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ENTREPRENEURSHIP AND NATURAL RESOURCE RENT-SEEKING: THE ROLES OF INSTITUTIONAL QUALITY

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ENTREPRENEURSHIP AND NATURAL RESOURCE RENT-SEEKING:

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1. Introduction

A large amount of natural resources may stimulate rent-seeking (Torvik 2002) that prevents the sustainable consumption and production of natural resources, hampering sustainable development (Barbier 2007). Natural resources provide a curse to some countries due to rent-seeking, but it also brings a blessing to other countries (Canh and Thong 2020). Thus, investigating the mechanism through which natural resources deliver a curse or blessing to an economy is a significant and ongoing issue. In this regard, recent studies emphasize entrepreneurship as an agent that determines the rent-seeking of natural resources.

By using a theoretical model, Murphy et al. (1993), Robinson (1994) and Acemoglu (1995) suggest that an increase in the number of rent-seekers lowers returns of both rent-seeking and productive entrepreneurship, but returns from productive entrepreneurship are affected more. Thus, initial rent-seeking activity reinforces itself by crowding out productive entrepreneurship from the market. Baland and Francois (2000) argue that an increase in natural resources enhances domestic rent-seeking when the initial proportion of agents engaged in rent-seeking is large. Torvik (2002) shows that an increase in natural resources increases the number of rent-seeking entrepreneurs and decreases that of productive entrepreneurs by making rent-seeking relatively more profitable. That is, natural resources move productive entrepreneurs into rent-seeking activity, lowering the national income and welfare.

For the ensuing empirical studies, Chambers and Munemo (2019) consider the relationship between natural resource rents and new business creation. This study finds that heavy natural resource extraction lowers entrepreneurial activity, depending on the quality of governance. Youssef et al. (2018) show, by using an environmental Kuznets curve, that entrepreneurship is conditioned on heavy energy use, deteriorating environmental quality and sustainability of African countries.

Meanwhile, studies in environmental economics show that better institutional quality enhances environmental performance (Tamazian and Bhaskara Rao 2010, Nguyen et al. 2019) due to less pollution (Sarkodie and Adams 2018) and higher environmental protection (Mavragani et al. 2016). Moreover, improvement in institutional quality have positive impacts on economic growth (Nguyen, Su, et al. 2018, Nguyen, Schinckus, et al. 2018, Phuc Canh 2018) and employment (Beltrán 2016). Thus, institutional improvement can reduce natural resource rents by providing employment opportunities and economic activities in other industries than natural resources industries.

Building on the existing literature, our study estimates the impact of entrepreneurship density and institutional quality on natural resource rents. Our study investigates if an increase in entrepreneurs causes natural resource rents to increase, acknowledging that an increase in the number of entrepreneurs lowers the rate of return for overall businesses, making rent-seeking more profitable at the margin.

In contrast to previous empirical studies by Chambers and Munemo (2019) that analyse the impact of natural resource rents on entrepreneurship, our study estimates the impact of entrepreneurship on natural resource rents. Our study examines the reversed direction of causality. Youssef et al. (2018) also estimate the effects of entrepreneurship on the environment, focusing on the direction of causality running from entrepreneurship to pollution. However, our study

considers the impact of entrepreneurship on natural resource rents, instead of environmental pollution.

In this study, we estimate natural resource rents by multiplying the total outputs with monopoly rents in the oil and gas, coal and forest industries. This measure represents not only the total amounts of natural resources exploited but the total amounts of monopoly rents attained in the resources industry in a country. The greater the resource rents are, the more the resources are exploited. By pursuing the rents, countries can overexploit their natural resources, depleting exhaustible natural resources. Economic growth is unsustainable for these countries. This is observed in many developing countries experiencing stagnant economic growth despite their rich natural resources.

However, an increase in natural resource rents does not necessarily harm sustainable development. Natural resources are boon for some countries. For example, Canada and Australia enjoy developed economies by utilizing their abundant natural resources. Nevertheless, an increase in natural resource use is associated more with poverty and sluggish growth than not. This is especially true when a country suffers from bad institutions. Under the circumstances, we investigate how entrepreneur dynamism affects natural resource exploitation, which is not sustainable without quality institutions.

In investigating the relation between entrepreneurship and natural resource rents, we do not assume that entrepreneurs engaged with the resources industry are bad because they are pursuing rents from natural resources. They are active rent seekers like entrepreneurs in any other industry. All entrepreneurs might exploit monopoly rents if opportunity exits. All entrepreneurs also want to innovate production processes and invent new products to obtain monopoly power, which bring them monopoly rents. In this regard, all entrepreneurs are rent seekers.

Nonetheless, an existence of natural resource rents attracts entrepreneurs who want to claim a share of them. Many of them are willing to pay a part of the rents to anyone who possesses a power to distribute them. This can be rampant when institutions are corrupt. Massive existing rents make entrepreneurs be opportunistic instead of creating new monopoly rents through innovation. Only talented entrepreneurs can earn monopoly rents through innovation. Thus, it is much easier for entrepreneurs in the resources industry to be opportunists rather than innovators. In this sense, an increase in natural resource rents deteriorates economic sustainability. However, quality institutions would create business opportunities elsewhere than in the resources industry, reducing the rent-seeking in the resources industry.

Against this backdrop, we attempt to investigate if an increase in entrepreneurship density induces entrepreneurs to engage more with rent-seeking activity than productive activity, causing an increase in natural resource rents. We find a previous paper noticing a linkage among institutional quality, entrepreneurial activities and natural resources rents. Chowdhury et al. (2019) show that entrepreneurial activity and natural resource rent-seeking are strongly impacted by the institutional setting(Chowdhury et al. 2019)(Chowdhury et al. 2019)(Chowdhury et al. 2019)(Chowdhury, Audretsch, and Belitski, 2019)(Chowdhury et al., 2019)(Chowdhury, Audretsch, & Belitski, 2019)(Chowdhury, Audretsch, and Belitski 2019)(Chowdhury et al., 2019)(Chowdhury et al., 2019)(Chowdhury et al., 2019)(Chowdhury et al., 2019). Following this, we assume that an improvement in institutional quality provides a good catalyst that limits natural resource rents sought by new entrepreneurs. Quality institutions would create opportunities and wealth elsewhere than in the resource industry, so new entrepreneurs would be less likely to be involved with rent-seeking activity of natural resources.

Our methods are rigorous in investigating this relationship. Specifically, our study examines the associated effects of institutional quality and entrepreneurship density on natural resource rents, after controlling for economic growth, urbanization, and FDI inflows. We apply the two-step system general method of moments (GMM) to a panel of 60 countries over the period 2006-2016. For institutions, we utilize an overall index for institutional quality obtained by averaging six different institutional indicators including control of corruption, government effectiveness, regulatory quality, political stability and voice, rule of law, and accountability. However, we input each indicator separately into the regression as well. We classify the sample into two subsamples of 34 high-income economies and 26 low- and middle-income economies. Finally, we check the robustness of our findings by using the sequential two-stage estimation of linear panel-data models (SELPDM).

There is a number of ways in which our study contributes to the existing literature. First, whereas most of the existing literature examines the effect of natural resources on entrepreneurship, in our article we look at the effect of entrepreneurship on natural resources. Second, our study contributes to the literature of the resource curse by revealing a specific mechanism that transmits natural resource rents. From this, we can suggest policy implications that can reduce the problem. Third, our study contributes to the literature of sustainable development by showing that increased entrepreneurship density should be supported by the improved institutional quality for sustainable development. This is significant because natural resource rents are highlighted as a major problem in human economic activities, hampering sustainable development (Farzanegan et al. 2018, Torvik 2002, UN 2019). According to UN (2019), human being uses ever-increasing amount of natural resources, while the efficiency in resources consumption is not improved as much as expected, i.e. the wastes of resources (e.g., food) and material footprint per capita are increasing faster over the period 2000–2017 in low- or middle-income countries.

Empirical results of our study show that an increase in entrepreneurship density has a significant positive impact on natural resource rents, the improvement in institutional quality has a significant negative impact, and that the association between institutional quality and entrepreneurship density is notably found with a significant negative relationship.

Our findings imply a natural resource rent-seeking is one of the main entrepreneurial activities. This thrusts a new hard issue in the literature of the link between entrepreneurship and sustainable development. The quality of institutions, especially its association with entrepreneurship, is important in controlling entrepreneurs' resource rent-seeking activities. Thus, concerted efforts to boost entrepreneurship and environmental institutions are required to achieve sustainable production and consumption.

Our study is organized as follows. Section 2 discusses the methodology and data. Section 3 discusses the empirical results. Section 4 presents the conclusions.

2. The Empirical Model

Let's start from a baseline empirical model of natural resource rents as follows:

$$NR_{it} = \alpha_0 + \beta_1 EG_{it} + \beta_2 Urb_{it} + \beta_3 FDI_{it} + \varepsilon_{it}, \quad (1)$$

where NR, EG, Urb, and FDI represent natural resource rents, economic growth, urbanization, and foreign direct investment, respectively. In accounting for natural resource rents, economic growth should be one of the main drivers because economic activities consume natural resources (e.g., Abdulahi et al. (2019)). In terms of social factors, urbanization represents a change in living standards and social structure. Urbanization requires massive use of natural resources such as cement, steel, aluminum, and coal, increasing natural resource rents (Shen et al. 2005).

Urbanization is usually associated with industrialization processes, which instigate a higher demand for natural resources (Mudakkar et al. 2013). Thus, urbanization can be argued to be a main driver of high natural resource consumption (Shen et al. 2005, Shuancheng et al. 2009). However, urbanization to some extent can reduce natural resource rents. Urbanization with higher population density requires more efficient supplying and use of natural resources, which may save natural resources as the results from economies of scale (Jia et al. 2017). Moreover, urbanization along with industrialization may transform the nature of production systems mostly based on natural resources toward higher value-added and less natural dependence (Gollin et al. 2016). Thus, is can show us whether these positive effects outweigh the negative effect or not. The baseline model also includes FDI net inflows as an explanatory variable. Existing literature has well documented that inward FDIs often attempt to gain access to natural resource rents (Hajzler 2014, Ndikumana and Sarr 2019).

To investigate the influence of institution and entrepreneurship on natural resource rents, we add institutional quality and entrepreneurship density as explanatory variables to the baseline model to derive our regression model:

$$NR_{it} = \alpha_0 + \beta_1 EG_{it} + \beta_2 Urb_{it} + \beta_3 FDI_{it} + \beta_4 Ent_{it} + \beta_5 Ins_{it} + \varepsilon_{it}, \quad (2)$$

where Ent and Ins denote entrepreneurship density and institutional quality, respectively. To estimate the association between these two variables on natural resource rents, we also incorporate an interaction term between institutional quality and entrepreneurship density, $Ent * Ins$.

In estimation, we have a sample of 60 countries over the period 2006–2016. In fact, natural resource rents are likely a relatively long-term activity, which would take long time for transformation (Gaddy and Ickes 2005). That is, the natural resource rents are likely to be subject to a long-term trend so that we use a dynamic panel data model after including a lagged dependent variable as a regressor. The dynamic panel model can deal with this problem as well.

Now our regression model can be written as:

$$NR_{it} = \alpha_0 + \alpha_1 NR_{it-1} + \beta_1 EG_{it} + \beta_2 Urb_{it} + \beta_3 FDI_{it} + \beta_4 Ent_{it} + \beta_5 Ins_{it} + \beta_6 Ent * Ins_{it} + \varepsilon_{it}, \quad (3)$$

In the regression model, there exists an endogeneity problem, which is a problematic issue in estimating the dynamic panel model. For example, growth affects natural resource rents, but natural resource rents also influence growth. Natural resources attract FDI even though we include FDI as a regressor (Hajzler 2014). Further, we estimate the effect of entrepreneurship on natural resource rents, but other studies investigate the impact of natural resource rents on entrepreneurship.

To address the endogeneity problem in the dynamic model, we adopt the two-step system GMM developed by Blundell and Bond (1998) as our main estimator. However, we also utilize the sequential (two-stage) estimation of linear panel-data models (SELPDM) proposed by Kripfganz (2017) as an alternative to the system GMM estimator to check the robustness of our empirical results. This method is useful to identify the coefficient of time-invariant regressors consistently by providing partial robustness to model specification.

In estimation, we include control variables (urbanization and FDI inflows) one by one to check for the sensitivity of the results. Besides overall institutional quality, we include six institutional indicators separately in the estimation to check for the influences of different dimensions of institutional quality. Finally, we divide our sample into two subsamples of high-income economies (HIEs) and low and middle-income economies (LMEs) according to the World Bank classification. This is to distinguish any difference in the influences of entrepreneurship and institutions on natural resource rents in different income levels.

3. Data and Empirical Results

3.1. Data

We compile the data from two of the World Bank's databases, the World Development Indicators (WDI) and Worldwide Governance Indicators (WGI).

For natural resource rents, we employ two indicators of the percentage share of total natural resource rents in GDP (*NRG*) and the log of total natural resource rents per capita in USD (*NRC*) as a proxy for natural resource rents. Total resource rents comprise oil rents, natural gas rents, coal rents, and forest rents. For each commodity, total rents are calculated by multiplying production quantity by unit rents, which are estimated as the difference between its unit world price and average production cost. Notice that the important characteristic is not the total stock of natural resources but the size of natural resource rent over which entrepreneurs exploit (Chambers and Munemo 2019).

For entrepreneurship, we use a new business density, that denotes new business registrations per 1,000 people between ages 15-64 to proxy entrepreneurship (*Ent*). According to World Development Indicators' definition (WB 2019), this index counts the number of new limited liability corporations registered in the calendar year. Because of this, the proxy provides a better measure for new official business density than other options. Notice that it covers only firms in the formal sector and firms with limited liability due to the lack of data availability. We take a log on the variable in estimation.

Regarding control variables, we use real GDP growth rate (*EG*), the share of net FDI inflows in GDP (*FDI*) and the share of the urban population in total population (*Urb*) to proxy for economic growth, FDI inflows, and urbanization, respectively. We estimate the overall institutional quality (*Ins*) by averaging six institutional indicators including control of corruption, government effectiveness, regulatory quality, rule of law, political stability and absence of violence, voice and accountability compiled from WGIs.

The sample consists of 26 LMEs and 34 HIEs over the period of 2006-2016. For most of the sample countries, data for new business registrations per 1,000 people between ages 15-64 from WDIs is available from 2006 till 2016, which restricts our sample period. We include all 60 countries in our sample for which that all the variables for estimation are available (see *Table A1*, Appendix, for the list of countries). Our data is a balanced panel with a total of 660 observations. *table 1* presents the variable abbreviations, descriptions, and sources, along with summary statistics.

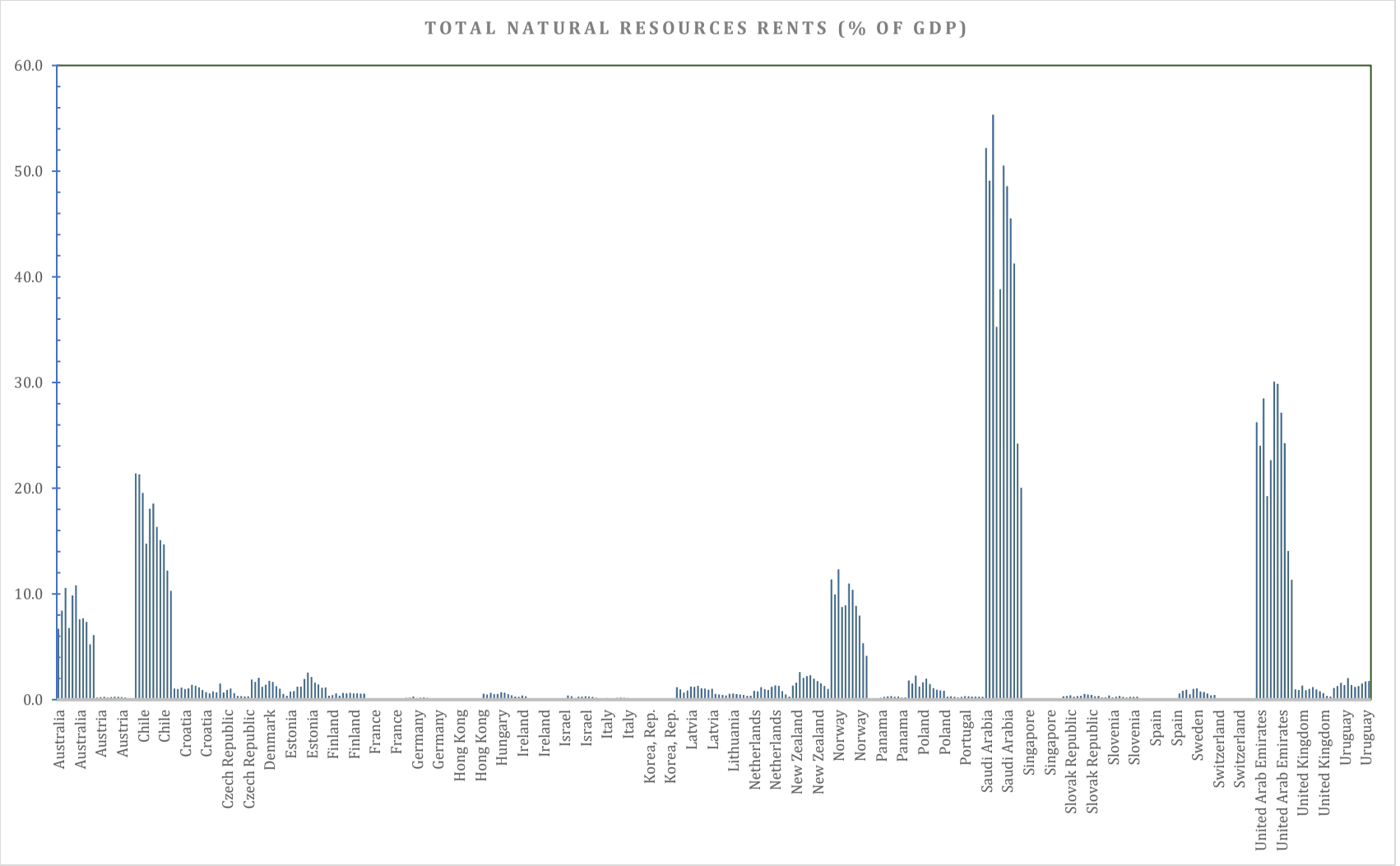
Table 1. Variables, Abbreviations, Constructions, Sources and Summary Statistics

Variables	Abb.	Constructions	Sources	Mean	S.D.
Total natural resource rents	NRG	Total natural resource rents (% of GDP)	WDI	4.34	7.59
Total natural resource rents in per capita	NRP	Log of total natural resource rents per capita (in USD)	WDI	9.46	1.98
Economic growth	EG	Real GDP growth rate (%)	WDI	3.05	3.65
Institutional quality	Ins	Average of six institutional indicators	WGI	0.50	0.83
Entrepreneurship	Ent	Log of New business density (new registrations per 1,000 people ages 15-64)	WDI	0.71	1.37
Urbanization	Urb	Urban population (% of total)	WDI	69.6	15.6
FDI inflows	FDI	Foreign direct investment, net inflows (% of GDP)	WDI	5.35	8.65

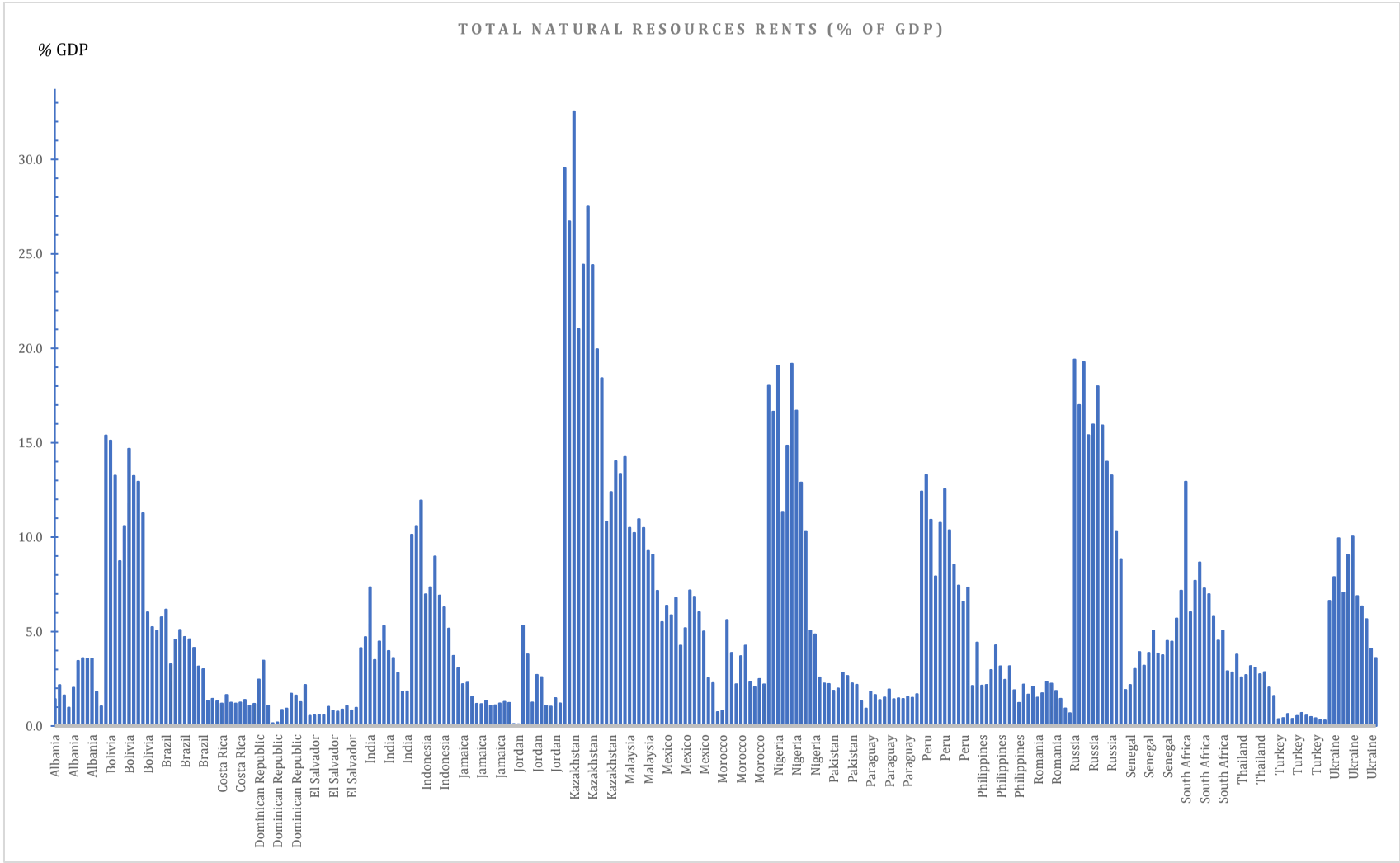
Notes: WDI denotes World Development Indicators Database in World Bank; WGI represents World Governance Indicators Database in World Bank; Six institutional indicators from WGI includes Control of Corruption, Government Effectiveness, Regulatory Quality, Rule of Law, Political Stability and Absence of Violence, Voice and Accountability.

Figures 1a and 1b show total natural resource rents as a percentage of GDP for 34 HIEs and 26 LMEs, respectively. Among HIEs, Saudi Arabia, UAE, and Chile are the countries with the highest natural resource rents with about 50%, 30%, 20% of GDP, respectively. There are some signs of decreasing natural resource rents over the sampling period among HIE countries such as Chile, Norway, and Australia.

Overall, natural resource rents are relatively higher in LMEs than HIEs. Among LMEs, Kazakhstan, Russia, Nigeria, and Bolivia are the countries with the highest natural resource rents with about 25%, 16%, 15%, and 13%, respectively (see *figure 1*). There are also decreasing trends in natural resource rents among LME countries such as Kazakhstan, Peru, South Africa, Brazil, Indonesia, Malaysia, and Thailand over the sampling period.



a) High-Income Economies



a) Low- and Middle-Income Economies

Figure 1. Total Natural Resource Rents (% GDP) across Economies (2006 - 2016)

3.2. Main Empirical Findings

In this section, we discuss our main empirical results, which consist of three parts. First, we present determinants of natural resource rents in the full sample estimation by using two indicators for the rents such as (*i*) total natural resources to GDP and (*ii*) total natural resources rent in per capita. Second, we estimate interaction effects of institutional quality and entrepreneurship on natural resource rents. Third, we provide empirical results based on two subsamples. We also check the robustness of our results by applying SELPDM estimator and estimating models with six different indicators of institutions such as control of corruption, government effectiveness, rule of law, regulatory quality, political stability and absence of violence, and voice and accountability. Before estimation, we examine correlation between explanatory variables. *Table 2* reports the unconditional correlations matrix.

The Pierson correlation coefficients show that entrepreneurship is significantly correlated with institutional quality with r=0.67, and urbanization is significantly correlated with institutional quality and entrepreneurship with r=0.56 and 0.55, respectively. These correlations are not considered as too much collinearity to cause multicollinearity in the literature.

Table 2. Correlation between Explanatory Variables

	EG	Ins	Ent	Urb	FDI
EG	1.00				
Ins	-0.23***	1.00			
Ent	-0.17***	0.67***	1.00		
Urb	-0.11***	0.56***	0.55***	1.00	
FDI	0.17***	0.23***	0.25***	0.25***	1.00

Notes: *, **, *** denote significant levels at 10%, 5%, 1%, respectively.

All main results are presented in *Tables 3* and *4*. The insignificance of the Hansen test and AR (2) tests in most results confirm the consistency and robustness of two-step system GMM. The robustness check by SELPDM estimation and six different indicators of institutions are reported in *Table A2* to *A4*, Appendix.

Entrepreneurship, Institutional Quality and Natural Resource Rents

Table 3 presents the determinants of natural resource rents (*NR*) in the full sample. We implement estimations based on two different forms to represent natural resource rents, (i) the percentage share of total natural resource rent in GDP (*NRG*) and (ii) the log of per capita total natural resource rent (*NRP)*. Interestingly, estimations show that the influences of determinants of natural resource rents are consistent, irrespective of both proxies of natural resource rents.

Table 3. Institutional Quality, Entrepreneurship and Natural Resource Rents (two-step system GMM estimator)

	NRG				NRP			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
L.NR	0.894***	0.883***	0.885**	0.885**	0.9285***	0.932***	0.918**	0.904***
	[0.001]	[0.001]	[0.001]	[0.001]	[0.0041]	[0.003]	[0.0047]	[0.004]
EG	0.158***	0.159**	0.168***	0.198**	0.0454***	0.046***	0.047**	0.048***
	[0.002]	[0.004]	[0.004]	[0.005]	[0.0013]	[0.001]	[0.001]	[0.001]
Ins	-0.360***	-0.656***	-0.568***	-0.434***	-0.113***	-0.086***	-0.074***	-0.002
	[0.026]	[0.020]	[0.029]	[0.051]	[0.016]	[0.011]	[0.015]	[0.021]
Ent	0.199***	0.237***	0.231***	0.243***	0.071***	0.049***	0.053***	0.0298***
	[0.010]	[0.006]	[0.009]	[0.016]	[0.005]	[0.005]	[0.005]	[0.0049]
Urb		0.012***	0.012***	0.0115***		0.002***	0.002***	0.002***
		[0.001]	[0.001]	[0.0014]		[0.000]	[0.000]	[0.0005]
FDI			-0.015***	-0.016***			-0.005***	-0.005***
			[0.002]	[0.002]			[0.000]	[0.0005]
Ent*Ins				-0.118***				-0.026***
				[0.033]				[0.005]
Con.	-0.182***	-0.844***	-0.833***	-0.835***	0.552***	0.385***	0.504***	0.672***
	[0.016]	[0.088]	[0.101]	[0.107]	[0.041]	[0.046]	[0.066]	[0.041]
AR(1) test	0.022	0.022	0.022	0.021	0.001	0.001	0.001	0.001
AR(2) test	0.060	0.059	0.059	0.054	0.027	0.027	0.028	0.028
No of IVs	58	59	60	74	58	59	60	67
Hansen test	0.287	0.319	0.331	0.861	0.257	0.249	0.252	0.258
No. Countries	60	60	60	60	60	60	60	60
Obs	600	600	600	600	600	600	600	600

Notes: Standard errors are in parentheses. *, **, *** denote significant levels at 10%, 5%, 1%, respectively. Hanse test statistics represent p-values.

Regarding control variables, real GDP growth rate has a significant negative impact on natural resource rents, implying economic growth is one of the main drivers of natural resource rents. These results are consistent not only with theoretical studies of environmental economics, energy economics and natural resource economics (Nelson and Kennedy 2009) but empirical studies (*e.g.*, Abdulahi et al. (2019)). Urbanization has a significantly positive impact on natural resource rents as well. This suggests that urbanization processes bring about greater natural resource rents. These results are consistent with the theory about the higher demand of urban citizens (Shen et al. 2005). Lastly, estimations show that FDI inflows have a significant negative effect on natural resource rents. Our results that FDI inflows can reduce natural resource rents are surprising, considering many studies that have documented the rent-seeking of natural resources exploited by capital inflows (*e.g.*, Hajzler (2014), Ndikumana and Sarr (2019)). These results can reflect a current trend in which countries are more interested in promoting green capital inflows than before. For instance, Yang et al. (2019) observe several actions from governments across countries in promoting green investments. They also document that green-credit policies contribute to the capital inflow to renewable energy industry. Feng et al. (2018) notice that the environmental regulations in China have positive linkages with inward FDI on green innovation efficiency. Frankel and Romer (1999) argue that the effect of FDI on environmental depend on either the pollution-haven or the pollution-halo hypothesis. Our results support the pollution-halo hypothesis as FDI inflows reduce natural resource rents.

Regarding our main variables, empirical results show that entrepreneurship has a significant positive impact on natural resource rents, while institutional quality shows to have a significant

negative one. That is, an increase in entrepreneurship density increases natural resource rents but an improvement in institutional quality decreases it. Interestingly, our findings show that entrepreneurs exploit rent-seeking opportunities in natural resources if not institutionally prevented. However, our results are consistent with an argument by Torvik (2002) that natural resource abundance might lead new entrepreneurs to rent-seeking behaviour, while the number of entrepreneurs running productive firms are crowded-out from the market. Our results also confirm our research hypothesis that an increase in entrepreneurship density increases natural resources rents at the country level. Our results show an interesting issue for the literature on entrepreneurship, which seems to indicate the need for new business models for entrepreneurial activities to contribute to sustainable development goals.

The negative impact of institutional quality on natural resource rents not only contributes to the existing literature but provide important policy implications. Beneficial effect of institutional quality on natural resource rent are consistent with new institutional economics in the sense that institutional quality shapes entrepreneurial behaviours toward resource rents. Especially, our results confirm that an improvement in institutional quality would stimulate natural and environmental protection through changes in entrepreneurs' behaviour and the responsibility and effectiveness of government policies (Pata 2018). Better institutional quality would help reduce asymmetric information, transaction cost, and risks, improving the efficiency of resource allocation and market efficiency (Williamson 1981, Cohen et al. 1983). Enhancing greater efficiency in production would reduce natural resource rents. Our results are also consistent with previous studies that argue good institutional quality is a positive factor in reducing the natural exploitation and environmental degradation (Galinato and Chouinard 2018) while bad institutional quality might lead to the institutional capture from populism (Chesterley and Roberti 2018) or worsen natural resource exploitation (Sulaiman et al. 2017). Our study underscores the importance of institutional reforms toward sustainable policies.

Model (4) and (8) in *Table 3* estimate interaction terms between entrepreneurship and institutional quality. Concerning interaction effect, estimation results show that the interaction term between institutional quality and entrepreneurship (*Ent*Ins*) has a significant negative effect on natural resource rents, regardless of proxies used for the rents (*NRG or NRP*). The interaction effect reinforces the impact of both institutional quality and entrepreneurship on natural resource rents. Thus, an improvement in institutional quality reduces natural resource rents not only directly but indirectly by limiting the rent-seeking behavior of entrepreneurs. This is further proof of the importance of institutional quality as an instrument for achieving sustainable consumption and production. An improvement in institutional quality provides a good catalyst that limits natural resource rents by new entrepreneurs. Quality institutions would create opportunities and wealth elsewhere than in the resource industry, so new entrepreneurs would be less likely to be involved with rent-seeking activity of natural resources.

Our results coincide with the literature of new institutional economics, that institutional quality is a vital catalyst to change human activities. In this case, the institutional quality is a crucial explanatory variable as to the rent-seeking behavior of entrepreneurs. Our results underline an important role of institutional conditions in determining entrepreneurship, as documented in previous studies (Heiskanen et al. 2019, Chowdhury et al. 2019). Nevertheless, our study emphasizes its role as a promoter of sustainable entrepreneurship. The results are checked for robustness by SELPDM model, the results reported in *Table A2*, Appendix, showing consistent findings.[1]

[1]Authors also runs different estimation strategy for robustness. The results are provided upon requests.

For further robustness checking, we examine the influences of different dimensions of institutions on natural resource rents, we include six institutional indicators separately into the estimation. *Table A3, Appendix,* reports the estimation results. There are some main facts for notice. The results show that five among six institutional indicators (control of corruption, government effectiveness, regulatory quality, rule of law, and political stability) have the same coefficient estimates in the same manner as the overall institutional quality. That is, those institutional quality characteristics have a significant negative impact on natural resource rents, and their interaction with entrepreneurship also has a significant negative impact. This confirms the crucial role of institutional quality, which is valid for most institutional dimensions.

Table 4. Institutional Quality, Entrepreneurship and Natural Resource Rents: HIEs vs LMEs (two-step system GMM estimator)

	High-Income Economies (HIEs)		Low- and Middle-Income Economies (LMEs)	
	NRG	NRP	NRG	NRP
L.NR	0.909***	0.951***	0.874***	0.834***
	[0.000]	[0.004]	[0.024]	[0.037]
EG	0.118***	0.033***	0.208***	0.054***
	[0.002]	[0.002]	[0.029]	[0.005]
Ins	-0.053***	-0.022*	-0.345	-0.144**
	[0.017]	[0.013]	[1.358]	[0.065]
Ent	0.008	0.017**	-0.023	0.078***
	[0.009]	[0.008]	[0.236]	[0.026]
Urb	0.001**	-0.000	0.014	0.004
	[0.001]	[0.000]	[0.014]	[0.003]
FDI	-0.012***	-0.003***	0.099***	0.027***
	[0.001]	[0.001]	[0.014]	[0.006]
Con.	-0.126*	0.402***	-1.675*	1.025***
	[0.067]	[0.046]	[0.906]	[0.348]
AR(1) test	0.157	0.000	0.035	0.049
AR(2) test	0.158	0.064	0.256	0.067
No. of Ivs	42	42	42	42
Hansen test	0.672	0.575	0.990	0.920
Countries	34	34	26	26
Obs	340	340	260	260

Notes: Standard errors are in parentheses. *, **, *** denote significant levels at 10%, 5%, 1%, respectively. Hanse test statistics represent p-values.

Now, we divide the total sample into two subsamples of HIEs and LMEs to examine the relationship between entrepreneurship and natural resource rent. *Table 4* presents empirical results, which shows relatively robust findings. That is, institutional quality has a significant negative impact on natural resource rents in both HIEs and LMEs, while entrepreneurship has a significant positive impact. This suggests that our results about the links between entrepreneurship and institutional quality to natural resource rents are not only consistent but independent on income

levels. It would be interesting to examine the interacting effects of institutional quality and entrepreneurship. Observations of the subsamples are relatively too small to apply the two-step system GMM in estimations.

With a better institutional framework, especially in regulations and the rule of law in HIEs compared with LMEs, a stronger catalyst effect is present of institutional quality on entrepreneurial behaviours for HIEs. Further, entrepreneurs in HIEs engage more in higher technology sectors than lower technology sectors, which consume a lot of natural resources like entrepreneurs in LMEs. We can't empirically test this hypothesis due to a lack of available data. The study also checks for the robustness of two subsamples's estimations by SELPDM. The results are reported in *Table A4*, Appendix, showing consistent findings.

4. Conclusions

By pursuing natural resource rents, countries can overexploit their natural resources, depleting exhaustible natural resources. Economic growth is unsustainable for these countries. We observe this in many developing countries experiencing stagnant economic growth despite their rich natural resources. An increase in natural resource rents does not necessarily harm sustainable development. Regardless, an increase in natural resource use is associated more with poverty and sluggish growth than not. This is especially true when a country suffers from bad institutions. Against this background, we investigate how entrepreneur dynamism affects natural resource exploitation, which is not sustainable without quality institutions.

Entrepreneurs engaged with the resources industry are bad because they are pursuing rents from natural resources. They are active rent seekers like entrepreneurs in any other industry. Nonetheless, an existence of natural resource rents attracts entrepreneurs who want to claim a share of them. Many of them are willing to pay a part of the rents to anyone who possesses a power to distribute them. This can be rampant when institutions are corrupt. Thus, massive existing rents make entrepreneurs be opportunistic instead of creating new monopoly rents through innovation. In this sense, an increase in natural resource rents deteriorates economic sustainability.

However, quality institutions would create business opportunities elsewhere than in the resources industry, reducing the rent-seeking in the resources industry. Improving institutional quality reduces asymmetric information, transaction costs, and risks, enhancing resource allocation and market efficiency. Our study links new institutional economics with a theory of entrepreneurship to explain dynamics of natural resource rents resulting from changes in entrepreneurial activities and institution quality.

We applied the two-step system GMM to a global sample of 60 economies over the period 2006–2016 to examine the influences of institutional quality and entrepreneurship density on natural resource rents. We emphasized an association between institutional quality and entrepreneurship in affecting natural resource rents.

Our empirical results show that (*i*) an increase in entrepreneurship density increases total natural resource rents, which represents the degree of rent-seeking activities over natural resources by entrepreneurs; while (*ii*) an improvement in institutional quality reduces total natural resource rents; (*iii*) noticeably, an improvement in institutional quality reduces the rent-seeking activities by entrepreneurs.

Our study contributes to the existing literature in a number of ways. First, it rekindles the problem of natural resource rents in entrepreneurial activities, which are blamed as one of the reasons for the natural resources curse. This problem looms larger as the costs associated with externalities related to climate increase. Second, our results highlight the important role of institutional quality

in shaping human behaviors. Noticeably, good institutions protect natural resources and reduce the rent-seeking of entrepreneurship.

We checked the robustness of our results by using six different indicators of institutional quality and two subsamples of high-income economies and low- and middle-income economies. Moreover, we can replicate all these results by using the SELPDM estimation method. Our study calls for increased efforts in institutional reforms toward sustainable development of natural resources.

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Appendix

Table A1. List of countries

26 Low- and Middle-Income Economies (LMEs)				
Albania	India	Malaysia	Paraguay	Senegal
Bolivia	Indonesia	Mexico	Peru	South Africa
Brazil	Jamaica	Morocco	Philippines	Thailand
Costa Rica	Jordan	Nigeria	Romania	Turkey
Dominican Rep.	Kazakhstan	Pakistan	Russia	Ukraine
El Salvador				
34 High-Income Economies (HIEs)				
Australia	Finland	Italy	Panama	Spain
Austria	France	Korea, Rep.	Poland	Sweden
Chile	Germany	Latvia	Portugal	Switzerland
Croatia	Hong Kong	Lithuania	Saudi Arabia	United Arab Emirates
Czech Republic	Hungary	Netherlands	Singapore	United Kingdom
Denmark	Ireland	New Zealand	Slovak Republic	Uruguay
Estonia	Israel	Norway	Slovenia	

Notes: Income classification is followed the World Bank's classification

Table A2. Institutional Quality, Entrepreneurship and Natural Resource Rents (SELPDM estimator)

	NRG				NRP			
	(A1)	(A2)	(A3)	(A4)	(A5)	(A6)	(A7)	(A8)
L.NR	0.909***	0.907***	0.907***	0.908***	0.964***	0.963***	0.963***	0.964***
	[0.001]	[0.002]	[0.002]	[0.001]	[0.003]	[0.003]	[0.003]	[0.003]
EG	0.062***	0.061***	0.064***	0.063***	0.008***	0.008***	0.009**	0.010***
	[0.010]	[0.010]	[0.011]	[0.009]	[0.003]	[0.003]	[0.003]	[0.003]
Ins	-0.069***	-0.098***	-0.092***	-0.072***	-0.021**	-0.033***	-0.032***	-0.022***
	[0.024]	[0.027]	[0.027]	[0.019]	[0.010]	[0.009]	[0.005]	[0.007]
Ent	0.056***	0.048***	0.052***	0.051***	0.018***	0.011**	0.011**	0.013***
	[0.017]	[0.017]	[0.017]	[0.013]	[0.006]	[0.005]	[0.005]	[0.004]
Urb		0.003**	0.003**	0.003**		0.002***	0.002***	0.002***
		[0.001]	[0.001]	[0.001]		[0.000]	[0.0003]	[0.000]
FDI			-0.006***	-0.006***			-0.0008	-0.001
			[0.002]	[0.002]			[0.0005]	[0.001]
Ent*Ins				-0.007				-0.008**
				[0.007]				[0.004]
Con.	-0.013	-0.168*	-0.143	-0.090	0.491***	0.396***	0.400***	0.397***
	[0.068]	[0.094]	[0.102]	[0.071]	[0.040]	[0.040]	[0.039]	[0.039]
AR(1) test	0.021	0.021	0.020	0.020	0.006	0.007	0.007	0.007
AR(2) test	0.077	0.077	0.077	0.078	0.064	0.063	0.064	0.063
No of IVs	40	41	42	52	40	49	50	52
Hansen test	0.014	0.014	0.014	0.074	0.223	0.474	0.465	0.542
Countries	60	60	60	60	60	60	60	60
Obs	600	600	600	600	600	600	600	600

Notes: Standard errors are in parentheses. *, **, *** denote significant levels at 10%, 5%, 1%, respectively. Hanse test statistics represent p-values.

Table A3. Institutional Quality, Entrepreneurship and Natural Resource Rents: Robustness check by Individual Institutional Indicators (two-step system GMM estimator)

	Control of Corruption	Government effectiveness	Regulatory quality	Political Stability	Rule of Law	Voice and Accountability
	(9)	(10)	(11)	(12)	(13)	(14)
L.NR	0.900***	0.886***	0.882***	0.899***	0.895***	0.838***
	[0.001]	[0.001]	[0.002]	[0.001]	[0.001]	[0.002]
EG	0.170***	0.170***	0.202***	0.199***	0.215***	0.201***
	[0.002]	[0.004]	[0.005]	[0.005]	[0.005]	[0.008]
Ins	-0.070**	-0.438***	-0.443***	-0.071**	-0.138**	-1.282***
	[0.026]	[0.051]	[0.043]	[0.035]	[0.056]	[0.051]
Ent	0.095***	0.381***	0.292***	0.103***	0.149***	0.223***
	[0.012]	[0.018]	[0.0152]	[0.009]	[0.007]	[0.016]
Ent*Ins	-0.011*	-0.399***	-0.1552***	-0.130***	-0.059**	0.376***
	[0.006]	[0.024]	[0.0384]	[0.020]	[0.026]	[0.035]
Urb	0.005***	0.021***	0.014*	0.002*	0.007***	0.005*
	[0.001]	[0.001]	[0.002]	[0.001]	[0.002]	[0.003]
FDI	-0.015***	-0.005**	-0.015***	-0.015***	-0.019***	-0.023***
	[0.001]	[0.002]	[0.001]	[0.003]	[0.002]	[0.002]
Con.	-0.531***	-1.137***	-0.856***	-0.349***	-0.765***	-0.146
	[0.054]	[0.078]	[0.085]	[0.086]	[0.119]	[0.189]

AR(1) test	0.021	0.021	0.021	0.021	0.020	0.021
AR(2) test	0.061	0.058	0.051	0.055	0.051	0.048
No. of Ivs	61	79	72	74	74	74
Hansen test	0.346	0.893	0.679	0.842	0.759	0.848
Countries	60	60	60	60	60	60
Obs	600	600	600	600	600	600

Notes: Standard errors are in parentheses. *, **, *** denote significant levels at 10%, 5%, 1%, respectively. Hanse test statistics represent p-values.

Table A4. Institutions, Entrepreneurship and Natural Resources Rents: HIEs vs LMEs
(SELPDM estimators)

	High Income Economies (HIEs)		**Low and Middle Income Economies (LMEs)**	
Dep. Var:	**NRG**	**NRP**	**NRG**	**NRP**
L.NR or L.NRpc	0.9113***	0.9816***	0.8948***	0.9179***
	[0.0008]	[0.0020]	[0.0128]	[0.0197]
GDPg	0.0849***	0.0012	0.0627**	0.0201***
	[0.0118]	[0.0043]	[0.0253]	[0.0036]
Inst	**-0.0998*** **	**-0.0420** **	**-0.0937**	**-0.0716**
	[0.0263]	[0.0184]	[0.1819]	[0.0578]
Entre	**0.0408** **	**0.0094**	**0.0298**	**0.0081**
	[0.0170]	[0.0084]	[0.0862]	[0.0239]
Urban	0.0014	0.0013**	0.0069	0.0052***
	[0.0014]	[0.0006]	[0.0080]	[0.0014]
FDI	-0.0069***	0.0006	0.0439	0.0289*
	[0.0022]	[0.0004]	[0.0426]	[0.0148]
Cons.	-0.2998***	0.2895***	-0.1608	0.4329***
	[0.1122]	[0.0466]	[0.5104]	[0.1557]
Year effects	Yes	Yes	Yes	Yes
Observations	340	340	260	260
Countries	34	34	26	26
No. of IVs	33	33	33	33
Hansen test (p-value)	0.270	0.449	0.738	0.955
AR(1) test	0.157	0.000	0.031	0.085
AR(2) test	0.158	0.065	0.570	0.121

Note: Standard errors are in []; *, **, *** denote significant levels at 10%, 5%, 1%, respectively.