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The Relationship between Natural Resource Abundance and Human Development in Belt and Road Initiative Countries: The Role of Financial Development

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ABSTRACT

The goal of this study is to explore the relationship between natural resource abundance and human development. In particular, account for the role of financial development. This study uses data from 51 BRI countries over the period 2000-2018. Concerning the HDI, the results suggest U-shaped relationship between total natural resource rents and HDI. Similarly, gas rents, mineral rents and oil rents are non-linearly related to HDI in BRI countries. For example, in the case of total rents, once its share in GDP exceeds 42.8%, further dependence on natural resources leads to increase in HDI. In our sample, only Iraq, Kuwait, Saudi Arabia and Oman were above the turning points at some observation years. The interaction term is positive and significant. This implies that increase in natural resource rents in countries with higher levels of financial development does not lead to a reduction of human development. In a similar vein, domestic credit to private sector alleviates negative effect of oil and mineral rents.

Keywords: Natural Resources, Financial Development Human Capital, Sustainability

JEL Classifications: O13

1. INTRODUCTION

Over the past three decades there has been ongoing debate on the relationship between natural resources wealth and economic growth. In one of the early review papers, Sachs and Warner (2001) show that countries with higher resource base tend to experience lower GDP growth rate compared to resource poor countries, the so-called “curse of natural resources.” The global natural resource market, for example, is associated with volatility of commodity prices. As a result, these instabilities lead to uncertainty and vulnerability in revenues from natural resource extraction. Van Der Ploeg and Poelhekke (2017) provides evidence that resource dependent countries (with primary exports above 19%) have higher levels of GDP growth volatility compared to countries that rely less on commodities exports. A number of papers attempted to revisit earlier findings

by identify policy variables that can mitigate the negative effect on natural resources on economic growth. These studies shows that political regime, liberalization of trade policies, quality of institutions and financial development (Brunnschweiler, 2008; Arezki and Van der Ploeg, 2010; Badeeb and Lean, 2017) may influence the relationship between natural resources and economic growth. Moreover, recent empirical studies show that results are at best mixed. While some studies confirm the negative impact of natural resources on economic growth, others show that the relationship is positive or non-linear (Ben-Salha et al., 2021; Abdulahi et al., 2019; Liu et al., 2023).

At the same time, a separate strand of research has emerged that explores the relationship between natural resources and other socio-economic outcomes. For example, studies show that natural resource dependence influences investment, institutions, child

health, social progress and longevity (Gylfason and Zoega, 2006; Wigley, 2017; Pendergast et al., 2011; Vaskovskyi, 2020).

In this study, we attempt to contribute to this area of research by focusing on the relationship between natural resources and human development. Our research makes the following contributions to nascent research. First, we explore the relationship between natural resource rents and human development index (HDI). Comparing to GDP per capita, child health or life satisfaction as indicators of quality of life, HDI is a complex index which captures multidimensional nature of social progress. This index incorporates longevity, quality of education and GDP per capita. Second, we focus on the sample of Belt and Road Initiative (BRI) countries. According to World Bank, in 2018 6 out of 10 countries with the highest share of total natural resources rents in GDP were located in BRI region¹. At the same time, GDP per capita in BRI has increased by more than 170% over the period 2000-2018, compared to 118% in the rest of the world. Therefore, it is essential to explore whether these trends exerted significant effect on quality of human development in BRI region. Third, following Madreimov and Li (2019) we explore non-linear (quadratic) relationship between natural resource rents and HDI. Finally, we attempt to assess the role that financial development may play in influencing the relationship between natural resources and HDI. Indeed, extant research modeling economic growth pinpoints that financial sector development seems to be an important variable. For example, Erdoğan et al. (2020) shows that once the level of financial deepening exceeds 45% oil exports have positive effect on GDP growth in Next-11 countries.

There are several channels through which natural resources can influence HDI in BRI countries. First, greater reliance on natural capital increases the impact of price volatility on public policies which in turn leads to pro-cyclical fluctuations in state spending priorities. For example, Cockx and Francken (2016), using data for 140 economies over the period 1995-2009, show that resource dependence is negatively related to government expenditure on education. In an earlier study, Cockx and Francken (2014) additionally show that globally “natural resource curse” extends to state spending on health (another dimension of human development). The authors conclude that “resource wealth as a source of unearned state income enhances state autonomy and increases volatility, which leads to policies that fail to prioritize human development” (p. 136). Hong (2017) based on analysis for the years 1972-2008 further confirmed that oil dependence decreased motives of bureaucrats to invest in human capital via social spending in markets with poor quality of institutions. As a result, governments windfall revenues from extraction of natural resources may lead a rise in non-productive spending priorities such as defense spending (e.g., Ali and Abdellatif (2017) for MENA region). At the same time, single country studies show that natural resource wealth is positively correlated with social spending in China (Sun et al., 2019) and Bahrain (Hamdi and Sbia, 2013).

Second, natural resource dependence significantly correlated with health outcomes. Specifically, empirical studies show that natural

resource wealth/dependence is a significant predictor of HIV rates, life expectancy and malaria death cases (De Soysa and Gizelis, 2013; Stretesky et al., 2017; Chang and Wei, 2018). However, some studies show that increase in energy use may also lead to improvement in human wellbeing such as infant mortality in Africa (Shobande, 2020). At the same time, studies have shown that poor health and diseases spread reduces HDI (Lou et al., 2014). For example, Goodarzi et al. (2020), using two-variable correlation analysis for the global data for the year 2017, documents positive and significant negative correlation between malaria incidence and HDI. Therefore, if policymakers use natural resource income as a policy tool to improve health outcomes and invest in human capital, natural resource wealth may have positive effect on HDI in BRI countries.

Third, it is not only state spending and health outcomes that can affect HDI in resource dependent countries. A number of studies argue that it is important to consider the quality of institutions. Some studies underline that resource rents have negative impact on human development by deteriorating the quality of institutions. Efficiently functioning institutions lead to more effective distribution of resource income to various socio-economic sectors including human capital accumulation. Torvik (2009) finds that countries with more developed institutions are not likely to experience reduction in GDP growth rates from natural resource dependence. At the same time, significant dependence on natural resources may act as an impediment to liberalization and prioritization of human capital on the reform agenda (Libman and Obydenkova, 2014).

2. REVIEW OF LITERATURE

Mehlum et al. (2006) propose a theory how natural resource wealth can be linked to GDP growth. According to two scenarios: Countries can economically win or lose from the extraction of natural resources. These scenarios depend on the type of institutions adopted by these countries. In countries with resource grabber-friendly institutions natural resources have negative effect on national income, while in countries with producer friendly institutions there is a positive effect from mineral wealth to GDP. A number of studies tested the relationship between natural resources and economic outcomes. Gylfason (2001) assess the relationship between natural capital and economic growth and human capital, using ordinary least squares regression in a sample of 86 countries. The correlational evidence suggests that resource abundant countries have lower GDP growth rates and education enrollment rates. Hayat (2018) explores the role of natural resources in the FDI-economic growth relationship, using data from 104 countries over the period 1996-2015. With the aid of generalized method of moments (GMM) the study finds that FDI has positive impact on economic growth. However, once the author interacts FDI with natural resources, the rise in commodities sector diminishes the size of the effect of FDI on GDP growth. Moreover, the negative effect of natural resources on economic growth via FDI is stronger in low and middle-income countries. Topcu et al. (2020) explores the complex relationship between natural resources, energy consumption, investment and economic growth in a sample of 122 countries, using panel VAR

¹ Iraq, Kuwait, Saudi Arabia, Azerbaijan, Oman and Brunei Darussalam

and Granger causality tests. The results show that urbanization reduces GDP growth in less developed countries. Natural resources have positive effect on GDP growth. Energy use and urbanization promote economic growth in high-income countries. Kim and Lim (2015) apply panel data tools to assess the global interrelationship between natural resources and economic development. The results show that in developing countries natural resources sector inhibits economic growth rates. However, the effect of natural resources on GDP growth differs depending on the level of financial development, globalization and quality of institutions. Havranek et al. (2016) conducts a meta-analysis of empirical research that explores the relationship between natural resource wealth and economic growth. The authors compile dataset with evidence from 43 published papers that contain 605 estimations. Overall, the study suggests that the evidence that natural resource curse holds is weak, once the authors account for the publication bias. The study highlights that it is important to take into account the quality of institutions, investment level and differences in the types of natural resources.

A separate strand of research explores the relationship between natural resources and economic growth for different groups of countries of regions. For example, Gerelmaa and Kotani (2016) empirically assess the relationship between natural resources and economic growth using the most updated dataset and applying the quantile regression estimator for the years 1970-2010. Their results are mixed. While the study confirms negative effect of natural resources on economic growth for 1970-1990, economic growth is driven by natural resources during 1990-2010. One of the potential explanations is that in post 1990's era, the manufacturing sector has well developed in resource abundant countries. Zalle (2019) assess the role of human capital and institutions in the natural resources and economic growth relationship, using data from 29 countries over the period 2000-2015. The authors use Autoregressive distributed lag (ARDL) model to unbundle this relationship. The findings show that investment in human capital and better anticorruption policies are instrumental foster economic growth and reduce the negative effect of natural resource dependence on economic growth. Erum and Hussain (2019) tests the effect of natural resources on economic growth in a sample of 43 OIC member states over the period 1984-2016. The authors apply ARDL estimator and find that corruption has negative effect on economic growth, while natural resources have positive impact on economic growth. At the same, the study also finds that ICT penetration is another important driver of economic growth. In a similar vein, Hassan et al. (2019a) apply ARDL model to test the relationship between natural resources, environmental degradation and economic growth in Pakistan. The results suggest that natural resources increase ecological footprint which degrades the environmental quality. Apart from that there is bi-directional causality between natural resources and ecological footprint. In a different study, Hassan et al. (2019b) tests the relationship between natural resource, globalization and economic growth in Pakistan over the period 1970-2014, using ARDL method. The results show that globalization and natural resources have positive effect on economic growth. There is bi-directional causality between natural resources and globalization. Usman et al. (2022) explore the drivers of environmental degradation and economic growth

in a sample of eight Arctic countries for the years 1990-2017. The results suggest that natural resources along with financial development, globalization and energy use increase economic growth. However, economic growth, natural resources and non-renewable energy use lead to a rise in greenhouse gas emissions.

Zaidi et al. (2019) explore the effect of natural resource along with other economic variables on financial development in a sample of 31 OECD member states over the years 1990-2016. The study using panel data methods and causality tests such as Dimitrescu and Hurlin test show that natural resources, globalization and human capital have positive effect on financial development. The causality runs from natural resources to financial development. Pao and Fu (2013) test the effect of natural resources on economic growth in Brazil for the years 1980-2009. The use of cointegration method shows that various types of energy consumption have effect on economic growth. Moreover, investment, human capital and renewable energy sector are positively related to economic growth. Asiedu (2006) assess the role of natural resources in promoting FDI in 22 countries of Africa over the period 1984-2000. The empirical findings show that natural resources and market size have positive effect on FDI. Apart from that human capital, quality of institutions and political stability are also important drivers of FDI.

3. DATA AND METHODOLOGY

3.1. Theoretical Underpinnings

To empirically analyze the relationship between natural resources and HDI in BRI countries, our research adopts its impulse from Madreimov and Li (2019) which non-linearly accounts natural resource dependence as a source of human capital accumulation. Moreover, Figures 1 and 2 suggest that HDI is also non-linearly related to total natural resource rents in our sample. Indeed, natural resource rents are shown to significantly affect access to basic needs. For example, a U-shaped relationship between rents and access to clean water is established by Tadadjeu et al. (2020) for a sample of African countries.

Figure 1: Scatter plot between total rents and human development index for 2000

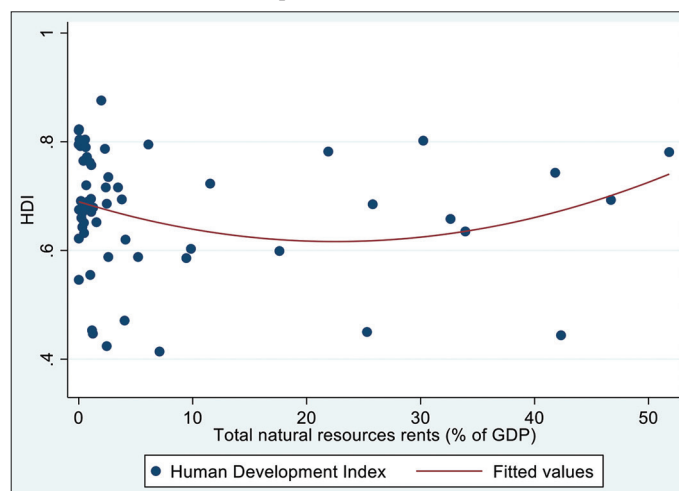
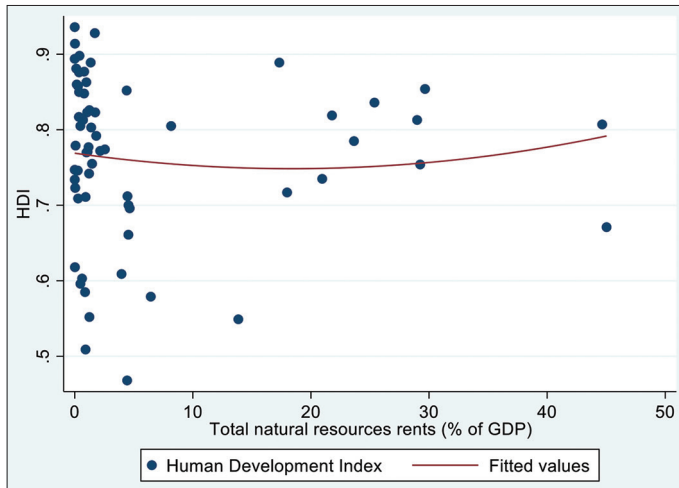


Figure 2: Scatter plot between human development index and total rents for 2018**Table 1. Variables definition and sources**

Variable	Description	Source
HDI	Human Development Index (0,1)	United Nations
TR	Total natural resource rents as % of GDP	World Bank
GOV	Government final consumption expenditure as % of GDP	World Bank
FD	Financial development index	IMF
TO	Trade openness as % of GDP	World Bank
Urban	Urbanization rate, %	World Bank
Democ	Democracy Index	Freedom House

Therefore, based on the above-mentioned agreements, the empirical model to explore the relationship between HDI and natural resource rents can be expressed as:

$$HDI_{i,t} = a_0 + a_1 Rents_{i,t} + a_2 FD_{i,t} + a_3 Rents * FD_{i,t} + \beta X_{i,t} + \varepsilon_{i,t} \quad (1)$$

Where HDI represents human development index; Rents stands for natural resource rents, FD is a proxy for the level of financial development, X is a vector of control variables and ε is an error term.

3.2. Data

Our study uses data from 51 BRI countries over the period 2000-2018. Our data is obtained from two main sources: World Bank Databank and United Nations (UN).

Our dependent variable is Human Development Index (HDI). The HDI is estimated from three core dimensions: long and healthy life (captured by life expectancy at birth), knowledge (captured by average years of schooling) and standard of living (captured by gross national income (GNI). The HDI scores range from 0 to 1, where higher values reflect better human development.

As a measure of natural resource dependence, we use five indicators from the World Bank: total natural resource rents, mineral rents, oil rents, gas rents and coal rents. All these variables are expressed as % of GDP. Extant research has used resource

rents as proxy for natural resource dependence (Vaskovskyi, 2020; Tadadjeu et al., 2020).

We also include a vector of control variables as determinants of HDI. We add government consumption as % of GDP and trade as % of GDP as macroeconomic factors. Urbanization rate is used as a proxy for demographic transition. For example, Tripathi (2021) shows that HDI is higher in countries with higher levels of urbanization rates. Democracy index is used as a proxy for quality of institutions. Considering that studies suggested non-linear effect of democracy on economic growth, income distribution and environmental quality (Plümper and Martin, 2003; Burkhardt, 1997; Buitenzorgy and Mol, 2011), we also include democracy and its squared term in our regression model. The descriptive statistics and variables description is reported in Table 1.

3.3. Empirical Strategy

In order to explore the effect of natural resource rents and financial development on HDI we follow nascent empirical research and use two-step system GMM estimator. The use of this method is advantageous to other panel data methods such as ordinary least squares, fixed effect or panel corrected standard errors estimator for a number of reasons. First, abovementioned methods do not take into account the problem of endogeneity that exists in panel data studies. Second, GMM estimator considers that dynamic nature of the panel data and overcomes the problems of simultaneity and reverse causality (Tadadjeu et al., 2022). Moreover, considering that panel data suffers from heteroskedasticity and autocorrelation, Blundell and Bond (1998) show that the two-step GMM estimator efficiently resolves these two problems. Third, GMM approach is efficient to other methods in empirical studies where $N > t$. Our sample contains 52 BRI countries ($n = 52$) over the period 2000-2018 ($t = 18$). Finally, a number of studies use two-step GMM estimator to assess the effect of natural resources on various socio-economic outcomes (Dagar et al., 2022; Ullah et al., 2022; Canh et al., 2020). The technical discussion of the two-step GMM estimator can be found in Arellano and Bover (1995).

We use the following specifications in level (2) and 1st difference (3) forms:

$$HDI_{i,t} = \sigma_0 + \sigma_1 HDI_{i,t-\tau} + \sigma_2 RENTS_{i,t} + \sigma_3 FD_{i,t} + \sum_{h=1}^k \delta_h W_{h,i,t-\tau} + v_{i,t} \quad (2)$$

$$HDI_{i,t} - HDI_{i,t-\tau} = \sigma_1 (HDI_{i,t-\tau} - HDI_{i,t-2\tau}) + \sigma_2 (RENTS_{i,t} - RENTS_{i,t-\tau}) + \sigma_3 (FD_{i,t} - FD_{i,t-\tau}) + \sum_{h=1}^k \delta_h (W_{h,i,t-\tau} - W_{h,i,t-2\tau}) - (v_{i,t} - v_{i,t-\tau}) \quad (3)$$

Where σ_0 constant; σ and δ are parameters to be estimated; W is a set of control variables; τ denotes the parameter of auto-regression; v is the disturbance term.

4. RESULTS

The main empirical results are presented in Table 2. Concerning the HDI, the results suggest U-shaped relationship between total natural resource rents and HDI (Column 1). Similarly, gas rents, mineral rents and oil rents are non-linearly related to HDI in BRI countries (Columns 2-4). We also find that turning points vary significantly depending on the type of natural resource rents. For example, in the case of total rents, once its share in GDP exceeds

42.8%, further dependence on natural resources leads to increase in HDI. In our sample, only Iraq, Kuwait, Saudi Arabia and Oman were above the turning points at some observation years. This implies that total natural resource rents exert significant negative effect on HDI in BRI region. Therefore, we included interaction term between rents and financial development (domestic credit to private sector as % of GDP) to explore whether financial development offsets negative effect of resource dependence on HDI. The interaction term is positive and significant. This implies that increase in natural resource rents in countries with higher

Table 2: Main results

Variable	I	II	III	IV	V
HDI _{t-1}	0.9564 (100.39)***	0.9653 (84.93)***	0.9675 (97.42)***	0.9735 (82.19)***	0.9819 (108.37)***
TR	-0.0006 (4.78)***				
TR ² /100	0.0007 (4.82)***				
TR*FD	0.0000 (1.97)*				
GOV	-0.0001 (0.69)	0.0002 (2.25)**	-0.0002 (1.98)*	0.0001 (0.97)	0.0001 (0.84)
TO	0.0000 (0.28)	0.0000 (1.21)	0.0000 (0.38)	0.0000 (0.53)	-0.0000 (1.08)
URBAN	0.0000 (0.71)	0.0000 (0.53)	0.0001 (2.18)**	-0.0000 (0.51)	-0.0001 (1.39)
FD	-0.0000 (1.66)	-0.0000 (1.92)*	-0.0000 (1.35)	-0.0000 (2.08)**	-0.0000 (1.76)*
DEMOC	-0.0015 (3.08)***	-0.0018 (4.93)***	-0.0011 (3.05)***	-0.0008 (1.88)*	-0.0005 (0.85)
DEMOC	0.0001 (2.59)**	0.0001 (4.49)***	0.0000 (2.69)***	0.0000 (1.56)	0.0000 (0.52)
GR		-0.0025 (2.52)**			
GR ² /100		0.0168 (2.43)**			
GR*FD		-0.0000 (0.00)			
OR			-0.0006 (4.30)***		
OR ² /100			0.0006 (3.50)***		
OR*FD			0.0000 (3.67)***		
MR				-0.0010 (4.03)***	
MR ² /100				0.0030 (4.04)***	
MR*FE				0.0000 (4.29)***	
CR					0.0008 (3.31)***
CR ² /100					0.0010 (1.51)
CR*FE					-0.0000 (4.10)***
Constant	0.0463 (6.36)***	0.0355 (5.67)***	0.0339 (4.18)***	0.0299 (5.60)***	0.0281 (5.48)***
AR (1)					
AR (2)					
Hansen P-value					
Fisher stat					
N	705	705	705	705	705
Turning point	42.8%	7.4%	50%	16.7%	-

*P<0.1; **P<0.05; ***P<0.01

levels of financial development does not lead to a reduction of human development. In a similar vein, domestic credit to private sector alleviates negative effect of oil and mineral rents. However, turning to gas rents we document again U-shaped link with HDI, but the interaction term is not statistically significant. Finally, coal rents are linearly and positively related to HDI and interaction term is negative and significant. Canh et al. (2020) in a similar vein documents opposite results for gas rents have compared to other type of resource rents when it comes to resource curse empirical modeling. Apart from that we also find that democracy has U-shaped relationship with HDI in our sample.

5. CONCLUSION

Natural resource abundance can be a significant factor in influencing human capital accumulation in developing countries. Human capital, which refers to the skills, knowledge, and abilities of individuals, is crucial for economic development and sustainable growth. However, countries that are rich in natural resources often face challenges in developing their human capital. One major challenge is the phenomenon known as the “resource curse.” This term refers to the negative consequences that can occur when a country’s economy is heavily reliant on natural resources. These consequences can include corruption, inequality, and a lack of diversification in the economy. When natural resources are plentiful, governments may be less motivated to invest in education and other forms of human capital development because they can generate revenue from the sale of these resources. This can lead to a shortage of skilled labor and limit opportunities for economic diversification. Another challenge related to natural resource abundance is the risk of environmental degradation. When countries extract and exploit natural resources, it can lead to pollution, habitat destruction, and other forms of environmental damage. This can negatively impact the health and well-being of citizens, as well as limit opportunities for human capital development. For example, exposure to pollution can lead to health problems that can make it difficult for individuals to attend school or work. Despite these challenges, there are also opportunities for natural resource abundance to positively impact human capital accumulation. For example, countries that effectively manage their natural resources can generate revenue that can be used to invest in education and other forms of human capital development. Additionally, natural resources can provide opportunities for employment and economic growth, which can create incentives for individuals to invest in their own human capital.

One approach to overcoming the challenges associated with natural resource abundance is to prioritize sustainable development. This involves balancing economic growth with environmental protection and social development. For example, governments can invest in renewable energy sources and work to reduce the environmental impact of natural resource extraction. This can help to mitigate the negative effects of natural resource abundance while also providing opportunities for human capital development.

Many countries that are rich in natural resources, such as oil and gas, have used the revenue generated from these exports to invest in human capital development. Norway is often cited as

an example of a country that has effectively managed its natural resources to promote human capital development. The country has a sovereign wealth fund, known as the Government Pension Fund Global, which is funded by revenue from the country’s oil and gas exports. The fund is used to finance public services, including education and healthcare, and to support research and innovation. Qatar is another country that has used its revenue from natural gas exports to invest in human capital development. The country has established the Qatar National Vision 2030, which outlines a strategy for sustainable development that includes investments in education and healthcare. The Qatar Foundation for Education, Science and Community Development, which is funded by the government, has established a number of educational institutions, including universities and research centers, to promote human capital development. United Arab Emirates (UAE) is a country that has used revenue from its oil exports to invest in human capital development. The country has established a number of initiatives to promote education, including the Abu Dhabi Education Council, which is responsible for developing and implementing educational policies. In summary, there are many examples of countries that have used revenue from natural resource exports to invest in human capital development. These investments have included funding for education, healthcare, research, and innovation, and have helped to promote economic growth and sustainable development.

Based on the findings of this research paper, it can be concluded that financial development can play a crucial role in mitigating the negative impact of natural resource dependence on human development in developing countries. The study has demonstrated that a well-developed financial system can provide a buffer against economic volatility and uncertainty, which are common in resource-dependent economies. By providing access to credit and facilitating investment in other sectors, financial development can help diversify the economy and reduce its reliance on natural resources. It is important to note, however, that the relationship between financial development, natural resource dependence, and human development is complex and multifaceted. This study has identified some of the key factors that contribute to this relationship, but there is still much to be explored. Future research should continue to examine the role of financial development in promoting sustainable economic growth and human development in resource-dependent countries.

Overall, the findings of this research paper have important implications for policymakers and development practitioners. By prioritizing financial development and diversification of the economy, developing countries can reduce their vulnerability to economic shocks and promote long-term sustainable development.

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