Resource rents and inclusive human development in developing countries

Nchofoung, Tii and Achuo, Elvis and Asongu, Simplice

January 2021

A G D I Working Paper

WP/21/025

Resource rents and inclusive human development in developing countries

Tii N. Nchofoung
University of Dschang, Cameroon;
Ministry of Trade, Cameroon
E-mail: ntii12@yahoo.com

Elvis Dze Achuo
University of Dschang, Cameroon;
Ministry of Secondary Education, Cameroon
E-Mail: elratina@ymail.com

Simplice A. Asongu
African Governance and Development Institute,
P.O Box 8413, Yaoundé, Cameroon
&
University of South Africa, South Africa
E-mails: asongusimplice@yahoo.com,
asongus@afridev.org

2021 African Governance and Development Institute WP/21/025

Research Department

Resource rents and inclusive human development in developing countries

Tii N. Nchofoung, Elvis Dze Achuo & Simplice A. Asongu

May 2021

Abstract

This study aims to empirically verify the effects of natural resource rents on inclusive human development in developing countries. The results from the IV Tobit regression show that natural resource rents have a positive direct effect on inclusive human development in developing countries and that this relationship varies by regional groupings, income levels, level of development and export structure. Looking at the transmission mechanisms, when the interactive variables of governance and environmental quality is introduced, the modulating channel through governance exerts a robust negative synergy effect in the sample of developing countries and positive synergy effects for Africa and low-income countries. When the interactive variable of CO2 emissions is introduced for Africa, a negative net effect of natural resource rents on inclusive human development is obtained. This was up to a policy threshold of 25.4412 of CO2 emissions when the negative effect is nullified. For Asia and the Latin America and Caribbean, a positive net effect is obtained. This is up to a CO2 emissions threshold of 29.038 and 3.6752 respectively, when the positive effect is nullified. Besides, the high income and the upper-middle income countries produce a negative net effect of resource rents on inclusive human development through CO2 modulation, with up to positive CO2 emission thresholds of 37.9365 and 23.6257 respectively. Policy implications are highlighted. In summary, contingent on engaged specificities, where conditional effects are negative, negative thresholds for complementary policies have been provided and in scenarios where conditional impacts are positive, actionable positive thresholds have been provided.

Key Words: Resource Rents, Inclusive Human Development, Institutional Quality, Environmental Quality.

JEL Code: P48; O11; C23

1. Introduction

The question whether natural resource wealth is a blessing or curse to development outcomes remains a contemporary debate among researchers and policy makers. This study empirically verifies whether natural resource rents contribute to the enhancement of human development which is necessary for sustainable economic growth. Since the pioneering works of Auty (1993) concluding that countries rich in natural resources recorded low development outcomes than their resource-poor counterparts, several studies have emerged, evaluating this hypothesis by exploring various explanatory variables encompassing economic, institutional, political and environmental factors (Auty, 1995; Di John, 2011; Carmignani and Avom, 2010; Carmignani, 2013).

While several growth studies reveal that the impact of natural resources on a country's development outcomes depends on human capital (Gylfason, 2001; Zalle, 2019), others reiterate the importance of institutional quality (Sala-i-Martin and Subramanian, 2013). Several studies argue that natural resource wealth negatively impacts on institutional quality as it prevents the development of institutional reforms thereby retarding economic development (Leite and Weidmann, 1999; Isham et al., 2005; Norman, 2009). For example, poor institutional quality (Sachs and Warner, 1995; Sala-i-Martin and Subramanian, 2013), lower levels of the rule of law (Norman, 2009) economic mismanagement (Badeeb et al., 2017) and high levels of corruption (Leite and Weidmann, 1999; Bulte and Damania, 2008; Zalle, 2019) are predominant in natural resource-rich countries.

However, there is yet no consensus among researchers on the effect of natural resource wealth on development outcomes and the transmission mechanisms. Recently, Havranek et al. (2016) revealed that while approximately 20% and 40% of empirical studies have respectively found a positive and negative effect, about 40% of studies do not find any effect. Nevertheless, this variability in results across studies may arise from the use of different variables in controlling for institutional quality, the distinction between resource dependence and abundance as well as distinction between various types of natural resources (Havranek et al., 2016). The effect of natural resources on development outcomes has equally been examined through its effects on human capital (Khan et al., 2020; Ahmed et al., 2020).

A majority of human capital related studies have been concerned with the contribution of human capital (notably education and health) to growth. Hence, the question whether investments in human capital can spur sustainable development has been the concern of several contemporary

economists. The role of human capital in explaining growth can be traced to the initial neoclassical growth theory developed in 1956 by the 1987 Economics Noble Prize Winner, Robert Solow. Although Solow Growth theory (Solow, 1956) does not lay emphasis on various components of human capital, it makes use of physical and human capital as important inputs to production. Nevertheless, the importance of human capital development in the growth process of every economy has been emphasized by protagonists of endogenous growth theory (Lucas, 1988; Romer, 1990; Pack, 1994).

Private or public spending on education, training and healthcare constitute investments in human capital since human beings are inseparable from their knowledge, skills and health (Becker, 1992). Ample literature has demonstrated the role of education (Mankiw et al., 1992; Maksymenko and Rabani, 2011; Qadri and Waheed, 2014) and health (Strauss and Thomas, 1998; Bhargava et al, 2001; Bloom et al., 2004; Jayadevan, 2021) on economic growth and development across various countries.

In this light, investments in the health and educational sectors have far reaching positive benefits on the growth of every economy. Quality health and education are fundamental for the enhancement of human capital. Access to educational facilities enables the acquisition of knowledge and skills. Improved human capital not only increases the individual's skills, but also enhances his productivity, earnings and quality of life (Berker, 1992; Webber, 2002; Eggoh et al., 2015; Ogundari and Awokuse, 2018). However, poor quality of institutions characterised by corruption and bureaucracy can blur the contribution of human capital to economic growth. This believe is affirmed in a study of 49 African countries by Eggoh et al. (2015) arguing that human capital through health and education expenditures negatively impacted Africa's economic growth over the 1996-2010 period.

Nowadays, there has been a paradigmatic shift in the perception of the development agenda of countries around the world. Sustainable development encompasses many indicators and various functional sectors as outlined in the United Nations Sustainable Development Goals (SDGs) adopted in 2015. Hence, besides considering the economic dimension (notably economic growth indicators), any country dreaming to attain sustainable development must consider the social dimension with regard to enhancements in human capital through quality health and education (Raheem et al., 2018; Ogundari and Awokuse, 2018; Jayadevan, 2021) as well as ensuring environmental sustainability

(Asongu et al., 2016; Sarkodie et al., 2020; Hassan et al., 2020; Erdogan et al., 2020; Zhang et al., 2021). Nevertheless, to achieve this, there is need to consider the quality of institutions given that governance indicators like corruption and the rule of law (Sala-i-Martin and Subramanian, 2013; Bulte and Damania, 2008; Zalle, 2019) are believed to greatly affect the functioning of the economy. It is in this light that this paper is out to examine the underlying effects of natural resource rents on inclusive human capital development.

Specifically, the contribution of this paper to the existing literature is at least threefold: first, studies on this subject have often focused on small sub-regional groupings such as Asia Pacific countries (Sinha and Sengupta, 2019). To the best of our knowledge, this is the first attempt to empirically establish the effects of natural resources rents on inclusive human development on a global sample of developing countries. Second, the transmission mechanisms through which natural resources rents affect inclusive human development have often been limited to globalisation in the literature (Sinha and Sengupta, 2019), whereas, developing countries are characterised by relatively poor quality of institutions. Besides, the exploitation of natural resources is often characterised by the disposal of harmful waste and gas into the environment. This study thus considers the modulating effects of institutional quality and environmental quality in how resource rents affect inclusive human development. Third, developing countries are not uniform with respect to their levels of development. Some are rich in natural resources than others, while each country or region is peculiar with its own type of natural resources. Besides some have comparative advantages based on their geographical locations while others in terms of their export structure. This study therefore undertakes a comparative analysis based on geographical groupings, income levels, levels of development and export structure.

After this brief introduction, the rest of the paper is organised as follows. Section two presents a review of salient literature. The methodology is contained in section three. The results are presented and discussed in section 4. Section 5 provides a conclusion and policy implications.

2. Review of Selected Literature

The premise that endowments in natural resources can catalyse economic growth in countries rich in natural resources has not been of universal acceptance among scholars. Unlike Balassa (1980), a number of growth studies have provided paradoxical results by demonstrating that resource-poor countries can outperform their resource-rich counterparts. Economic literature refers to this

phenomenon as the resource curse (Auty, 1993; Sachs and Warner, 1995). Over the past decade, several studies have confirmed the validity of the resource curse hypothesis across various regions and countries (Carmignani and Avom, 2010; Shao and Yang, 2014; Badeeb et al., 2017). Moreover, several channels through which natural resource wealth can impact socioeconomic development have been identified. While some studies look at the interaction between real GDP growth and natural resource abundance and dependence, others explore the link between natural resource rents and institutional quality. Moreover, the need to ensure an inclusive human capital development which takes various forms of inequalities into consideration in the construction of the human development index, increasing research interest has been on the nexus between natural resource rents and inclusive human capital development, as well as between natural resource rents, information and communication technology (ICT) and environmental sustainability. In this section, we explore some salient literature with respect to the aforementioned indicators both at the individual and cross-country levels.

Zalle (2019) employing the ARDL modelling approach argues that natural resources enhance human capital development in Africa. In addition, his findings support the validity of the resource curse thesis. Moreover, improvements in human capital positively affect economic growth. However, the author concludes that natural resources can spur economic growth by simultaneously controlling for the indirect effects of corruption and human capital. This result is in congruence to earlier findings by Bulte and Damania (2008).

Canh et al. (2020) employ the two-step system GMM approach to examine the institutional quality and entrepreneurial effects on natural resource rents over the 2006-2016 period and conclude that while improvements in institutional quality lead to reductions in total natural resource rents, increased entrepreneurial activities have a soaring effect on natural resource rents for sample of 60 countries across the globe. However, in an earlier study, Bulte and Damania (2008) contend that high levels of corruption and poor democratic practices are responsible for the resource curse experienced by most resource-rich countries. Poor institutional quality has equally been blamed for the poor economic performance of the Nigerian economy despite her rich natural resource base (Sala-i-Martin and Subramanian, 2013).

Another body of literature probes into the nexus between natural resource wealth, foreign direct investment (FDI) and financial development (Yildirim et al., 2020; Guan et al., 2020; Asif et al.,

2020). Intuitively, financial development and increased FDI has the ability of boosting domestic investment across various socioeconomic sectors. The increased investment resulting from increased FDI and financial development will lead to a fall in the level of unemployment which in turn increases the income level both at the individual and national levels. Increased individual income will enable the individual to increase investments in education and health. In this light, FDI and financial development can be perceived as indirect mechanisms for modulating the effects of natural resources on human capital development. The few studies in this perspective have not provided concordant results. While some authors opine that natural resources lead to financial development especially in high income countries (Shahbaz et al., 2018; Gokmenoglu and Rustamov, 2019), others report a negative relation especially for developing countries (Guan et al., 2020; Asif et al., 2020).

With the help of the ARDL and VECM models, Hassan et al. (2020) examine the linkages between total natural resources, carbon dioxide (CO2) emissions and real income per capita in Pakistan for the 1971-2017 period, and reveal that natural resources use leads to environmental degradation through increased CO2 emissions. They also find evidence of bidirectional causality between natural resources use and CO2 emissions. Erdogan et al. (2020) in their empirical investigation of the effects of natural resources, globalization, human capital, and urbanization on the ecological footprint for a sample of 23 resource-based Sub-Saharan African (SSA) countries employ the fully modified ordinary least squares approach and found that both natural resource dependence and abundance dampen environmental quality. However, unlike natural resources which negatively affect environmental quality, the authors posit that improvements in human capital and globalisation positively impact on the environmental quality of SSA countries. In a related study for 18 SSA countries, Raheem et al. (2018) concludes that natural resource rents and investments in human capital especially through health expenditure have a stimulating effect on economic growth. Increased growth therefore has a tendency of worsening environmental quality following the Environmental Kuznets Curve (EKC) hypothesis. Contrarily, Behbudi et al. (2010) posit that human capital and resource abundance are the major roadblocks for economic development of resource-rich countries.

Recent development studies have been concerned with the examination of the key determinants of inclusive human development. For example, a number of studies have stressed the importance of information and communication technologies (ICT) and environmental degradation (Asongu and Le

Roux, 2017; Asongu et al., 2019; Khan et al., 2019; Asongu and Odhiambo, 2019), globalisation and natural resource rents as well as economic, political and institutional governance (Asongu and Nwachukwu, 2016; Sinha and Sengupta, 2019; Nathaniel et al., 2021; Pata et al., 2021) in enhancing inclusive human development. While Asongu and Le Roux (2017) contend that ICT (through telephone, mobile phone, and internet penetrations) encourages inclusive human development in a panel of 49 SSA countries, Asongu and Odhiambo (2019) opine that the positive contribution of ICT (through mobile phone penetration) to inclusive human development is slowed down by the low quality of formal education, especially at the primary level. Similar results have been found by Khan et al. (2019) in a related study for Pakistan.

Moreover, Asungo et al. (2019) found that improvements in ICT dampen the negative impacts of CO2 emissions on inclusive human development in SSA. The modulating effects are however divergent across various sub-regional groupings. On the natural resource and human development nexus, Sinha and Sengupta (2019) established a positive effect of resource rents on human development modulated through globalisation, good governance and strong institutions. However, Khan et al. (2019) contend that trade openness, FDI and urbanisation have adverse effects on inclusive development of Pakistan. Besides, Asongu et al. (2017) adopt the Generalised Method of Moments (GMM) to assess the complementarity effects between ICT and environmental degradation on inclusive development of 44 SSA countries and argue that the ability of ICT tools (such as the electronic settlement of hospital bills through internet and mobile phones) to avert unwarranted transport cost and enhance the efficient management of households and businesses can enable the abatement of CO2 emissions. Thus, the author concludes that the complementarity between ICT use (mobile phone penetration) and carbon dioxide (CO2) emissions have a net positive effect on inclusive human development.

3. Econometric Strategy

3.1 Empirical model specification

Based on existing literature, the following empirical model can be specified:

$$IHDI_{it} = \beta_0 + \beta_1 Resources_{it} + \beta_2 X_{it} + \mu_{it} \qquad (1)$$

Where IHDI is the human development index corrected for inequality, Resources is the natural resources rents. X is a vector of control variables. μ is the stochastic error term, subscripts i and t are the individual and the time dimensions of the panel.

The dependent variable, IHDI is used as a proxy for inclusive human development in accordance with existing literature (Asongu et al., 2017; Asongu and Le Roux, 2017). The indicator is the HDI adjusted for inequality. The HDI is made up of 3 basic dimensions, namely: health and life expectancy, education, and basic living standards. Lastly the adjustment for inequality in the distribution of the last 3 dimensions yields the IHDI. In the computational process of the IHDI, the inequality term is introduced during the normalisation process of the variables that constitute each of the dimensions of the HDI.

The variable of interest, Resources is the measure of resources rents. The variable is chosen based on existing literature (Sinha and Sengupta, 2019). Natural resources rents is measured through the total natural resources rents as a percentage of GDP (Resources_Rent), forest rent as a percentage of GDP (Forest_Rent), Mineral rents as a percentage of GDP (Mineral_rents), Oil rents as a percentage of GDP (Oil_rents). Sinha and Sengupta (2019) established a positive effect of resources rents on human development modulated through globalisation. In line with this view, the first hypothesis of the study is stated thus: **Natural resources affect inclusive human development in developing countries.**

Five control variables are retained to control for omitted variables bias in our model. These are foreign direct investment inflows (FDI), trade openness index (trade), information and communication technology (ICT) proxied by internet penetration rate (Internet), environmental protection proxied by the carbon dioxide emission rate (CO2), and governance measured as the average of the six governance indicators of Kaufmann. This arithmetic aggregation of the indicators is based on contemporary literature (Ngouhouo et al., 2021). These indicators are: Control of corruption (Corruption), Regulatory Quality (Reg_qual), Political stability and absence of violence (Political_Stability), Rule of law (Rule_law), Voice and accountability (Voice_Account), Government Effectiveness (Governmt_Eff). Asongu et al. (2017) argued that CO2, ICT and FDI all positively enhance inclusive human development in Africa. A positive sign is thus expected to be associated to these variables. Asongu and Odhiambo (2019) argued that good governance enhances inclusive human development. A positive sign is thus expected to be associated to this variable.

Under normal circumstances, the availability of natural resources and their exploitation within the economy entails disposal of waste unto the environment. Moreover, the machines used in the exploitation release a lot of gas into the air which may have great consequences on human health and as a result on human development. Furthermore, for natural resources rents to impact human development, the revenue from the exploitation of natural resources must be used in the economic and social development of the country such as providing for health services, ensuring quality education just to name a few. This can only be realised if an efficient institution is put in place that ensures this. From the above arguments, the second hypothesis of this study is that governance and **environmental quality are the main mechanisms through which natural resources rents impact human development.**

Accounting for this transmission channels in an econometric model entails introducing a multiplicative interactive term of CO2 and Governance in (1).

$$IHDI_{it} = \beta_0 + \beta_1 Resources_{it} + \beta_2 CO2_{it} + \beta_3 Governance_{it} + \beta_j X_{it} + \pi_1(Governace_{it} \text{ x } Resources_{it}) + \pi_2(CO2_{it} \text{x } Resources_{it}) + \mu_{it} \quad (2)$$

Where β is the coefficient of the variables that captures the direct explaining factors of inclusive human development, π is the coefficient of the variables that captures the indirect effect of inclusive human development determinants. Differentiating (2) in first place with respect to Resources yields:

$$\frac{\partial IHDI_{it}}{\partial Resources_{it}} = \beta_1 + \pi_1 Governace_{it} + \pi_2 CO2_{it} \quad (3)$$

Where $\boldsymbol{\partial}$ is the partial derivative operator. Unit change in resources rents depends on the sign and magnitude of the interactive variables "Governance" and "CO2". Based on the signs and significance of β_1 and π, this interactive effect could yield a net effect such that:

$$Net\ effect = \begin{cases} \beta_1 + (\Omega \times \pi) & iff\ \beta_1\ and\ \pi\ are\ opposing\ in\ sign\ and\ all\ significant \\ n.a & iff\ \beta_1\ and\ \pi\ have\ the\ same\ sign \\ & or\ atleast\ one\ of\ them\ is\ non-significant \end{cases} \quad (4)$$

Where n.a here implies "not applicable" and as a result, the net effect cannot be computed. Π is the magnitude of the indirect effect, Ω is the average of the policy modulating variable(s) under consideration.

3.2 Data

The data for the human development index is collected from the UNDP database. Data on governance is collected from the Worldwide Governance Indicators of the World Bank while the rest of the variables are collected from the World Development indicators of the World Bank. The data covers the 1996-2019 periods for 107 Developing countries. The list of countries and sources of data are detailed in Appendices 1 and 2 respectively. Table 1 highlights the summary statistics of the variables used.

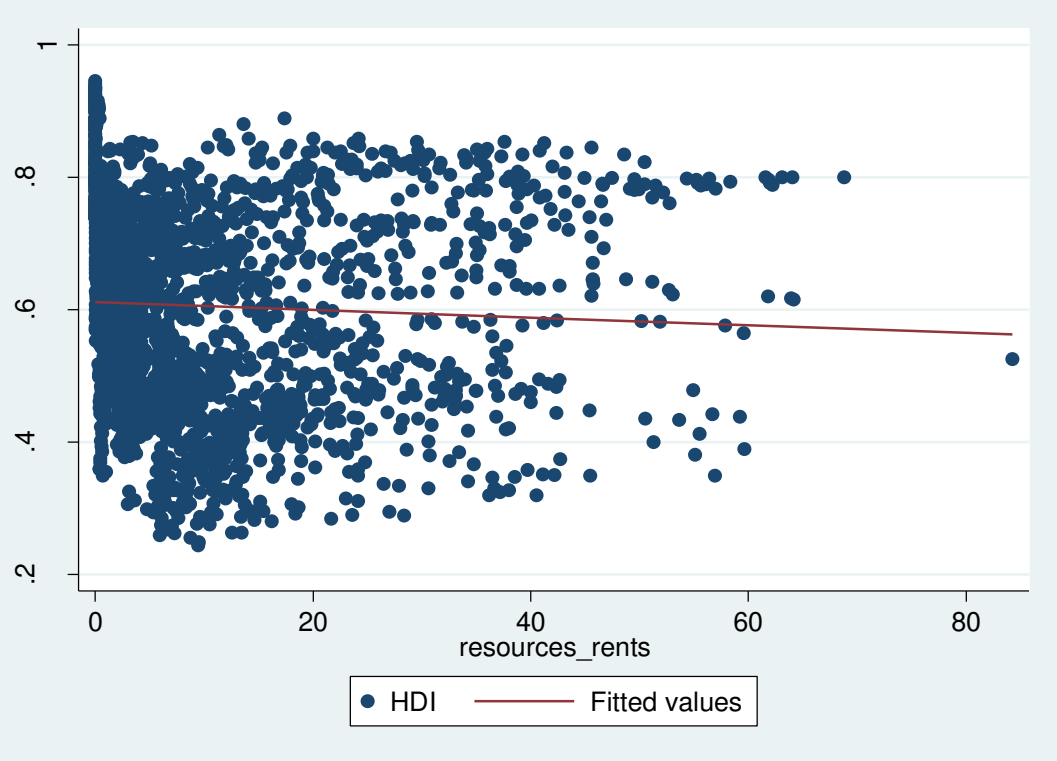
Table 1. Summary Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Inclusive human development	2,482	0.606401	0.150407	0.244	0.949
Environmental quality	2,268	3.670566	7.429898	0.01628	70.04223
Foreign direct investments	2,554	4.310621	7.491572	-37.1548	161.8237
Trade openness	2,367	83.96471	54.69998	0.026889	442.62
Internet penetration rate	2,393	17.71138	23.01605	0	99.70151
Total resources rents (%GDP)	2,448	10.46584	12.61293	0.000188	84.22876
Governance index	2,582	-0.65057	4.088979	-2.09	2.41265
Forest rents (%GDP)	2,452	3.209093	5.140509	0	40.42677
Mineral rents (%GDP)	2,452	1.663264	4.334086	0	46.62465
Gas rents(%GDP)	2,411	0.458844	1.24267	0	13.69206
Oil rents(%GDP)	2,448	4.992922	11.4693	0	78.54109
Control of Corruption	2,588	-0.32836	0.771676	-1.82638	2.32558
Government effectiveness	2,585	-0.34393	0.776379	-2.27942	2.436975
Regulatory quality	2,586	-0.32877	0.768096	-2.42551	2.260543
Rule of law	2,589	-0.37805	0.754002	-2.32212	1.878559
Voice and account	2,589	-0.36416	0.779024	-2.23327	1.342969
Political stability	2,585	-0.28424	0.893638	-2.1808	1.615338

Source: authors

At the same time, Figure 1 presents the sense of correlation between natural resources rents and inclusive human development for our sample.

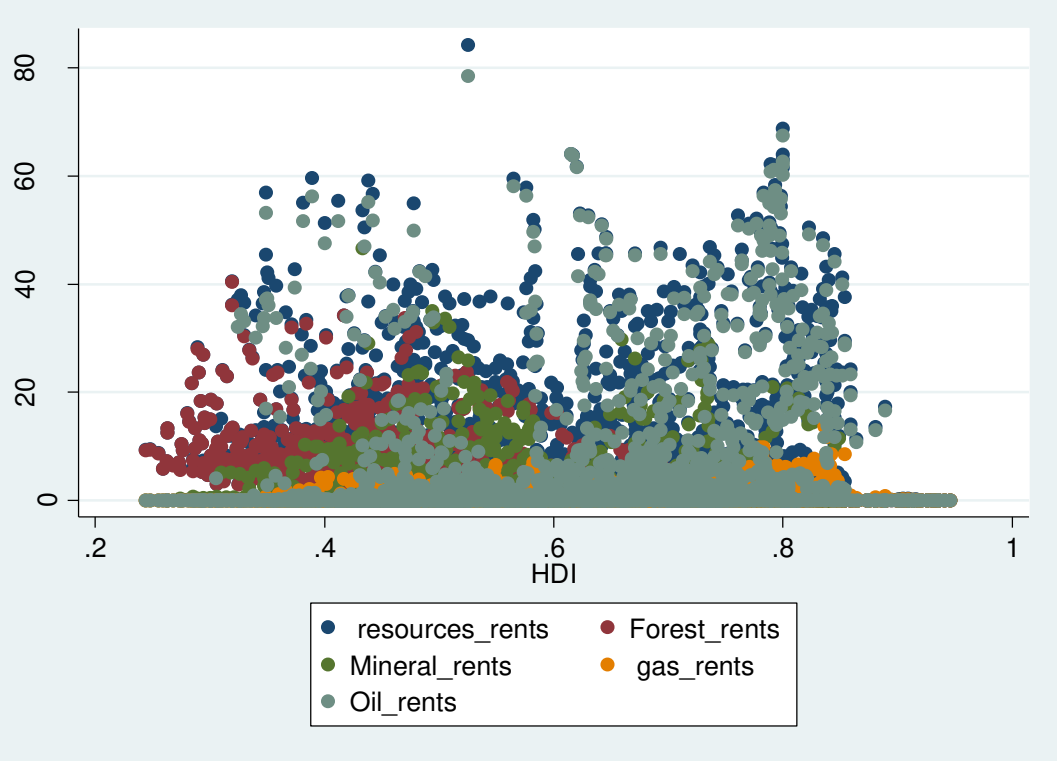
Figure 1. Correlation of Total resources rents and inclusive human development.



Source: Authors

Figure 1 shows that most countries in our sample have very low human development scores, at the same time, resources rents on average represent a significant portion of the GDP of countries under study. Just slightly below 20% of GDP. While that of inclusive development is crowded around the 0.6 value. At the same time, the resources rents and inclusive development nexus seems to be negative though not very strong; control variables are thus very likely to influence this perceived weak relationship. However, before proceeding to our methodology, there is need to see the dispersion of the various natural resources types across our sample. Figure 2 presents this dispersion.

Figure 2. Natural resources dispersion by type



Source: Authors

Figure 2 shows that oil rent has greatly contributed to resources rents than other natural resources and is highly dispersed. In fact, the high dispersion of total natural resource rents is as a result of a similar trend in oil rent. This is seen from their standard deviation values in table 1.

3.3. Estimation Method

This study adopts the Tobit regression based on contemporary literature (Asongu and Le Roux, 2017). This method is appropriate in the sense that the inequality adjusted human development index has a limited range (between 0 and 1). In this case, estimation by Ordinary Least Squares will produce biased results. A doubled censored Tobit regression is thus adopted to account for the limited range in the dependent variable (see Kumbhakar and Lovell, 2000; Koetter et al., 2008; Ariss, 2010; Coccorese and Pellecchia, 2010; Asongu and Le Roux, 2017). Our data values however do not contain 0 and 1 in the observations. In fact it ranges between 0.244 and 0.949. Estimation with a doubled censored Tobit in this case is similar to estimation with a linear regression because the likelihood functions coincide. At the same time, given that there is possibility of double causality among the variables under study and equally unobserved heterogeneity, the instrumental variable

Tobit is adopted in place of a simple Tobit regression. We start through a simple Tobit model as follows:

$$IHDI^*_{it} = \alpha_0 + \beta X_{it} + \mu_{it} \qquad (2)$$

Where $IHDI^*$ is the hidden response variable, X is the observed vector of explanatory variables, α_0 is a constant, and μ is an independent variable in X which is identically and independently distributed. The observation of the latent response variable is based on the value of a stochastic constant γ, such that:

$$IHDI_{it} = \begin{cases} IHDI^*_{it} \; if \; IHDI^*_{it} > \gamma \\ 0 \; if \; IHDI^*_{it} \leq \gamma \end{cases} \qquad (3)$$

The value of the latent variable is thus missing when it is less than or equal to γ. The above modelling procedure however applies to simple Tobit models. To control for the simultaneity and unobserved heterogeneity dimensions of endogeneity in our case, the instrumental variable (IV) Tobit is used and the Natural resources rents:

$$Resources\_Rents_{it} = \alpha_0 + \delta(Resources_{it-1}) + \nu_i + \mu_{it} \qquad (4)$$

Where the variables are defined as in equation (1), at period t and (t-1). ν_i is the country fixed effect. In the same line, the instrumental procedure for Governance is as follows:

$$Governance_{it} = \alpha_0 + \delta(Governance_{it-1}) + \nu_i + \mu_{it} \qquad (5)$$

This procedure in (4) and (5) is equally applied to CO2. The instrumented procedure is as in contemporary literature (Asongu and Le Roux, 2017). That is regressing the variable by its corresponding lag and saving the fitted values. The fitted values are then used as the main explanatory variable in the Tobit regression. For the regression to be valid, the Wald test of exogeneity must be significant. It is a Chi2 test under the null hypothesis of exogeneity. The rejection of the null hypothesis implies that the variable is endogenous and as a result the IV Tobit is a valid regression.

4. Results and Discussion

The results present in the first place the direct effect of natural resource rents on inclusive human development and then, the interactive regression of natural resources with governance. In each of these regressions, robustness is checked using alternative measures of resources rents and sensitivity verified across regions, income group, export structures and level of development.

4.1 Direct effect

The results in Table 2 indicate that natural resource rents is significantly enhancing on inclusive human development. However, this result varies based on the indicator of natural resources used. While total natural resources rents, gas rents and oil rents are enhancing, forest rents and mineral rents are harmful to inclusive human development. Looking at other control variables, governance, carbon dioxide emissions and information and communication technology enhance IHDI while foreign direct investment is harmful. Trade openness though enhancing is non-significant. This result corroborates that of Sinha and Sengupta (2019) in Asian Pacific countries. Revenues from natural resources especially in natural resources dependent economies (which is the case in most developing economies) are used in providing basic social amenities for citizens. These include providing education, health facilities and creating jobs that reduces social inequalities. These are essential elements for inclusive human development. However, in most of these countries, the quality of governance has led to the misappropriation of these rents. This has led to very low human development scores in most of these countries despite abundance in natural resources.

The negative effect of forest and gas rents on inclusive human development can be justified by the fact that, rents of forest resources implies forests are gradually exploited leading to deforestation. This has adverse consequences on the environment, negatively impacting on the health status of individuals and a result on human development. It is thus interesting for us to test this transmission mechanism through environmental quality and quality of institutions. Before assessing the transmission mechanisms, it is worth evaluating if result obtained is sensitive across regions, income groups, export structure and level of development. The regions here mention are the geographical regions of each country. This is specifically considered because natural resources are extracted beneath or on the earth surface, specific locations are maybe favourable in natural resources abundance than others. For instance, desert areas are less favourable with forest rents. Furthermore, income groups are considered due to the fact that high income countries have the tendency of

investing in areas that improve human development than low income countries, there is thus need to see the behaviour of results across these groups. Moreover, Oil rents in predominant in the total natural resources rents indicator, whereas, not all developing countries are oil exporters. There is thus need to see if there is a comparative advantage in oil exports in developing human development than other natural resources.

Table 2.Tobit Non-interactive regression: Dependent variable=Inequality adjusted human development index.

Variables	1	2	3	4	5	6	7	8	9	10
Governance						0.0179***	0.0111***	0.0157***	0.0170***	0.0192***
						(-0.00241)	(-0.00166)	(-0.00161)	(-0.00172)	(-0.00182)
CO2						0.00374***	0.00397***	0.00445***	0.00380***	0.00189***
						(-0.00059)	(-0.0003)	(-0.00034)	(-0.00043)	(-0.00049)
FDI						-0.00076**	0.000392	-0.000613*	-0.000742**	-0.00031
						(-0.00036)	(-0.00032)	(-0.00035)	(-0.00035)	(-0.00034)
Trade						0.0000167	0.00007.5	0.0000532	0.0000467	-0.0000327
						(-6.56E-05)	(-5.07E-05)	(-5.62E-05)	(-5.69E-05)	(-5.92E-05)
Internet						0.00285***	0.00258***	0.00289***	0.00279***	0.00286***
						(-0.00016)	(-0.00013)	(-0.00015)	(-0.00016)	(-0.00015)
resourcesrents	0.0591**					0.000681*				
	(-0.028)					(-0.00038)				
Forest rents		-0.169**					-0.00917***			
		(-0.079)					(-0.00057)			
Mineral rents			0.0438***					-0.00074		
			(-0.007)					(-0.00053)		
Gas rents				0.242***					0.00722***	
				(-0.044)					(-0.00246)	
Oil rents					-0.196					0.00266***
					(-0.277)					(-0.0003)
Constant	-0.0147	1.129***	0.529***	0.490***	1.588	0.573***	0.590***	0.570***	0.573***	0.578***
	(-0.294)	(-0.248)	(-0.013)	(-0.022)	(-1.392)	(-0.0097)	(-0.00744)	(-0.00892)	(-0.00921)	(-0.00926)
Observations	2,341	2,345	2,345	2,304	2,341	1,961	1,961	1,961	1,956	1,961
chi2_exog	122.9***	149.3***	138.8***	106.9***	128.6***	4.64**	2.863*	3.36*	5.287**	5.303**
chi2	4.443**	4.474**	40.75***	30.38***	0.499**	3038***	4648***	3033***	3013***	3169***

Source: Authors. NB: Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1: CO2 is environmental quality, FDI is foreign direct investment

Table 3. Sensitivity of the non-interactive regression across regions and export structure

	(1) Africa	(2) Asia	(3) Latin America and Caribbean	(4) Fuel exporting countries	(5) Non-fuel exporting countries
VARIABLES	Dependent variables: inequality adjusted human development index				
Governance	-0.0207**	0.0171***	0.00667***	0.0131***	0.00104
	(0.00929)	(0.00422)	(0.00141)	(0.00461)	(0.00331)
Environmental quality	0.0393***	0.00208***	0.0181***	0.00258***	0.0253***
	(0.00466)	(0.000676)	(0.00203)	(0.000889)	(0.00257)
Foreign direct investment	0.000160	0.00165***	0.000791	-0.00279***	0.00107***
	(0.000537)	(0.000489)	(0.000877)	(0.000759)	(0.000366)
Trade	0.000691***	-0.000250*	-0.000126*	-0.000354	8.62e-05
	(0.000174)	(0.000147)	(6.87e-05)	(0.000222)	(5.80e-05)
Internet	0.00453***	0.00191***	0.00167***	0.00202***	0.00296***
	(0.000381)	(0.000135)	(0.000120)	(0.000238)	(0.000160)
Resources rents	-0.00392**	0.000545	0.000910*	0.00181***	-0.00442***
	(0.00160)	(0.000357)	(0.000518)	(0.000484)	(0.000518)
Constant	0.339***	0.653***	0.622***	0.631***	0.513***
	(0.0318)	(0.0209)	(0.00885)	(0.0288)	(0.0124)
Observations	909	585	467	444	1,517
chi2_exog	22.55***	0.367*	3.489*	0.387*	8.724**
chi2	813.1***	1704***	1090***	597.0***	3837***
Rank	7	7	7	7	7
Tobitll	0.244	0.401	0.428	0.263	0.244
Tobitul	0.800	0.936	0.845	0.864	0.936

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

Source: Authors

The results indicate that natural resources rents is harmful on inclusive human development in Africa, Non-oil exporting countries, high income countries, lower-middle income countries, lower income countries, least developed countries and less developed countries. The positive effect is in upper-middle income countries, Asia, Latin America and Caribbean and in oil exporting countries.

Table 4.Sensitivity of the non-interactive regression across income levels and development levels

	(1)	(2)	(3)	(4)	(5)	(6)
	High income	Upper-middle income	Lower-middle income	Lower income	Least Developed	Less developed
VARIABLES	Dependent variables: inequality adjusted human development index					
Governance	-0.000794	0.0330*	-0.0140**	-0.135	-0.0538***	0.0144***
	(0.00248)	(0.0189)	(0.00657)	(0.0839)	(0.0131)	(0.00175)
CO2	0.00111***	-0.000368	0.0355***	0.367**	0.162***	0.00256***
	(0.000175)	(0.00318)	(0.00462)	(0.175)	(0.0350)	(0.000437)
FDI	0.00101***	0.00188	0.00249***	0.00331	0.000654	-0.000126
	(0.000362)	(0.00134)	(0.000857)	(0.00235)	(0.00116)	(0.000307)
Trade	0.000107***	-0.00103*	0.000226	0.000904	0.000944***	-0.000110**
	(3.39e-05)	(0.000532)	(0.000150)	(0.000706)	(0.000278)	(4.91e-05)
Internet	0.000930***	0.00239***	0.00339***	0.0118***	0.00848***	0.00213***
	(6.77e-05)	(0.000287)	(0.000302)	(0.00450)	(0.00140)	(0.000111)
Resources rents	-0.000732***	0.00577*	-0.00291***	-0.0166*	-0.00689***	0.000745**
	(0.000229)	(0.00336)	(0.000900)	(0.00934)	(0.00144)	(0.000302)
Constant	0.749***	0.716***	0.434***	-0.178	0.156***	0.633***
	(0.00997)	(0.0416)	(0.0327)	(0.340)	(0.0605)	(0.00657)
Observations	302	603	597	443	610	1,351
chi2_exog	2.046*	10.42**	15.76***	121.3***	113.8***	1.600*
chi2	458.9***	126.7***	387.6***	13.00**	110.6***	2127***
Rank	7	7	7	7	7	7
Tobitll	0.693	0.518	0.379	0.244	0.244	0.289
Tobitul	0.936	0.840	0.735	0.547	0.637	0.936

NB: Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1: CO2 is the environmental quality, and FDI is foreign direct investments

Source: Authors

4.2. Accounting for Transmission Channels

From the direct effect established, there is need to verify if governance and environmental quality are effective mechanisms through which the effect of resources rents is modulated on inclusive human development. In this light, there is a direct effect and the interactive effect. These can yield net or synergy effects depending on the signs of the direct and interactive effects. In accordance with reliable existing literature on interactive regressions (Tchamyou et al., 2019; Asongu and Nchofoung, 2021), the net effects of resource rents on inclusive human development are computed on the bases of average values of the policy variables. That is CO2, governance and the constituent indicators of the governance variable, notably, control of

corruption, voice and accountability, political stability, government effectiveness, rule of law and regulatory quality. In the computational process, when at least one of the variables needed to compute the net or threshold effect is insignificant, the computation is non-applicable (n.a) or when the sign of the direct and interactive effect is the same which we talked of synergy effect (s.e).

Table 5 indicates that the effect of natural resources on inclusive development has a negative synergy effect through governance. This synergy effect is robust to alternative measures of governance. Looking at these transmission mechanisms by regions as in Table 6, governance has a synergy positive effect in modulating resources rents on inclusive development in Africa and low income countries. The effect in other regions or income groups cannot be applicable due to the non-significance of at least one of either the conditional or unconditional coefficients.

Furthermore, Table 7 indicates that environmental quality negatively interacts with natural resources rents to produce a negative marginal effect in developing countries. But the influence of the direct effect overcomes this negative marginal effect producing a positive net effect. This is up to a CO2 threshold of 111.42. This is not however a feasible threshold for developing countries because it is out of the range of values of total natural resources rents presented in the summary statistics. In Africa, the negative unconditional effect of natural resources overrides the positive marginal effect through CO2 emission producing a negative net effect of natural resources rents on inclusive human development. This is up to a policy threshold of 25.4412 of CO2 emission when the negative effect becomes positive. This has policy implications as the computed value is within the range of values of CO2 presented in the summary Statistics.

Table 5. Dynamism of governance on the Natural resources and inclusive development relationship

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Dependent variables: inequality adjusted human development index						
Control variables	Yes	Yes	yes	yes	yes	yes	yes
Governance	0.0199***						
	(0.00263)						
Resources rents	-0.00145***	-0.00174***	-0.00105***	-0.00157***	-0.00143***	-0.00396***	-0.00239***
	(0.000270)	(0.000279)	(0.000272)	(0.000245)	(0.000263)	(0.000414)	(0.000515)
Governance×resources rents	-0.000462***						
	(7.85e-05)						
Corruption (A)		0.117***					
		(0.0164)					
A×resources		-0.00303***					
		(0.000476)					
Government effectiveness(B)			0.0817***				
			(0.0108)				
B×resources rents			-0.00141***				
			(0.000331)				
Regulatory quality(C)				0.0840***			
				(0.0111)			
C×resources rents				-0.00213***			
				(0.000366)			
Rule of law (D)					0.120***		
					(0.0169)		
D×resources rents					-0.00271***		
					(0.000481)		
Voice and accountability (E)						0.150***	
						(0.0216)	
E×resources rents						-0.00562***	
						(0.000792)	
Political Stability (F)							0.321***
							(0.0936)
F×resources rents							-0.00960***
							(0.00294)
Constant	0.580***	0.592***	0.565***	0.559***	0.592***	0.561***	0.699***
	(0.0105)	(0.0126)	(0.00862)	(0.00793)	(0.0125)	(0.00882)	(0.0562)
Observations	1,961	1,963	1,963	1,963	1,963	1,963	1,961
chi2_exog	2.266*	12.65**	1.648*	0.00263**	9.106**	15.23***	43.69***
chi2	3189***	2728***	3315***	3189***	2870***	2662***	639.6999
Tobitll	0.244	0.244	0.244	0.244	0.244	0.244	0.244

Tobitul	0.936	0.936	0.936	0.936	0.936	0.936	0.936

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

Source: authors

Table 6. Dynamism of governance across Geographical regions and income levels.

	(1) Africa	(2) Asia	(3) Latin America and Caribbean	(4) High income	(5) Upper middle	(6) Lower Middle	(7) Low Income
VARIABLES	Dependent Variable: Inequality adjusted human development index						
Control variables	yes	Yes	yes	Yes	yes	yes	yes
Governance (A)	-0.0186**	0.0225***	0.00739***	-0.000909	0.00180**	-0.0160**	-0.111***
	(0.0074959)	(0.0055051)	(0.0019716)	(0.0029062)	(0.0008324)	(0.0073668)	(0.0374408)
Resources rents	0.00364***	-0.000290	0.000818*	-0.000743***	0.000271	0.000670	0.0397***
	(0.000975)	(0.000225)	(0.000485)	(0.000264)	(0.000360)	(0.00100)	(0.0140)
A×resources rent	0.00105***	-0.000391***	-0.000147	2.13e-05	-4.50e-07	0.000669**	0.00719***
	(0.000309)	(0.000114)	(0.000140)	(8.86e-05)	(4.89e-05)	(0.000313)	(0.00242)
Constant	0.326***	0.674***	0.624***	0.750***	0.0471***	(0.0312)	(0.184)
	(0.0313)	(0.0254)	(0.0101)	(0.0109)	(0.00581)		
Observations	909	585	467	302	603	597	443
chi2_exog	23.51***	2.476*	4.891**	3.064*	3.181*	19.63***	122.0***
chi2	1086***	1862***	1124***	457.0***	347.7***	395.6***	44.32***
Tobitll	0.244	0.401	0.428	0.693	0.401	0.379	0.244
Tobitul	0.800	0.936	0.845	0.936	0.845	0.735	0.547

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

Source: Authors

Table 7. Dynamism of environmental quality on the resources rents and inclusive development relationship

VARIABLES	(1) Developing countries	(2) Africa	(3) Asia	(4) Latin America ıd Caribbean	(5) High income countries	(6) Upper-middle income	(7) Lower- le income	(8) Low income
	Dependent variable: Inequality adjusted human development index							
Governance	0.147***	-0.0158***	0.0387***	0.00214	-0.0508***	-0.0176***	-0.163	-0.00269
	(0.0235)	(0.00582)	(0.00270)	(0.00214)	(0.0182)	(0.00351)	(0.100)	(0.00281)
CO2	-0.0166***	0.0341***	0.00177**	0.0290***	-0.00483*	0.00431**	0.199**	0.258***
	(0.00540)	(0.00399)	(0.000832)	(0.00367)	(0.00249)	(0.00179)	(0.0938)	(0.0335)
FDI	-0.00397**	9.31e-05	0.00265***	0.00219**	0.00280*	-5.93e-05	0.0149*	0.000509*
	(0.00164)	(0.000461)	(0.000648)	(0.00105)	(0.00153)	(0.000887)	(0.00878)	(0.000265)
trade	-0.00260***	0.000629***	-0.00100***	-0.000135*	0.000551***	0.000357***	0.00287	0.000190**
	(0.000509)	(0.000126)	(0.000111)	(7.28e-05)	(0.000199)	(0.000123)	(0.00189)	(9.19e-05)
Internet	-0.00272**	0.00452***	0.00142***	0.00166***	0.00133***	0.00191***	0.00573**	0.00708***
	(0.00113)	(0.000324)	(0.000168)	(0.000128)	(0.000305)	(0.000160)	(0.00249)	(0.000583)
Resources rents	0.0195***	-0.00346***	0.00302***	0.00430***	-0.00717***	-0.00404***	-0.0185	-0.00106*
	(0.00345)	(0.000986)	(0.000409)	(0.000939)	(0.00246)	(0.000769)	(0.0117)	(0.000600)
CO2×Resources	-0.000175*	0.000136*	-0.000104***	-0.00117***	0.000189**	0.000171**	-0.00349*	-0.00365***
	(9.67e-05)	(8.19e-05)	(2.37e-05)	(0.000280)	(7.96e-05)	(7.85e-05)	(0.00197)	(0.00133)
Constant	1.031***	0.359***	0.749***	0.589***	0.966***	0.617***	-0.341	0.342***
	(0.0865)	(0.0213)	(0.0148)	(0.0135)	(0.0810)	(0.0115)	(0.508)	(0.0119)
Observations	1,961	909	585	467	302	603	597	443
Net effect	**0.0188577**	**-0.002961**	**0.002638**	**0.00000544**	**-0.006476**	**-0.003412**	s.e	s.e
Threshold	**111.42**	**25.4412**	**29.038**	**3.6752**	**37.9365**	**23.6257**	n.a	n.a
chi2_exog	982.6***	35.37***	352.8***	11.37***	326.4***	80.34***	255.1***	2.008*
chi2	196.6***	986.9***	1066***	999.2***	35.71***	257.3***	15.00**	388.6***
rank	8	8	8	8	8	8	8	8
tobitll	0.244	0.244	0.401	0.428	0.693	0.518	0.379	0.244
tobitul	0.936	0.800	0.936	0.845	0.936	0.840	0.735	0.547

Source: Authors. NB: Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1: CO2 is environmental quality, and FDI is foreign direct investments inflows. The net effect in the second column is =0.0188577 or (3.670566×0.00175)+0.0195. In the computation, 3.670566 is the average value of CO2 emissions. The corresponding threshold is 111.42 or (0.0195/0.000175).

In Asia and the Latin America and Caribbean, the positive unconditional effects predominate the negative conditional effects thereby producing positive net effects. This is up to CO2 emission thresholds of 29.038 and 3.6752, respectively, when the positive effect becomes negative. Looking at these developing countries with regard to income levels, the high income and the upper-middle countries, the negative unconditional effects predominate the positive marginal effects through CO2 emission, producing a negative net effect of resources rents on inclusive human development. This is up to CO2 emission thresholds of 37.9365 and 23.6257, respectively. These threshold results have policy implications because the corresponding thresholds are situated within the CO2 range presented in the summary statistics.

5. Conclusion and Policy implications

This paper empirically examined the underlying effects of natural resource rents on inclusive human development. Specifically, the contribution of this paper to the existing literature is at least threefold: first, this is the first attempt to empirically establish the effects of natural resources rents on inclusive human development on a global sample of developing countries. Second, this study considered the modulating effects of institutional quality and environmental quality on the resources rents' effect on inclusive human development. Third, developing countries are not uniform with respect to their levels of development. Some are rich in natural resources than others, while each country or region is peculiar with its own type of natural resources. Besides some have comparative advantages based on their geographical locations while others in terms of their export structure. This study therefore undertakes a comparative analysis based on geographical groupings, income levels, levels of development and export structure. The methodology was based on the IV Tobit regression on a sample of 107 developing countries. The results of the estimation indicated that natural resource rent has a positive direct effect on inclusive human development in developing countries. Looking at regional groupings, income levels, level of development and export structure, this direct positive effect was only noticeable in oil-exporting countries, Latin America and the Caribbean; upper-middle income countries and less developed countries. Negative significant effects were observed in Africa, high income, lower-middle income, lower-income and least developed countries. Looking at the transmission mechanisms, when the interactive variables of governance

and environmental quality were introduced, the modulating channel through governance exerted a robust negative synergy effect in all samples except for Africa, lower-middle and low-income countries where the modulation of governance had a positive synergy effect. When the interactive variable of CO2 was introduced, for Africa, the negative unconditional effect of natural resources overrides the positive marginal effect through CO2 emission producing a negative net effect of natural resources rents on inclusive human development. This was up to a policy threshold of 25.4412 of CO2 emission when the negative effect becomes positive. For Asia and the Latin America and Caribbean, the positive unconditional effects prevailed over the negative conditional effects, producing positive net effects. This was up to CO2 emission thresholds of 29.038 and 3.6752, respectively, when the positive effect becomes negative. Looking at these developing countries in terms of their income levels, the high income and the upper-middle income countries, the negative unconditional effects predominates the positive marginal effects through CO2 emission producing a negative net effect of resources rents on inclusive human development. This was up to a CO2 emission threshold of 37.9365 and 23.6257, respectively.

The policy implications of this study engage policy makers in developing countries not to neglect the opportunities offered by natural resources in their development strive. In this case, there is need for proper governance, as governance quality has proven to show a devastating effect on the resources rent and inclusive development relationship. In this respect, governments should implement proper mechanisms for the fight against corruption in the oil sector, and to resolve internal and cross-border conflicts that have often led to illegal exploitation of natural resources. Moreover, there is need for environmental protection to avoid the destructive CO2 emission threshold point within these economies. Besides, policy models should be elaborated based on the specificities of each economy, in this regard, the geographical location, income level, level of development and export structure should be considered in policy evaluation and not based on global experiences.

In summary, contingent on engaged specificities, where conditional effects are negative, negative thresholds for complementary policies have been provided and in scenarios where conditional impacts are positive, actionable positive thresholds have been provided. Thresholds for complementary policies imply that when the modulating variables have reached the critical

levels, the modulating variables should be complemented with other policy initiatives in order to maintain the positive incidence of resource rents on human development. Conversely, positive thresholds are critical levels of the moderating variables that should be attained in order for resource rents to engender a positive incidence of the outcome variable.

This study obviously leaves space for future research especially in the light of considering other moderating variables by which natural resource rents can improve human development. Moreover, country-specific studies using the relevant analytical cross-specific approaches are also worthwhile for more country-oriented implications.

References

Ahmed, Z., Asghar, M. M., Malik, M. N., & Nawaz, K. (2020). Moving towards a sustainable environment: the dynamic linkage between natural resources, human capital, urbanization, economic growth, and ecological footprint in China. *Resources Policy*, *67*, 101677.

Ariss, R. T. (2010). On the implications of market power in banking: Evidence from developing countries. *Journal of banking & Finance*, *34*(4), 765-775.

Asif, M., Khan, K.B., Anser, M.K., Nassani, A.A., Abro, M.M.Q., Zaman, K. (2020). Dynamic interaction between financial development and natural resources: evaluating the 'Resource curse'hypothesis. *Resources Policy*, 65, 101566.

Asongu, S. A., & Le Roux, S. (2017). Enhancing ICT for inclusive human development in Sub-Saharan Africa. *Technological Forecasting and Social Change*, *118*, 44-54.

Asongu, S. A., & Nwachukwu, J. C. (2016). The role of governance in mobile phones for inclusive human development in Sub-Saharan Africa. *Technovation*, *55*, 1-13.

Asongu, S. A., & Odhiambo, N. M. (2019). Basic formal education quality, information technology, and inclusive human development in sub-Saharan Africa. *Sustainable Development*, *27*(3), 419-428.

Asongu, S. A., Le Roux, S., & Biekpe, N. (2017). Environmental degradation, ICT and inclusive development in Sub-Saharan Africa. *Energy Policy*, *111*, 353-361.

Asongu, S. A., Nwachukwu, J. C., & Pyke, C. (2019). The comparative economics of ICT, environmental degradation and inclusive human development in Sub-Saharan Africa. *Social Indicators Research*, *143*(3), 1271-1297.

Asongu, S., & Nchofoung, T. (2021). The terrorism-finance nexus contingent on globalisation and governance dynamics in Africa. *European Xtramile Centre of African Studies WP/21/016*.

Asongu, S., El Montasser, G., & Toumi, H. (2016). Testing the relationships between energy consumption, CO 2 emissions, and economic growth in 24 African countries: a panel ARDL approach. *Environmental Science and Pollution Research*, *23*(7), 6563-6573.

Auty, R. M. (1995). Economic development and the resource curse thesis. In *Economic and political reform in developing countries* (pp. 58-80). Palgrave Macmillan, London.

Auty, R.M. (1993). *Sustaining development in mineral economies: the resource curse thesis*. Routledge, London.

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

Balassa, B.A. (1980). The process of industrial development and alternative development strategies. World Bank, Washington, DC.

Becker, G.S. (1992). Human capital and the economy. *Proceedings of the American philosophical society*, 136(1), 85-92.

Behbudi, D., Mamipour, S., & Karami, A. (2010). Natural resource abundance, human capital and economic growth in the petroleum exporting countries. *Journal of Economic Development*, *35*(3), 81.

Bhargava, A., Jamison, D.T., Lau, L.J., & Murray, C.J. (2001). *Modeling the effects of health on economic growth. Journal of Health Economics, 20(3), 423–440.*

Bloom, D.E., Canning, D., & Sevilla, J. (2004). The effect of health on economic growth: a production function approach. *World development*, *32*(1), 1-13.

Bulte, E., & Damania, R. (2008). Resources for sale: corruption, democracy and the natural resource curse. *The BE Journal of Economic Analysis & Policy*, *8*(1).

Canh, N. P., Kim, S., & Thanh, S. D. (2020). Entrepreneurship and natural resource rent-seeking: The roles of institutional quality. *Economics Bulletin*, *40*(2), 1159-1177.

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

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

Coccorese, P., & Pellecchia, A. (2010). Testing the 'quiet life'hypothesis in the Italian banking industry. *Economic Notes*, *39*(3), 173-202.

Di John, J. (2011). Is there really a resource curse? A critical survey of theory and evidence. *Global governance: A review of multilateralism and international organizations*, *17*(2), 167-184.

Eggoh, J., Houeninvo, H., & Sossou, G. A. (2015). Education, health and economic growth in African countries. *Journal of Economic Development*, *40*(1), 93.

Erdogan, S., Çakar, N. D., Ulucak, R., & Kassouri, Y. (2021). The role of natural resources abundance and dependence in achieving environmental sustainability: Evidence from resource-based economies. *Sustainable Development*, *29*(1), 143-154.

Gokmenoglu, K.K., Rustamov, B. (2019). Examining the World Bank Group lending and natural resource abundance induced financial development in KART countries. Resour. Pol. 63, 101433.

Guan, J., Kirikkaleli, D., Bibi, A., & Zhang, W. (2020). Natural resources rents nexus with financial development in the presence of globalization: is the "resource curse" exist or myth?. *Resources Policy*, *66*, 101641.

Gylfason, T. (2001). Natural resources, education, and economic development. *European economic review*, *45*(4-6), 847-859.

Hassan, S.T., Xia, E., & Lee, C. C. (2021). Mitigation pathways impact of climate change and improving sustainable development: The roles of natural resources, income, and CO2 emission. *Energy & Environment*, *32*(2), 338-363.

Havranek, T., Horvath, R., & Zeynalov, A. (2016). Natural resources and economic growth: A meta-analysis. *World Development*, *88*, 134-151.

Isham, J., Woolcock, M., Pritchett, L., & Busby, G. (2005). The varieties of resource experience: natural resource export structures and the political economy of economic growth. *The World Bank Economic Review*, *19*(2), 141-174.

Jayadevan, C.M. (2021). Impacts of health on economic growth: evidence from structural equation modelling. *Asia-Pacific Journal of Regional Science*, 1-10. https://doi.org/10.1007/s41685-020-00182-4.

Khan, N. H., Ju, Y., & Hassan, S. T. (2019). Investigating the determinants of human development index in Pakistan: an empirical analysis. *Environmental Science and Pollution Research*, *26*(19), 19294-19304.

Koetter, M., Kolari, J. W., & Spierdijk, L. (2008). Efficient competition? Testing the 'quiet life'of US banks with adjusted Lerner indices. In *Proceedings of the 44th 'Bank structure and competition'conference, Federal Reserve Bank of Chicago*. February.

Kumbhakar, S. C., & Lovell, C. A. K. (2000).Stochastic Frontier Analysis, Cambridge MA: Cambridge University Press.

Leite, M. C., & Weidmann, J. (1999). *Does mother nature corrupt? Natural resources, corruption, and economic growth*. IMF Working Paper No 34; International Monetary Fund.

Lucas, R.E. (1988). *On the mechanics of economic development. Journal of Monetary Economics, 22(1), 3–42.*

Maksymenko, S., & Rabbani, M. (2011). Economic reforms, human capital and economic growth in India and South Korea: A cointegration analysis. *Journal of Economic Development-Seoul*, *36*(2), 39.

Mankiw, N.G., Romer, D., & Weil, D.N. (1992). A contribution to the empirics of economic growth. *The quarterly journal of economics*, *107*(2), 407-437.

Nathaniel, S. P., Nwulu, N., & Bekun, F. (2021). Natural resource, globalization, urbanization, human capital, and environmental degradation in Latin American and Caribbean countries. *Environmental Science and Pollution Research*, *28*(5), 6207-6221.

Norman, C. S. (2009). Rule of law and the resource curse: abundance versus intensity. *Environmental and Resource Economics*, *43*(2), 183-207.

Ogundari, K., & Awokuse, T. (2018). *Human capital contribution to economic growth in Sub-Saharan Africa: Does health status matter more than education? Economic Analysis and Policy, 58, 131–140.*

Pack, H. (1994). Endogenous Growth Theory: Intellectual Appeal and Empirical Shortcomings. *Journal of Economic Perspectives*, 8(1): 55-72.

Pata, U. K., Aydin, M., & Haouas, I. (2021). Are natural resources abundance and human development a solution for environmental pressure? Evidence from top ten countries with the largest ecological footprint. *Resources Policy*, *70*, 101923.

Qadri, F.S., & Waheed, A. (2014). Human capital and economic growth: A macroeconomic model for Pakistan. *Economic Modelling*, *42*, 66-76.

Raheem, I. D., Isah, K. O., & Adedeji, A. A. (2018). Inclusive growth, human capital development and natural resource rent in SSA. *Economic Change and Restructuring*, *51*(1), 29-48.

Romer, P. (1990). Are nonconvexities important for understanding growth? NBER Working Paper No. 3271.

Sachs, J. D., & Warner, A. M. (1995). *Natural resource abundance and economic growth*. NBER Working Paper No. 5398.

Sala-i-Martin, X., & Subramanian, A. (2013). Addressing the natural resource curse: An illustration from Nigeria. *Journal of African Economies*, *22*(4), 570-615.

Sarkodie, S. A., Adams, S., Owusu, P. A., Leirvik, T., & Ozturk, I. (2020). Mitigating degradation and emissions in China: the role of environmental sustainability, human capital and renewable energy. *Science of the Total Environment*, *719*, 137530.

Shahbaz, M., Nasir, M.A., Roubaud, D. (2018). Environmental degradation in France: the effects of FDI, financial development, and energy innovations. *Energy Economics*, 74, 843–857.

Shao, S., & Yang, L. (2014). Natural resource dependence, human capital accumulation, and economic growth: A combined explanation for the resource curse and the resource blessing. *Energy Policy*, *74*, 632-642.

Sinha, A., & Sengupta, T. (2019). Impact of natural resource rents on human development: what is the role of globalization in Asia Pacific countries?. *Resources Policy*, *63*, 101413.

Solow, R.M. (1956). A contribution to the theory of economic growth. *The Quarterly Journal of Economics*, 70(1), 65-94.

Strauss, J., & Thomas, D. (1998). Health, nutrition, and economic development. *Journal of economic literature*, 36(2), 766-817.

Tchamyou, V. S., Asongu, S. A., & Odhiambo, N. M. (2019). The role of ICT in modulating the effect of education and lifelong learning on income inequality and economic growth in Africa. *African Development Review*, *31*(3), 261-274.

Webber, D.J. (2002). Policies to stimulate growth: should we invest in health or education? *Applied Economics*, 34(13), 1633–1643.

Yıldırım, S., Gedikli, A., Erdoğan, S., & Yıldırım, D. Ç. (2020). Natural resources rents-financial development nexus: Evidence from sixteen developing countries. *Resources Policy*, *68*, 101705.

Zalle, O. (2019). Natural resources and economic growth in Africa: The role of institutional quality and human capital. *Resources Policy*, *62*, 616-624.

Zhang, L., Godil, D. I., Bibi, M., Khan, M. K., Sarwat, S., & Anser, M. K. (2021). Caring for the environment: How human capital, natural resources, and economic growth interact with environmental degradation in Pakistan? A dynamic ARDL approach. *Science of The Total Environment*, *774*, 145553.

Appendix

Appendix 1. List of Countries under Study (107)

Algeria, Argentina, Bahamas, Bahrain, Bangladesh, Barbados, Belize, Benin, Bhutan, Bolivia (Plurinational State of), Botswana, Brazil, Brunei Darussalam, Burkina Faso, Burundi, Cabo Verde, Cambodia, Cameroon, Central African Republic, Chad, Chile, China, Colombia, Comoros, Dem. Rep of Congo, Rep of Congo, Costa Rica, Côte d'Ivoire, Djibouti, Dominican Republic, Ecuador, Egypt, Equatorial Guinea, Eritrea, Eswatini (Kingdom of), Ethiopia, Fiji, Gabon, Gambia, Ghana, Guatemala, Guinea, Guinea-Bissau, Guyana, Haiti, Honduras, Hong Kong, China (SAR), Indonesia, Iraq, Israel, Jamaica, Jordan, Kenya, Kiribati, Kuwait, Lao People's Democratic Republic, Lebanon, Lesotho, Liberia, Libya, Madagascar, Malawi, Malaysia, Mali, Mauritania, Mauritius, Mexico, Mongolia, Morocco, Mozambique, Myanmar, Namibia, Nicaragua, Niger, Nigeria, Oman, Panama, Papua New Guinea, Paraguay, Peru, Philippines, Qatar, Rwanda, Samoa, Sao Tome and Principe, Saudi Arabia, Senegal, Seychelles, Sierra Leone, Singapore, Solomon Islands, South Africa, Suriname, Tanzania (United Republic of), Thailand, Togo, Trinidad and Tobago, Tunisia, Turkey, Uganda, United Arab Emirates, Uruguay, Vanuatu, Venezuela (Bolivarian Republic of), Viet Nam, Yemen, Zambia, Zimbabwe.

Appendix 2. Variables and data sources

Variables	abbreviation	Source
Foreign direct investment inflows (%GDP)	FDI	WDI
Trade (% of GDP)	Trade	WDI
Governance index	Governance	Authors from WGI data
Control of corruption	corruption	WGI
Government effectiveness	Government_eff	WGI
Political stability and absence of violence	political_stability	WGI
Regulatory quality	reg_qual	WGI
Rule of law	rule_law	WGI
Voice and accountabity	voice_acc	WGI
Individuals using internet (% of population)	Internet	WDI
CO2 emissions (metric tons per capita)	CO2	WDI
total natural resources rents (% GDP)	Resources_rent	WDI
Forest rents (% GDP)	Forest_rent	WDI
Mineral Rent (% GDP)	Mineral_rent	WDI
Oil rent (%GDP)	Oil_rent	WDI