC, available at: http://www.who.int/gho/child_health/mortality/mortality_under_five_text/en/.

Pusok, K. (2016), "Public-private partnerships and corruption in the water and sanitation sectors in developing countries", *Political Research Quarterly*, Vol. 69 No. 4, pp. 678-691.

Sergi, B.S., Popkova, E.G., Borzenko, K.V. and Przhedetskaya, N.V. (2019), "Public–private partnerships as a mechanism of financing sustainable development", *Financing Sustainable Development*, Palgrave Macmillan, Cham, pp. 313-339.

Simeon, A.O. and Nicaise, L.A. (2018), "Major determinants of foreign direct investment in the West African economic and Monetary region", *Iranian Economic Review*, Vol. 22 No. 1, pp. 121-162.

Soliño, A.S. and Gago de Santos, P. (2010), "Transaction costs in transport public–private partnerships: comparing procurement procedures", *Transport Reviews*, Vol. 30 No. 3, pp. 389-406.

Somma, E. and Rubino, A. (2016), "Public-private participation in energy infrastructure in Middle East and North African countries: the role of institutions for renewable energy sources diffusion", *International Journal of Energy Economics and Policy*, Vol. 6 No. 3, pp. 621-629.

Torchia, M. and Calabrò, A. (2018), "Increasing the governance standards of public-private partnerships in healthcare. Evidence from Italy", *Public Organisation Review*, Vol. 18 No. 1, pp. 93-110.

Wang, H., Liu, Y., Xiong, W. and Song, J. (2019), "The moderating role of governance environment on the relationship between risk allocation and private investment in PPP markets: evidence from developing countries", *International Journal of Project Management*, Vol. 37 No. 1, pp. 117-130.

WaterAid (2011), *Off-track, Off-Target: Why Investment in Water, Sanitation and Hygiene Is Not Reaching Those Who Need it Most*, WaterAid, New York, NY.

WEF (2019), *Global Competitiveness Index 2018-2019*, World Economic Forum (WEF), Geneva.

Wibowo, A., Permana, A., Kochendörfer, B., Kiong, R.T.L., Jacob, D. and Neunzehn, D. (2012), "Modeling contingent liabilities arising from government guarantees in Indonesian BOT/PPP toll roads", *Journal of Construction Engineering and Management*, Vol. 138 No. 12, pp. 1403-1410.

World Bank (2013), "Fact sheet: infrastructure in Sub-Saharan Africa", The World bank, available at: http://web.worldbank.org/WBSITE/EXTERNAL/COUNTRIES/AFRICAEXT/0,contentMDK: 21951811~pagePK:146736~piPK:146830~theSitePK:258644,00.html.

World Bank (2017), "Public–private partnerships: reference guide, version 3.0", available at: https:// openknowledge.worldbank.org/handle/10986/20118.

Further reading

Osei–Kyei, R. and Chan, A.P. (2016), "Developing transport infrastructure in Sub-Saharan Africa through public–private partnerships: policy practice and implications", *Transport Reviews*, Vol. 36 No. 2, pp. 170-186.

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