Are growth effects of foreign capital significant for increasing access to electricity in Africa?

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Abstract: Despite the advancements towards Sustainable Development Goal 7, access to electricity in Africa is still lagging far behind the goal. In this study, we employ a panel data covering 36 African countries from 2000 to 2017 to investigate the effects of FDI, remittances and foreign aid on access to electricity. We use a dynamic empirical model based on system GMM to control for unobserved heterogeneity and potential endogeneity of the explanatory variables. The results show that FDI and remittances matter for increasing access to electricity. Also, foreign aid reduces access to electricity. We also find that remittances reduce urban-rural disparities in access to electricity, while FDI and foreign aid increase disparities. Finally, these results remain globally robust when we perform sub-regional analyses.

Keywords: FDI, Remittances, Foreign aid, Access to electricity, System GMM, Africa

JEL Classification: F21, F24, F35, Q42

1. Introduction

The long-standing literature on foreign capital has largely focused on their effect on long-term growth (Alfaro et al., 2004; Ang, 2010; Ekanayake and Mihaalis, 2008; Khan and Ayaz, 2007; Ndambendia, 2010; Fambon, 2013; Ndambendia and Njoupouognigni, 2010; Uwaoma and Ryan, 2015; Chorn and Siek, 2017). As a consequence, little is known on how the flows of foreign capital may affect access to electricity in developing world, including African countries. The goal of this study is to fill this gap. This assessment is important for at least three main raisons. First, the number of people gaining access to electricity in Africa doubled from 9 million a year between 2000 and 2013 to 20 million people between 2014 and 2018, outpacing population growth (IEA, 2019). However, sub-Saharan Africa's electrification rate of 45% in 2018 remains very low compared with other parts of the world, particularly North Africa is electrified at more than 95%. Despite slowly rising in access to electricity, about the half of African's population (600 million people) does not have access to electricity, and if the recent rates of growth in electricity access are maintained, Africa will not meet the Sustainable Development Goal 7 (SDG-7) by 2030 "Ensure access to affordable, reliable, sustainable and modern energy for all". Besides, more than 80% of 600 million people in Africa who live without electricity are residing in rural areas.

Second, increasing access to electricity can result in improved human development and in the transformation of African economies (Kanagawa and Nakata, 2007, 2008; Ouedraogo, 2013; Sarkodie and Adams, 2020). Access to reliable electricity affects human activities, such as education, communication, health, nutrition, trade, transport, tourism and women's empowerment. In short, access to electricity is an effective tool for improving people's capabilities.

Third, access to electricity plays a critical role in the achievement of the Sustainable Development Goals 1 and 7. Owusu and Asumadu (2016) contend that human, social and economic development depend on the extent to which electricity play a crucial role in creating opportunities for income-generating activities, especially in developing countries to help mitigate multidimensional poverty. However, in spite of the development priority given to access to electricity, many developing countries have limited investment capacity to fill the investment gap.

In fact, Sub-Sahara Africa currently invests about US$8 billion a year in electricity generation and, Transmission and Distribution (T&D), equivalent to 0.5% of GDP (IEA, 2014). This level of investment is inadequate to address the electricity access deficit in Africa. Indeed, the region has under-invested for a number of years. According to the Africa Infrastructure Country Diagnostic (AICD) the annual investment requirement between 2000 and 2015 was more than the three times higher than this current investment, at US$27 billion a year (Eberhard et al., 2011). However, 15% out of this investment was used in the maintenance of existing infrastructure. Furthermore, the International Energy Agency (IEA, 2019) estimates that the amount needed to achieve universal electricity access in SSA by 2030 is about $454 billion (i.e. an average of $35 billion per year), is far beyond the capacity of Africa's public finance. An adequate regulatory framework may also help attract foreign capital to fill the gap where public funding falls short.

Indeed, to achieve SDG-7, discussions have arisen around Sustainable Development Investments (SDIs) aimed at steering foreign capital towards the achievement of the SDGs. Thus, Governments have undertaken domestic reforms to create a viable and attractive investment environment[1] to facilitate international investment in the power sector, including Foreign Direct Investment (FDI), commercial bank lending, multilateral and bilateral development assistance, etc.

Theoretically, there are several processes through which foreign capital can affect access to electricity. First, the impact of foreign capital on a host country's electricity sector is largely through capital accumulation and technology transfer that can expand the existing stock of knowledge in the host country through labour training, skill acquisition and diffusion, and the injection of new managerial practices and organisational arrangements (De Mello, 1999; Almfraji and Almsafir, 2014). Accordingly, FDI is found to expand electricity supply through positive spill-overs effect of technology and knowledge of developed-country investors into the production function of the recipient host countries industries (Borensztein et al., 1998; Liu, 2008; Liang, 2017).

Second, foreign capital tends to increase national and household incomes. Higher national income levels may lead to higher spending on infrastructure, physical and human capital accumulation, which could result in the improvement of the electric system. As household

[1] See Asiedu (2002), Jaiblai and Shenai (2019) and Nguea (2021) for more explanations on the determinants of Foreign Direct Investment.

income increases, demands for electricity and energy-related goods and services are also increasing. Furthermore, with higher income, people may invest more in their education, which would increase household's willingness to connect to electricity services. Third, foreign capital can be used to financing electric sector development in the long-run trough the build-up of new grids and solar Off-Grid solutions in order to expand access to reliable electricity, especially in rural areas.

Fourth, foreign capital may influence access to electricity through its impact on the quality of political institutions. In fact, foreign capital may result in higher disposable incomes and hence enable government and households[2] to overcome financial constraints. Higher disposable incomes for households may expand the capabilities, which would empower the citizens to pressure politician for an improvement in political institutions (Williams, 2017; Deonanan and Williams, 2017). Meanwhile, the volume of foreign capital inflows may also serve as constraints on the political leader, and hence improve political institutions (Altincekic and Bearce, 2014; Jones and Tarp, 2016; Kim). Besides, some scholars argue that democratic governments tend to provide more public good (Deacon, 2009; Lake and Baum, 2001). For instance, Ahlborg et al. (2015) find that democracy and institutional quality have significant positive effects on provision of electricity to African households.

In light of the above arguments, this study aims to investigate the effects of foreign capital on access to electricity in African countries for the period from 2000 to 2017. The study contributes to the literature in the following ways. First, as far we know, no previous studies have examined foreign capital as a determinant for increasing access to electricity in Africa. Second, to measure foreign capital inflows, we use FDI, foreign aid and remittances, which allows for investigating the effects of these three different sources of foreign capital on access to electricity. The reason for concentrating on these three forms of foreign capital inflows is that, they constitute the most significant sources of foreign capital in African economies (African Development Bank, 2020). Third, according to Blimpo and Malcom (2019) that highlight evidence of large disparities between urban and rural areas in access to electricity, this study also investigates the effects of foreign capital on the urban-rural disparities in access electricity.

[2]Acemoglu and Robinson (2006) suggest that middle-class people are more likely to support democratic institutions because democratic institutions protect private property and encourage private investment.

The rest of the study is organized as follows: Section 2 describes the data, while Section 3 presents the empirical methodology. Section 4 presents the empirical results followed by the conclusion in Section 5.

2. Data

This paper uses an unbalanced panel of 36 African countries[3], covering the period from 2000 to 2017. The time frame and scope of inquiry adopted are justified by the availability of relevant data. This section briefly describes the variables and related data sources.

We use two dependent variables in this study. The first variable is access to electricity defined as the percentage of the population (total, urban and rural) with access to electricity provided by national, industry surveys and renowned international databases (World Bank, 2020). The second variable is disparity measured as the difference in access to electricity between urban and rural areas. The data for access to electricity come from World Development Indicators (WDI, 2020) of the World Bank.

The main independent variable is foreign capital measured by personal remittances, foreign direct investment and foreign aid. Personal remittances (% GDP) are the sum of three elements: personal current and capital transfers between resident and non-resident households and compensation of employees, less taxes and social contributions[4]. FDI is measured by FDI net inflows, that is, the sum of equity capital, reinvested earnings, long-term capital, and short-term capital as shown in the balance of payment. We use in this study the ratio of FDI net inflows over GDP. Foreign aid is the "Net official development assistance received" which is defined as the disbursement flows (net of repayment of principal) that meet the DAC definition of ODA and are made to countries and territories on the DAC list of aid recipients (percentage of Gross National Income (GNI)). Data on foreign capital were derived from WDI (2020).

To address the widely known potential of omitted variables bias, several control variables are included in the specified empirical model: GDP per capita, crude oil prices, population growth, and the quality of political institutions. GDP per capita accounts for economic development. As GDP per capita increases, households are willing to invest in access to electricity. Crude oil price controls for energy price[5]. We mainly expect that electricity access decreases as the energy price rises because the latter increases inflation and reduces economic

[3] Table A1 provides a list of countries in the sample.
[4] For a technical definition of remittances and their computation see International Monetary Fund (2009).
[5] Sources: International Energy Agency and Inflationdata.com.

growth and the household purchasing power. Population growth is employed to accounting for demographic structure and changes in demand for access to electricity. In fact, increased population growth increases the pressure on available economic and government's social welfare spending, thus reducing the government's capacity and commitment to providing social services.

The quality of political institutions is measured by the polity2 variable. This index captures a competitiveness of political participation, the openness and competitiveness of executive recruitment and the extent to which the head of the state is subject to constitutional constraints. The polity2 variable ranges from -10 (strongly autocratic) to +10 (strongly democratic). We expect an enhancing effect of the institutional quality on access to electricity.

While data on economic development, demographic structure are retrieved from the World Development Indicators (WDI, 2020), those on polity2 are from the Polity IV dataset developed by Marshall and Jaggers (2002).

The descriptive statistics of the different variables used in the empirical analysis are given below in Table 1. It comes out of the Table that, on average, 41% of the population has access to reliable electricity. There are also disparities between urban and rural population. On average, only about 27% of the rural population in Africa has access to electricity, compared with 67.6% of the Africa's urban population.

Over the recent decades, African governments and international community have undertaken efforts to reform economic, social and political environments in order to increase the receipt of international capital flows with the main aim of enhancing economic development. Table 1 shows that the average level of FDI inflows (% GDP) for the sample is 3.616; the maximum (57.837), is recorded in Seychelles in 2012. The average remittance inflows for the sample is 3.338 (% GDP) and Lesotho registered the maximum value (53.826) in 2000. Looking at the foreign aid variable, the average flows of net official development assistance received in the sample is 7.038 (% GNI) and the maximum (49%) belonged to Mozambique in 2002.

"Please insert Table 1 here"

Figure 1 below plots the relationship between the average values of FDI, remittances and foreign aid, and the share of total population that has access to electricity for the sample of 36

African countries. The relationships between foreign capital and access to electricity are quite scattered across the various levels of the three forms of foreign capital and access to electricity. The scatterplots in Fig. 1 clearly show that higher levels of FDI inflows are associated with increases in access to electricity, while foreign aid and remittances are negatively correlated with access to electricity. However, it remains essential to use econometric analyses to investigate the relationship between foreign capital and access to electricity.

"Please insert Figure 1 here"

3. Empirical Strategy

The first model that is used aims at assessing the effect of foreign capital on access to electricity. It is specified as follows.

$$Access_{it} = \theta + \delta_1 Access_{it-1} + \delta_2 FC_{it} + \delta_3 X_{it} + \mu_t + \varphi_t + \omega_{it} \quad (1)$$

In Equation (1) the subscripts i and t denote the country and time. $Access$ is the share of the population (total, rural and urban, alternatively) that has access to electricity, FC stands for foreign capital variables, X is a vector of control variables consisting of determinants of access to electricity, namely GDP per capita, energy price, population growth, polity2 of political institutions, μ_t is a term that accounts for unobserved country-specific factors, φ_t is time specific effect and ω_{it} is a random error term.

The second model specified aims at investigating the impact of foreign capital on urban–rural disparities in access to electricity. It is specified as follows.

$$Disparity_{it} = \theta + \delta_1 disparity_{it-1} + \delta_2 FC_{it} + \delta_3 X_{it} + \mu_t + \varphi_t + \omega_{it} \quad (2)$$

Where $Disparity$ is the difference in access to electricity between the urban and rural areas. The other terms and symbols are unchanged. Moreover, foreign capital helps to reduce disparity if $\delta_1 < 0$. Otherwise, it increases it. We estimate the models (1) and (2) for Sub-Saharan African countries to account for heterogeneity that may be driving our results. As indicated above, access to electricity varies across Africa's sub-regions.

Estimation technique is choosing according to the relationships being investigated among the variables, sample size and the time frame. The presence of the lagged dependent variable in combination with the time invariant unobserved heterogeneity (μ_t) in equations (1) and (2) may lead to the random disturbances and create endogenous problems. Using static estimation approaches (OLS, random effects and fixed effects models) do not deal with these

endogeneity issues. That is why we use the System Generalized Method of Moments estimator (System GMM) because it addresses potential problems associated with endogeneity of regressors (Arellano and Bover, 1995; Blundell and Bond, 1998).

Furthermore, the consistency of the GMM estimator depends on the validity of the assumption that the error term does not exhibit autocorrelation of residuals (AR (2)). Then, the AR (2) and the Hansen test of the jointly valid instruments are performed. Too many instruments can severely weaken and bias the Hansen over-identifying restrictions test, and therefore, the rule of thumb is that the number of instruments should be less than the number of countries (Roodman, 2009).

4. Results

The estimated results of the relationship between foreign capital and access to electricity, along with some other control variables toward access to electricity increase in Africa are reported in Tables 2-5. Sub-section 4.1 reports the estimation results of the effects of foreign capital on the share of total population that has access to electricity. Sub-section 4.2 considers the effects of foreign capital on the urban and rural population with access to electricity, while sub-section 4.3 presents the effects of foreign capital on urban-rural disparities in access to electricity.

In all the Tables, the first three columns show the results for the full sample of 36 African countries, while the last three columns present the estimation outcomes in SSA countries (columns (4), (5) and (6)). Furthermore, the columns (1) and (4) show the results with FDI, the following columns (2) and (5) give the remittances results while the last columns (3) and (6) present the estimation results with foreign aid.

Prior to the discussion of results from our estimations, we would like to observe that all p-values of AR (2) are greater than 0.05, suggesting that the hypothesis of no second-order of serial correlation is accepted, and thus higher other tests are not required. Moreover, The Hansen test fails to reject the hypothesis of jointly valid instruments for all estimated models. Hansen J test also confirms the goodness of fit of all models. Similarly, the estimated results are consistent for interpretation.

4.1 The Effects of foreign capital on total access to electricity

Table 2 below presents the basic results of the effects of FDI, remittances and foreign aid for the full sample and sub-sample. For the full sample, the estimated coefficients of FDI

and remittances are positive, and statistically significant, meaning that, increases in the inflows of FDI and remittances are associated with an increase in the share of total population that has access to electricity in Africa. These results support the hypothesis that inward FDI provides African countries access to get advanced technologies, which can lead to improve the quality of electricity supply, while remittances increases the household income which could increase the demand for electricity.

The results also show that foreign aid is significantly and negatively correlated with total access to electricity; suggesting that foreign aid tend to worsening total access to electricity. The negative coefficient of foreign aid is in line with the theory that contends that foreign aid flows of developing countries may negatively affect economic development because this distorts domestic income distribution or encourages a less efficient and more corrupt government (Khan and Ahmed, 2007). Akin to the full sample estimates (Columns (1), (2) and (3)), the results for the SSA sample are qualitatively similar. FDI and remittances positively and significantly affect access to electricity, while the effect of foreign aid is negative and statistically significant.

Regarding the control variables, GDP per capita is positively associated with the share of total population with access to electricity, suggesting that countries experiencing higher economic progress are also those with higher share of the population that has access to electricity. These results are in accordance with those previously found, namely by Ahlborg (2015) who established a positive and significant link between GDP per capita and provision of electricity. With regards to energy price, the results reveal that, as the price of energy increases, access to electricity decreases (negative and significant coefficient). In fact, as expected, higher oil price may drive the electricity price upward, then contributing to exclude poor households from access to this important service

Our estimates also show that the access rate to electricity is likely to decline in countries with higher population growth rate. The results also show that the effect of the quality of political institutions is mixed. In fact, the polity2 variable has a positive and significant effect when FDI is used, while its effect is negative and significant on access to electricity when the variable remittances is used as foreign capital measure. Therefore, one cannot determine whether quality of political institution is ‘good’ or ‘bad’ for access to social services. In fact, a country with ‘bad’ government could design and implement a specific policy in favours of

access to electricity. Finally, the coefficients of the lagged dependent variables, which capture the initial levels of access to electricity, are positive and significant, revealing the persistence of access to electricity over time.

"Please insert Table 2 here"

4.2. Linking foreign capital to access to electricity in urban and rural areas

Tables (3) and (4) hereunder show the results of the effect of foreign capital on rural and urban population with access to electricity. Table (3) shows the results of the effects of foreign capital on access to electricity in rural areas, while Table (4) reports results of the link between foreign capital and access to electricity in urban areas.

The overall results from Tables (3) and (4) show that the coefficients attached to FDI and remittances are positive and statistically significant, meaning that the higher the inflows of FDI and remittances, the higher the share of rural and urban population that have access to electricity in Africa. Results for foreign aid suggest that access to electricity in rural area is lower in country that receives more foreign development assistance, while access to electricity in urban areas is increasing with greater level of foreign aid. For the sample of SSA countries, the results once again suggest that inflows of FDI and remittances increase the share of rural and urban population that have access to electricity. Regarding the foreign aid variable, the results show a negative and significant effect on access to electricity in rural areas, while its effect remains positive and significant in urban areas.

"Please insert Table 3 here"

"Please insert Table 4 here"

4.3. Does foreign capital reduce urban-rural disparities in access to electricity?

Table (5) reports the results of the effects of FDI, remittances and foreign aid on urban-rural disparities in access to electricity. The first set of results shows that the coefficients of FDI inflows are positive and significant, indicating that FDI inflows may contribute to increasing urban-rural disparities in access to electricity. In other words, FDI is more beneficial for urban area than rural area as far as access to electricity is concerned. When considering remittances, the findings suggest that remittances matter in reducing the urban-rural disparities. Hence, inflows of remittances are used for household investment purposes that promote reduction in

disparities in access to electricity in Africa. Turning to the relationship between foreign aid and urban-rural disparities, the findings seem to be revealing that foreign aid is oriented toward increasing the supply for electricity in urban areas detrimental to rural areas.

Looking at the other variables, the results show that a higher income per capita level significantly reduces the urban-rural disparities in access to electricity, while energy price increases disparities in access to electricity. Moreover, an increase in the population growth rate increases urban-rural disparities in access to electricity (See Table 5). Finally, better political institutions increase disparities in Africa; while they reduce urban-rural inequalities in access to electricity in SSA. In a democratic system, political entrepreneurs may give priority to the urban areas more populated than rural areas.

"Please insert Table 5 here

5. Conclusion

This study investigates the effects of foreign capital on access to electricity in Africa. Specifically, it examines the effects of FDI, remittances and foreign aid on access to electricity using a sample of 36 African countries for the 2000-2017 period. To the best of our knowledge, no previous study has been carried out in this region. The two-step difference GMM estimates is used to attain some interesting results. (i) Increasing inflows of FDI and remittances are likely to significantly increase access to electricity in Africa. (ii) The effects of foreign aid on access to electricity (total and rural) are negative and significant, while its effects on urban access to electricity are positive and significant. We also examine whether these forms of foreign capital contribute to reducing urban-rural disparities in access to electricity. The results show that the inflows of remittances are effective in reducing urban-rural disparities in access to electricity. However, FDI and foreign aid seem to increase urban-rural disparities in access to reliable electricity. Finally, our results suggest that the GDP per capita growth enhances access to electricity, while an increase in the energy price and the growth rate of the population are limiting factors. The effect of improved political institutions is not uniform across various estimations.

In the light of these findings, we suggest that African countries should pursue adequate reforms to create a favourable environment to international investment in the power sector by prioritizing the flows of FDI and remittances. Thus, policies to promote foreign investments

through technology and knowledge transfer, and enhance inward remittances flows should be considered as priority. African governments should provide attractive political environment as well as pertinent incentives policies that permit private investors to participating in the sector of electricity. Furthermore, policymakers should design and implement sound fiscal and monetary policies aimed at macroeconomic and relative price stability. There is also the need for the governmental authorities to encourage funds that migrants remit back to Africa. African governments should also strengthen the law and legal framework to overcome the negative effect of foreign aid that impedes the achievement of SDG7. Some policy reforms may be implemented in view of promoting access to electricity prioritizing rural areas. International organizations should go beyond financial support Africa's electrification and provide technical and political assistance that promote good governance.

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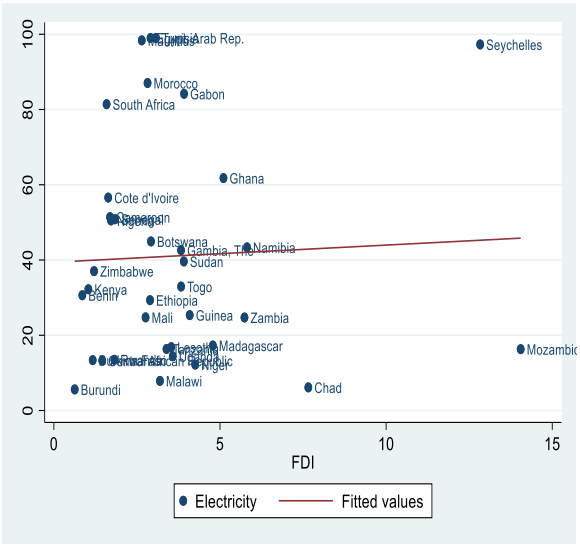
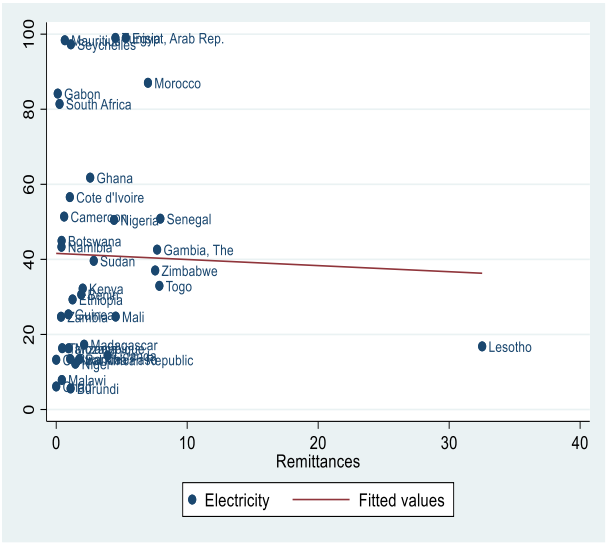
List of figures

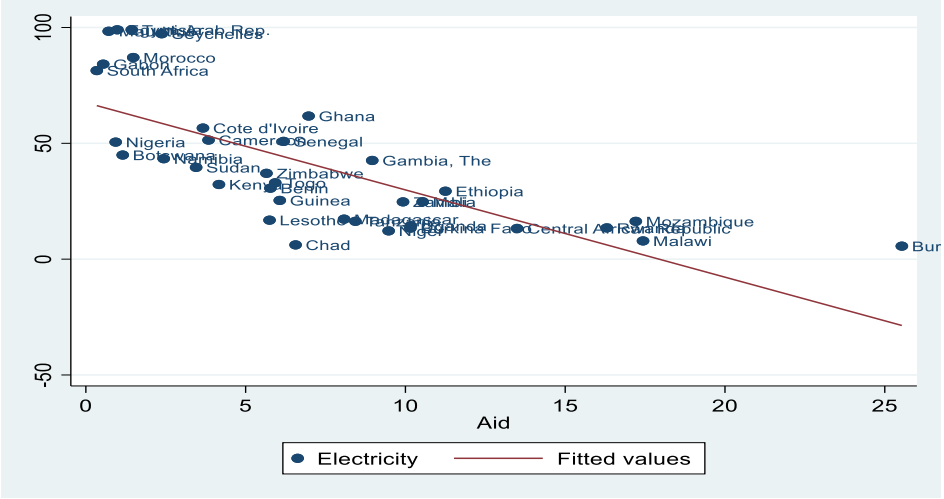
Figure 1: Electricity access and foreign capital



a) Electricity access and FDI



b) Electricity access and Remittances



c) Electricity access and Foreign aid

Source: The author

List of Tables

Appendix A

Table A1. List of countries

Benin	Botswana	Burkina Faso
Burundi	Cameroon	Central African Republic
Chad	Ivory Coast	Egypt
Ethiopia	Gabon	Gambia
Ghana	Guinea	Kenya
Lesotho	Madagascar	Malawi
Mali	Morocco	Mauritius
Mozambique	Namibia	Niger
Nigeria	Rwanda	Senegal
Seychelles	South Africa	Sudan
Tanzania	Togo	Tunisia
Uganda	Zambia	Zimbabwe

Table 1. Descriptive statistics

Variable	Measurement	Obs	Mean	Std. Dev.	Min	Max
Total Access to electricity	% total population	647	41.076	30.085	1.413	100
Rural Access to electricity	% rural population	597	27.911	31.742	0.059	100
Urban Access to electricity	% urban population	647	67.664	22.665	11.496	100
FDI	% of GDP	648	3.616	4.991	-4.845	57.837
Remittances	% of GDP	623	3.338	6.102	0	53.826
Foreign aid	% of GNI	648	7.038	6.625	-0.250	43.702
GDP per capita	US$ 2015 constant prices	648	2192.842	2764.433	194.873	14028.72
Energy price	US$	648	74.588	30.855	34.66	124.2
Population growth	%	647	2.323	0.930	-2.628	5.604
Polity2	-10 + 10 scale	624	2.363	4.859	-6	10

Table 2. The effects of foreign capital on access to electricity

	Africa			Sub-Saharan Africa		
	(1)	(2)	(3)	(4)	(5)	(6)
Access(-1)	0.974***	0.916***	0.965***	0.969***	0.930***	0.930***
	(0.006)	(0.004)	(0.004)	(0.006)	(0.005)	(0.005)
FDI	0.005***			0.006***		
	(0.001)			(0.001)		
Remittances		0.008***			0.007***	
		(0.002)			(0.002)	
Foreign aid			-0.003**			-0.010***
			(0.001)			(0.003)
GDP per capita	-0.008	0.037***	-0.003	-0.005	0.029***	0.009*
	(0.005)	(0.003)	(0.005)	(0.004)	(0.004)	(0.005)
Energy price	-0.013***	-0.010***	-0.008***	-0.016***	-0.009***	-0.003
	(0.002)	(0.002)	(0.003)	(0.001)	(0.003)	(0.002)
Population growth	-0.007***	-0.002	-0.006**	-0.007***	-0.006**	-0.005***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.002)
Institutions	0.001***	-0.001***	0.000	0.000*	-0.002***	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)
Constant	0.260***	0.116***	0.239***	0.262***	0.140***	0.253***
	(0.017)	(0.019)	(0.023)	(0.015)	(0.022)	(0.032)
Groups	35	33	35	32	30	32
Obs	547	524	581	498	473	530
Instruments	33	30	33	32	26	30
[AR(2)]	0.967	0.629	0.867	0.995	0.657	0.894
Hansen J-Test	0.254	0.296	0.385	0.300	0.224	0.456

Note: standard errors are in parentheses. ***p < .01 **p < .05 *p < .10. All explanatory variables are considered as predetermined or suspected to be endogenous and the lags of the independent variables are used as instruments. All variables except institutions and population are expressed in logarithms.

Table 3. The effects of foreign capital on rural access to electricity

	Africa			Sub-Saharan Africa		
	(1)	(2)	(3)	(4)	(5)	(6)
Access(-1)	0.862***	0.650***	0.756***	0.906***	0.947***	0.731***
	(0.023)	(0.041)	(0.021)	(0.010)	(0.005)	(0.029)
FDI	0.017***			0.004***		
	(0.006)			(0.001)		
Remittances		0.073***			0.006***	
		(0.020)			(0.001)	
Foreign Aid			-0.082***			-0.093***
			(0.016)			(0.021)
GDP per capita	0.095***	0.356***	0.107***	0.033***	0.015***	0.095***
	(0.029)	(0.060)	(0.033)	(0.008)	(0.003)	(0.028)
Energy price	-0.047***	-0.095***	-0.020	-0.003	-0.014***	-0.014
	(0.008)	(0.022)	(0.018)	(0.002)	(0.002)	(0.023)
Population growth	-0.044***	-0.054***	-0.066***	-0.004*	-0.004**	-0.045***
	(0.009)	(0.015)	(0.012)	(0.002)	(0.002)	(0.010)
Institutions	-0.005**	-0.014***	-0.003	-0.000	-0.001***	0.007
	(0.002)	(0.004)	(0.005)	(0.001)	(0.000)	(0.006)
Constant	0.045	-0.978***	0.299	0.151***	0.192***	0.332*
	(0.133)	(0.321)	(0.202)	(0.029)	(0.010)	(0.169)
Groups	35	33	35	32	30	32
Obs	495	473	524	498	473	473
Instruments	33	30	30	30	27	29
[AR(2)]	0.123	0.143	0.125	0.977	0.661	0.129
Hansen J-Test	0.215	0.275	0.365	0.360	0.226	0.447

Note: standard errors are in parentheses. ***p < .01 **p < .05 *p < .10. All explanatory variables are considered as predetermined or suspected to be endogenous and the lags of the independent variables are used as instruments. All variables except institutions and population are expressed in logarithms.

Table 4. The effects of foreign capital on urban access to electricity

	Africa			Sub-Saharan Africa		
	(1)	(2)	(3)	(4)	(5)	(6)
Access(-1)	0.972***	0.966***	1.023***	0.974***	0.969***	1.032***
	(0.005)	(0.009)	(0.006)	(0.006)	(0.012)	(0.008)
FDI	0.013***			0.011***		
	(0.002)			(0.002)		
Remittances		0.004***			0.005***	
		(0.001)			(0.001)	
Foreign Aid			0.007***			0.009***
			(0.001)			(0.002)
GDP per capita	-0.011***	-0.006**	-0.013***	-0.011***	-0.002	-0.014***
	(0.002)	(0.003)	(0.003)	(0.002)	(0.004)	(0.004)
Energy price	-0.005**	-0.003***	-0.007***	-0.003*	-0.004**	-0.007***
	(0.002)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)
Population growth	-0.005**	-0.004**	-0.005***	-0.007***	-0.005*	-0.011***
	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)
Institutions	0.001***	0.001*	0.001***	0.000*	-0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Constant	0.236***	0.231***	0.052**	0.227***	0.197***	0.036
	(0.016)	(0.016)	(0.024)	(0.019)	(0.030)	(0.029)
Groups	35	35	35	32	30	32
Obs	547	524	581	498	473	530
Instruments	34	32	34	32	28	30
[AR(2)]	0.092	0.083	0.060	0.091	0.084	0.062
Hansen J-Test	0.569	0.294	0.245	0.411	0.221	0.271

Note: standard errors are in parentheses. ***p < .01 **p < .05 *p < .10. All explanatory variables are considered as predetermined or suspected to be endogenous and the lags of the independent variables are used as instruments. All variables except institutions and population are expressed in logarithms.

Table 5. The effects of foreign capital on urban-rural disparities in access electricity

	Africa			Sub-Saharan Africa		
	(1)	(2)	(3)	(4)	(5)	(6)
Disparity(-1)	1.012***	0.780***	0.838***	0.547***	0.666***	0.741***
	(0.017)	(0.024)	(0.020)	(0.033)	(0.024)	(0.063)
FDI	0.004**			0.017		
	(0.002)			(0.011)		
Remittances		-0.059***			-0.024*	
		(0.011)			(0.013)	
Foreign Aid			0.061**			0.037*
			(0.026)			(0.021)
GDP per capita	-0.022***	-0.094***	0.019	-0.020**	-0.046***	0.036
	(0.005)	(0.011)	(0.025)	(0.008)	(0.013)	(0.024)
Energy price	-0.002	0.061***	0.018	0.030***	0.098***	0.054***
	(0.006)	(0.017)	(0.011)	(0.009)	(0.017)	(0.015)
Population growth	0.013	0.083***	0.071***	0.046***	0.047***	0.038*
	(0.008)	(0.010)	(0.019)	(0.013)	(0.014)	(0.020)
democracy	0.003***	0.009***	0.009***	-0.006**	-0.010***	-0.005
	(0.001)	(0.002)	(0.002)	(0.003)	(0.002)	(0.003)
Constant	0.081	0.995***	0.094	1.631***	1.117***	0.374
	(0.082)	(0.168)	(0.208)	(0.151)	(0.112)	(0.303)
Groups	34	33	35	31	30	32
Obs	470	447	500	431	407	460
Instruments	28	32	30	30	28	26
[AR(2)]	0.084	0.80	0.80	0.054	0.069	0.053
Hansen J-Test	0.560	0.424	0.181	0.483	0.415	0.311

Note: standard errors are in parentheses. ***p < .01 **p < .05 *p < .10. All explanatory variables are considered as predetermined or suspected to be endogenous and the lags of the independent variables are used as instruments. All variables except institutions and population are expressed in logarithms.