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Oil dependency, political institutions and urban-rural disparities in access to electricity in Africa

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Abstract: While recent studies established that natural resources have a negative impact on development outcomes, they do not tell us to what extent such impact varies from one region to another within the same country. In line with the resource curse literature, this paper examines the effect of oil dependency on the disparities in access to electricity between urban and rural areas in Africa, with relation to the quality of political institutions. Based on data from 19 African countries over the period 1998-2017, our investigation suggests that oil rents (% of GDP) increase urban-rural disparities in access to electricity. However, good institutions offset the detrimental effect of oil dependency on these disparities. The negative impact of oil dependency on urban-rural disparities is reversed from the threshold score of 7.57% of institutional quality. The robustness checks conducted support these results which call for the reinforcement of the quality of institutions in Africa.

Keywords: Oil dependency, urban-rural disparities, Access to electricity, Political institutions

JEL Code: O18, Q41, R11

1. Introduction

A growing number of studies have emerged over the last two decades as scholars attempt to test Sachs and Warner's (1995, 1997, 1999) hypothesis of a significant inverse relationship between natural resource abundance and countries' economic performances. Though authors such as Stijns (2005, 2006), Gylfason and Zoega (2006), Brunnschweiler (2008), Brunnschweiler and Bulte (2008), Alexeev and Conrad (2009), and Cavalcanti *et al.* (2011) have challenged the conclusion of Sachs and Warner (1995, 1997, 1999), the so-called "natural resource curse" is widely admitted in the literature[1]. Unfortunately, most of the studies on resource curse mainly focus on the effects of natural resources on economic growth. By so doing , they fail to consider the other dimensions of economic development.

A few existing resource curse analysis studies which focused on development outcomes are those of Bulte *et al*. (2005), Carmignani and Avom (2010), Daniele (2011), Carmignani (2013) and Ebeke and Etoundi (2017). Though these studies demonstrate that resource dependency has a negative impact on development outcomes, they do not tell us to what extent such impact varies from one region to another within a same country. In other words, does resource dependency have the same detrimental effect on people living in different regions? Our study addresses this issue by investigating the impact of oil dependency on urban-rural disparities in access to electricity in Africa, with relation to the quality of political institutions.

Our investigation is crucial for African countries since access to electricity power constitute a key development factor. Electricity power is a high-quality energy carrier, more productive and flexible than other energy vectors, with zero pollution at the end-use point (Stern *et al*., 2016). Toman and Jemelkova (2003) outline some of the ways by which increased energy

[1] See Ploeg (2011), Ploeg and Poelhekke (2016), Papyrakis (2017) and Badeeb *et al.* (2017) for an extensive literature review on natural resource curse.

availability is essential. Several are particularly applicable to electricity: reallocation of household time away from energy provision in favour of improved education and income generation; enhanced productivity of education investment due to children being able to study at night; the ability to use new technologies including communication technologies; and health benefits resulting from outcomes such as reduced smoke exposure, clean water and refrigeration. Beyond the importance of electricity for African development, statistics show that up till 590 million people (roughly 57% of the population) do not have access to electrical power in sub-Saharan Africa. Of the 590 million people without access to electricity, over 80% live in rural areas, where the electrification rate is less than 25%, compared with 71% in urban areas (IEA, 2017). Besides, the average rate of access to electricity in Africa in 2017 is 53% in low resource endowed countries with an urban-rural gap in access to electrical power of 39 % in favour of urban areas while it is only 51.5% in resource-rich countries, with an urban-rural gap in access to electrical power of 49% in support of urban areas (World Development Indicators dataset)[2].

It is reasonable to believe that resources generate more detrimental effects in rural than urban areas. The study of Gadom *et al.* (2018) supports such idea by showing that oil boom in Chad accompanied a decrease in income inequality in the city of Ndjamena and an increase in the other regions of the country. Smith and Wills (2018) also point out that oil booms promote regional inequality by benefiting those in towns and cities but not the rural poor. Resource intensity can affect living standards in rural areas more seriously than in urban areas in different ways. For instance, recent studies showed that resource intensity has a positive effect on urbanization (Gollin *et al.*, 2016; Ebeke and Etoundi, 2017). Resource-led urbanization may be accompanied by a reallocation of government expenditures on public infrastructures towards

[2] We considered resource-rich countries as those with the share of resource rents (% GDP) above the median value of 2.87% obtained from the whole sample of African countries in 2017. Countries with resource rent (% GDP) less than 2.87% are less endowed countries.

urban areas for at least two reasons: First, investing in electricity infrastructures requires a critical mass of solvent subscribers to ensure their economic viability. Such solvent subscribers who are more numerous in urban areas favour public investments in these localities[3]. Second, urbanization could increase the pressure on the governments to satisfy social and economic goals given the expected higher voice and accountability in cities (Ebeke and Etoundi, 2017).

In addition to analysing the relationship between oil dependency and urban-rural disparities in accessing to electricity, our study seeks to examine the extent to which political institutions in a country shape this relationship. We did it by controlling the interaction between institutional quality and oil dependency. Though a strand of the literature on resource curse considers that either the quality of institutions is hurt by resource abundance and constitutes the intermediate causal link between resources and economic performance or the institutions do not play an important role, another strand of the literature considers that resources interact with the quality of institutions such that resource abundance is a blessing when institutions are good and a curse when institutions are bad (mehlum *et al.*, 2006a)[4]. Undeniably, the work of Mehlum *et al.* (2006a, 2006b) has set the pace for a vast literature on the role of the quality of institutions in explaining the resource curse. In a study conducted from a sample of Sub-Saharan African countries, Ebeke and Etoundi (2017) found that resources increase urbanization which in turn

[3]. There are many solvent subscribers in urban areas because of the importance of population size following resource-led urbanization and the importance of the income per capita, which tend to be higher in urban than in rural areas.

[4] *"It may be that the presence of rich natural resources in a country does not necessarily cause institutional decay. Resource abundance may nevertheless put the institutional arrangements to the test. As examples, we have disappointing economic performances following the oil windfalls in Nigeria, Venezuela and Mexico. Institutions may be persistent and at the same time be an important part of the resource curse mechanism"* (Mehlum *et al.*, 2006a; page 1121).

reduces people's living standards[5]. The finding obtained mainly holds for countries with weak institutions and bad governance.

Our paper makes several contributions to the literature. Firstly, the study contributes to the still short literature on natural resource curse that goes beyond the traditional resource-growth nexus to focus on development outcomes. In this paper, we are interested in people's access to electricity. Secondly, by assuming that the resource curse can manifest itself differently in urban and rural areas, the study helps in the understanding on how oil dependency affects urban-rural disparities in living standards. To our knowledge, no such study has been conducted in the past. Finally, the study concerns African countries. Although the analysis of resource dependency on development outcomes has important policy implications for Africa, only a few studies such as Ebeke and Etoundi (2017) and Atangana Ondoua (2019) specifically focus on the region.

The remaining of the paper is organized as follows: Section 2 describes the data used. The econometric strategy is presented in Section 3. The results are presented and discussed in Section 3, while Section 4 concludes the paper.

2. Data

Our study concerns African countries and covers a period of 20 years (from 1998 to 2017). Because of data limitations, our analysis is limited to 19 oil-producing countries (see the list of countries in Table A1).

The World Development Indicators (WDI) computed by the World Bank is the main dataset used in the study. WDI provide information on the percentage of population with access

[5]. Living standards are measured by house quality, access to improved sanitation facilities and water and formality of the employment sector.

to electricity. This percentage is given for the whole population, the urban population and the rural population. The urban-rural disparities in access to electricity are therefore given by the percentage of urban population with access to electricity minus the percentage of rural population with access to electricity. This measure is used as our dependent variable.

WDI also provide data on our measure of oil dependency given by the oil rents as a share of the GDP. It gives the difference between the value of crude oil production at world prices and total costs of production. Rosser (2006) argues that compared to the traditional share of primary exports in GDP or total exports of Sachs and Warner (1995, 1997, 1999), our measure of resource dependency as a rent-oriented measure, provides a more useful basis for making judgements about the existence or non-existence of a resource curse. Furthermore, resource rents are best able to bypass the endogeneity related concerns associated with the traditional measure (Bhattacharyya and Holder, 2010).

The measure of political institutions used in our analysis is Polity 2 democracy index from the Polity IV dataset developed by Marshall and Jaggers (2002). The Polity IV index is a commonly used proxy for institutional quality in resource curse literature (see, for example Bhattacharyya and Hodler, 2010; Bhattacharyya and Collier, 2014; Boschini *et al.*, 2013). Polity score captures political regime authority spectrum on a 21-pont scale ranging from -10 (hereditary monarchy) to +10 (consolidated democracy). The Polity scores can also be converted into regime categories in a suggested three part categorization of "autocracies" (-10 to -6), "anocracies" (-5 to +5 and three special values: -66, -77 and -88), and "democracies" (+6 to +10). We normalized the Polity 2 democracy index to obtain positive values ranging from 0 to 100, with higher values indicating stronger institutions. This normalization is based on the following formula:

$$\mathrm{IQ} = 100\left(\frac{IQ_G - \min(IQ_G)}{\max(IQ_G) - \min(IQ_G)}\right)$$

Where IQ_G is the gross indicator and IQ the normalized variable. min and max denote minimum and maximum, respectively.

In our model, we used as control variables the GDP per capita to control for economic development and urbanization rate. Related data are provided by the WDI. Concerning urbanization rate, it is expected that urbanization dynamic increases the gap in electricity access between urban and rural areas. The idea is that urbanization may be accompanied by a concentration of public investments in urban areas. Indeed, at high levels of urbanization, there is probably less interest/incentive for governments to invest in rural infrastructure (Liddle, 2017).

For robustness check, we also used urban population growth (annual %) and the GDP per capita growth (annual %). Following previous empirical works on the macroeconomic determinants of spatial inequalities (Kim, 2008; Ezcurra and Rodríguez-Pose, 2014; Lessmann and Seidel, 2017), we also used trade openness measured by the exports of goods and services (% of GDP) as explanatory variables in our robustness checks.

Table A2 summarizes the data used and their sources. Table 1 gives the descriptive statistics of the variables used in the analysis.

Table 1 shows that the average difference in the proportion of people with access to electricity in urban and rural areas is 43% with the minimum value of -0.29% and the maximum value of 84%. Of the 370 observations on the urban-rural disparities, only 3 are negatives. Regarding our oil dependency measure, the table shows that the average oil rents as a share of the GDP are 6 % with important heterogeneity among countries (standard deviation is about 11%). Several countries of the sample have registered a 0% of oil rents (% of GDP) over one or several years (Benin, Chad, Madagascar, Mauritania, Mozambique, Niger and Senegal). In

contrast, Angola registers the highest percentage of resource rents in the GDP throughout the period of study (43% in 2006, 44% in 2005, 47% in 2007, 55% in 2000 and 56% in 2008).

Table 1. Descriptive statistics on the variables

Variables	Obs.	Mean	Std. Dev.	Min	Max
Urban-rural disparity	370	42.751	21.972	-0.293	83.973
Oil rents (% GDP)	380	6.319	10.607	0	56.139
Institutional quality	380	52	31.379	0	100
GDP per capita	380	2159	2355.895	251	11937.64
Urbanization rate	380	45	15.673	16	88.976
Urbanization growth rate	380	3.542	1.039	1.280	5.744
GDP growth rate	380	1.914	3.758	-15.30	28.676
Trade openness	378	67.461	23.552	19	152.547

Concerning the quality of political institutions, the figures show that the average value of institutional quality is 52% with also high heterogeneity among countries (standard deviation is about 31%). The less democratic country is Sudan which registered an institutional quality score of 0% between 1998 and 2001. In contrast, with a 100% institutional quality score registered over the whole period of study, South Africa is the most consolidated democratic country.

In what follows, we conducted a simple bilateral correlation between oil rents and urban-rural gap in access to electricity, according to the quality of institutions. Figures 1 and 2 present the scatter plot obtained respectively for the bottom and the top quartiles of institutional quality.

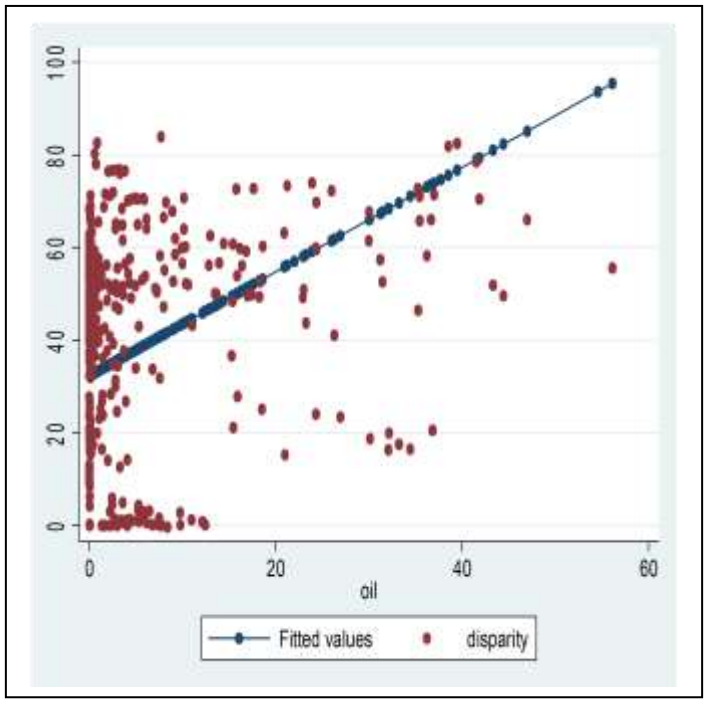

Figure 1. Scatter plot: Urban-rural gap and oil rents in the bottom quartile of institutional quality

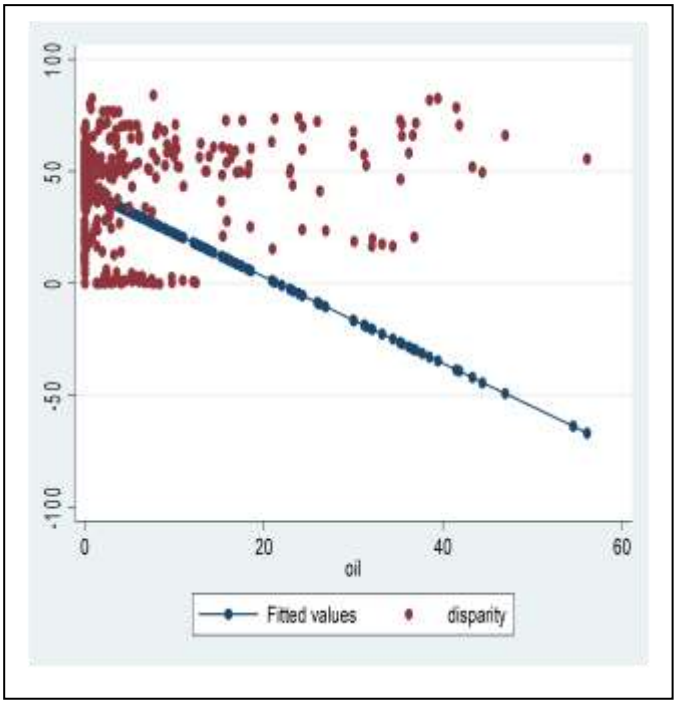

Figure 2. Scatter plot: Urban-rural gap and oil rents in the top quartile of institutional

In addition, we have also overlaid linear fit predicting urban-rural disparities from oil rents. To construct figures 1 and 2, we first regressed urban-rural disparities on oil rents. Afterwards, the residuals from the regressions were graphed on the oil rents. These residuals which represent the fit values are connected with a line and presented with the observations. A priori, the scatter plot and the fitted line suggest a positive relationship between urban-rural disparities and oil rents when institutions are weak and a negative relationship when institutions are strong. Based on this first evidence, we investigate in depth in the next sections, the relationship between the two variables by carrying out several appropriate econometric estimates.

3. Econometric strategy

To check whether institutions matter in explaining the effect of oil dependency on urban-rural disparities in access to electricity between urban and rural areas, we start our analysis by specifying the following baseline econometric specification that we estimate with the fixed effects-Ordinary Least Squares:

$$Disparity_{it} = a_0 + a_1 Oil_{it} + a_2 Oil_{it} * IQ_{it} + a_3 IQ_{it} + X'_{it}\beta + \mu_i + \tau_t + \varepsilon_{it} \quad (1)$$

i specifies the country and t time. The dependent variable $Disparity$ measures the urban-rural disparities in access to electricity. Oil measures oil dependency. IQ is the institutional quality variable. We postulate that institutional quality may condition the effects of oil rents on urban-rural disparities. Therefore, we expect to have $a_1 > 0$, meaning that in the presence of bad institutions, resource rents increase the disparities in access to electricity between urban and rural areas. We also expect that in the presence of good quality institutions, resource curse can turn into a blessing. The implication is $a_2 < 0$.

X is the vector of control variables. The control variables are GDP per capita and urbanization rate. GDP per capita growth rate, urbanization growth rate and trade openness are also considered in robustness checks. μ_i denotes country's fixed effects and τ_t time fixed effects. Country fixed effects control for country-specific time-invariant observables which may influence both resource rents and urban-rural disparities. Time dummy variables control for shocks that are time-varying and common.

It could have inertia in the dynamics of the urban-rural disparities in such a way that their current level is explained by their past level. This can be due to the fact that changes in urban-rural disparities take time, as they depend on structural factors such as infrastructures and

institutions. To account for that, we further estimated a dynamic panel model given by equation 2 which controls for the lagged value of the dependent variable:

$$Disparity_{it} = \sigma_0 + \sigma_1 Disparity_{it-1} + \sigma_2 Oil_{it} + \sigma_3 Oil_{it} * IQ_{it} + \sigma_4 IQ_{it} + X'_{it}\beta + \varepsilon_{it} \qquad (2)$$

Not taking into account inertia in the dynamics of the urban-rural disparities may induce biased estimates and a misspecification of the model. The presence of the lagged dependent variable in equation 2 gives rise to autocorrelation. Performing an OLS estimate might yield biased estimators. In addition, the OLS strategy might also be inappropriate due to some endogeneity issues. Indeed, the use of OLS is inappropriate if there is causality that runs in both directions: from resource rents and institutions to urban-rural disparities and from urban-rural disparities to resource rents and institutions. Concerning the possible reversed causality from urban-rural disparities to institutions for instance, Savoia *et al.* (2010) states that current understanding suggests that unequal societies develop exploitative and inefficient institutions with empirical research supporting to some extent such a proposition. For instance, Baryshnikova *et al.* (2016) found from a study conducted on a panel of 70 countries that inequality has a non-linear effect on law and order and military involvement in politics. Chong and Gradstein (2007) established a double causality between institutional strength and more equal distribution of income using dynamic panel and linear feedback analysis. Inequality affects the quality of institutions directly through persistent rent-seeking policies and indirectly through democracy. That is, the inequality effect on institutions may be lower in a more democratic country because democracy grants poorer people, who may demand redistribution and better public institutions, equal voting rights (Savoia *et al*., 2010). To deal with endogeneity bias that might also come from measurement errors and omitted variables, we use the system and the difference generalized method of moments (GMM) to estimate equation 2. The GMM handles

well with the endogeneity of the regressors by generating instruments from the lagged value of the regressors. The difference GMM of Arellano–Bond (1991) starts by transforming all regressors, usually by differencing, and uses the GMM (Hansen 1982, cited by Roodman, 2009). The system GMM of Arellano–Bover (1995) and Blundell–Bond (1998) estimator augments Arellano–Bond (1991) by making an additional assumption that first differences of instrument variables are uncorrelated with the fixed effects. This allows the introduction of more instruments and can improve efficiency. It builds a system of two equations (the original equation and the transformed one) and is known as system GMM (Roodman, 2009).

4. Results

4.1 Baseline estimates

Table 2 reports the results from our baseline model. This model was estimated with the fixed effects-Ordinary Least Squares. The dependent variable is the difference in the percentage of urban and rural population with access to electricity. We start in column 1 by reporting the results without control variables. The explanatory variables are oil rents (% of GDP), institutional quality and the interaction term between the two variables. The results from our main specification including the GDP per capita and the urbanization rate are reported in column 2. For robustness check, we also added trade openness, urbanization and GDP growth rates as control variables in column 3.

Whatever the specification considered, the results show that the coefficients on oil rents are positive and statistically significant. This clearly suggests that when the quality of institutions is bad[6], oil dependency increases urban-rural disparities in favour of urban areas. From our main specification reported in column 2, we conclude that when institutions are bad, a 1 percentage

[6] That is to say, the institutional variable IQ converges toward zero.

point increase in the resource rents (% GDP) translates into an increase in the urban-rural disparities by 0.60 percentage point.

Table 2. Oil dependency, political institutions and urban-rural disparities in access to electricity: OLS baseline estimates

Variables	(1)	(2)	(3)
Oil rents	0.564***	0.598***	0.428**
	(0.187)	(0.207)	(0.181)
Institutional quality	-0.0825**	-0.079*	-0.0857**
	(0.041)	(0.040)	(0.038)
Oil rents*Institutional quality	-0.013***	-0.012***	-0.01***
	(0.004)	(0.004)	(0.004)
GDP/capita	-0.012***	-0.012***	-0.012***
	(0.003)	(0.003)	(0.003)
Urbanization rate	-0.126	-0.0642	-0.06
	(0.390)	(0.362)	(0.359)
GDP growth rate		-0.302*	-0.354**
		(0.155)	(0.162)
Urbanization growth rate		0.774	-0.997
		(2.806)	(2.334)
Openness			0.148**
			(0.072)
Constant	99.500***	91.650***	90.450***
	(28.890)	(27.710)	(28.130)
Observations	370	370	370
Number of countries	19	19	19
R-squared	0.831	0.832	0.838

Notes: All models include countries and time fixed effects. Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1.

The results also show that the coefficients associated with institutions are negative and statistically significant, suggesting that democratic institutions reduce urban-rural gap. The negative and statistically significant coefficients on the interaction term suggest that the higher

the quality of institutions, the fewer resource rents increase the urban-rural disparities. Countries that are oil-dependent and where the quality of institutions is relatively democratic, experience on average, lower urban-rural disparities. Good political institutions, therefore, offset the detrimental effects of oil dependency on the inequalities. Combining the coefficients on oil rents and its interaction with institutions in column 2, our results suggest that oil rents increase disparities when institutional quality is below the score of 7.57%[7], which applies to 6 countries in our sample: Cote d'Ivoire, Egypt, Mauritania, Morocco, Niger and Sudan. Above the threshold of 7.57% of the quality of institutions, the negative effect of resources on disparities is reversed. Our finding is consistent with Boschini *et al.* (2007, 2013) and Adams *et al.* (2018) who stressed the role of institutions in resource curse occurrence. Indeed, a body of the literature establishes that a weak institutional environment can promote the resource-curse phenomenon. It concludes to a strong relationship between the resource curse and the country's level of corruption, transparency, accountability, institutional strength and efficiency of governance (Adams *et al*., 2019). For instance, Mehlum *et al.* (2006a) showed that the quality of institutions determines whether countries avoid the resource curse or not. The combination of poor institutions and resource abundance leads to low growth. Good institutions, however, help countries to take full advantage of their natural resources.

Our findings also suggest that urban-rural disparities significantly decrease with GDP and GDP growth rate. The coefficient on GDP is -0.012 in column 1, 2 and 3 and it is statistically significant at 1%. The coefficients on GDP growth rate are -0.302 and -0.354 in columns 2 and 3 respectively. Besides, we found that trade openness increases disparities. Such result is not surprising as the negative impact of trade openness on inequalities is largely documented. For

[7] The effect of oil rents equals zero for institutional quality x when 0.598-0.079x=0, which solved for *x* is equal to 7.570.

instance, Ezcurra and Rodríguez-Pose (2014) in a study conducted across 22 emerging countries over the period between 1990 and 2006 found that changes in international trade bring about a significant rise in within-country inequality. Consequently, the increase in trade exposure across the emerging world, while possibly benefiting the countries involved in the process in aggregate terms, is generating winning and losing regions.

To explore differently how institutions impact oil dependency-disparities relationship, we classified all sample countries into bottom quartile, second quartile, third quartile and top quartile of institutional quality. We defined dummies equal to 1 for countries belonging to each specific quartile and 0 otherwise. We then ran separate estimations in which each dummy variable interact with oil rents. The results are presented in table 3. They show that the coefficient on the interaction terms reflecting the difference in the impact of oil rents on urban-rural disparities between the specific quartile and the overall benchmark is positive for the bottom quartile and increasingly (in absolute value) negative for the three remaining quartiles (however, the coefficients are insignificant for the second and top quartiles). This confirms our finding that the negative effect of resources on disparities decreases with the quality of institutions.

Table 3. FDI interacted with income quartile dummies

Variables	(1)	(2)	(3)	(4)
Oil rents	0.064	0.196	0.198*	0.174
	(0.112)	(0.174)	(0.119)	(0.117)
Institutional quality	-0.098**	-0.147***	-0.103***	-0.131***
	(0.039)	(0.037)	(0.038)	(0.039)
Oil rents*Bottom quartile dummy of Institutional quality	0.436***			
	(0.126)			
Oil rents*Second quartile dummy of Institutional quality		-0.050		
		(0.159)		
Oil rents*Third quartile dummy of Institutional quality			-0.492***	
			(0.138)	
Oil rents*Top quartile dummy of Institutional quality				-1.799
				(1.139)
GDP/capita	-0.012***	-0.010***	-0.012***	-0.010***
	(0.003)	(0.003)	(0.003)	(0.003)
Urbanization rate	-0.139	-0.138	-0.114	0.0162
	(0.388)	(0.393)	(0.391)	(0.413)
Constant	102.600***	96.400***	98.670***	85.200***
	(28.000)	(27.670)	(28.460)	(29.300)
Observations	370	370	370	370
Number of countries	19	19	19	19
R-squared	0.830	0.825	0.829	0.827

Notes: All models include countries and time fixed effects. Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1.

4.2 Estimates on different samples

Some tests have been performed to check the robustness of our baseline results. Table 4 provides the results of the estimation of our baseline model carried out on different samples. This is to test the sensitivity of our baseline results to changes in the composition of the sample. In column 1 we ran our baseline specification on the sample of Sub-Saharan African countries. We, therefore,

excluded from the sample, Egypt, Morocco and Tunisia. Our main conclusions remained: Oil rents have a negative impact on urban-rural disparities when the country has poor political institutions. The higher the institutional quality, the less oil rents encourage urban-rural disparities. The marginal effects associated with oil rents and interaction variable are respectively 0.513 and -0.012.

Table 4. Oil dependency, political institutions and urban-rural disparities in access to electricity: robustness check estimates

Variables	SSA	Outliers removed	Lowly oil dependent countries	Highly oil dependent countries
Oil rents	0.513***	0.422**	1.148*	0.341*
	(0.176)	(0.200)	(0.593)	(0.186)
Institutional quality	-0.108**	-0.072*	-0.002	-0.127***
	(0.052)	(0.036)	(0.004)	(0.040)
Oil rents*Institutional quality	-0.012***	-0.011***	-0.022*	-0.008**
	(0.004)	(0.004)	(0.012)	(0.003)
GDP/capita	-0.007**	-0.012***	-0.024***	-0.004
	(0.003)	(0.003)	(0.003)	(0.003)
Urbanization rate	-0.196	-0.160	-0.615**	0.123
	(0.416)	(0.393)	(0.419)	(0.432)
Constant	86.15***	88.540***	84.230***	71.720**
	(28.920)	(28.610)	(17.630)	(31.760)
	16	19	17	18
Observations	310	358	280	278
R-squared	0.732	0.844	0.848	0.894

Notes: All models include countries and time fixed effects. Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1.

In column 2, we re-estimated our baseline model on the sample when outliers are removed. In the presence of outliers, OLS are likely to produce inaccurate model estimates. We applied a simple method consisting of removing from the sample, observations below the first percentile and those above the 99th percentile of the variables. Estimates are therefore carried out on a sample of 358 observations. Once again, the previous results are obtained, suggesting the robustness of our results to the removal of outliers.

In column 3, we restricted the sample to countries that are not heavily dependent on oil rents. This allows checking whether the resource curse holds even in countries that are not extremely dependent on resource rents. Our analysis is done by excluding from the regression, all the observations with oil rents (% GDP) falling into the fourth quartile. The results show that although the coefficient on institutional quality is no more significant, when the quality of institutions is bad, oil dependency increase urban-rural disparities. On the other hand, good institutions dampen the negative effect of resource dependency on urban-rural disparities. So, resource curse happens even in low oil dependent countries and the positive effect of political institution on oil rent-disparities remained. However, the marginal effects are now different. Compared to baseline estimates, the marginal effect of resource rents on inequalities when institutions are bad has increased from 0.598 to 1.148 while the marginal effect of the interaction between rents and institutions has increased (in absolute value) from 0.012 to 0.022. In less oil-rich countries, resource curse seems to be more accentuated in the presence of bad institutions when good institutions produce greater moderating effects.

In column 4, the sample is restricted to countries that heavily depend on oil rents. This sample is obtained by removing all the observations with oil rents (% GDP) falling into the first quartile. The results show that the coefficient on institutional quality is now significant. In

contrast, the amplitude of the coefficients on oil rents and the interaction term is smaller compared to those provided by the baseline estimates.

4.3 Dynamic panel estimates

We now consider the potential inertia in the dynamics of the urban-rural disparities. We estimated a dynamic panel data model given by equation 3 where the lag of the dependent variable is included among the explanatory variables. The results are reported in table 5.

Table 5. Resource dependency, institutions and urban-rural disparities in access to electricity: GMM estimates

Variables	System GMM	Difference GMM
Lag of urban-rural disparity	0.818***	0.979***
	(0.051)	(0.284)
Oil rents	0.460***	1.190**
	(0.146)	(0.490)
Institutional quality	-0.0506**	0.176
	(0.024)	(0.198)
Oil rents*Institutional quality	-0.009***	-0.029**
	(0.003)	(0.012)
GDP/capita	-0.004*	-0.018*
	(0.002)	(0.009)
Urbanization rate	0.688***	1.252***
	(0.231)	(0.419)
Constant	-12.540**	
	(4.847)	
Observations	351	332
Number of countries	19	19
Number of instruments	18	11
Arellano-Bond test for AR(1), p-value	-2.770***	-2.470**
Arellano-Bond test for AR(2), p-value	1.570	1.540
Sargan test of overid. restrictions	36.050***	10.340*
Hansen test of overid. restrictions	9.870	8.300

Notes: Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1.

Column 1 presents the results from the system GMM of Arellano–Bover (1995) and Blundell–Bond (1998) and column 2 presents the results from the difference GMM of Arellano–Bond (1991). The Hansen test of over identifying restrictions validates the quality of the instruments.

The coefficient on the lagged dependent variable is 0.818 in column 1 and 0.979 in column 2 and statistically significant, implying conditional convergence of urban-rural disparities in access to electricity. There is, therefore, persistence in the disparities process. As previously found, the results provided in table 5 confirm the negative effect of resource rents on urban-rural disparities when institutions are bad. This negative effect is offset when institutions are of good quality. The system GMM (difference GMM) estimates show that the marginal effect of resource rents on urban-rural disparities when institutions are bad is 0.46 (1.190) while the marginal effect of the interaction term is -0.009 (-0.029).

5. Conclusion

In this study, we analyzed how oil dependency affects people's unequal access to electricity between urban and rural areas, depending on the quality of political institutions. Little attention has been paid to this matter so far. Our study is conducted on a sample of 19 African countries over the period 1998-2017. In our empirical analysis, we first ran a series of OLS regressions which clearly showed that when institutions are bad, oil dependency increases urban-rural disparities. However, good institutions offset the detrimental effects of resource dependency on the inequalities. We conducted further analysis by successively using different country samples and considering the urban-rural gap dynamics. The different analysis provided support to our main conclusions.

Our results provide insights for African policymakers to promote broad-based and inclusive growth process within resource dependent countries. An important part of the oil rents need to be invested in the development of the rural economy (especially agricultural activities) and the supply of basic social infrastructures. This could substantially reduce resource-led urbanization which most of the time results in the reallocation of government expenditures on public infrastructures towards urban areas, increasing urban-rural disparities. Policymakers should also implement strategic institutional reforms for efficient use of the oil rents, especially in countries with weak institutions. Our results shed light on the efficiency effect of political institutions in reducing resource curse in both countries that are not very heavily dependent on oil rents and countries heavily dependent on oil rents.

Moreover, there is a strong need for diversification of African economies in order to reduce their overdependence on oil rents that might translate into more inequalities. Though a few countries in Africa (e.g. Tanzania, Uganda, and Kenya) have experienced significant export diversification in the recent period, many others have not (International Monetary Fund, 2014). The development of a strong and dynamic manufacturing sector that might ensure the transformation of raw materials into manufactured goods before exports are the key to sustainable and balanced development in Africa. As stated by Cadot *et al.* (2016), to date, national experiences of development without factories are very scarce and idiosyncratic to serve as a model.

References

Adams, D., S. Ullah, P. Akhtar, K. Adams, and S. Saidi (2018), 'The role of country-level institutional factors in escaping the natural resource curse: insights from Ghana', *Resources Policy* 61: 433-440.

Adams, D., K. Adams, S. Ullah, and F. Ullah (2019), 'Globalisation, governance, accountability and the natural resource 'curse': implications for socio-economic growth of oil-rich developing countries', *Resources Policy* 61: 128–140.

Alexeev, M. and R. Conrad (2009), 'The elusive curse of oil', *The Review of Economics and Statistics* 91(3): 586–598.

Arellano, M. and S. Bond (1991), 'Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations', *Review of Economic Studies* 58: 277–297.

Arrelano, M. and O. Bover (1995), 'Another look at the instrumental variables estimation of error components models', *Journal of Econometrics* 68: 29-51.

Atangana Ondoua, H. (2019), 'Natural resources curse: A reality in Africa', *Resource Policy* 63(C). DOI: 10.1016/j.resourpol.2019.101406

Badeeb, R.A., H.H. Lean, and J. Clark (2017), 'The evolution of the natural resource curse thesis: A critical literature survey', *Resources Policy* 51(C): 123-134.

Baryshnikova, N.V., N.T.A. Pham, and M.M. Wihardja (2016), 'Does Political and Economic Inequality Affect Institutional Quality?', *Economic Record* 92(297): 190–208

Bhattacharyya, S. and R. Hodler (2010), 'Natural resources, democracy and corruption', *European Economic Review* 54: 608–621.

Bhattacharyya, S. and P. Collier (2014), 'Public capital in resource-rich economies: is there a curse?', *Oxford Economic Papers* 66(1): 1–24.

Blundell, R. and S. Bond (1998), 'Initial conditions and moment restrictions in dynamic panel data models', *Journal of Econometrics* 87(1): 115-143.

Boschini, A., J. Pettersson, and J. Roine (2013), 'The Resource Curse and its Potential Reversal', *World Development* 43: 19–41.

Boschini, A., J. Pettersson, and J. Roine (2007), 'Resource curse or not: A question of appropriability', *Scandinavian Journal of Economics* 109(3): 593–617.

Brunnschweiler, C. N. (2008), 'Cursing the blessings? Natural resource abundance, institutions, and economic growth', *World Development* 36(3): 399–419.

Brunnschweiler, C. N. and E.H. Bulte (2008), 'The resource curse revisited and revised: A tale of paradoxes and red herrings', *Journal of Environmental Economics and Management* 55(3): 248–264.

Bulte, E. H., R. Damania, and R.T. Deacon (2005), 'Resource Intensity, Institutions, and Development', *World Development* 33(7): 1029–1044.

Cadot, O., J. De Melo, P. Plane, L. Wagner, L., and M. Woldemichael (2016), 'Industrialization et transformation structurelle : l'Afrique subsaharienne peut-elle se développer sans usines ?', *Revue d'économie du développement* 24(2) : 19-49.

Carmignani, F. (2013), 'Development outcomes, resource abundance, and the transmission through inequality,' *Resource and Energy Economics* 35(3): 412–428.

Carmignani, F. and D. Avom (2010), 'The social development effects of primary commodity export dependence,' *Ecological Economics* 70(2): 317–330.

Cavalcanti, T., K. Mohaddes and M. Raissi (2011), 'Growth, development and natural resources: New evidence using a heterogeneous panel analysis', *The Quarterly Review of Economics and Finance* 51(4): 305– 318.

Chong, A. and M. Gradstein (2007), 'Inequality and Institutions', *Review of Economics and Statistics* 89 (3): 454–65.

Daniele, V. (2011), 'Natural Resources and the 'Quality' of Economic Development', *Journal of Development Studies* 47(4): 545–573.

Ebeke, C.H. and S.M. Etoundi (2017), 'The Effects of Natural Resources on Urbanization, Concentration, and Living Standards in Africa', *World Development* 96(C): 408–417.

Ezcurra, R. and A. Rodríguez-Pose (2014), 'Trade Openness and Spatial Inequality in Emerging Countries', *Spatial Economic Analysis* 9(2): 162-182.

Gadom, D., S. Fondo, and A. Totouom (2018), 'Ressources pétrolières et disparité de revenu au Tchad', *Mondes en Développement* 46 (3): 71-90.

Gollin, D., R. Jedwab and D. Vollrath (2016), 'Urbanization with and without industrialization', *Journal of Economic Growth* 21: 35–70.

Gylfason, T. and G. Zoega (2006), 'Natural Resources and Economic Growth: The Role of Investment', *The World Economy* 29(8): 1091–1115.

International Energy Agency (2017), 'Energy Access Outlook 2017 from poverty to prosperity', World Energy Outlook Special Report.

International Monetary Fund (2014), 'Sustaining Long-Run Growth and Macroeconomic Stability in Low-Income Countries—The Role of Structural Transformation and Diversification', IMF Policy Paper, March 2014.

Kim, S., (2008), 'Spatial Inequality and Economic Development: Theories, Facts, and Policies,' Working paper No. 16, Commission on Growth and Development.

Lessmann, C. and A. Seidel (2017), 'Regional inequality, convergence, and its determinants – A view from outer space', *European Economic Review* 92: 110-132.

Liddle, B. (2017), 'Urbanization and inequality/poverty', *Urban Science* 1(35): 1-7.

Marshall, M. and K. Jaggers (2002), 'Polity IV Project: political regime characteristics and transitions, 1800-2002', University of Maryland, Baltimore, MD.

Mehlum, H., K. Moene and R. Torvik (2006a), 'Cursed by Resources or Institutions?', *The World Economy* 29(8): 1117–1131.

Mehlum, H., K. Moene, and R. Torvik (2006b), 'Institutions and the Resource Curse', *Economic Journal* 116(508): 1–20.

Papyrakis, E. (2017), 'The Resource Curse - What Have We Learned from Two Decades of Intensive Research: Introduction to the Special Issue', *The Journal of Development Studies* 53(2): 175-185.

Ploeg, F.V.D. (2011), 'Natural Resources: Curse or Blessing?', *Journal of Economic Literature* 49(2): 366–420.

Ploeg, F.V.D. and S. Poelhekke (2016)', The impact of natural resources: survey of recent quantitative evidence', *Journal of Development Studies* 53 (2): 205-216

Roodmand, D. (2009), 'How to do xtabond2: An introduction to difference and system GMM in Stata', *The Stata Journal* 9(1): 86–136.

Rosser, A. (2006), 'The Political Economy of the Resource Curse: A Literature Survey', Working Paper No. 268, Institute of Development Studies.

Sachs, J. and A. Warner (1995), 'Natural Resources Abundance and Economic Growth', NBER Working Paper 5398, Cambridge, MA.

Sachs, J. and A. Warner (1997), 'Natural resource abundance and economic growth', Center for International Development and Harvard Institute for International Development, Cambridge, MA.

Sachs, J. and A. Warner (1999), 'The big push, natural resources booms and growth', *Journal of Development Economics* 59: 43–76.

Savoia, A., J. Easaw, and A. McKay (2010), 'Inequality, Democracy, and Institutions: A Critical Review of Recent Research', *World Development* 38 (2): 142–54.

Smith, B. and S. Wills (2018), 'Left in the Dark? Oil and Rural Poverty', *Journal of the Association of Environmental and Resource Economists* 5(4): 865-904.

Stijns, J.P. (2005), 'Natural resource abundance and economic growth revisited', *Resources Policy* 30(2): 107–130.

Stijns, J.P. (2006), 'Natural Resource Abundance and Human Capital Accumulation', *World Development* 34(6): 1060–1083.

Toman, M.A. and B. Jemelkova (2003), 'Energy and Economic Development: An Assessment of the State of Knowledge', *Energy Journal* 24(4): 93–112.

World Bank (2018), 'World Developments Indicators', http://databank.worldbank.org/data/reports.aspx?source=world-development-indicators

Appendices

Table A1. List of countries involved in the analysis

Angola	Egypt	Nigeria
Benin	Gabon	Senegal
Cameroon	Ghana	South Africa
Chad	Mauritania	Sudan
Congo, Dem. Rep.	Morocco	Tunisia
Cote d'Ivoire	Niger	

Table A2. Data and sources

Variables	Sources
percentage of urban population with access to electricity	World Bank
percentage of rural population with access to electricity	World Bank
Oil rents (% GDP)	World Bank
Polity 2	Polity IV
GDP per capita (constant 2010 US$)	World Bank
Urban population (% of total population)	World Bank
GDP per capita growth (annual %)	World Bank
Urban population growth (annual %)	World Bank
Exports and imports of goods and services (% of GDP)	World Bank