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### The heterogeneous effect of natural resource rents on vulnerable employment in sub-Saharan Africa: Does the quality of institutions matter?

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#### Abstract

Natural resources have been seen both a blessing and a curse. This paper investigates the effect of natural resources rents on vulnerable employment in sub-Saharan Africa and explores the role of institutional quality. The data used cover 30 countries over the period 2005-2018. The results from the data-driven finite mixture model estimation highlight three vulnerable employment regimes. In the first regime, natural resources rents increase vulnerable employment. In the second regime, natural resources rents do not affect vulnerable employment while they reduce vulnerable employment in the third regime. Thus, natural resources are curse in the first regime, neutral in the second and blessing in the third. The results also show that countries with lower political risk, especially better investment profile, less internal conflicts, and where law and order and rigorous and impartial public administration prevail, are more likely to belong to the resource blessing regime. These results underline the need for resource-rich countries to improve the quality of their institutions to benefit from the blessing of natural resources.

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## **1. Introduction**

Some countries are endowed with natural resources while others do not. Do these resources allow countries to initiate their economic development better than countries less or not endowed with natural resources? Both theoretical and empirical literature provide a controversial answer to this fundamental question given that countries abundantly endowed with natural resources are both economic development losers and winners (Mehlum, Moene and Torvik, 2006 a; Orihuela, 2018). At the very beginning, economists argued that natural resources are beneficial to economic development through productive investments, the generation of foreign currencies, the attractiveness of foreign direct investments (Alssadek and Benhin, 2023). This thesis, known as the resources blessing hypothesis is called into question by the resources curse thesis. More specifically, the curse thesis posits that resource wealth is detrimental to economic development (Auty, 1993; Sachs and Warner, 1995).

The effect of natural resources on economic development has focused more on economic growth (Cavalcanti, Mata and Toscani, 2019). Less attention has been paid to the effect of natural resources on employment. The very few studies that have been carried out have focused on total employment, without taking quality dimension into account, and have concentrated on developed and emerging countries (Agerton *et al.*, 2017; Huo *et al.*, 2023; Weber, 2012; Wrenn, Kelsey and Jaenicke, 2015).

This paper investigates the effect of natural resources on vulnerable employment in Sub-Saharan Africa (SSA) and highlighting the role of institutional quality. SSA is one of the epicenters of vulnerable employment with a vulnerable employment rate which has stagnated over the last decade, going from 76.1% to 75.5% between 2012 and 2022 (International Labour Organization, 2024). It is also a region where the number of countries rich in natural resources has increased since 2000 (Cust and Zeufack, 2023).

This paper provides new insight on the natural resource- vulnerable employment nexus and contributes to the existing literature in three ways. First, unlike past studies which do not take into account the quality of employment, this research focuses on vulnerable employment. Second, the previous studies use a single model approach to test the curse/blessing hypothesis of natural resources. This approach suggests that the effect of natural resources is constant across the distribution and that the findings apply to all countries in the sample. It's all the more difficult to admit that the effects are not the same across countries and that «context matters» (Orihuela, 2018). In this paper, we use a finite mixture model to overcome all these drawbacks. Third, unlike previous studies, which use interactive variables (Chambers and Munemo, 2019), we use concomitant variables approach. We identify institutional quality as concomitant variables and this allows us to explain group membership and explore whether the institutional quality matters in the relationship between natural resources and vulnerable employment.

The rest of the paper is structured as follow: The second and third section presents respectively the literature review and the methodology. The fourth section presents and discusses the empirical findings. Finally, the last section concludes and provides some policy implications.

## **2. Vulnerable employment effect of natural resource: a literature review**

Theory provides conflicting predictions about the effect of natural resource on vulnerable employment. Three main contrasting perspectives have been used in describing the relationship between resource rent and vulnerable employment: (i) the resource curse hypothesis, (ii) the resource blessing hypothesis, (iii) and the conditional effect of natural resource on vulnerable employment.

### **2.1.The resource curse hypothesis**

Theory highlights several channels through which natural resources favor vulnerable employment. A boom in natural resources leads to an appreciation of the real exchange rate -the Dutch disease, and a loss of competitiveness for domestic non-resource traded products in the international markets (Cust, Devarajan and Mandon, 2022). According to Murshed (2018) and Sachs and Warner (1999), the abundance of natural resources tends to draw productive resources, namely capital and labour, away from the agriculture and manufacturing sectors, generating a crowding effect that may ultimately lead to premature and irreversible deindustrialization. Deindustrialization translates into a loss of productive jobs and an increase in vulnerable jobs, as the restructuring of the productive system does not always enable displaced workers to find equivalent types of employment. In the same vein, since the price of resource products tends to be very volatile, resource-rich economies tend to experience volatility in economic activity, which does not guarantee job sustainability and is likely to encourage vulnerable employment.

Likewise, because natural resource windfalls can be obtained without much effort, individuals are encouraged to engage in rent-seeking activities rather than productive activities such as innovation and industry (Sachs and Warner, 2001). When rent seeking makes the extractive sector more profitable than entrepreneurial activity, then the latter is crowded out (Asiamaha *et al.*, 2022). In fine, resource endowment limits the economy's capacity to generate productive employment and favoring vulnerable employment. Similarly, the natural resource economy has sometimes weak or no linkages with the rest of the national economy (Singer, 1950). This disconnection creates a kind of "**enclave resource economy**" that does not contribute to the expansion of local industries. Therefore, it does not allow for the creation of productive employment.

Empirical evidence supports the resource curse hypothesis. Weber (2012) find that the increase of gas production is associated with modest increases in employment in Colorado, Texas, and Wyoming. In the same vein, Wrenn, Kelsey and Jaenicke (2015) find that the Marcellus deposit in Pennsylvania has had a modest effect on overall employment. Huo *et al.* (2023) find that coal rents, natural gas rents and oil rents reduce employment generation in emerging economies.

### **2.2.The resource blessing hypothesis**

Exploiting natural resources increase employment opportunities by directly creating jobs all along the chain, from prospecting to extraction, transportation and processing (Huo *et al.*, 2023). These jobs are more productive and remunerative for households (Zabsonré, Agbo and Somé, 2018), reducing the vulnerable employment. In addition, resources booms generate new government jobs (Ross, 2007). Likewise, natural resource can foster human capital accumulation by providing additional revenues that can be put to good use to increase public spending on education (Stijns, 2006). The financial resources generated by natural resources can be used for other productive purpose (Lashitew and Werker, 2020) and improve productive employment. The opportunities created through the exploitation of natural resources increase household incomes, especially the poor, enabling them to invest in education (Savoia and Sen, 2021). This training made possible through the exploitation of natural resources enables households to secure stable employment,

thereby reducing vulnerable employment. The natural resources can also foster structural transformation through an increase in services GDP, share of workers in services, and the size of services firm (Cavalcanti, Mata and Toscani, 2019), and therefore reduce vulnerable employment. From an empirical perspective, Agerton *et al.* (2017) use time-series methods at the national level and dynamic panel methods at the state level to analyze the effect of an increase in exploration and production activity on employment in the United States. They find that changes in drilling for oil and gas as positive effect on employment. Huo *et al.* (2023) find that forest rents foster employment generation in emerging economies.

### **2.3. The conditional effect of natural resource on vulnerable employment**

Beyond the controversial debate, another wave of literature has highlighted the conditional effect of natural resource on vulnerable employment. Natural resource-vulnerable employment nexus is contingent on institutional quality (Alssadek and Benhin, 2023). Literature provides evidence that natural resources are blessing in countries with strong institutions and a curse in weak institutions environment (Alssadek and Benhin, 2023; Chambers and Munemo, 2019; Mehlum, Moene and Torvik, 2006 a ; 2006 b ; Orihuela, 2018; Ross, 2015; Tornell and Lane, 1999). Orihuela (2018) argues that since institutions interact with curse mechanisms, they matter for understanding the effect of natural resources on economic development. In the same wave of idea, Mehlum *et al.* (2006 a; 2006 b) maintain that natural resources generate growth in an environment of producer-friendly institutions, given that it is less profitable to engage in grabbing. In contrast, natural resource curses economic development when grabber-friendly institutions prevail due to the existence of gains from specialization in unproductive activities.

In countries richly endowed with natural resources, the political elites in power are more inclined to renege on contracts signed with private investors and nationalize companies, thereby increasing the political risk as perceived by companies (Jensen and Johnston, 2011). In this respect, Wang *et al* (2021) consider that this environment of instability is not conducive to countries using natural resources for development.

Although theory provides evidence that natural resources affect vulnerable employment, less attention has been paid to this link through empirical investigations. The rare empirical assessments have focused on employment in general, without taking into account the quality dimension, and have concentrated on Northern countries (Agerton *et al.*, 2017; Huo *et al.*, 2023; Weber, 2012; Wrenn, Kelsey, and Jaenicke, 2015). This paper provides new insight by investigating the effect of natural resources on vulnerable employment in Sub-Saharan Africa, one of the epicenters of vulnerable employment.

## **3. Empirical method and data sources**

This section presents the methodology and the data.

### **3.1. Traditional fixed/random effect model**

Following the previous work on the determinants of vulnerable employment (Erkul and Külünk, 2022; Gammage, Sultana and Glinski, 2020; Uwajumogu, *et al.*, 2022), the standard regression model of our empirical estimation is set as follows:

$$VE = f(Nat\_Ress, X) \quad (1)$$

Equation (1) indicates that the vulnerable employment is a function of natural resources and a set of control variables (X). When we take into account the panel and time dimension, we obtain equation (2).

$$VE_{it} = \alpha_0 + \alpha_1 Nat\_Ress_{it} + \beta_j X_{jit} + \varepsilon_{it} (2)$$

where  $\varepsilon_{it}$  is the error term; i stands for a country and t the period.

$VE_{it}$  is the vulnerable employment as share of total employment. Vulnerable employment is defined as contributing family workers and own-account workers as a percentage of total employment (International Labour Organization, 2024). For robustness, we take gender into account by assessing the effect of natural resources on vulnerable female employment and vulnerable male employment.

The independent variable of interest is total natural resources rents (% of GDP). Total natural resources rents are the sum of oil rents, natural gas rents, coal rents (hard and soft), mineral rents, and forest rents (World Bank, 2024). Following the previous works on the determinants of vulnerable employment, we include some control variables in the model (2) : fertility rate, financial development, economic globalization, urbanization and educational equality.

Following Bue *et al.* (2022) and Grammage *et al.* (2020), we posit that fertility rate increase the vulnerable employment rate. We control for financial development through domestic credit to private sector as a percentage of GDP. Better access to credit can encourage the creation of new businesses and reduce the rate of vulnerable employment. Economic globalization is also a factor that can influence the rate of vulnerable employment. Opening up to foreign markets, by facilitating the spread of knowledge and the adoption of modern technologies, can help reduce vulnerable employment. Globalization has led to the rise of manufacturing as a new formal employment sector in developing countries (Reichlin *et al.*, 2015). A negative relationship is expected between globalization and vulnerable employment rate. The rate of urbanization is also used as a determinant of the rate of vulnerable employment. Urban jobs, whether in the formal or informal sector, are more numerous, and often offer higher and more stable incomes than rural jobs, which are often subject to fluctuations due to seasonal changes, environmental stress or market mechanisms (Centre on Housing Rights and Evictions (COHRE), 2008). As a result, the expected sign of the coefficient associated with urbanization is positive. In fine, we control educational equality. Educational equality is the extent to which high quality basic education is guaranteed to all, sufficient to enable them to exercise their basic rights as adult citizens (Coppedge *et al.*, 2023). Equal access to education enables all citizens to benefit from sound training, thus increasing their productivity and employability. In so doing, this variable is negatively associated with vulnerable employment rates.

This traditional regression model assumes that the average marginal effect of natural resources on vulnerable employment is identical. This is problematic given the multiple regimes identified in the literature on the link between natural resources and economic development (Mehlum, Moene, and Torvik, 2006 b). Furthermore, as Wang and Lee, (2021) posit it, taking heterogeneity into account by partitioning the sample on the basis of ad hoc values does not correct for probable heterogeneity. In this paper, we use a finite mixture model that takes these limits into account.

### 3.2. Finite mixture model

We investigate the effect of natural resource rents on vulnerable employment in Sub-Saharan Africa by using the finite mixture model. The finite mixture model is a semiparametric method

which relaxes the single model and take into account any unobserved heterogeneity in the sample (Flachaire, García-Peñalosa and Konte, 2014). This allows us to investigate the distinct effect of natural resource on vulnerable employment. It allows an endogenous and probabilistic assignment of countries across the subgroups and take into account variations in the marginal effect of the control variables (DiVaio and Enflo, 2011). This method, together with the concomitant variables, makes it possible to explain membership of the various vulnerable employment paths. In the case in point, institutional quality is used as concomitant variables et allow us to explain countries' membership of the distinct natural resources - vulnerable employment nexus.

To specify a finite mixture model, we suppose that each country belongs to one of a set of latent classes  $j = 1, \dots, C$ , and that countries are heterogeneous across classes. Conditional on the observed covariates, there is homogeneity within a given class  $j$ . Thus, a mixture model of linear regression is specified by:

$$f(y/x; \Theta) = \sum_{c=1}^C \pi_c \phi(y/x; \beta_c, \sigma_c) \quad (3)$$

$f(y/x; \Theta)$  is the distribution of economic growth rates conditional on belonging to class  $c$  and on covariates  $x$ ;  $C$  is the number of groups; and  $\pi_c$  is the probability of belonging to class  $c$ . The probability of belonging to class  $c$  is:

$$\pi_c = \frac{\exp(\gamma_c)}{\sum_{c=1}^C \exp(\gamma_c)}, \text{ with } 0 < \pi_c < 1 \text{ and } \sum_{c=1}^C \pi_c = 1 \quad (4)$$

The estimation can be carried out using maximum likelihood with the Expectation-Maximization (EM) algorithm of Dempster, Laird and Rubin (1977).

$$\max_{\pi, \Theta} \log L = \sum_{i=1}^N \left( \log \left( \sum_{c=1}^C \pi_c f_c(y/\theta_c) \right) \right) \quad (5)$$

Following Hawkins, Allen, and Stromberg (2001) in the case of a mixture linear regression, the Bayesian Information Criterion (BIC) developed by Schwarz (1978) is used to select the number of components. The BIC is defined as

$$\text{BIC} = -2 \log(L) + K \log(N) \quad (6)$$

$\log(L)$  is the estimated value of the log-likelihood estimated in (3) and  $N$  is the number of observations.

### 3.3. Data source

The data used are annual and cover 30 countries over the period 2005-2018. The vulnerable employment, fertility rate, financial development and urbanization are taken from the World Development Indicators (WDI) (World Bank, 2024). Economic globalization come from KOF Globalization Index, compiled by Gygli *et al.* (2019). Educational equality is taken from V-Dem's database (Coppedge *et al.*, 2023).

Table 1 presents the descriptive statistics and data sources. The table shows that 70.24% of jobs in the sample were vulnerable during the study period. Vulnerable employment affects women more

than men, with a rate of 78.24% compared with only 63.55% for men. The natural resource rents accounted for 12.23% of GDP in the sample over the period.

Table 1: Descriptive statistics

| Variables                                          | N   | mean   | sd    | min     | max   | Source |
|----------------------------------------------------|-----|--------|-------|---------|-------|--------|
| Total Vulnerable employment, % of total employment | 420 | 70.24  | 20.41 | 8.826   | 94.14 | WDI    |
| Total natural resources rents, % of GDP            | 420 | 12.36  | 9.978 | 0.762   | 53.31 |        |
| Fertility rate, total (births per woman)           | 420 | 4.977  | 1.051 | 2.261   | 7.615 |        |
| Domestic credit to private sector % of GDP)        | 405 | 16.46  | 13.50 | 0.00328 | 70.38 |        |
| Urban population, % of total population            | 420 | 41.67  | 16.11 | 15.05   | 89.37 |        |
| Economic globalization                             | 420 | 43.18  | 8.326 | 23.42   | 61.94 | KOF    |
| Educational equality                               | 420 | -0.414 | 0.909 | -2.542  | 2.352 | DEM V  |

Source: Authors

## 4. Empirical results

In this section, the basic results are first presented. Then, we explain regime membership. Finally, we perform robustness tests.

### 4.1. Baseline results

The first step in a FMM is to identify the optimal number of subsamples. Table 2 below reports the model fit from one to four classes of mixture models. Smaller values in BIC means a better model fit.

Table 2: Selection of the number of classes

| Model         | BIC         |
|---------------|-------------|
| One sample    | 3155.381    |
| 2 sub-samples | 2954.356    |
| 3 sub-samples | 2751.856    |
| 4 sub-samples | Not concave |

Source: Authors

From Table 2, it appears that the model with the lowest BIC value is a three-samples model. Therefore, the model is best described with three sub-samples, and we select a mixture model with tree sub-samples. Moreover, the BIC value is higher in class 1, corresponding to a single model and suggesting the existence of heterogeneity. Traditional methods are therefore not appropriate.

The results obtained using panel fixed-effects, random effects and finite mixture model estimates are portrayed in Table 3.

Table 3: Vulnerable employment effect of natural resource rents: Fixed effect, random effect and GLS-FMM regressions

| Variables               | FE                  | RE                  | Generalized Least Squares-Finite Mixture Models |                     |                       |
|-------------------------|---------------------|---------------------|-------------------------------------------------|---------------------|-----------------------|
|                         |                     |                     | Regime 1                                        | Regime 2            | Regime 3              |
| Natural Resources Rents | 0.0295<br>(0.0216)  | 0.0285<br>(0.0222)  | 0.0984***<br>(0.0242)                           | -0.0270<br>(0.0699) | -0.445***<br>(0.0841) |
| Fertility               | 1.869***<br>(0.392) | 1.933***<br>(0.397) | -1.223***<br>(0.344)                            | 2.910***<br>(0.844) | 5.178***<br>(1.543)   |
| Financial Development   | -                   | -                   | -0.254***                                       | -0.211***           | -0.701***             |

|                                                           |          |          |           |           |           |
|-----------------------------------------------------------|----------|----------|-----------|-----------|-----------|
|                                                           | 0.0598** | 0.0669** |           |           |           |
|                                                           | (0.0273) | (0.0278) | (0.0400)  | (0.0679)  | (0.0902)  |
| economic globalization                                    | 0.0422   | 0.0395   | -0.00714  | 1.223***  | -0.767*** |
|                                                           | (0.0290) | (0.0300) | (0.0302)  | (0.0823)  | (0.115)   |
| Urbanization                                              | -        | -        | -0.543*** | -0.120*** | -0.393*** |
|                                                           | 0.273*** | 0.285*** |           |           |           |
|                                                           | (0.0547) | (0.0530) | (0.0270)  | (0.0429)  | (0.0633)  |
| Educational Equality                                      | -0.354   | -0.396   | -0.0137   | 4.804***  | -5.567*** |
|                                                           | (0.534)  | (0.540)  | (0.271)   | (0.554)   | (1.890)   |
| Constant                                                  | 70.68*** | 71.38*** | 112.2***  | 7.799*    | 105.0***  |
|                                                           | (3.989)  | (4.513)  | (3.216)   | (4.589)   | (11.72)   |
| Observations                                              |          |          | 405       |           |           |
| Prob > F /Prob > chi2                                     | 0.000    | 0.000    |           |           |           |
| R-squared                                                 | 0.399    | 0.398    |           |           |           |
| Number of countries                                       |          |          | 30        |           |           |
| Latent class marginal means of vulnerable employment in % |          |          | 79.94     | 64.55     | 66.33     |
| Latent class marginal probabilities in %                  |          |          | 51.42     | 20.00     | 28.58     |

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

Source: Authors

As it can be seen in Table 3, columns 1 and 2, the coefficient associated with natural resources rents is positive but insignificant in fixed-effects and random effects regressions. These results from traditional econometric models support the neutral hypothesis that resources wealth does not affect economic development.

The estimation from finite mixture model show that natural resources have a differentiated effect on the proportion of vulnerable employment across vulnerable employment regimes. Indeed, the sign and significance of the coefficient associated with natural resources is different across regimes, supporting our hypothesis that natural resource rents have different effect on vulnerable employment across regimes.

Three different vulnerable employment trajectory groups have been identified. In the first class, the coefficient associated with natural resources rents is positive and statistically significant at 1% level. In this regime, an increase of natural resources rent by one percentage point is associated with an increase of vulnerable employment by 0.098 percentage point. Therefore, the proportion of vulnerable jobs increases with natural resource rents, underlining the natural resource curse hypothesis. This result is explained by the fact that natural resources rents, by encouraging rent-seeking, discourage the accumulation of quality human capital and predispose jobseekers, who are low-skilled in this context, to access less productive and more precarious jobs. In addition, the natural resources rents hinder entrepreneurial activity and wealth creation (Chambers and Munemo, 2019). It limits therefore the economy's capacity to generate productive employment and favoring vulnerable employment. Moreover, the discovery of natural resources, coupled with rising labor costs and an appreciating real exchange rate, led to a decline in the competitiveness of export products not linked to natural resources, and thus create a crowding out effect to the disadvantage of other sectors and a drop in production (Weber, 2012). This can lead to a drop in the volume of productive employment, with some employees preferring to retrain in non-productive jobs in order to survive in the absence of an unemployment benefit mechanism, as is the case in most sub-Saharan countries. Similarly, in a context where the natural resource economy is not linked to the rest of the national economy, the disconnection creates a kind of "enclave resource economy", which although it may improve per capita income, limits its economics spillovers and does not

allow for the creation of productive employment. This finding is in accordance with the resource curse finding (Auty, 1993; Sachs and Warner, 1995).

In the second regime, however, the coefficient of resource rents is insignificant at conventional level, meaning a neutral effect of natural resources on vulnerable employment in in this class regime. In the third regime, in contrast, the coefficient associated with natural resources rents is negatively and significantly associated with 0.44 percentage points decline in the vulnerable employment. A one percentage point rise in natural resource rents is associated with vulnerable employment rate. Therefore, the resource blessing thesis is evidenced in class 3 regime. Increased natural resources are creating greater demand for labor, with the added benefit of higher incomes (Weber, 2012). This translates into more productive jobs and fewer vulnerable ones. Similarly, the exploitation of natural resources provides resources for the public sector and for certain sectors of the economy where a successful overlap with the extractive sector is achieved. These resources can be used to create productive jobs (Ross, 2007), and limit vulnerable employment. This result is consistent with the resources blessing thesis established in the literature (Hussain *et al.*, 2020; Sharma and Paramati, 2022).

The estimates indicate that three control variables are statistically significant: total fertility rate, financial development and urbanization rate. An increase in fertility is associated with an increase in the vulnerable employment share while the improvement of urbanization and financial development reduce vulnerable employment.

Table 3 also presents the latent class marginal means of vulnerable employment and the latent class marginal probabilities for the three classes. It reveals that vulnerable employment share is higher in the countries of regime 1, followed by the countries of regime 3 and regime 2. The average vulnerable employment share over the period is 79.94% % in class 1 countries compared to 64.55% for class 2 countries and 66.33% in Regime 3. From the table, it emerges also that 51.42%, 20% and 28.57% of the countries are more likely to be classified respectively in the first, second and third class.

#### **4.2. Explaining vulnerable employment regime membership: the role of political risk and administrative capacity**

Empirical results have established that natural resources affect vulnerable employment differently from one regime to another. In doing so, it is important to understand the factors that determine membership of different regimes. In this respect, previous studies highlight that natural resources can be a curse or a blessing depending on the institutional quality (Chambers and Munemo, 2019; Mehlum, Moene and Torvik, 2006 a). Unlike most of these authors, who have used an interactive variable approach, we use institutional quality as a concomitant variable.

The political risk index and certain of its components including investment profile, internal conflict, law and order in the one hand and rigorous and impartial public administration in the other hand as concomitant variables. The political risk index come from the International Country Risk Guide (Political Risk Services Group, 2023) and the rigorous and impartial public administration from Coppedge *et al.*, (2023). The political risk indicator is designed by weighting 12 components and scaled from 0 to 100, with 100 indicating a low level of political risk and 0 indicating a high level of political risk. The investment profile evaluates the factors that influence investment risk. It is scaled from 0 to 12 and based on three subcomponents (i) contract viability and expropriation and (ii) profits repatriation and (iii) payment delays. A higher value means less investment risk.

The internal conflict, scaled from 0 to 12 the evaluates the political violence in the country and its actual or potential impact on governance. A high value indicates a low level of internal conflict. Law and order is the extent to which the strength and impartiality of the legal system on the one hand and the popular observance of the law on the other prevail in a country. A high score is synonymous with a better-quality judicial system. It ranges from 0 to 6, with a score of 0 corresponding to a very high risk and a score of 6 to a very low risk. Rigorous and impartial public administration measure extent to which public officials generally abide by the law and treat like cases alike, or conversely, the extent to which public administration is characterized by arbitrariness and biases (i.e., nepotism, cronyism, or discrimination). This variable is scaled from 0 to 4, with 0 indicating less rigorous and biased administration and 4 indicating more rigorous and impartial administration. These concomitant variables allow us to examine whether political risk and rigorous and impartial public administration makes a country more likely to belongs to a regime.

In all regressions in which institutional quality is used as concomitant variable, we will use Class 3 as the base class given that the relationship between resource rents and vulnerable employment is negative in this group of countries. This will allow us to compare the countries in Class 3 with those of Classes 1 and 2 where the resource curse and the resource neutral effect have been found.

Table 4 presents the results where the variable political risk variables and rigorous and impartial public administration are used as concomitant variables.

Table 4: role of institutional quality in the relationship between natural resources rents and vulnerable employment

| Variables                                    | (1)                   | (2)                  | (3)                 | (4)                  | (5)                   |
|----------------------------------------------|-----------------------|----------------------|---------------------|----------------------|-----------------------|
| Political risk                               | 0.0142**<br>(0.00661) |                      |                     |                      |                       |
| Investment profile                           |                       | 0.0163*<br>(0.00851) |                     |                      |                       |
| Internal conflict                            |                       |                      | 0.0210*<br>(0.0111) |                      |                       |
| Law and order                                |                       |                      |                     | 0.0984**<br>(0.0473) |                       |
| Rigorous and impartial public administration |                       |                      |                     |                      | 0.0477**<br>(0.01775) |
| Constant                                     | -0.657*<br>(0.346)    | -0.370<br>(0.295)    | -0.381<br>(0.390)   | 0.0146<br>(0.210)    | 0.295***<br>(0.0504)  |
| Wald Test, P-value                           | 0.045                 | 0.0130               | 0.038               | 0.048                | 0.007                 |
| Observations                                 |                       |                      | 405                 |                      |                       |
| Number of countries                          |                       |                      | 30                  |                      |                       |

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

Source: Authors

Results in columns 1-4 show that the coefficients associated with political risk, investment profile, internal conflict and law and order are positive and statistically significant at the 5 and 10 percent level. This result suggests that countries with less political risk are more likely to be in class 3. In other words, countries with less political risk, better investment profile, low internal conflict and where law and order prevail are more likely to be in the group where natural resource is negatively associated with vulnerable employment. In addition, results in column 5 show that the coefficient associated with rigorous and impartial public administration is positive and statistically significant at 5 percent level. This result is in line with those of political risk and means that countries rigorous

and impartial public administration are more likely to be in class 3 where resources blessing hypothesis is established. This result is consistent with the findings of previous studies, including those of using interactive variable approach, that natural resource rents are a blessing if institutions are better and a curse in an environment where institutions are weak (Chambers and Munemo, 2019; Mehlum, Moene and Torvik, 2006 b).

### 4.3. Robustness checks

We assess the robustness of our main findings in two different ways: (i) using of male and female vulnerable employment as dependent variable (ii) adding additional control variables.

#### i) Use of male and female vulnerable employment

We use the vulnerable employment rate by gender to test the robustness of our basic results. Estimates with the vulnerable employment rate for men and women as the dependent variable are reported in columns 1-3 and 4-6 of Table 5 respectively.

Table 5. Robustness check : use of Male vulnerable employment and female vulnerable employment as dependant variable

| Variables               | (1)                        | (2)                   | (3)                   | (4)                          | (5)                  | (6)                   |
|-------------------------|----------------------------|-----------------------|-----------------------|------------------------------|----------------------|-----------------------|
|                         | Male vulnerable employment |                       |                       | Female vulnerable employment |                      |                       |
|                         | Regime 1                   | Regime 2              | Regime 3              | Regime 1                     | Regime 2             | Regime 3              |
| Natural Resources Rents | 0.00488<br>(0.0322)        | -0.132*<br>(0.0693)   | -0.574***<br>(0.0873) | 0.155***<br>(0.0241)         | 0.00558<br>(0.0731)  | -0.246***<br>(0.0521) |
| Fertility               | -1.765<br>(1.154)          | 3.089***<br>(0.820)   | 2.793<br>(2.051)      | -0.961***<br>(0.306)         | 7.973***<br>(1.175)  | 18.74***<br>(0.617)   |
| Financial Development   | -0.357***<br>(0.126)       | -0.442***<br>(0.0830) | -0.858***<br>(0.0885) | -0.128***<br>(0.0350)        | 0.185***<br>(0.0638) | -0.115***<br>(0.0353) |
| Economic globalization  | -0.0706<br>(0.0623)        | 0.941***<br>(0.101)   | -0.632***<br>(0.109)  | -0.0161<br>(0.0263)          | 0.714***<br>(0.0762) | -0.0893<br>(0.0820)   |
| Urbanization            | -0.742***<br>(0.0944)      | -0.121***<br>(0.0434) | -0.346***<br>(0.0601) | -0.277***<br>(0.0274)        | 0.346***<br>(0.0524) | -0.279***<br>(0.0347) |
| Educational Equality    | -0.414<br>(0.720)          | 6.711***<br>(0.808)   | -7.339***<br>(1.091)  | 0.262<br>(0.250)             | 4.087***<br>(0.476)  | 3.758***<br>(0.667)   |
| Constant                | 121.0***<br>(9.739)        | 18.39***<br>(6.881)   | 106.9***<br>(13.18)   | 106.8***<br>(2.945)          | -4.425<br>(6.213)    | -1.283<br>(5.327)     |
| Observations            | 405                        |                       |                       |                              |                      |                       |

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

Source: Authors

The findings show that natural resources rents are negatively and significantly associated with male vulnerable employment in regimes 2 and 3 whereas it is positive and insignificantly associated with male vulnerable employment in regime 1. This result supports the resource blessing hypothesis in Class 2 and 3 even if the resource curse is not established in class 1. Additionally, results of regressions with female vulnerable employment as an alternative measure are consistent with the main findings. The coefficient of natural resources is positive and significant in class 1, insignificant in class 2 and negative and significant in class 3. This result is in line with our baseline finding that resources are blessing in regime 3, have neutral effect in regime 2 and are curse in regime 1. Overall, these results confirm our basic findings.

## ii) Including more control variables in the specification

In this robustness check, we add more control variables. These variables are Gross Fixed Capital Formation as share of GDP and the share of individual using internet. Gross fixed capital formation in economic activity can contribute to productive employment, thus reducing vulnerable employment. Similarly, the use of the internet has a profound effect on the labor market by creating new job opportunities in emerging sectors and transforming traditional work models. They are obtained from the World Bank's World Development Indicators (WDI) database. The results are shown in Table 6.

Table 6. Robustness check: additional control variables in the specifications

| Variables                     | Generalised Least Squares-FMM |                       |                       |
|-------------------------------|-------------------------------|-----------------------|-----------------------|
|                               | Regime 1                      | Regime 2              | Regime 3              |
| Natural Resources Rents       | 0.169***<br>(0.0169)          | -0.136<br>(0.107)     | -0.392***<br>(0.0797) |
| Fertility                     | -3.564***<br>(0.324)          | 3.692***<br>(0.996)   | 3.172***<br>(0.821)   |
| Financial Development         | 0.0208<br>(0.0329)            | -0.354***<br>(0.0918) | -0.865***<br>(0.0476) |
| economic globalization        | -0.385***<br>(0.0291)         | -0.320*<br>(0.167)    | -0.631***<br>(0.102)  |
| Urbanization                  | -0.437***<br>(0.0304)         | 0.165*<br>(0.0961)    | -0.482***<br>(0.0512) |
| Educational Equality          | -1.288***<br>(0.349)          | 7.021***<br>(1.017)   | -6.525***<br>(0.687)  |
| Gross Fixed Capital Formation | 0.0744***<br>(0.0159)         | 0.0822<br>(0.0757)    | -0.263***<br>(0.0883) |
| Internet user                 | -0.234***<br>(0.0252)         | -0.686***<br>(0.0995) | 0.113**<br>(0.0445)   |
| Constant                      | -0.0211<br>(0.0979)           | -0.140<br>(0.176)     | 0.126<br>(0.632)      |
| Observations                  |                               | 316                   |                       |

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

Source: Authors

Results in Table 7 remain strongly consistent with those of the baseline regression. Thus, the inclusion of additional control variables does not change our core findings.

## 5. Conclusion

In this study, we investigate the effect of natural resource on vulnerable employment in sub-Saharan Africa by taking into account the possibility that countries are grouped into different vulnerable employment path. We used a finite mixture model which takes into account unobserved heterogeneity on a sample covering 30 countries over the period 2005-2018. We identify three

vulnerable employment regimes and find that the effect of natural resource differs across regimes. In the first regime, natural resource rents increase vulnerable employment. In the second regime, natural resources rents do not affect vulnerable employment. However, natural resources rents reduce vulnerable employment in the third regime. These results means that natural resources are curse in the first regime, neutral in the second and blessing in the third. We also find that countries with lower political risk, especially better investment profile, less internal conflicts and where law and order prevail in the one hand and rigorous and impartial public administration are more likely to belong to the resource blessing regime. These results underline the need for resource-rich countries to improve the quality of their institutions to benefit from the blessing of natural resources.

Our findings have important policy implication for countries. The results clearly highlight that for resource-rich countries to reap the benefit of these resources, they need to build and improve the quality of their institutions.

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