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Oil Abundance and Human Capital in Malaysia: A Multivariate Cointegration Analysis

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ABSTRACT

A large body of literature shows that resource-rich countries tend to have higher rates of autocracy and confrontation, lower rates of economic stability and growth as well as less developed human capital. On top of that, many studies are wary of the crowding-out effect of natural resource dependence by the rich-resource countries on human capital development. It is of great interest to determine how Malaysia as an oil abundance country manages its natural resource wealth to develop the human capital of this country. Thus, this study utilised data from the World Bank covering the period of 1980-2017. The empirical analysis was performed using an ARDL bound testing procedure and a few cointegration methods such as FMOLS, DOLS and CCR to obtain robust estimations. The results showed mixed results between fuel exports and oil and gas rent with human capital development.

Keywords: Natural Resources, Oil Abundance, Human Capital Development, Autoregressive Distributed Lag, Malaysia

JEL Classification: JO1

1. INTRODUCTION

Natural resources serve as the basis for economic consumption and production, as well as creating new industrialisation. By managing natural resource wealth efficiently, governments can achieve sustainable development and growth for their nations. As agents of their natural resources, governments have the responsibility to manage and regulate the use of these natural assets, transforming it into sustained prosperity for the benefit of current and future generations (SDSN, 2013). Currently, there has been an increasing amount of literature on the relationships between resource abundance and several measures of economic performance. Most of the literature has looked at the negative correlation between several measures of mineral abundance and long-term and short-term economic growth (Petkov, 2018; Kim and Lin, 2018, 2017; Murshed and Serino, 2011; Papyrakis, 2011; 2014). Much of the literature focuses on oil and its correlation to poverty (Apergis and Katsaiti, 2018); bureaucratic efficiency (Goldberg et al., 2008); corruption (Bhattacharyya and Hodler, 2010); and educational

attainment (Behbudi et al., 2010; Wang et al., 2009; Douangneune et al., 2005). Moreover, mismanagement in handling natural resource wealth can cause high losses of revenue for nations due to corruption which in turn generates a high possibility of environmental deterioration due to weak environment policies, as well as social and economic conflict (SDSN, 2013).

The relationship between natural resources, especially oil, and economic growth has received significant attention by economists (Mehlum et al., 2006; Apergis and Payne, 2014; Betz et al., 2015; Hassan et al., 2019). Theoretically, oil and other non-renewable natural resources should offer huge benefits to a nation's economy. Nevertheless, there has been considerable empirical evidence showing that these resources do not always improve economic growth. This phenomenon is described as the natural resource curse (Auty, 1993). The natural resource curse can be defined as the impending growth of a country or a region caused by reliance on natural resources such as oil and natural gas (Shao and Yang, 2014).

Human capital has been seen as an important factor in sustaining economic growth (Barro, 2001; Becker, 1993; Abramovitz, 1989; Lucas, 1988). Some empirical studies have found that natural resource growth is closely related to human capital accumulation (Shao and Yang, 2014). Nevertheless, there are still some debate regarding the contribution of resources wealth to human capital development (Stijns, 2006; Kurtz and Brooks, 2011; James and Aadland, 2011).

Thus, this study focuses on the oil curse paradox in Malaysia's economy. The specific objective of this study is to investigate the relationship between oil abundance (oil and gas rent, fuel export) and Malaysia's human capital development. It is worth noting that Malaysia has an abundance of oil reserves that have become the country's main income. In addition, this study is important, as there is a lack of studies into the relationship between natural resource dependence, particularly crude oil, and human capital development especially in Malaysia.

This paper starts with an introduction, followed by the literature review. Section 3 is the research methodology. Section 4 contains the results from the analysis. Section 5 includes a discussion of the findings and finally, Section 6 is the conclusion of this study.

2. LITERATURE REVIEW

2.1. Natural Resource Abundance, Growth and Sustainable Development

The resource curse refers to the failure of many resource-rich countries to fully take advantage of their natural resource wealth in a positive way. This curse also refers to the governments in countries that fail to perform effectively to fulfil public welfare needs. The usual expectation of resource-rich countries is that they have better development outcomes. However, the rich-resource countries tend to have higher rates of inequalities and autocracy, and lower rates of economic stability and progress compared to non-resource rich countries (Badeeb et al., 2016). Kim and Lin (2018) discovered the latest finding on resource curse by using a sample of 40 developing countries from 1990 to 2012. Their findings indicated that natural resources are a curse on income in the long run, regardless of a country's economy, political climate and culture, while there were huge deviations in the short-term effects on income growth across countries. This result is consistent with the findings of Petkov (2018) who found that natural resource abundance was associated with negative development outcome. However, Petkov (2018) suggested a counteractive policy measure to alleviate the resource curse from continuing in order to sustain economic development, especially through economic diversification and the restructuring of the economy. He believes it to which it should be left to the free market, especially by promoting industrialisation and strengthen the monetary policy through currency devaluation. Shahbaz et al. (2018), Kim and Lin (2017), Satti et al. (2014) and Papyrakis (2014) also discovered the same results for developing countries. They found countries endowed with abundant natural resources tend to develop more slowly than countries with scarce resources. In Malaysia, Doraisami (2015) discovered that over-dependence on natural resources has caused the Malaysian government to

employ unproductive activities and channel public funding into uncultivable investments.

Moreover, in many resource-rich countries the stumbling block for an efficient natural resource management is caused by weak institutions and poor governance (Kim and Lin, 2018; Khanna, 2017; Al Mamun et al., 2016; Sarmidi et al., 2014). Due to this, renewable resources continue to be extracted, non-renewable resources are depleted irresponsibly, and pollution intensity increases dramatically (Auty, 2003). Current research recognizes resource abundance as an important cause of policy failure. As the natural resources from primary sector remains as the main contributor to GDP for most rich-resource countries, the inverse impact of the natural resource rents to socioeconomic indicators will affect the government goals and the development pathway of the economy (Auty, 2001). Thus, there is a need of an active government intervention in the economic decision process especially through changes in macroeconomic policy. Due to resource curse, high revenue received from resource wealth only fosters a climate that produces greedy political states who set up resource rents in ways that cumulatively distort the economy so it falls into a staple trap. This undermines economic growth and environmental sustainable policies (Auty, 2003). Moreover, lack of ability to manage the resource wealth efficiently includes failing to manage renewable resources on a sustainable basis - such as loss of fertile soils, unsustainable forest management, reduction of freshwater availability, an extreme biodiversity loss rate, and the failure to collect proper rents from resource concessions, thereby allowing most of the gains from resources to go to private sectors at the expense of the public. As a result, governments lose opportunities to achieve sustainable economic development, and create costs to human beings and the environment due to poor decision-making (OECD, 2012). Thus, sound macroeconomic policy is vital to the success of microeconomic measures such as strengthening environmental policy, a fact that is often unrestrained by environmental reformers (Auty, 2003).

Past studies also indicate that scarce-resource countries always outperform resource-rich countries (Alpha and Ding, 2016; Douangneune et al., 2005) with these countries being more competitive in industrialisation with high saving rates, as well as strong economic and environmental sustainability. The scarce-resource countries have taken on board an initiative to overcome the weakness in scarce resource wealth by strengthening their formal institutions, institutional accountability and social capital, so that their development policies are also becoming socially more sustainable (Woolcock et al., 2004).

2.2. Natural Resource Abundance Nexus Human Capital

Growth literature indicates that human capital, technological advancement and education are valuable factors for economic growth (Romer, 1990; Barro, 1991; Mankiw et al., 1992; Benhabib and Spiegel, 1994). As mentioned before, many empirical studies found that natural resource development is closely associated with human capital growth (Cockx and Fracken, 2016; Shao and Yang, 2014; Kim and Lin, 2017). Nevertheless, some researchers such as Shao and Yang, (2014), Behbudi et al. (2010), Wang et al. (2009),

and Douangneune et al. (2005) discovered rich-resource countries were cautious of the crowding-out effect of natural resource dependence on human capital. The findings showed abundance of natural resources could be the cause of a negative relationship between human capital and economic growth.

Furthermore, based on panel data from 65 countries, Gylfason (2001) discovered that public expenditure on education, the expected years of formal education for girls, and the gross secondary-school enrolment were shown to be inversely related to the share of natural capital in national wealth across countries. He concluded that natural capital crowd out human capital, thus, slowing economic development. Behbudi et al.'s (2010) study supported Gylfason's (2001) claim. Their research into petroleum exporting countries revealed that rich-resource countries tend to neglect the development of human resources. These countries fail to provide an adequate focus on education, causing the countries to have a slower growth rate than other countries. Douangneune et al. (2005) also endorsed the crowding-out effect of land resources on education investment. These researchers compared the levels of education and economic development in Thailand, Japan, and South Korea. They noted that Thailand had more natural resources compared to Japan and South Korea. The results showed that Thailand unsuccessfully managed the resource rent effectively for modern development, particularly from the education sector, compared to South Korea and Japan. Apart from that, Birdsall et al. (2001) demonstrated that Brazil, as a rich-resource country, was facing difficulties utilising resource rents for the benefit of the people. Instead, resource rents were only enjoyed by the government and few businessmen, leading to high inequality and lower economic growth. Shao and Yang (2014) found that enrolment rates, human capital growth and economic growth deteriorate with the rise of resource goods price, thus the crowding-out effect of natural resources is unavoidable.

Despite these findings showing the impact of the resource curse, there is also some literature demonstrating countries that have successfully utilized their resource wealth to produce a skilful human capital. Kurtz and Brooks (2011) discovered that natural resource wealth could be either a "curse" or a "blessing" depending on domestic and international factors. These factors are responsive to changes in public policy, such as human capital formation and globalization. Meanwhile, a study of the US state-level data from 1970 to 2008 showed that public spending on education in resource-rich states was significantly higher than in resource-scarce states, with private education being crowded in the resource-rich states (James and Aadland, 2011). This research also showed that teachers' salaries, public enrolment rates, and teacher-student ratios tend to move pro-cyclically with resource booms and busts. Based on the cross-sectional data from 1970 to 2011 for 55 developed and developing countries, Kim and Lin (2017) found that natural resource dependence and non-agricultural exports improved human capital development. Cockx and Fracken (2016) also discovered the importance of government allocating the revenue from natural resources to the public good, especially education, as well as improving institutions and government accountability to overcome the resource curse in rich-resource countries.

3. THEORETICAL FRAMEWORK

The importance of education as a gauge of human capital development to achieve sustainable economic growth was initiated by Romer (1986) and Lucas (1988). Their studies showed society's accumulation of knowledge can be generated from schooling and on-job-training (learning by doing), thereby contributing to an increase in human capital development and economic growth. Their findings also revealed that there is a positive relationship between human capital accumulation and per capita profit growth. Further studies by Barro (2001) and Barro and Lee (2013) strengthen the argument of the importance of education attainment to develop human capital in order to reduce poverty and attain economic progress, especially in developing countries (Krueger and Lindahl, 2001; Baldacci et al., 2008) which have lower human capital skills and rich in natural resources. Thus, it is important for the government to play a pivotal role in managing natural resources wealth to improve the human capital development in their countries.

Thus, in this study, we are adapting the models devised by Kim and Lin (2017) and Gylfason (2001) which show resource dependency (shown by natural resources export and rent) and economic growth may affect the human capital development. From the theoretical study, the general form of human capital function is modelled as below:

$$HC = f(FUE, OGR, GDP) \quad (1)$$

All the variables have been transformed into natural-log specifications to provide reliable empirical results in elasticities between dependent and independent variables, respectively. The empirical equation of this model is modelled as the following:

$$LSCH_t = \beta_0 + \beta_1 LOGR_t + \beta_2 LFUE_t + \beta_3 LGDP_t + \varepsilon_t \quad (2)$$

Where *LSCH* indicates a natural log of secondary school enrolment (as a proxy of human capital), *LOGR* is a natural log of oil and gas rents, *LFUE* is a natural log of fuel exports, *LGDP* is a natural log of *GDP* per capita (constant 2010 US\$), β_0 , β_1 and ε represent the intercept, coefficient of independent variables and the error term, respectively.

3.1. Research Methodology

This study utilized annual data from 1980 to 2017. The data was obtained from the World Development Indicators dataset from World Bank website.

3.1.1. ARDL estimation

The ARDL bound testing approach is used to examine the cointegration of the variables. The bound test can be implemented regardless of whether the underlying regressors in the model are purely *I*(0), *I*(1) or mutually co-integrated. The ARDL approach is capable of assessing the existence of short-run and long-run relationships between the independent variables and the dependent variable simultaneously. The ARDL approach is also able to provide a robust result when it applies to a small sample data. The cointegration relationship can be estimated using a simple

ordinary least square (OLS) method after determining the order of lags in the ARDL model.

There are three steps in evaluating the bound testing procedure using the ARDL approach. The first step requires the test of the presence of a long-run relationship (cointegration). This is done by performing the F-test or the Wald test. The unrestricted error correction model regression used in this study had the following form expressed in the equation below:

$$\begin{aligned} \Delta LSCH_t = & \alpha_i + \sum_{j=1}^n \beta_1 \Delta LSCH_{t-j} + \sum_{j=1}^n \beta_2 \Delta LOGR_{t-j} \\ & + \sum_{j=1}^n \beta_3 \Delta LFUE_{t-j} + \sum_{j=1}^n \beta_4 \Delta LGDP_{t-j} + \sigma_1 LSCH_{t-1} \\ & + \sigma_2 LOGR_{t-1} + \sigma_3 LFUE_{t-1} + \sigma_4 GDP_{t-1} + \varepsilon_t \end{aligned} \quad (3)$$

The above equations with the summation signs represent the error correction dynamics, σ_i indicates to the long-run relationship and the white noise error term is represented by ε_t . To compute the ARDL F-statistics we can act in accordance with the null hypothesis of no cointegration, $H_{01}: \beta_1 = \beta_2 = \beta_3 = \beta_4 = 0$, and alternate hypothesis of existence of cointegration, $H_{11}: \beta_1 \neq \beta_2 \neq \beta_3 \neq \beta_4 \neq 0$. Based on the result of the F-test, if the computed F-test is higher than the upper bound, there is a cointegration, but there is no cointegration when the F-test is lower than the lower bound. Meanwhile, the result is inconclusive if the F-test lies between the lower and the upper bounds.

After the cointegration is confirmed, the second step was taken to estimate the long-run relationship between the secondary school enrolment rate as an indicator of human capital and the independent variables based on ARDL approach. The equation can be estimated as:

$$\begin{aligned} LSCH_t = & \alpha_1 + \sum_{j=1}^n \alpha_2 LSCH_{t-j} + \sum_{m=1}^{k1} \alpha_3 LOGR_{t-j} \\ & + \sum_{p=1}^{k2} \alpha_4 LFUE_{t-j} + \sum_{p=1}^{k2} \alpha_5 LGDP_{t-j} + \mu_t \end{aligned} \quad (4)$$

Finally, in the third step, short-run elasticity is constructed based on an error correction model as stated in the equation below:

$$\begin{aligned} \Delta LSCH_t = & \delta_1 + \sum_{j=1}^n \delta_2 \Delta LSCH_{t-j} + \sum_{m=1}^{k1} \delta_3 \Delta LOGR_{t-j} \\ & + \sum_{p=1}^{k2} \delta_4 \Delta LFUE_{t-j} + \sum_{p=1}^{k4} \delta_5 \Delta LGDP_{t-j} + \phi ECM_{t-1} + \varepsilon_t \end{aligned} \quad (5)$$

Where δ_i is the short run dynamic coefficients of the models' convergence to equilibrium and ϕ measures the speed of adjustment.

3.1.2. Robustness check

To check on the robustness, this study applies an alternative single equation estimator, OLS, the fully modified OLS (FMOLS), Dynamic OLS (DOLS) and Canonical Cointegration Regression (CCR) procedures.

The fully modified OLS (FMOLS) is able to deliver effectual estimates of cointegrating regressions. This method had been

developed by Phillips and Hansen (1990). The FMOLS is used to eliminate the serial correlation effect by applying a non-parametric transformation to residuals that are generated from cointegration regression. The result from FMOLS is more robust as compared to general OLS.

The dynamic OLS (DOLS) is a parameter method that is used to attain long-run coefficients by considering the lead and lagged values of variables. Meanwhile, the canonical cointegration regression (CCR) estimator is formed on a transformation of the variables in the cointegration regression, removing the second-order bias of the OLS estimator.

Fully modified OLS (FMOLS), Dynamic OLS (DOLS) and Canonical Cointegration Regression (CCR) are free from the endogeneity issues and autocorrelation problem, as well as it is fit for small sample data (Phillips and Hensen, 1990; Park, 1992; Stock and Watson, 2019).

4. RESULTS

4.1. Unit Root Test

The unit root test for all variables is shown in Table 1. The results of the ADF unit root test showed that the t-test for all the variables were insignificant at level. Therefore, the H_0 of non-stationary in the model of intercept with trend based on SIC was not rejected. Nevertheless, when the ADF test was conducted at the first difference of each variable, the results showed that all variables were stationary at 1% significant level. Thus, it can be determined that all variables were integrated at order one. Meanwhile, using a Philip Perons unit root test, it was observed that all variables were insignificant. The H_0 of non-stationary for these variables was not rejected. On the other hand, the Philip Perons unit root test showed that all variables were significant at 1% and stationary at order one after we reject H_0 of non-stationary at I(1) using Bartlett kernel.

4.2. Bound F-test

The results from the bound tests are shown in Table 2. Note that the results were based on Equation 3. The results in Table 2 demonstrate that the computed F-tests were above the critical value proposed by Narayan (2005) at 5%. This provides strong statistical evidence of a long-run relationship between independent variables and secondary school enrolment as a proxy of human capital development.

4.3. Cointegration

The result for long-run relationship that based on equation 4 is shown in Table 3. The findings show that fuel exports and GDP per capita have a significant long-run relationship with secondary school enrolment at 1% significant level. In addition, it is observed

Table 1: Results of the unit root tests

Variables	ADF at I(0)	ADF at I(1)	PP at I(0)	PP at I(1)
LGDP	-0.598548	-5.078577***	-0.597280	-5.078577***
LFUE	-1.425627	-4.590038***	-1.518013	-4.501883***
LOGR	-2.140330	-6.348514***	-2.140330	-6.565837***
LSCH	-1.059494	-5.443157***	-1.088897	-5.447634***

** and *** indicate significance level at 5% and 1% respectively

that a 1% increase in fuel exports will lead to a 0.136% increase in secondary school enrolments. Meanwhile, a 1% increase in GDP per capita will lead to 0.202% increase in secondary school enrolments. The positive relationship between GDP and human capital is consistent with the finding from Satti et al. (2014) and Kim and Lin's (2017). It shows that better economic growth can improve the human capital development of the country.

In order to determine if there is a multicollinearity between the dependent variable and the independent variables, the OLS is carried out. Concurrently, we test for robustness of the cointegration, using three different cointegration processes, FMOLS, DOLS and CCR. The results from the OLS and the cointegrations are shown in Table 4. The results from the OLS, FMOLS, DOLS and CCR are consistent with the result from ARDL except the finding of a long run relationship between oil and gas rent (OGR) with human capital in FMOLS, DOLS and CCR is insignificant.

In order to check for the stability of the cointegration, the Hansen's instability test is examined to test on the stability of the parameters of the model. The null hypothesis assumes stability of the parameters and the alternative assumed parameter is instable. Based on the result of Hansen instability test, we accept H_0 where

Table 2: Bound test results

F-statistics	The critical value of the F-statistics with intercept and no trend					
	1%		5%		10%	
	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)
5.3926***	4.428	5.816	3.164	4.194	2.618	3.532

Source: Critical value bounds were adapted from Narayan (2005); Case II: restricted intercept and no trend. Number of parameters (variables); k=3. ***, ** and * denote significant at 1%, 5% and 10% significant level

Table 3: Long-run relationship of human capital determinants

	ARDL	OLS	FMOLS	DOLS	CCR
LGDP	0.20164*** (0.027224)	0.249872*** (0.019200)	0.267978*** (0.024925)	0.300812*** (0.026705)	0.274418*** (0.027067)
LFUE	0.13645*** (0.029735)	0.063770*** (0.017481)	0.083926*** (0.022483)	0.079580*** (0.019290)	0.085100*** (0.023085)
LOGR	-0.10349 *** (0.031101)	-0.045418** (0.019406)	-0.042334 (0.025399)	-0.009720 (0.023918)	-0.039909 (0.029696)
C	2.3117*** (0.25538)	1.954169*** (0.187389)	1.740993*** (0.242185)	1.426299*** (0.239822)	1.677197*** (0.269584)
R ²	0.96976	0.881239	0.865716	0.944961	0.861702
F test	248.5389***	84.09633***			
Hansen instability			0.213659	0.041333	0.149372
Prob.			>0.2	>0.2	>0.2

Dependant variable is natural log of secondary school enrolment. ***, ** and * denote significant at 1%, 5% and 10% significant level

it indicates that the parameters for FMOLS, DOLS and CCR are stable.

4.4. Short Run and Error Correction Model

Table 4 shows the results for short-run relationship and the error correction based on equation 5. The error correction terms (ecm_{t-1}) were generated from the long-run and it measures the speed of adjustment to restore equilibrium in the dynamic model. The negative sign confirming the existence of a long-run relationship among the variables and it is statistically significant at 1%. The error correction is -0.31836 . This indicates that a deviation from long-run growth in this period was corrected by about 32%, which is considered a slow movement towards equilibrium.

The diagnostic tests for the error correction model showed that the model passes the Jarque–Bera normality tests and the ARCH tests suggest the errors are homokedastic and independent of the regressors. There is also no indication of autocorrelation in the disturbance of the error. Meanwhile, the Ramsey's RESET test indicates that the model is correctly specified.

In order to examine the stability of estimate coefficient of our model, CUSUM and CUSUMSQ are used. Figure 1 illustrates graphical representations of CUSUM and CUSUMSQ and both graphs show a stable model.

5. DISCUSSION

The empirical results above show that there is a cointegration between oil abundance (oil and gas rents and fuel exports) and human capital development. In terms of long-run relationship, there was a positive relationship between fuel exports and GDP per capita with secondary school enrolment as a proxy of human

Figure 1: (a-b) Plots of CUSUM and CUSUMSQ statistics for coefficient stability

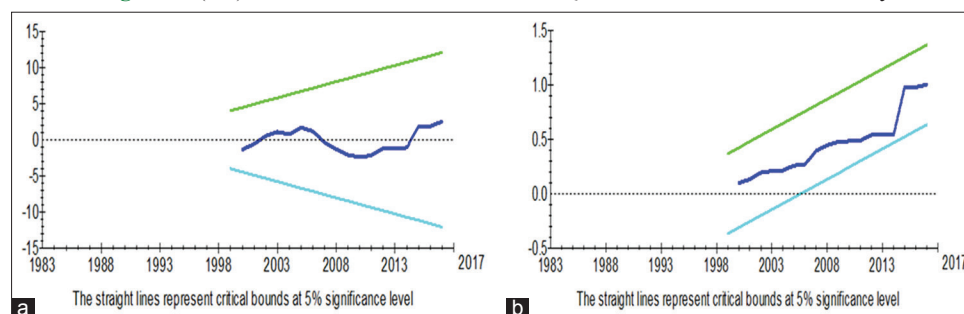


Table 4: Error correction representation of ARDL model

Regressors	Coefficient	t-value
ΔOGR	-0.032946	-3.7348***
ΔFUE	0.043440	4.8063***
ΔGDP	0.064193	3.3266***
$\Delta\text{Constant}$	0.73595	3.9615***
Ecm_{t-1}	-0.31836	-4.1127***
OLS Results:		
R^2	0.47678	
Adjusted R^2	0.40701	
F-statistics	6.8342***	
Diagnostic Checking		
Breusch-Godfrey LM test	0.11305 (0.737)	
Ramsey's RESET test	1.4711 (0.225)	
Jarque-Bera normality test	1.8586 (0.395)	
ARCH test	1.2388 (0.266)	

***, ** and * denote significance at 1%, 5% and 10% levels respectively

capital development. This positive relationship between fuel exports and human resource development is in line with the finding from Cockx and Francken (2016), and Collier et al. (2010). This is also shown that revenue from fuel export has been used efficiently and the natural resource revenues has been invested in the education sector for the benefit of human capital development. With higher revenues from fuel exports, the revenues can slacken off the budget constraints of fiscal expenditure especially on education expenditure. This result is vital for the sustainable management of oil revenue, as this country could benefit from the revenue of the fuel export by enhancing the wellbeing of the people, improving the quality of human capital and sustaining the development of this nation, especially by investing the revenues in public goods such as education sector.

Oil and gas rent (OGR) shows a negative relationship with secondary school enrolment at 1% significant level. The negative relationship between oil and gas rent (OGR) and human capital is consistent with the findings of Shao and Yang (2014), Behbudi et al. (2010), Douangngeune et al. (2005), and Gylfason (2001), all showed that resource abundance crowds out human capital. It suggests that the crowding-out effect of natural resources on education is related to policy failures rather than the resources themselves (Gylfason, 2001). This means that relying more on oil rent tends to grieve more from the resource curse than those that are more dependent on non-resource rent. Thus, the result indicates that in this country, depending on revenue from oil rent will cause the natural resources to crowd out human capital attainment and it will slow down the economic progress of this country.

These results are particularly important for the sustainable management of natural resource wealth in resource-rich countries as they could achieve high returns by investing resource revenues in public investments especially in education and concurrently enhance the wellness of the people and withstand the development of their nation.

Government as an agent for natural capital, especially in the oil and gas sector, plays a vital role in human capital accumulation. The low priority of human capital expansion in public education is consider a fundamental policy failure. To achieve economically sustainable development, the government should be dedicated

to increase education quality and opportunities, whether at the primary, secondary, tertiary or in vocational level in order to produce skilful and knowledgeable human capital through the thoughtful allocation of resource rent.

6. CONCLUSION AND IMPLICATION

Developing human capital through education is the key to improving the country's sustainability. Since one of the sources of economic income for the Malaysia's government is oil, it is crucial to understand the impact of oil abundance on human capital development. There are two major conclusions that can be drawn from this study. First, the revenue gained from fuel exports has been invested efficiently by the resource owner (the government) in the education sector. Secondly, oil and gas rent (OGR) has a negative relationship with secondary education enrolment. These findings demonstrated that resource abundance crowds out human capital. Even though the results are mixed between oil abundance (oil and gas rents and fuel exports) and human capital, it is still pertinent for policy makers to overcome this impediment, especially for future implementation. Reforming fuel subsidies, reviewing gas pricing, and shifting the government's focus onto targeted assistance will benefit the people, especially through education development.

Moreover, cooperation with the private sector, especially oil and gas industries, should be encouraged to get more funding for education through the Corporate Social Responsibility initiatives or through other inventive channels that can benefit the education sector and economic development. Additionally, as a policy maker, the government can enhance the existence of tax reductions for companies that contribute to human capital investment such as companies which provide education and training for their current workers. They should be given extra tax redemptions to improve lifelong learning.

On the other hand, good governance can mitigate the resource curse effect and indirectly improve human capital development. Strengthening the institutional policies can help improve transparency among institutions and reduce corruption and dishonesty related to the management of resource capital. Thus, good quality institutions can improve the implementation of resource policies more effectively and achieve sustainable development.

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REFERENCES

- Abramovitz, M. (1989), *Thinking about Growth: And Other Essays on Economic Growth and Welfare*. United Kingdom: Cambridge University Press.
- Al Mamun, M., Sohag, K., Hassan, M.K. (2016), *Governance, resources*

- and growth. *Economic Modelling*, 63, 238-261.
- Alpha, B.B., Ding, H. (2016), A study on the impact of natural resources endowment on economic growth: Empirical evidence from mali. *Journal of Economics and Development Studies*, 4(4), 81-103.
- Apergis, N., Katsaiti, M.S. (2018), Poverty and the resource curse: Evidence from a global panel of countries. *Research in Economics*, 72(2), 211-223.
- Apergis, N., Payne, J.E. (2014), The oil curse, institutional quality, and growth in MENA countries: Evidence from time-varying cointegration. *Energy Economics*, 46, 1-9.
- Auty, R.M. (1993), *Sustaining Development in Mineral Economies: The Resource Curse Thesis*. Resource Abundance and Economic Development. Oxford, London: Routledge, Oxford University Press. p57-75.
- Auty, R.M. (2001), The political economy of resource driven growth. *European Economic Review*, 45, 839-846.
- Auty, R.M. (2003), Third time lucky for Algeria? Integrating an industrializing oil-rich country into the global economy. *Resources Policy*, 29, 37-47.
- Badeeb, R.A.B., Lean, H.H., Smyth, R. (2016), Oil curse and finance-growth nexus in Malaysia: The role of investment. *Energy Economics*, 57, 154-165.
- Baldacci, E., Clements, B., Gupta, S., Cui, Q. (2008), Social spending, human capital, and growth in developing countries. *World Development*, 36(8), 1317-1341.
- Barro, R., Lee, J.W. (2013), A new data set of educational attainment in the world, 1950-2010. *Journal of Development Economics*, 104, 184-198.
- Barro, R.J. (1991), Economic growth in a cross section of countries. *Quarterly Journal of Economics*, 106, 407-443.
- Barro, R.J. (2001), Human capital and growth. *The American Economic Review*, 91(2), 12-17.
- Becker, G.S. (1993), *Human Capital. A Theoretical and Empirical Analysis with Special Reference to Education*. Chicago: University of Chicago Press.
- 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, 81-102.
- Benhabib, J., Spiegel, M. (1994), The role of human capital in economic development: Evidence from aggregate cross-country data. *Journal of Monetary Economics*, 34(2), 143-173.
- Betz, M.R., Partridge, M.D., Farren, M., Lobao, L. (2015), Coal mining, economic development, and the natural resources curse. *Energy Economics*, 50, 105-116.
- Bhattacharyya, S., Hodler, R. (2010), Natural resources, democracy and corruption. *European Economic Review*, 54, 608-621.
- Birdsall, N., Pinckney, T., Sabot, R. (2001), *Natural Resources, Human Capital and Growth: Resource Abundance and Economic Growth*. Oxford: Oxford University Press.
- Cockx, L., Francken, N. (2016), Natural resources: A curse on education spending? *Energy Policy*, 92, 394-408.
- Collier, P., Van Der Ploeg, R., Spencer, M., Venables, A.J. (2010), Managing resource revenues in developing economies. *IMF Staff Paper*, 57(1), 84-118.
- Doraisami, A. (2015), Has Malaysia really escaped the resource curse? A closer look at the political economy of oil revenue management and expenditures. *Resources Policy*, 45, 98-108.
- Douangneune, B., Hayami, Y., Godo, Y. (2005), Education and natural resources in economic development: Thailand compared with Japan and Korea. *Journal of Asian Economic*, 16, 179-204.
- Goldberg, E., Wibbels, E., Mvukiyele, E. (2008), Lessons from strange cases: Democracy, development, and the resource curse in the U.S. States. *Comparative Political Studies*, 41, 477-514.
- Gylfason, T. (2001), Natural resources, education, and economic development. *European Economic Review*, 45, 847-859.
- Hassan, S.T., Xia, E., Huang, J., Khan, N.H., Iqbal, K. (2019), Natural resources, globalization, and economic growth: Evidence from Pakistan. *Environmental Science and Pollution Research*, 26, 15527-15534.
- James, A., Aadland, D. (2011), The curse of natural resources: An empirical investigation of US counties. *Resource Energy Economic*, 33, 440-453.
- Khanna, A.A. (2017), Revisiting the oil curse: Does ownership matter? *World Development*, 99, 214-229.
- Kim, D.H., Lin, S.C. (2017), Human capital and natural resource dependence. *Structural Change and Economic Dynamics*, 40, 92-102.
- Kim, D.H., Lin, S.C. (2018), The resource curse hypothesis: Dynamic heterogeneous approach. *Emerging Markets Finance and Trade*, 54(12), 2698-2717.
- Krueger, A., Lindahl, M. (2001), Education for growth: Why and for whom? *Journal of Economic Literature*, 39, 1101-1136.
- Kurtz, M.J., Brooks, S.M. (2011), Conditioning the resource curse: Globalization, human capital, and growth in oil-rich nations. *Comparative Political Studies*, 44, 747-770.
- Lucas, R.E. (1988), On the mechanics of economic development. *Journal of Monetary Economics*, 22, 3-42.
- Mankiw, G., Romer, D., Weil, D. (1992), A contribution to the empirics of economic growth. *Quarterly Journal of Economics*, 107, 407-437.
- Mehlum, H., Moene, K., Torvik, R. (2006), Institutions and the resource curse. *Economic Journal*, 116, 1-20.
- Murshed, S.M., Serino, L.A. (2001), The pattern of specialization and economic growth: The resource curse hypothesis revisited. *Structural Change and Economic Dynamics*, 22(2), 151-161.
- Narayan, P.K. (2005), The saving and investment nexus for China: Evidence from cointegration test. *Applied Economics*, 37(17), 1979-1990.
- OECD. (2012), *Review of the Implementation of the OECD Environmental Strategy for the First Decade of the 21st Century*. Available from: <https://www.oecd.org/env/50032165.pdf>. [Last accessed on 2019 May 10].
- Papayrakis, E. (2011), Resource windfalls, innovation, and growth. *Journal of Economic Policy Reform*, 14, 301-312.
- Papayrakis, E. (2014), A development curse: Formal vs. informal activities in resource-dependent economies. *International Journal of Social Economics*, 41, 244-264.
- Park, J.Y. (1992), Canonical cointegrating regressions. *Econometrica*, 60, 119-143.
- Petkov, B. (2018), Natural resource abundance: Is it a blessing or is it a curse. *Journal of Economic Development*, 43(3), 25-56.
- Phillips, P.C.B., Hansen, B. (1990), Statistical inference in instrumental variables regression with I(1) processes. *Review of Economic Studies*, 57, 99-125.
- Romer, P.M. (1986), Increasing returns and long-run growth. *Journal of Political Economy*, 94(5), 1002-1037.
- Romer, P.M. (1990), Endogenous technological change. *Journal of Political Economy*, 98, 71-102.
- Sarmidi, T., Law, S.H., Jafari, Y. (2014), Resource curse: New evidence on the role of institutions. *International Economic Journal*, 28(1), 191-206.
- Satti, S.L., Farooq, A., Shahbaz, M. (2014), Empirical evidence on the resource curse hypothesis in oil abundant economy. *Economic Modelling*, 42, 421-429.
- SDSN. (2013), *Harnessing Natural Resources for Sustainable Development: Challenges and Solutions*. Thematic Group on Good Governance of Extractive and Land Resources of the Sustainable Development Solutions Network. Available from: <http://www.unsdsn.org/wp-content/uploads/2014/02/TG10-Final-Report.pdf>.
- Shahbaz, M., Naeem, M., Ahad, M., Tahir, I. (2018), Is natural resource abundance a stimulus for financial development in the USA? *Resources Policy*, 55(18), 223-232.

- 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.
- Stijns, J.C. (2006), Natural resource abundance and human capital accumulation. *World Development*, 34, 1060-1083.
- Stock, J.H., Watson, M.W. (2019), *Introduction to Econometrics*. 4th ed. Boston, MA, USA: Pearson Education Inc.
- Wang, M.H., Sun, G.N., Kang, G.D. (2009), A spatial dislocation analysis of natural capital, human capital and economic capital in the mainland China. *Social Studies of Science*, 16, 179-204.
- Woolcock, M., Pritchett, L., Isham, J. (2004), The social foundations of poor economic growth in resource-rich countries. In: Auty, R.M., editor. *Resource Abundance and Economic Development*. Oxford: Oxford University Press.