Oil rent and the quality of institutions in Sub-Saharan African countries: Evidence using the dynamic panel threshold model

Bybert Moudjare Helgath[1,•]

[1]Doctor in Economics Faculty of Economics and Management (FSEG) -University of Maroua, Cameroon

Abstract

This paper aims to determine the optimal level of oil rent having a positive effect on the quality of institutions in Sub-Saharan Africa. The study covers the period 1995 to 2016, for a sample of 12 countries. To achieve this objective, we used the threshold effect model of the DF-GMM estimator inspired by Seo and Shin (2016), put into practice by Seo et al. (2019) in stata. To do this, we used three (03) measures of the quality of institutions namely balance of power, control of corruption and government efficiency. The results of the study show that: i) *The direct effect of oil rents on the quality of institutions is negative, supporting the political resource curse hypothesis*. ii) *The relationship between oil rent and the quality of institutions is positive for a high level of oil rent. In particular, above the threshold of 29.935, 22.526 and 18.263*. For the robustness analysis, we conduct a sensitivity analysis using the fixed-effect dynamic threshold model of Couttenier (2012). The results of the analysis confirm those found by the DF-GMM model of Séo and Shin (2016).

1. Introduction

The World Bank in its classification of countries taken as its clientele specified that more than 50 countries are dependent on natural resources (Barma et al., 2011). In addition, natural resources occupy a central place in the economy of most of these countries and play an important role in governance and the quality level of institutions. To do this, the presence of the natural resource curse influences the need for a real quality of institutions in its relation to the richness of these resources (Wiens, 2014).

Moreover, with regard to the oil-exporting countries of Sub-Saharan Africa (SSA), they most often have very poor quality institutions and poor government practice (Ross, 2001; 2015). According to World Bank data (2020), relating to Sub-Saharan African countries with the best quality institutions and policies, all oil exporting countries except South Africa have poor quality institutions. In addition, according to data from Central African countries, oil represents 70% of exports (Moudjaré & Nourou, 2020). As for other countries, like Nigeria and Angola, oil accounts for more than 80% of exports. While South Africa, Niger, Ivory Coast and DRC each have less than 50% of petroleum products in their total export. It is therefore easy to see that an endowment in petroleum resources can lead to poor quality institutions. This situation may be accelerated by the existence of already poor quality political institutions and questionable governance mechanisms (James, 2019). However, countries like Norway and South Africa have better quality institutions and a significant amount of oil.

Regarding the economic literature, there is still a debate on the effects of natural resources on the quality of institutions (Mehlum et al., 2006; Brunnschweiler, 2008; Avom and Carmignani, 2010; Chang, 2020; Shadabi and Adkisson, 2021; Ertimi et al.,2021). It is in this perspective that a current of research will be born focusing on the effects of so-called "peak" resources like oil and minerals on the quality of institutions (Barro, 1999;

Deason, 2005; Masi et al. Ricciuti 2019). Oil being a resource with different characteristics than other natural resources (cocoa, coffee, etc.), it plays an important role in the world economy and in the quality of institutions in particular (Isham et al., 2005). It is with this in mind that one of the very first researchers to examine the effects of oil rents on the quality of institutions was Michael Ross (2001, 2015). The latter will show a negative effect of the oil rent on the quality of institutions. This is how he will support the "political resource curse theory." However, other studies like Herb (2005), Dunning (2008), Menaldo (2016), O'Connor et al. (2018), will question these results. They find a positive effect of the oil rent on the quality of institutions. In addition, other studies go even further and support a conditional effect of oil resources on the quality of institutions (Caselli and Tesei, 2015; Brooks and Kurtz, 2016; Houle, 2018). Among these authors, some have been interested in the non-linear relationship between petroleum resources and the quality of institutions. Leite and Weidman (1999) argue that the effects of oil rents on the quality of institutions are based on the level of dependence on oil rents. It is in the spectrum of the non-linearity approach that Couttenier (2012) studies the threshold above which natural resources have an effect on the quality of institutions. The latter finds a positive effect of the resource rent on the quality of institutions at a certain threshold. Thus, the "political resource curse" may be limited to a certain level of oil rent. However, *what is the level of the oil rent that ensures a positive effect on the quality of institutions in Sub-Saharan Africa?*

In order to answer the question below, the study revisits the relationship between oil rent and the quality of institutions in Sub-Saharan Africa. This question is of crucial importance and rests on several aspects. The first interest of this study rests on the empirical level. To our knowledge, it is one of the first studies[1] to contribute to the enrichment of the literature on the non-linear relationship between oil rent and the quality of institutions. Indeed, by determining the optimal level of oil rent, it allows the renewal of studies on the relationship between oil rent and the quality of institutions. In addition, it provides a response to the divergence of approaches and the non-convergence of conclusions.

The second contribution is on the methodological level. The majority of studies use oil rent in terms of oil dependence, leading to endogeneity problems (Tsui, 2011). Similarly, Lall (2016) argues that the absence of data has led to spurious results both for the oil variable and for the quality of institutions. In addition, these studies focus on the linear relationship between oil rent and the quality of institutions (Bjorvatn et al., 2012; Caselli & Tesei, 2015; Hendrix, 2018), while setting aside the idea of non-linearity. In order to overcome these limitations and taking into account the fact that economic phenomena are not always linear, we use the estimation of the FG-GMM threshold model by Seo and Shin (2016), put into practice by Seo et al. (2019). In addition, the choice made on this model is based on the fact that it limits the change in value of the model variables as the threshold is changed. What is criticized for other models with threshold effects like the PTR model of Hansen (1999) and the PSTR model of Gonzales et al. (2005). As a result, it overcomes the problem of endogeneity of variables by using the estimation of the Generalized Moments Method (GMM) in difference. Thus, we use a sample of 12 oil-exporting countries from Sub-Saharan Africa. The study covers the period 1995 to 2016, taking a three-year average. For the robustness of our results, we conduct a sensitive analysis using the fixed-effect dynamic threshold model of Couttenier (2012). Our empirical analysis argues that the direct effect of oil rent on the quality of institutions is negative. In addition, we find that the oil rent acts positively on the quality of institutions at a certain threshold.

The structure of this article is as follows. Section (2) presents the literature review. In section (3), we present the data and the methodological framework. Section (4) is devoted to results and discussion. Section (5) is based on the conclusion and recommendations of economic policies.

2. Literature review

The analysis of the effects of oil rents on the quality of institutions continues to generate much ink and saliva. Theoretical and empirical analyzes are still inconclusive and fall within the scope of the "natural resource curse" (Badeeb et al., 2017; Frankel, 2010; Murshed, 2018; Ross, 2015). The debate fits more specifically into that of the curse of "political resources" (Ross, 2001; 2009). Nonetheless, long before Ross's (2001) studies of the "political resource curse", Tornell and Lane (1999) and Torvik (2002) developed a theory that fits within the "resource curse" theory. policies "which has been called "rent-seeking theory". However, apart from the study by Couttenier (2012), there are few studies that have assessed the threshold effects of oil rents on the quality of institutions by taking into account several measures of the quality of institutions. This is how Bergougui and Murshed (2020) classify the effects of oil rents on the quality of institutions into three main branches. However,

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[1] Couttenier (2012) is interested in the non-linear relationship between natural resources and the quality of institutions. However, the analysis of the oil rent in particular has not been done.

for the purposes of this study, we will categorize them into two broad groups. Indeed, the second (that of the conditionalists) and the third group complement each other.

The first group are the skeptics. They support the idea of a negative effect of the oil rent on the quality of institutions. Indeed, Tornell and Lane (1999) will set up a theoretical model, presenting the rent-seeking behaviors, characteristic of an economy with weak political and judicial institutions and several powerful interest groups. They will highlight the "greediness effect" which manifests itself in an allocation of resources, favoring production towards the less productive and untaxed sector, while balancing the increase in gains from external effects. Thus, it has a negative effect on the whole economy. In addition, Torvik (2002) examines the relationship between natural resources (possibly oil) and the poor performance of countries holding these resources. He presents in a model rent-seeking theory, the political competition of entrepreneurs and / or the frenzied race in search of rent leads to an increase in corruption and a bad practice of democracy. However, the first to explicitly express the "political resource curse" is Ross (2001). He sets up a theoretical model in which he shows the negative effects of petroleum resources on the quality of institutions. It presents three (03) mechanisms from which oil resources act on the quality of institutions. First, states rich in oil rents tend to rush towards oil resources to finance public spending by setting aside taxation: this is the "rentier effect". Then, the "repression" effect supports the limitation of elementary rights relating to democracy and the establishment of repression of the population. Finally, the "modernization" effect highlights the idea that the presence of oil hinders social evolution (the absence of enthusiasm for studies, the unnecessary need for a great democracy). In the same vein, Smith (2004) examines the lifespan in power of the leaders of oil-producing countries during the period 1960 to 1999. He seeks to assess the controversies relating to oil wealth which improves or reduces the lifespan. of a diet. The results of his study show that oil wealth improves the stability of the regime. In addition, Cuaresma et al. (2011) in the same idea, evaluate the effects of the oil rent on the duration of autocratic leaders. Their research results show that dictators in countries that are relatively better endowed with oil tend to stay in office longer. Cotet and Tsui (2013) support the idea that an increase in oil resources leads to political violence. Anyanwu and Erhijakpor (2014) carry out a study on the effects of oil wealth on democracy in Africa over a period from 1995 to 2008 and find that the oil rent has a negative effect on the quality of institutions. Blanco et al. (2015) argue that the oil rent has a negative effect on the quality of institutions and on socio-economic conditions. Cassidy (2019) assesses the long-term effects of oil rents on development. He uses the instrumental variables of 172 countries over a period between 1966 and 2008. The results of his study show that oil production has a negative effect on democracy.

The second wave of literature is defended by the so-called "conditionalists". According to these authors, the effects of oil rents on the quality of institutions are based on several factor conditionalities. Couttenier (2008) establishes a theory putting forward the idea of a conditional effect of natural resources on the quality of institutions based on the idea of Mehlum et al. (2006). It demonstrates both theoretically and empirically that natural resources have a negative impact on the quality of institutions. However, this negative effect turns into a positive one, once there is a considerable abundance of resources. On the other hand, Caselli and Cunningham (2009) theoretically highlight the hypothesis of the presence of an existing non-linear relationship between natural resources and the quality of institutions in a country with a presidential system. Avom and Carmignani (2010) argue that natural resources improve economic inequalities in a context of weak institutions. In addition, the description of the transmission channels of the negative effects of natural resources was put forward. Couttenier (2012) studies the threshold above which natural resources have a positive effect on the quality of institutions. It shows that natural resources have a negative effect on the quality of institutions, but above a certain threshold, this negative effect turns into a positive one. Caselli and Tesei (2015) show that the resource rent arising from an increase in commodity prices is at the root of the presence of an authoritarian state. Omgba (2015) focuses on a sample of oil-exporting countries. They find in his study a positive effect between the start of oil production and the period of independence of these countries. Brooks and Kurtz (2016) use data from 183 countries over a period from 1964 to 2004 to study the effects of oil wealth on political regimes. They find that oil resources are not necessarily a curse. That in the long run the latter can improve the quality of institutions. In addition, Houle (2018) defends the conditionality of the failure of the authoritarian regime which is at the origin of the negative effect of oil on the quality of institutions. At the end of this literature review, it emerges that there is no taxic agreement on the effects of oil rents on the quality of institutions. In addition, to our knowledge, there is no study that has looked at the non-linear relationship between oil rent and the quality of institutions. Hence the need to dwell on the evaluation of this relationship, in order to fill this void in the literature.

3. Data and research methodology

It is a question of presenting the methodological approach of the research (3.2). However, well before this phase, the need to go through the presentation of the studied variables and the data source is important (3.1).

3.1. Study data

Our study is based on determining the optimal level of oil rent having a positive effect on the quality of institutions. To do this, we are interested in the exporting countries of Sub-Saharan Africa. Due to the unavailability of data, we limited ourselves to 12 countries[2] over a period from 1995 to 2016, a three-year average. The choice based on an average of three years is relative to the condition imposed by our dynamic threshold model[3]. Thus, the number of individuals must be greater than the number of times (N> T). In addition, the choice of the study period is based on the harmonization of data and time. In addition, relating to our data, the majority of our data come from the database of the World Bank (WDI, 2020; WGI, 2020) and from Cruz et al. (2018). The choice made for the World Bank database is based on the fact that the latter does not suffer from any bias that is criticized by other databases (Couttenier, 2012). For the database of Cruz et al. (2018) is a credible database as it comes from Inter-American Development Bank. It is a credible American institution with international notoriety.

3.1.1. Dependent variable

Quality of institutions: This is a variable that takes into account the institutional arrangement and environment. As part of this research, we will focus on the institutional arrangement. Chekouri et al. (2017) are interested in the relationship between the oil rent and the quality of institutions in Algeria. To do this, within the framework of this study, by approaching in the same sense as these authors, we use three (03) institutional indicators which are used: *the balance of power (BP), the control of corruption (CC) and government efficiency (GE)*. However, we do not measure the linear relationship between rent and the quality of institutions, but we are interested in a non-linear relationship. Thus, the power balance variable is a variable established by Kaufman et al. (2004). The latter was taken over by Inter-American Development Bank (Cruz et al. 2018). This variable explains the probability that two (02) deputies chosen at random from the government or parliament belong to different parties. The choice made on this variable is based on the idea that it better reflects the role of political fractionation. Bjorvatn et al (2012) in his study on the resource curse in oil-rich countries. The corruption control (CC) variable is one of the variables of good governance. It determines the corruption and abuse of public powers for the purpose of profit. Thus, the choice made on this variable is due to the fact that it highlights the misappropriation of state property by the elites. The importance of this variable was made by Shadabi and Adkisson (2021). In addition, petty corruption and grand corruption are taken into consideration. In addition, the government efficiency variable takes into account the performance of the bureaucracy in the quality of the provision of public services.

3.1.2. Threshold variable

Oil rent (Oilrev): This variable represents the difference between the international price of oil and the average unit of extraction cost (Mohammed et al. 2015). Tan and Isa (2011) support a positive relationship between the price of oil and the stock performance of the energy industry in Malaysia. Thanks to an increase in the price of oil, this induces an increase in profits from the latter. In the same vein, Chekouri et al. (2017) put in relation the oil rent and the quality of institutions in Algeria. They showed the important place of the oil rent and its influence on the quality of institutions.

3.1.3. Control variables

Income inequality (Gini/head): It reflects the income disparities existing in a country during the period as a percentage of GDP. This measurement is made using the Gini index. The choice made on this indicator is based on the fact that it allows a better description of the income disparities existing in the countries of Sub-Saharan Africa, more specifically the countries rich in oil resources.

Education (EDU): This variable measures the education rate of individuals in secondary school. The effects of the latter on the quality of institutions must be positive. However, it is noticed that the countries rich in natural resources and particularly oil are less inclined to a weak school attraction.

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[2] L'Angola, le Cameroun, le Congo, le Gabon, la Guinée Equatoriale, le Nigéria, le Tchad, le soudan, la Côte d'ivoire, la République Démocratique du Congo, le Ghana, le Niger et l'Afrique du Sud.
[3] For more information, please consult Seo et al. (2019).

3.2. Justification of the econometric choice and choice of the research method

This subsection is based on the one hand on the justification for the choice of the econometric model and on the other hand on the methodological presentation.

3.2.1. Justification and specification of the econometric model

 This research aims to determine the optimal level at which the oil rent positively affects the quality of institutions in SSA countries. We use the dynamic threshold effect model unlike Seo and Shin (2016). Indeed, having a particularity to take into account the heterogeneity in the relationship between oil rent and the quality of institutions, it considers endogenous covariances and lagged variables. In addition, the model of Séo and Shin (2016) allows countries to make gradual changes over time. Finally, as the support Abdulahi et al. (2019), it takes into account the endogenous non-linearity highlighting the thresholds.

Moreover, Couttenier's (2012) model, although it takes into account the fixed country effect, suffers from the problem that it is not a real threshold model. The models of Hansen (2000) called the PTR model and the PSTR model of Gonzalez et al. (2005) suffer from an endogeneity problem. Thus, the choice made on the model of Séo and Shin (2019) remains the best suited. Therefore, Séo et al. (2019) put the stata model into practice and it can be specified as follows:

$$institution_{it} = \beta_0 + \beta_1 x_{it} + \beta_2 q_{it} + \delta (q_{it} - \gamma)\, 1\{q_{it} > \gamma\} + \alpha_{it} + \varepsilon_{it} \qquad (1)$$

With t representing the study period and i representing the country. Thus, we have two periods of panel data (t = 1.2). The latter take in first difference on the suppression of α_{it}, the individual characteristics of time-invariant in such a way that they are associated with the measurement of the oil rent. We then have the following second equation:

$$\Delta institutions_{i2} = \Delta\beta_1 x_{i2} + \Delta\beta_2 q_{i2} + (\delta_0 + x_{i2}\delta_1 + q_{i2}\delta_2)1\{q_{i2} > \gamma\} - (\delta_0 + x_{i1}\delta_1 + q_{i1}\delta_2)1\{q_{i2} > \gamma\} + \Delta\varepsilon_{i2} \qquad (2)$$

In addition, the variable $institutions_{it}$ represents the quality level of institutions in country i at period t. It is measured by three (03) variables: balance of power (BP), Control of corruption (CC) and government efficiency (GE). q_{it} represents the oil rent threshold variable (Oilrev), x_{it} : represents my different control variables like: education (Edu) and Income inequality (Gini/head).

3.2.2. Methodology for producing the econometrics model of Seo and Shin (2016)

The choice made on the dynamic panel threshold of Seo and Shin (2016) led us to adopt the procedure put into practice by Séo et al. (2019). Based on the principles of GMM, we proceed to four stages for the realization of the model:

The first step is to determine the non-linear relationship between oil rent and the quality of institutions using the Boostrap method. To do this, we validate the presence of nonlinearity, when the probability is zero (Seo et al. 2019).

The second step relies on using the high lags of the dependent variable to regress the instrumental variables. To do this, the endogenous variable is regressed on a set of instrument variables.

The third step insists on determining the threshold, after estimating the regression of the instrumental variables. To do this, we use the method of Hansen (1999).

The fourth step estimates the coefficients of the slope and the asymptotic variance using the generalized method of moments. The result of the estimate leads us to a curve with a slope whose coefficient is denoted K.

3.2.3 Presentation of Couttenier's threshold model (2012) to test the robustness of our results

To assess the robustness of the results, use the dynamic threshold model of Seo and Shin (2016), put into practice by Seo et al. (2019), we use the fixed-effect estimator of the dynamic threshold model of Couttenier (2012). Thus, Couttenier in order to take into account the fixed country effect, he uses the Within estimator and decides to shift the threshold variable by one period in order to solve the endogeneity problem. To do this, it squares the threshold variable, while leaving the control variables unchanged. By adapting his model to our study, the specification of his model looks like this:

$$institution_{it} = \partial_0 + \partial_1\, oilrev_{it-1} + \partial_2\,(Oilrev_{it-1})^2 + \sum Z_{i+}\varepsilon_i \quad (3)$$

Where $institution_{it}$ represents the dependent variable of country i at period t. $Oilrev_{it-1}$ is the oil rent of country i at period t shifted by one period. $\sum Z_i$ represents the sum of the control variables. $(Oilrev_{it-1})^2$ represents the oil rent threshold of country i shifted by one period. This expression represents the non-linearity between the oil rent and the quality of institutions.

4. Results and discussions of the estimates

This section deals with presenting the results (4-2) and discussing them (4-3). Long before that, it is a question of determining the stationarity of our variables (4.1).

4.1. Unit root test results

The objective of our research is based on estimating the optimal threshold of oil rent having a positive effect on the quality of institutions. These estimates are made on a sample of 13 SSA countries rich in petroleum resources. Well before proceeding to any estimates, it is necessary to proceed to the stationarity of our variables. The study of the stationarity of is done using the tests of Im, Pesaran and Shin (IPS) (2003) and the test of Levin, Lin and Chu (LLC) (2002). The results of the IPS and LLC tests led to significant results (see table [1] in the appendix). At the first result, with the IPS test, all the variables are stationary in level. Indeed, the test values are greater than the threshold of 1% and 5%. The second result, with the LLC test, shows us that all the variables are stationary in level, except the corruption and government efficiency variables which remain non-stationary despite the differentiation. We retain the results of the IPS test insofar as it considers both heterogeneity and autoregression of a unit root. In addition, this test corrects the limitation of the LLC test which suffers from the presence of unit root homogeneity.

4.2. Results of the estimation of the dynamic threshold model of Seo and Shin (2016)

The objective of our research is to determine the level of oil rent having a positive effect on the quality of institutions in the countries of Sub-Saharan Africa. Thus, we use the FG-GMM dynamic panel data threshold model of Séo and Shin (2016), put into practice by Séo et al. (2019).

The summary of these results can be found in Table [1] and the estimates made support the presence of an oil rent threshold. To do this, the hypothesis of the non-linearity between the oil rent and the quality of institutions at the threshold of 1%, 5% and 10%, is confirmed by the P_value of Boostrap (P_value = 0.000). In addition, the asymptotic formula for the GMM estimator of the dynamic threshold model is good and is supported by the value of the cutoff point denoted Ѓ, with a P_value <1%. Finally, the presence of an inverted U-shape is supported by the tilt angle, confirming the asymptotic shape of the model.

In addition, models (1), (2), (3), each having one of the three (03) indicators of the quality of institutions, namely: the balance of power (BP), Government efficiency (GE) and Corruption Control (CC), present several results. Thus, from these results, we can draw several lessons:

First, the direct relationship between the oil rent and the quality of institutions is materialized by the coefficient of the parameter β_1. To do this, our variable of interest which is the oil rent acts negatively and not significantly on the balance of power and the control of corruption with the respective values -0.0035 and -0.0420. But in a negative and significant way on the effectiveness of government with the respective value -0.0423. On the other hand, the inequalities of income and education variables improve the quality of institutions. However, income inequalities have a positive and significant effect on the balance of power with a value of 0.019. While education plays a positive and significant role on corruption with a value of 0.007.

Second, the relationship of non-linearity between the oil rent and the quality of institutions is presented by the parameter K. Being the parameter of the angle of inclination, materializing the asymptotic form, it allows to highlight an inverted U shape. It is observed that a relationship between the oil rent and the quality of institutions is positive. This positive relationship is significant with the variables of good governance (Government efficiency and control of corruption). On the other hand, not significant with the power balance variable. The values of the parameters of K, measuring the angle of inclination, are respectively 0.03405 (model 1), 0.023 (model 2) and 0.0389 model (3).

Table 1. Results of the dynamic threshold effect model with the quality of institutions as dependent variable

Dependent variable: BP		Dependent variable: CC		Dependent variable: EG	
Model (1)		Model (2)		Model (3)	
Estimated Threshold (γ)	29.93563 (0.000)	Estimated Threshold (γ)	22.526 (0.005)	Estimated Threshold (γ)	18.263 (0.000)
95% confidence interval	[18.564 ; 41.306]	95% confidence interval	[6.800 ; 37.279]	95% confidence interval	[8.234 ; 28.2929]
oil rent effect		**oil rent effect**		**oil rent effect**	
β_1	-0.0035 (0.608)	β_1	-0.0420 (0.852)	β_1	-0.0423 (0.000)
K	0.03405 (0.116)	K	0.023 (0.001)	K	0.0389 (0.000)
<u>**control variables**</u>		<u>**control variables**</u>		<u>**control variables**</u>	
BP_{t-1}	0.495 (0.318)	CC_{t-1}	0.4566 (0.000)	EG_{t-1}	-0.540 (0.000)
Education	0.000 (0.933)	Education	0.007 (0.000)	Education	0. 001 (0.212)
Gini/head	0.019 (0.001)	Gini/head	0.002 (0.852)	Gini/head	0.005 (0.197)
Number of current conditions	50	Number of current conditions	50	Number of current conditions	50
P_value of Boostrat	0	P_value of Boostrat	0	P_value of Boostrat	0
Number of countries	12	Number of countries	12	Number of countries	12

Note: **β₁** represents the upper speed parameter, while K represents the bank angle parameter. The values in parentheses represent the probabilities associated with the parameters.

 Source: Author, from stata.

4.3. Discussion and robustness test using Couttenier's dynamic fixed-effect threshold model (2012)

It is easy in this subsection to discuss our results in the light of another estimation technique, in order to confirm the solidity of the latter. This is how we use the dynamic fixed-effect threshold model of Couttenier (2012). The choice made on this model is based on the fact that it captures the fixed country effect. Thus, country fixed effects make it possible to capture all the factors during a period (Couttenier, 2012). To do this, it is then a question of comparing our results obtained in table [1] with those obtained in table [4]. In addition, it is also important in this subsection, a justification of the non-significance of our variables and the results obtained, in the light of the literature.

Regarding the results obtained in Table [1], we can safely say that we find substantially the same results in Table [2]. This confirms us on the strength of our results. Thus, the negative and insignificant effect of the oil rent on the balance of power and the control of corruption on the one hand and the positive and significant effect of the oil rent on the other hand. Government efficiency is part of the political resource curse theory (Ross, 2001). According to Ross (2001), countries with an oil presence tend to devote themselves to this windfall. Thus, Arezki and Brükner (2011) argue that in the presence of oil manna, the authorities, in order to escape redistribution and conflict, increase civil liberties and reduce political freedoms. The results of the negative linear effect of oil rent on the quality of institutions are in line with those found by Chekouri et al. (2017). Moreover, the negative effect of the oil rent turns into a positive effect on the indicators of the quality of institutions at a certain threshold. These results are in line with those found by Couttenier (2012).

The education variable is insignificant due to the absence of a real education policy in these countries as shown in models (1), (3) and (4). But, despite this lack of educational policy, it manifests itself in a positive effect on the balance of power and government effectiveness. These results are in line with those found by Asongu and Nwachukwu (2015). However, the non-significance present in models (5) and (6) is accompanied by a negative effect of the education variable on corruption and on government efficiency using Couttenier's model (2012).

The insignificance and positivity of the income inequality variable in models (2), (3) and (4) can be explained by development theory. Indeed, the distribution of income in these countries, although unequal, it improves government efficiency and corruption control. These results go in line with those found by Khan (2021) and Policardo et al. (2020). In contrast to models (5) and (6), in addition to having a negative effect on government variables, income inequality significantly on these variables.

Table 2. Robustness test using the dynamic fixed-effect threshold model of Couttenier (2012)

Dependent variable: BP Model (4)		**Dependent variable**: CC Model (5)		**Dependent variable**: EG Model (6)	
oil rent effect		**oil rent effect**		**oil rent effect**	
$Oilrev_{t-1}$	-0.009 (0.188)	$Oilrev_{t-1}$	-0.0186 (0.123)	$Oilrev_{t-1}$	-0.028 (0.028)
$Oilrev_{t-1}^2$	0.0002 (0.077)	$Oilrev_{t-1}^2$	0.0002 (0.344)	$Oilrev_{t-1}^2$	0.0002 (0.267)
control variables		**control variables**		**control variables**	
Education	0.00021 (0.869)	Education	-0.001 (0.625)	Education	-0. 001 (0.472)
Gini/head	0.008 (0.112)	Gini/head	-0.018 (0.041)	Gini/head	-0.019(0.038)
Constant	0.1598 (0.013)	Constant	-0.547 (0.000)	Constant	-0.360 (0.02)
R^2 (Within)	0.0725	R^2 (Within)	0.120	R^2 (Within)	0.189
Number of Observations	84	Number of Observations	84	Number of Observations	84
Number of Countries	12	Number of Countries	12	Number of Countries	12

Note: The values in parentheses represent the probabilities associated with the parameters.

Source: Author, from stata.

5. Conclusion

The object of this research rested on the optimal determination of the oil rent from which, the quality of the institutions has a good performance. Our sample focused on 12 oil-rich Sub-Saharan African countries. The study period was between 1995 and 2016. In order to take into account, the conditions of our dynamic threshold model, we took a three-year average. Thus, the dynamic threshold model of Séo and Shin (2016), put into

practice by Séo et al. (2019) supports three (03) thresholds respectively of 29.935, 22.526 and 18.263. In addition, the three (03) indicators for measuring the quality of institutions (balance of power, control of corruption and government efficiency) better describe the theory of the political curse of natural resources put forward by Ross. (2001). Moreover, in terms of economic policy recommendations, the presence of monitoring of government action in these countries must be accentuated. Thus, the parliament must set up a commission which evaluates the achievements made by the government. In addition, the independence of the legislative, executive and judicial power is very important. This is how, to fight corruption, these three (03) powers must be evaluated in full transparency.

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Appendix

Table 1. Results of unit root tests

Variables	Level		First difference		Observation
	IPS	LLC	IPS	LLC	
Corruption Control (CC)	-8.701*** (0.000)	2.170 (0.985)	-12.229*** (0.000)	8.324 (1.000)	I(0)
Balance of Power (BP)	-1.289** (0.098)	-2.349** (0.009)	-7.565*** (0.000)	-6.562*** (0.000)	I(0)
Government Effectiveness (GE)	-7.620*** (0.000)	0.642 (0.739)	-11.870*** (0.000)	5.539 (1.000)	I(0)
Education (EDU)	-1.802** (0.035)	2.384 (0.991)	-9.312*** (0.000)	-3.686*** (0.001)	I(0)
Income inequality (Gini/head)	-6.486*** (0.000)	-2.872*** (0.002)	-10.107*** (0.000)	-7.728** (0.000)	I(0)
Oil rent (Oilrev)	-1.981** (0.023)	-3.010*** (0.001)	-6.940*** (0.000)	-6.471*** (0.000)	I(0)

Notes: (***), (**) significance at 1%, 5%. Values in parentheses are probabilities.

Source: Author, from stata.