Extended Abstract

A Non-Linear Approach of

Natural Resources Rents on Internal Conflicts

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Abstract

This paper investigates the non-linear effect of natural resources rents on internal conflicts in 60 natural resources countries over the period 1984-2016 using a Panel Smooth Transition Regression approach. Data used in this study is obtained from International country Risk Guide and WDI of the World Bank. Results suggest that using a linear panel model we obtain no effect of natural resources rent on internal conflicts. However, when we estimate using a PSTR model we obtained a positive and significant effect of natural resources rent on conflict in the first and second regime. This indicates that in the first regime, the effect of natural resources becomes positive due a gradually (smooth) increases over the transition function. Likewise, we observe a positive effect in the second regime. Moreover, the effect becomes negative above the threshold level of 17.212 indicating a non-linear effect. They study thus indicate that natural resources can also be used to reduce conflict and should not only be considered as a curse. There is need to adequately chose the specification and techniques in macroeconomics because it's difficult to observe linear economic phenomena.

1. Introduction and objective

Effort to identify determinants of conflicts brings to mind some important questions. First, in which context do we observe conflicts? Second, what are the possible transmission mechanism? Third, which variable or correlates determine conflicts? Finally, which econometric approaches resolve potential econometric limitations? These questions are perennial and difficult to tackle because they require appropriate identification of conflict transmission mechanism as well as model specification.

Recently, the notion of resources curse has gained considerable attention across social sciences. However, conflict in natural resources sectors seems to have been one of the main factor which may explain the resources curse. Studies linking natural resources and conflicts have been conducted in a wide range of disciplines, environmental studies, geography, sociology,

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anthropology, political sciences and economics. Despite significant studies conducted on this linkage, there is lack of scientific consensus on the effect of natural resources on the onset, duration, intensification and risk of conflicts. The literature on natural resources-conflict nexus is broadly classified into three main groups. The first group argue that natural resources abundance mostly non-renewable fuel, violence, inequalities and conflicts. Those of the second group claim that it's scarcity of both renewable and non-renewable rather than abundance that leads to conflicts and instability. The last group posits that the results obtained by the first group and second groups are not robust and therefore argue for a non-significant effect of natural resources on conflicts.

The objective of this chapter is twofold. Firstly, the study aims at presenting an overview of the origin, historical evolution and development of resources-conflict nexus. Secondly, determine the non-linear effect of natural resources rent which may mitigate the effect of natural resources on conflict. Following Bayramov (2018), we agree that overviewing the origin, historical evolution and development of resources-nexus conflicts may help us to better understand the transmission mechanisms of natural resources on conflicts. This thus constitute the first value addition of this paper. The second value addition of this chapter is empiric. We use a panel threshold methodology to determine the non-linear effect of natural resources rent on internal conflict in 60 natural resources countries. To the best of our knowledge, this study is the first to use a non-linear panel data to evaluate the effect of resources rents on internal conflicts.

Natural resources constitute a key sector for the development of a country. It is therefore important to understand which correlates-observed and composite variable impedes it from it positive contribution to economic development. This paper attempt to link-up the concept of natural resources, and conflict.

2. Data and Sources

Data used here are obtained from two distinct sources namely, International Country Risk Guide (ICRG, 2018) and World Development indicator of the World Bank (WDI, 2018).

ICRG of the PRC group provides both monthly and annual data on political risk (12 components and 15 sub-components), financial risk (5 components) and economic risk (5 components) from 1984 to date. Each component is assigned a maximum numerical value (risk points), with the highest number of points indicating the lowest potential risk for that component and the lowest number (0) indicating the highest potential risk. The maximum

points able to be awarded to any particular risk component is pre-set within the system and depends on the importance (weighting) of that component to the overall risk of a country. The ICRG risk is asses on the basis of political, financial and economic information collected in each country and converted into "risk points" for each variable on the basis of consistent pattern of evaluation. Political risk are calculated based on subjective data whereas financial and economic risk are based on objectives data.

In this study, we focus on political risk component to evaluate the non-linear effect of natural resources rent on internal conflicts. The political risk rating aims to provide a way of evaluating the political stability of a country on comparable basis. As such, it provides risk points to a pre-group of factors, called political risk components. For consistency raisons, both between countries and overtime, points are computed by the editor based on a series of pre-set questions for each risk component.

The components of political risk used here are; internal conflicts, Religions tension, Ethnic tension and democratic accountability.

Internal Conflict (dependent variable) asses' political violence and it actual or potential impact on government in a given country. The highest rating (4) is assigned to countries where there is no armed or civil opposition to the government and the government does not contribute in arbitrary violence, either direct or indirect against its own people. The lowest rating (0) is attributed to countries engaged in an on going war. Finally, the risk assigned is the sum of three sub-components Civil war/Coup threat, Terrorism/Political Violence and Civil Disorder. A score of 4 represents a low risk whereas a score of 0 is for high risk. In other to ease interpretation, we restructure the variable by subtracting all the variables from 12 such that the lower risk has a score of 0 and the higher risk has a score of 12.

Religious Tension, represents is when the rules and regulation of a country is strictly dominated by a single religion group seeking to replace the civil and excluding other religions from political and or social decision. A high risk assigned a value of 0 whereas a low risk has score of 6 for interpretation purposes, we restructure it in such that low risk has a score of 0 and high risk a score of 6.

Ethnic Tension, it measures the degree of tension is a country attributed to racial, nationality, language division and region of origin. Unlike religious tension, a high risk assigned a value of 0 whereas a low risk has score of 6 for interpretation purposes, we restructure it in such that low risk has a score of 0 and high risk a score of 6.

Democratic accountability, this the degree of sensitivity of the government to it people. ICRG differentiates five types of democracy namely, alternating democracy, dominated democracy, de facto one-party state, de jury one-party state and autarchy. The best form being alternating and the worst being autarchy. The highest score (6) of risk is attributed to alternating democracy and lowest score (0) to autarchies.

Other explanatory variables obtained from World Development Indicator (WDI) of the World Bank include; **Natural resources rent percentage of GDP, income per capita, total population and the proportion of youth's population (aged between 15 and 30).** Natural resource rents are defined in this study as the difference obtained from the total revenue that can be generated from the extraction of the natural resource minus the cost of extracting these resources (plus normal return on investment reported by extractive enterprises). This is the sum of oil rents, natural gas rents, coal rents (hard and soft), mineral rents, and forest rents.

3. Empirical Methodology and Results
3.1. Empirical Methodology

In this paper, the theoretical specification of our empirical model is based on the model suggested by Collier and Hoeffler (2004)

To estimate our empirical model, we opt for a panel data regression model. In regression models for panel data, it is typically assumed that heterogeneity associated to the nature of the data can be captured by means of (random or fixed) individual effects and time effects, such that the coefficients of the observed explanatory variables are identical for all observations. In many empirical applications, this poolability assumption may be violated and therefore warrants the adoption of techniques that may account more robustly for heterogeneity.

We suggest using the panel smooth transition regression (PSTR) model. This approach presents both advantages and disadvantages. Concerning advantages, the PSTR specifications allow the natural resources rent-conflicts coefficient to vary between countries, between different regimes and also overtime. This provides a simple way to appraise the heterogeneous nature of the relationship between natural resources rents and conflicts overtime and by countries. Another advantage associated to the PSTR approach is that it permits a smooth and/or a brutal change in country-specific correlation depending on the threshold variables. In this paper, our threshold variables is natural resources

Nonetheless the PSTR also has some disadvantages. First, the PSTR does not solve the problem of endogenous variable found among the explanatory variables. Second, the PSTR assumes a unique threshold for all the countries.

To investigate the non-linear relationship between natural resources rents and internal conflicts, we use a PSTR approach developed by González et al. (2005), which is a generalization of the Hansen (1999) Panel Threshold Regression model. Let the basic panel smooth transition regression model with two regimes be expressed as:

$$y_{it} = \mu_i + \beta'_0 x_{it} + \beta'_1 x_{it} g(q_{it}; \gamma, c) + \varepsilon_{it} \tag{1}$$

where $i=1,...,N$, and $t=1,...,T$, with N and T denoting the cross section and time dimensions of the panel, y_{it} the dependent variable, x_{it} a k-dimensional vector of time varying exogenous variables, μ_i the fixed individual effect, ε_{it} the error term are iid$(0, \delta^2)$. Re-writing equation 1 in the form of the empirical model adopted for the PSTR in this paper, we obtain:

$$Confl_{i,t} = \mu_i + \beta_{01}ETHF_{i,t} + \beta_{02}RET_{i,t} + \beta_{03}DEMO_{i,t} + \beta_{04}LNGDPPPCA_{i,t} +$$
$$\beta_{05}POPY_{i,t} + \beta_{06}LnTPOP_{i,t} + \beta_{11}NR_{i,t}g(q_{it}; \gamma, c) + \varepsilon_{it} \quad (1b)$$

Where, $CONfl_i$ represents internal conflict for individual i, TNR total natural resources rent, ETHF ethnic tension, DEMO democratic accountability, $LNGDPPPCA$ ln of GDP per capita, POPY ln youth population(aged between 15 and 30), $LnTPOP$ ln of total population and ε_i the error term.

The transition function $g(q_{it}; \gamma, c)$ is a continuous function and depends on the threshold variable q_{it} (Hansen, 1999). Granger and Tarasvirta (1993) provide a logistic specification of the transition function with c denoting threshold parameters, γ determines the smoothness or slope of the transition, q_{it} the threshold variable and m the number of thresholds. β'_0 are the parameters estimated without the transition, β'_1, are the parameters on which the transition variable interact with, μ_i and $g_j\left(q_{it}^{(j)}; \gamma, c_j\right)$ is an integrable transition function on [0, 1].

The choice of transition variables depends on the studied economic phenomenon, and therefore are statistically significance to account for structural breaks in the model. In our case, "natural resources rent" is the threshold variables. Our choice is justified by the fundamental character of this variable in understanding the economic resources dependence for the rentier States. In this case, the transition function is:

$$g_1\left(IQ_{it}^{(1)}; \gamma_1, c_1\right) = \left[1 + exp\left(-\gamma \prod_{j=1}^{m}(IQ_{it} - c_i)\right)\right]^{-1} \quad (2)$$

3.2.Results

The table 1 shows the sequence of test for choosing between the number of threshold or inflection points(m*=1 and m*=2) as suggests the PSTR formulation.

Table 1: Determination of Number of Threshold between m=1 and m=2

Hypothesis	Lm_f Test	SL	Robust chi 2	SL
$H_0^*: \beta_1^* = \beta_2^* = \beta_3^* = 0$	9.459	0.000	25.19	0.000
$H_{03}^*: \beta_3^* = 0$	20.01	0.000	18.341	0.000
$H_{02}^*: \beta_2^* = 0 \mid \beta_3^* = 0$	7.966	0.004	6.2	0.012
$H_{01}^*: \beta_1^* = 0 \mid \beta_3^* = \beta_2^* = 0$	0.315	0.574	0.254	0.614

Source: Author's estimation using RATS 9.1 software and data from World Bank and ICRG

Following the series of test proposed by Granger and Terasvirta (1993) and Terasvirta (1994), firstly, we observe that H_0^*: is rejected meaning that they exist at least one threshold. Secondly, H_{03}^* indicates that we don't have 3 threshold, likewise for 2 threshold, H_{02}^*. The model thus, selects H_{01}^* *one threshold.*

Table 2: Test of Linearity Vs PSTR with m* = 1

Hypothesis	Lm_f Test	SL	Robust chi 2	SL
$H_0^*: \beta_1^* = 0$	0.315	0.574	0.254	0.614

Source: Author's estimation using RATS 9.1 software and data from World Bank and ICRG

This test relies on the Wald and Lagrange multiplier test. The null hypothesis test consist of verifying the null hypothesis for which the PSTR has a single threshold (m=1) against the alternative hypothesis has at least two threshold. Table two shows that we have a single threshold and thus indicate that we have two regimes.

Table 3: Panel Regression estimations.

Variables	Dependent variable: internal conflict				
	Model 1 *Fixed Effect Panel Without transition*	*Model 2* *Fixed Effect Panel With transition*			
Ethic Fragmentation	0.612*** (0.057)	0.569*** (0.055)			
Democratic accountability	-0.344*** (0.047)	-0.343*** (0.042)			
Religious Tension	0.427*** (0.055)	0.439*** (0.051)			
Ln GDP per Capita	0.332* (0.183)	0.326* (0.171)			
Ln total Population	-1.769*** (0.223)	-1.985*** (0.214)			
Ln youth population	-0.924 (0.736)	-0.944 (0.757)			
Natural resources	0.006 (0.010)	-			
Natural Resources (β_0)		0.103*** (0.016)			
Natural resources (β_1)		-0.091*** (0.016)			
$\hat{c}$		17.212*** (0.428)			
$\hat{\gamma}$		0.408*** (0.060)			
R^2	0.555	0.563			
Natural resources Regime 1 (transition=0)		0.103*** (0.018)			
Natural resources Regime 2 (transition=1)		0.011*** (0.007)			

Source: Computed by authors from WDI 2018 and ICRG. Note: (***), (**) (*) denote significance at 1%, 5% and 10%, respectively. Standard errors are reported in parentheses.

Table 3 presents the results of the model outlined in equation (1b) using 60 natural resources countries over the period 1984-2016. Model 1 is a fixed panel estimation without the transition functions. The results from this model show that natural resources rents has no effect on internal conflicts this results is consistent with those obtained by Bodea et al.,(2016) Easteban et al., (2012), Fearon (2005). Moreover, other explanatory variables such as ethnic fragmentation, democratic accountability, and religious tension are significant and are consistent with the existing literature.

For model 2, we introduce the transition function as exposed in the Panel smooth transition model. First, we observe that the relationship between natural resources and internal conflict is

non-linear as made evident by the different signe of natural resources on internal conflict. Second, we observe a positive effect of natural resources on internal conflict when natural resources rent gradually increases over the transition function. This positive effect is also obtained by Collier and Hoeffler in most of their papers conducted on this effect, Fearon and Laitin (2003). Third, we have two regime a lower regime which have a positive an significant effect on internal conflict and a higher regime which also has a positive and significant effect on internal conflicts. Finally, observe that all the other controlled variables are consistent with the results obtained when we do not include the transition function.

However, this results also suggests that natural resources can also be used to reduce conflict. This is shown by the negative and significant effect of natural resources rent on internal conflict given by Natural resources(β_1).

Figure 2: Transition function
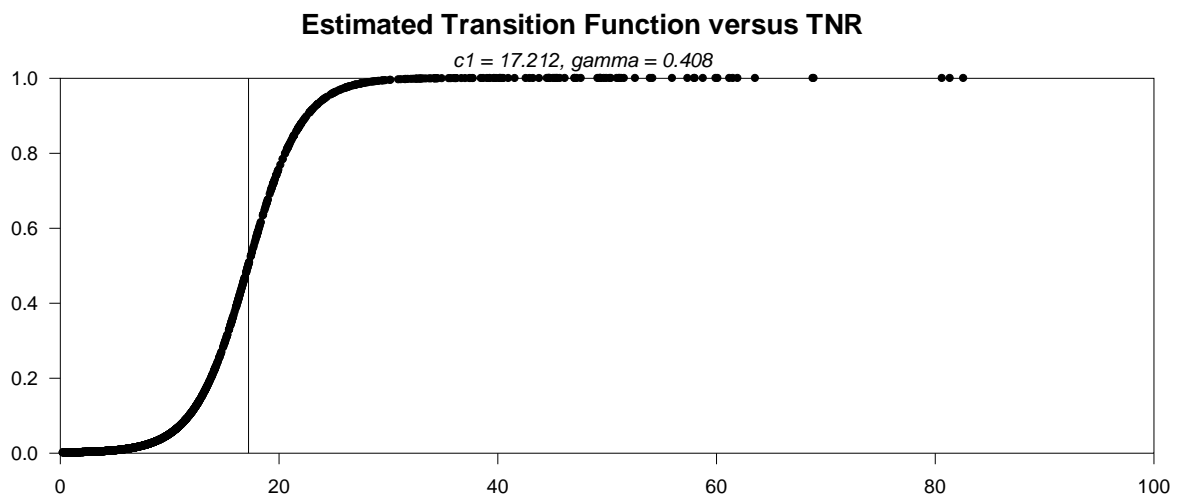
The transition function versus the natural resources provides 3 important information. First, the threshold level of natural resources from one regime to another. Second, the slope of the transition function. Here, the graph suggests a smooth transition function. Finally, the relationship between natural resources and internal conflict in different regimes. We observe that the effect increases gradually in the first regime and become constant in the second regime indicating that natural resources has no effect on internal conflict.

4. Conclusion

This paper on the first hand aims at presenting and over view of the historical evolution and theoretical concept of the expression resources war and resources scarcity. On the other hand, evaluates the non-linear effect of natural resources rent on internal conflicts in 60 natual resources countries using data from ICRG and WDI over the period 1984-2016. The results suggest that 1) there is a non-linear effect of natural resources rent on internal conflicts 2) the effect of natural resources rent on internal conflict is positive and significant when natural resources rent increases gradually over the transition function. 3) Natural resources rent both has a positive and significant effect on conflict in the lower and the higher regime. However, it is positive in the lower regime because the estimate takes into account the evolution of natural resources on the transition function. Moreover, above the higher regime an increase in natural resources rent has no effect on internal conflicts as made evident by the transition function. 4) the threshold level of natural resources which mitigates the positive effect of natural resources rent on conflict is 17.212 this indicates that a gradual increases in natural resources causes an increase in internal conflict above that point (inflection point) the effect becomes negative. This indicates that natural resources can also be used to reduce conflict as suggests Brunnschweiler and Bulte (2009). Moreover, this indicates that natural resources can also be considered as a blessing not as a curse as many studies claim.

Most studies on the effect of natural resources uses linear models an most of them find a non-significant effect of natural resource on conflict. The contribution of this study is thus empiric using PSTR model. The model has the advantages of determining the nonlinear effect of the variable of interest on the dependent variable. Moreover the model proposes the variation of the estimated coefficient over time and per individual countries. Finally, it provides the marginal effects per individuals. This study highlights that there is need to choose adequate specification and methods when dealing with macroeconomics phenomena.

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