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Natural resource abundance and financial development: A case study of emerging seven (E−7) economies

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ABSTRACT

The effect of natural resources on financial development has been tested extensively. However, this study uses a new proxy for financial development to measure its depth, accessibility, and efficiency of financial markets and institutions. As the conventional measures for financial development and human development ignored these dimensions. Unlike previous studies, a new index for human capital is used as a covariate that covers labor market information and provides adjusted estimated returns to education for each country. The sampled area for this study is emerging seven (E−7) economies, and the time period is ranging from 1990-2017. The results found an adverse effect of natural resources rent on financial development, which verifies the existence of a resource curse hypothesis for emerging seven (E−7) economies. In contrast, financial development is positively affected by the rise in human capital through the level of education. Similarly, the openness of trade is found to help promote financial development for the emerging seven economies (E−7). This study suggests the provision of greater financial accessibility and efficiency to better use the available natural resources in the financial sector. More focus should be devoted to the financial sector in comparison with the non-financial sector for effectively using natural resources. Human capital should be focused in order to effectively utilize the abundance of natural resources for speeding up the pace of financial development.

1. Introduction

Natural resources abundance and its role in promoting economic growth are in discussions since Smith (1776) and Ricardo (1917). They both consider the abundance of natural resources, such as oil, minerals, and gas, as integral components for contributing to the economic development of a country (Su et al., 2017; Badeeb et al., 2017b; Su et al., 2020). On the role of natural resources hypothesis with its lagged contribution to the economic growth of a country having low natural resources is considered as a resource curse hypothesis (Auty, 1994). However, recent literature is mostly dominated by the resources curse hypothesis due to many reasons, i.e., rent-seeking, corruption, low institutional quality, and less investment in the manufacturing sectors. Based on different approaches, the orthodox way delivers a simple framework for forming the linkage amid the resource-based sectors and economy (Prebisch, 1962). In order to boost economic growth and to efficiently utilized natural resources abundance of a country, there is a need to have a proficient financial system (Pradhan et al., 2016). For instance, financial development role is essential to attain economic growth (Nawaz et al., 2019; Zaidi et al., 2019). Even, Rajan and Zingales (2003) linkage financial expansion as a basis of converting the resource curse into a blessing through strong institutional quality, quality human capital, and trade with other countries. For developing countries, the outcomes mainly indicate a negative association between economic growth and natural resources abundance (Sachs and Warner, 1995). The negative association between economic growth and natural resources considered as a resource curse or referred to as the phenomena of "Dutch Disease" (Matsen and Torvik, 2005; Van Wijnbergen, 1984). Similarly, Financial development, which is an indispensable factor for promoting economic growth, is also found to be low among the numerous resources dependent economies (Elbadawi and Soto, 2012; Sachs and Warner, 2001; Gelb, 2010). Financial development is an important measure to understand the efficiency, accessibility, and depth of the financial market of a country and also its financial institutions.

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Moreover, opening up helps ease barriers not only through sharing technology but also across borders with goods, money, and people. Increasing trade promotes not only financial development but also helps to improve domestic institutional quality, financial markets, and also bring internationalization to the host country's financial markets. Opening-up helps to attract foreign direct investment, exchange of both physical and human capital, transfer of technology, and availability of goods and services to the consumer (Rodrik, 2007). The benefits of international trade can only be achieved through quality human capital and to promote financial development since the human capital role is vital for the utilization of natural resources effectively (Lederman and Maloney, 2007; Gylfason, 2001). As observed by (Hatemi-J and Shamsuddin, 2016; Barro and Lee, 2013), in comparison with unskilled and illiterate people, educated people shall use both natural and financial resources in a better way. Similarly, from the theoretical perspective, human capital is allied with the promotion of financial development (Lucas Jr., 1990; Cleeve et al., 2015). However, the role of human capital, especially the one adjusted for the estimated returns to education and also varied across different countries with different levels of education, has not been studied.

In this regard, this study is an attempt to cover the effect of natural resources abundance on financial development. This study is different from previous studies in many ways. First, this study using a sample of emerging seven (E−7) countries, including China, Brazil, India, Mexico, the Russian Federation, Turkey, and Indonesia. E−7 countries are vital to study because most of these countries possess a large number of natural resources reserves, and their financial markets are growing faster than most of the developed countries, i.e., Group of Seven (G7) countries. E−7 countries are emerging markets and targeted globally for high future economic growth, and by 2014 estimates it even surpasses the purchasing power parity of a group of seven (G7) countries. Besides, E−7 countries are forecasted to dominate world top economies by 2050, and the global economic power of E−7 countries shall also double (Hanson et al., 2014; Hawksworth, 2017). Also, by 2050, six out of seven economies in the world are forecasted to be from emerging seven countries, with China and India, to lead, followed by Indonesia. By 2050, based on the current and forecasting's, Brazil economy shall surpass Japan base. Also, Russia, Indonesia, and Mexico will be larger than the United Kingdom, France, and Germany, while Turkey's economy shall be as good as Italy in terms of the magnitude of the economy (Hawksworth and Cookson, 2008). These essential features are more valuable to analyze the role of natural resources abundance in the financial development of these countries and to devise a relevant policy implication for these emerging markets. Second, the important aspects that have not been covered so far by previous studies, especially by measuring financial development and human development.

Before mentioning the key objectives and why this study is important, we first need to evaluate the role of financial development index. The financial development index assesses the accessibility of financial markets and institutions, i.e., the ability of financial markets to provide financial services at a lower cost. Financial development can be of great help, especially escaping the curse of natural resources. Countries with a large number of natural resources increase their deposit mobilization from tax receipts from the government, public, and private sectors, which causes banking sectors to increase liquidity. Hence, it is important to explore the relationship between financial development and natural resources abundance. Moreover, financial development is linked with economic growth, and the effect of natural resources on financial development shall ultimately influence the long-term economic growth of any country.

Therefore, this study adds new dimensions to previous literature by using new multidimensional indicators for financial development, which is important for three reasons: 1) it covers the financial development efficiency aspects of financial markets and institutions; 2) The index helps to understand the depth of the financial system; 3) It also shows the availability of financial institutions and markets. Third, the role of human capital has been tested by many empirical studies; however, the human capital measured in previous studies is only measured through the level of education and does not provide any significant information about the returns and labor market. Therefore, a new index for human capital is employed, which captures not only the labor market information but also adjusted for the returns to education, which also varied across countries. Lastly, this study uses a more updated long-time panel data econometrics approaches, i.e., augmented mean group (AMG) for long-run and short-run analysis, Westerlund (2007) panel cointegration and Pesaran, 2007) panel unit root test for the analysis. The role of estimation technique important for this study because econometric techniques that are not relevant for a specific situation, i.e., in the existence of cross-section dependency and heterogeneity, may lead to provide misleading results. Therefore, a more robust econometric approach is followed to obtain reliable results.

2. Literature review

Khan et al. (2020) investigated the association among natural resources abundance, technological innovation, human capital, and financial development for China using data from 1987-2017. The study confirms the resources curse for China due to the adverse association between natural resources abundance and financial development. Authors further found that trade openness, technological innovation, and human capital are positively associated with financial development. It is also found that GDP is positively linked to financial development. Besides, the use of three different financial development indicators, that is, money supply to GDP, deposits money banks assets to GDP, and liquid liabilities to GDP, are also negatively related to financial development. Ahmed et al. (2016) used the Ng-Perron unit root test to discover the long-run relationship between economic growth and labor, capital, exports, and richness of natural resources in the Iranian case using time series data from 1965-2011 while employing Ng-Perron unit root test (Ng and Perron, 2001), Bayer-Hank combined the cointegration technique (Bayer and Hanck, 2013) and the VECM Granger causality test. The outcomes of the study conclude that all the variables are cointegrated, and the long-run analysis also confirms the resource-curse hypothesis, which suggests that natural resource abundance harms economic growth. Furthermore, the empirical results showed that a 1% increase in the production of natural resources causes a 0.47% decrease in GDP. However, they reported the bidirectional causality of exports and capital used to that of economic growth, whereas from labor, the unidirectional causality runs toward economic growth.

Sinha and Sengupta (2019), examine the natural rent impact on human development, particularly exploring the role of globalization in 30 Asian pacific countries throughout 1996–2016. They employed bootstrapped quantile regression and the second generation panel models. The empirical results show that, at an individual level, natural resources have a positive impact on HDI in the absence of globalization and vice-versa. In contrast, the presence of globalization, strong institutions, and governance reverse the adverse effects of natural resources on human development otherwise not. Shahbaz et al. (2018) discover the stimulating role of natural resources in financial development for the USA throughout 1960–2016, while the other variables such as education, economic growth, and capitalization are also included. They used the Bayer-Hank cointegration and bound testing approach as well as traditional and recent unit root tests for examining the integration properties of variables. The empirical results of the study show that the bidirectional causality between natural resources and financial development is that natural resources abundance encourages financial development. Furthermore, they explore that natural resources positively affect financial development, education, and economic growth has a positive impact on financial development, whereas the effect of capitalization is reported as negative. Furthermore, the FMD positively play a significant role in promoting cleaner energy in sub-sample of the countries with high growth of carbon intensity, a higher innovative

growth as well as culture, and low dependency on fossil fuels. Capital financial markets' role in the production of clean energy is robust too for controlling the available technology, government support, and the economy size.

Shahbaz et al. (2020) investigate the public-private partnership investment in the energy sector and carbon emission nexus, considering the significant role of technological innovation in carbon for the case of china. Bootstrapping autoregressive distributed lag modeling is used to analyze the cointegration between carbon emission and its determinants. The findings reveal that the public-private investment partnership investments in the energy sector slowdown the quality of an environment via an increase in emitting carbon. The exports and FDI are positively linked with carbon emission, which negatively affects the quality of an environment, whereas technological innovation adversely affects carbon emission. The link amid economic growth and carbon emission confirms the environmental Kuznets curve. Al Mamun et al. (2018) explore the financial markets development (FMD) role in promoting cleaner energy for the case of 25 OECD countries by robust methodology. The empirical findings suggest that FMD significantly increase the total cleaner energy, biomass as well as non-biomass energy production in the long run. In FMD, the impact of the equity market is positively more significant than that of the credit market. The study also found the negative effects of the 2008 global financial crises in the non-biomass energy.

Alvarez-Herranz et al. (2017) investigate the economic growth and environmental pollution nexus, particularly an investigation of environmental Kuznets Curve (EKC) for the case of 17 OECD countries throughout 1990–2012. The empirical results of this study show that the N-shaped EKC relationship exists for income and environmental degradation. Additionally, the growth in consumption of fossil sources speed-up the economic growth that, in turn, negatively affect air pollution. Moreover, this study reveals that the relationship between improvement in the energy innovation process and the per capita greenhouse-gas is positive, which pays the highest return in the long-run only. Sinha et al. (2020) analyze the relationship between environmental quality and technological innovation, the formulation of SDGs policies for the case of Next-11 countries over the time frame of 1990–2017, focusing on the technological strategies via addressing many problems such as environmental degradation, sustained economic growth issue, clean and affordable energy, and educational quality. Two indices are designed for environmental degradation and technological advancement, and their association is analyzed following the EKC hypothesis. Using bootstrap quantile regression, they analyzed the association of countries having low, middle, and high air pollution. This study suggests that for the reduction of inequality, the country must start making clean and affordable energy for the benefits of its citizens as well as strengthening the environmental policies. Furthermore, education and innovation play an active role in awareness, which encourages the creation of employment and decreasing income inequality, which leads toward achieving the SDGs.

Shahbaz et al. (2019) discovered the resource abundance and resource dependence effects on economic growth in 35 natural resource abundance countries over the period 1980–2015. A second generation panel data methodologies are used to identify the cross-sectional dependence amongst countries. The variables such as natural resource rent per capita, natural resource share of GDP, capital, trade openness, and financial development are analyzed to find out their association with economic growth. The empirical results synthesized as variables are cointegrated. This study reveals that abundance of natural resource encourages economic growth whereas the natural resource dependence slow down the economic activities and the problem of resource curse occurs, but, the human capital and effective planning could reverse the resource curse into resource blessings. Zafar et al. (2019) investigate the impact of renewable and non-renewable energy on economic growth for APEC countries over the period 1990–2015. They employed a second-generation panel unit root tests to determine the cross-sectional dependence and Westerlund cointegration test to analyze the long-run equilibrium association between various variables. The empirical results conclude that both renewable and non-renewable energy encourages economic growth; also, R&D and trade openness has a positive impact on economic growth. Furthermore, the time series analysis shows that for individual countries, renewable energies have a positive effect on economic growth. It is also reported in the study that there is bidirectional causality between energy (both forms) consumption and economic growth.

Yuxiang and Chen (2011) also showed the dependency of natural resources on financial system development. They used provincial data for the case of China data from 1996-2006 were analyzed via applying a system GMM estimator and found that the abundant natural resources areas are slower in the development of a financial system, while the poor natural resources regions are noticed faster in financial development. Additionally, after controlling the effects of investment, financial development is a significant determinant for long-run economic growth. Beck (2011) demonstrated the demand and supply-side prospects of the relationship of dependence between the abundance of natural resources and financial development. The study found a negative relationship for natural resources abundance with financial development due to less developed financial systems. The linkage of natural resources abundance with financial development is also shown by Zoega and Gylfason (2001). For this purpose, they consider a sample of 85 countries that covered a period of 34 years, i.e., 1965–1998, and employed a seemingly unrelated regression (SUR) methodology. They found that a higher degree of dependence on natural resources is associated with a lower level of financial development. Barajas et al. (2016) investigated heterogeneity in growth performance. For this purpose, they adopted a panel dynamic GMM methodology, which might be related to the financial resources curse in three aspects. That is the regional, income level, and for the oil exports of 146 countries for 1975–2005. The results obtained revealed that financial development plays an important role in diminishing the natural resources curse on economic growth.

A link amid the oil rents (a measure of natural resources), institutions, and the financial development for oil-exporting countries are investigated by Hoshmand et al. (2013). They employed a Generalized Method of Moment (GMM). The data were taken from 2002 to 2010. The results indicate that natural resources deteriorate the financial development process, which leads to the decline of economic growth. The existing empirical literature comprises of many studies which consider financial development as an important element for economic growth inadequate while investigating the resources-growth nexus. For instance, Satti et al. (2014) analyze the relationship between resources and economic growth in the Venezuelan economy. They include financial development in an augmented production function. The results indicated that for the long-run relationship, all the variables are cointegrated. Besides, their empirical analysis represents that financial development could not nullify the adverse influence of natural resources on economic growth. Similarly, In the case of Yemen, Badeeb and Lean (2017a) find that the link amid natural resources is negatively linked with that of economic growth. The authors explored further in their empirical analysis that a developed financial sector can transform the natural resources curse into a blessing by adequately allocating the domestic savings into productive investment ventures. The relationship between sectoral growth and its determinants in the long-run is described by Badeeb and Lean (2017)a. The conclusion of their empirical results showed that the agricultural sector and manufacturing sectors are negatively affected by natural resources. This study confirms the "Dutch Disease" as an abundance of natural resources causes negative growth in other sectors. In contrast, the study of Quixina and Almeida (2014) used oil revenues as a measure of natural resources and evaluated financial development as an important determinant of economic growth. They concluded that natural resources are having a positive impact on economic growth. On the other hand, financial development has played a small role in promoting economic growth.

Various existing studies have shown the impact of natural resources on human capital. Gylfason (2001), on the abundance of natural resources, claims that it causes crowding out of other capitals. The other forms of capital could be human capital, physical capital, and social capital. The conclusion ends up with the results that those countries who are not focusing on investing in human capital failed to get free from their dependency on primary products, Because of which they might experience diversification in their economies. Such in the case of Finland and Korea, the industrial development in these two countries moved from a commodity-based economy to an export-driven economy. This indicates the linkage amid human capital and economic growth or economic development. While the study of Gylfason and Zoega (2006) shows the relationship amid human capital and natural resources, concluding that through human capital, natural resources indirectly and positively affect economic growth. Another factor contributing to economic growth is trade openness. According to (Niemeyer, 2004; Law, 2009; Zhang et al., 2015), trade openness is considered as one of the essential factors which not only improves the financial development of a country but also contributes toward achievement of higher economic growth. Likewise, the development of the financial markets is associated with the opening up of trade with other countries (Do and Levchenko, 2004; Huang and Temple, 2005; Adak, 2015), which is an indicator of the economic growth.

Furthermore, the study of Ibrahim and Sare (2018) for African countries, found that the relationship between trade openness and human capital positively influence financial development. Similarly, For Asian countries, institutional quality and trade openness have positively contributed to financial development and financial depth during the period 1995–2011 (Le et al., 2016). For the United States, Douglas and Walker (2017) found that there is a positive link between the educational expenditures and that of an abundance of resources with higher returns. Higher the revenue from resources abundance, higher will be the spending on education, but not always. In some cases, resources have been found to cause delays in education, just like coal in the eastern side. Consistently, in the case of Turkey, Sibel et al. (2015) conclude that financial development can significantly be promoted because of the human capital. Following previous literature, the relation of human capital and technological innovation may also provide a ensure a new way for financial development.

In short, all of the studies, as mentioned above, leave a research gap in terms of using a comprehensive index for measuring financial development and human capital. Moreover, emerging seven economies are in discussion due to its rising economic growth and increasing trade with the rest of the world. Therefore, it is essential to cover the existing literature gap by using advance measurements for financial development and human capital along with updated data for emerging seven economies from 1990-2017.

3. Theoretical framework and methodological background

3.1. Theoretical framework

On the theoretical side, there are different mechanisms through which natural resources abundance can affect financial development. On the conventional side, it is believed that natural resources shift the factors of production from the manufacturing sector of a country, causing to decline in the traded sector, which in turn decline financial development (Krugman, 1987). There is a negative effect of natural resources abundance on financial development for countries with weak traded sector Baltagi et al. (2009). Similarly, with resource booms, the reduction in the number of entrepreneurs also lower financial development due to the increase in rent-seeking and corruption.

Moreover, the abundance of natural resources may also weaken incentives for both public and private sectors, especially incentives for accumulating human capital (Stijns, 2006; Gylfason, 2001). Similarly, natural resource sectors extract a significant portion of investment and skills from the financial sectors lowering both saving rates and demand. Further, abundant natural resources are also found to be a source of crowding out social capital (Gylfason and Zoega, 2006). With a decline in social capital, which is a crucial determinant for the level of trust is found to be negatively affecting the speed of financial as most of the financial contracts are based on trust. It is found that social capital is important to promote financial development.

Further, due to Dutch disease, it is found that with a rise in corruption and rent-seeking, the investment level in the manufacturing sector tends to decline following interest group theory (Murphy et al., 1993; Rajan and Zingales (2003)). Similarly, both social and human capital accumulation, especially if it is stagnant, may adversely affect financial development negatively. However, with increasing accumulation of quality human capital, the pace of financial development can speed up (Shahbaz et al., 2018). Because with quality human capital, people have more understanding of financial literacy and participate more in financial activities and can access to different financial services easily.

Similarly, financial development is also based on the promotion of human capital and trade openness (Nawaz et al., 2019). The role of human capital is crucial for effectively utilizing the abundance of available natural resources (Tiba and Frikha, 2019). The role of human capital based on endogenous growth theory is considered to be essential for the growth of an economy (Romer, 1994). Moreover, the depth of a financial market is associated with the openness of trade with other countries (Huang and Temple, 2005). The openness of trade is found to be one of the key sources for promoting financial development. While Trade openness contributes to financial development in many ways. First, it attracts foreign investment to the host countries and increases competition in the market. Second, it helps to improve the process of production and bring more external financing, which contributes to speeding up the pace of financial development (Rajan and Zingales, 2003). Based on our theoretical framework, this study hypothesis the expected signs for our model for natural resources abundance as $\varnothing_1 = \frac{\partial FD}{\partial NRR} < 0$, while for human capital $\varnothing_2 = \frac{\partial FD}{\partial HCI} > 0$ and for trade openness $\varnothing_3 = \frac{\partial FD}{\partial TO} > 0$.

3.2. Data and model specification

This study uses a new proxy for the financial development index developed by Svirydzenka (2016). The traditional measure for financial development, such as domestic credit to the private sector or stock market capitalization ratio to gross domestic product (GDP) does not cover the multidimensional approach of financial development. Therefore, a new variable for financial development is used in this study. It provides a multidimensional approach to cover the depth, efficiency, and accessibility of financial markets and institutions. Data for the financial development index is obtained from the International Monetary Fund (IMF) database. Similarly, this study also uses a new approach to measure human capital. We used the human capital index (HCI) developed by Penn World Table (PWT, 9.1), which not only covers labor market information and is also adjusted for the estimated returns to education. It also varies across countries having different levels of education. Natural resources rent denote the total rent received through coal, mineral, forest, oil, and natural gas rents. Trade openness which measures the degree of openness in terms of increasing or restricting trade with other countries. It is calculated by summing exports and imports and dividing them by gross domestic product (GDP). Data for exports, imports, gross domestic product (GDP), and the population is obtained from World Data Bank (WDI, 2019). The log form for variables are used.

The functional form for this study is given below as:

$$FD_{i,t} = f(NRR_{i,t}, HC_{i,t}, TO_{i,t}) \quad (1)$$

Where $"i"$ and $"t"$ denoted the total of cross-sections or countries and the time period. While FD denotes financial development, NRR (Natural

Resources Rent), HC (Human capital), and TO for trade openness. The baseline regression for this study is given below as:

$$FD_{i,t} = \varnothing_{1,i} NRR_{i,t} + \varnothing_{2,i} HC_{i,t} + \varnothing_{3,i} TO_{i,t} + \varepsilon_{i,t} \quad (2)$$

Equation (2) is the primary regression model which is to be tested for empirical analysis. $\varnothing$ denote the coefficients, and ε is the error term. The data spanning from 1990-2017 while the total number of countries are seven.

3.3. Econometric techniques

3.3.1. Pesaran (2004) Cross-section dependence (CD) test

In the long-time panel data, there is a possibility of having the problem of cross-section dependency among cross-sectional units. Assuming independent cross-section shall provide misleading results. In order to check for the independence or dependence among cross-sectional units, Pesaran (2004) cross-sectional dependence test is employed. The null hypothesis suggests independence, while the alternative hypothesis suggests dependence.

$$CD_{statistics} = \sqrt{\frac{2t}{n(n-1)}\left(\sum_{i=1}^{n-1}\sum_{j=i+1}^{n}\widehat{\rho_{i,j}}\right)} \quad (3)$$

Which is normally distributed with zero mean and variance is one. Moreover, ρ denoted pairwise correlation. The null hypothesis indicates that there is no cross-section dependence, and the alternate suggests dependence between cross-section units.

3.3.2. Unit root tests

It is essential to employ a consistent econometric unit root approach which deals with the issue of cross-section dependency. This study uses a second-generation unit root test called cross-sectionally augmented Im, Pesaran, and Shin (Pesaran, 2007) test. CIPS test incorporates the issue of dependence among cross-section units and also provides excellent results in the presence of a heterogeneous panel. Pesaran (2007) approach take averages of cross-sections for the first difference and lagged for all cross-section for augmentation. The basic equation for Pesaran (2007) test is given as:

$$\Delta X_{i,t} = \varnothing_i + \varnothing_i X_{i,t-1} + \varnothing_i \overline{X}_{t-1} + \sum_{l=0}^{p} \varnothing_{il} \Delta \overline{X_{t-l}} + \sum_{l=1}^{p} \varnothing_{il} \Delta X_{i,t-l} + \varepsilon_{it} \quad (4)$$

Where, in equation (4), the averages of both first and lagged terms for cross-sections are denoted by $\overline{X}_{t-1}$ and $\Delta\overline{X_{t-l}}$. The CIPS is shown as:

$$\widehat{\text{CIPS}} = \frac{1}{\text{N}}\sum_{\text{i}=1}^{\text{n}} \text{CADF}_{\text{i}} \quad (5)$$

The value of Cross-sectionally augmented dickey fuller (CADF) in equation (5) is obtained from equation (4). Besides, Pesarans (2007) unit root test, this study also uses Im et al. (2003) panel unit root test to check for the stationarity of data. The null hypothesis of both the test indicates the non-stationarity problem in the data, while the alternative hypothesis suggests no occurrence of a unit root problem.

3.3.3. Westerlund (2007) Panel cointegration test

For panel cointegration, this study uses an error correction based approach developed by Westerlund (2007). This test is based on four key test statistics. The group mean statistics are denoted by G_a and G_t, while, panel test statistics are denoted by P_a and P_t. The null hypothesis for group means statistics indicate no long-run cointegration while the alternate hypothesis suggests that at least one of the cross-sections is cointegrated. Similarly, for panel statistics, the null hypothesis nullifies the cointegration link, while the alternate hypothesis ensures a cointegration relationship for the whole panel.

3.3.4. Augmented mean group (AMG) for long and short-run estimations

For the long-run and short-run results estimation, this study employed a new approach developed by Eberhardt (2012). This approach is useful is the presence of dependency among cross-sections, data non-stationarity, and also provides efficient results in the presence of heterogeneous parameter slope (Mrabet et al., 2019). This approach also treats unobserved common factors and cross-sectional dependence issues as dynamic effect parameters. The basic equation for AMG is given as:

$$\Delta W_{i,t} = \varnothing_{1,i} + \varnothing_{2,i} \Delta IND_{i,t} + \varnothing_{3,i} UF_i + \sum_{t=2}^{T} \varnothing_{4,t} CDP_t + \varepsilon_{i,t} \quad (6)$$

In equation (6), $\Delta W_{i,t}$ is financial development and $IND_{i,t}$ provide all the independent variables such as human capital, natural resources rent, and trade openness. $\varnothing_{1,i}$ is the constant term capturing invariant time heterogeneous effects, UF_i is for the unobservable common factor and $\varnothing_{3,i}$ shows the heterogeneous factors loading, is for heterogeneous factor loadings and the dynamic common process is shown through $\varnothing_{4,t}$(Mrabet et al., 2019).

Once the value of $\varnothing_{2,i}$ is obtained from equation (6), so AMG estimator is shown as:

$$\widetilde{AMG}_{statistics} = \frac{1}{N}\sum_{i=1}^{N} \widetilde{\varnothing_{2,i}} \quad (7)$$

Moreover, the robustness check for this study is performed by using a random effect generalized least square (RE-GLS) approach, including gross domestic product (GDP) per capita as a new covariate.

4. Discussion and interpretation of results

The obtained results from Pesaran (2004) cross-section dependence test shows that the null hypothesis of independence is rejected for all the variables at a 1% significance level as the results indicate that dependence of cross-section present in our data (Table 1). The results of dependence among cross-section units are valid, due to increasing economic integration and increasing trade volume can be associated with increasing dependency. These emerging seven economies growing economic growth not only impact each other but also affecting the global economic activities. These results invalidate the use of first-generation unit root tests due to the presence of cross-section dependence. So, this study shall use panel unit root tests that are suitable to overcome the problem of dependence and heterogeneity among cross-section units.

The Im, et al (2003) tests are used for unit root tests, and then it is more appropriate if the heterogeneity problem persists (Table 2). The null hypothesis supports the existence of the unit root problem in the data, while the alternative suggests no unit root issue. The estimated results show a mixed integration order as some of the variables are stationarity at a level, and some are stationary at first difference. The results for Im, Pesaran, and Shin (IPS) is obtained using both constant and no trend and also constant with the trend. The results confirm that the financial development index is stationary at a level along with trade openness and gross domestic product. Human capital and natural resources are found to be stationary at first difference. However, these results cannot be relied on in the presence of cross-section dependence.

Table 1
Cross-section dependence test.

Variables	Test Statistics	P-Value
Financial Development Index	14.33***	0.000
Human Capital	−3.31***	0.001
Natural Resources	13.42***	0.000
Trade Openness	7.20***	0.000
Gross Domestic Product	21.50***	0.000

Note: P<0.01*** significance level at 1%.

Table 2
Im et al. (2003) Unit root test.

Level Variables	t-statistics$_{constant}$	t-statistics$_{trend}$	Order
Financial Development Index	−2.732***	−3.236***	I(0)
Human Capital	−1.460	−2.156	–
Natural Resources	−1.673	−2.085	–
Trade Openness	−3.013***	−3.060**	I(0)
Gross Domestic Product	−2.350**	−2.383	I(0)
Difference			
Financial Development Index	–	–	–
Human Capital	−3.624***	−3.651***	I(1)
Natural Resources	−3.687***	−3.694***	I(1)
Trade Openness	–	–	–
Gross Domestic Product	–	–	–

Note: P<0.01, 0.05 & 0.1 shows significance at 1%, 5% and 10%.

Therefore, besides Im et al. (2003) test is used which overcome the problem of cross-section dependence and also deals with heterogeneous panel data set.

The results given in table-3 is obtained from employing Pesaran, 2007) cross-sectionally augmented Im, Pesaran, and Shin (CIPS) test. The results obtained are both for constant with no trend and constant with the trend. The outcomes are slightly different from Im et al. (2003) test as the power of Pesaran (2007) is high. The order of integration, similar to Im et al. (2003), is found mixed, i.e., I(0) and I(1). Financial development and trade openness are found to be stationary at a level, and human capital, natural resources, and gross domestic product are found to be stationary at first difference. The significance level for all the variables are mixed, i.e., 1%, 5%, and 10%, respectively. Since there is dependency among cross-section units, therefore, a valid econometric cointegration approach should be used for efficient results..

Table-4 shows estimated results by employing Westerlund (2007) long-run cointegration approach. This approach is suitable both in the presence of heterogeneous and dependent cross-section units. The estimated results provide reasonable support for the long-run cointegration relationship among variables, i.e., natural resources, financial development, abundance, trade openness, and human capital, for emerging seven economies. Except for $G_{a,}$ which is significant at 10%, the rest of the results for G_t, $P_{t,}$ and P_a, respectively, are significant at a high level, i.e., 1%. Since the cointegration relationship is verified by Westerlund (2007), in the next step, the short-run and long-run results are estimated for this study.

The estimated results for the long-run, which is obtained by employing the augmented mean group (AMG) is given in table-5. The estimated results established a negative and statistically significant association between financial development and natural resources abundance. As on average, −0.046% decline is found in financial development due to a one percent rise in natural resources abundance. The emerging seven economies are still on the path to development by improving institutional quality and efficiently managing the available natural resources. Therefore, there still exists the problem of the resource curse in terms of financial sector development due to natural resources abundance. The mechanism at work that causes to decline in financial development is mainly through the expansion and increase in exports related to natural resources causing an insufficient amount of investment for the manufacturing sector in these countries (Zhang and Brouwer, 2019).

Furthermore, there is a need to change the industry structure efficiently utilize the available natural resources (Qian et al. (2019); Martinez-Fernandez et al. (2012)). Similarly, having poor infrastructure and crowding-out investment from the industrial and manufacturing sector also leads to a decline in financial development in these emerging economies (Zhou and Chen, 2014; Zhang and Brouwer, 2019; Ahmad et al., 2016; Al Mamun et al., 2018). Moreover, human capital, which is a comprehensive index for measuring the information for the labor market and also adjusted for the returns to education, shows a positive association with financial development. With a one percent increase in human capital, there is a rise of 0.017% in financial development. Human capital is an essential factor for not only effectively utilizing the natural resources but also to help economies with improvement in financial literacy and financial inclusion, which turn helps to expand the financial development (Hatemi-J and Shamsuddin, (2016); Shahbaz et al. (2018)). However, a decline in the human capital, primarily in terms of the investment, may also be allied with lower economic growth (Zhang, 2017).

For most of the developing countries, Outreville (1999) also reported that education is an essential factor for financial development. In sampled emerging economies, more human capital creates more opportunities in the financial sector by building skill-building economies. Furthermore, an increase in human capital provides an economic growth conducive environment through the promotion of the financial sector. It also helps to improve the total productivity both directly as well as indirectly. Trade openness is also obtained to be positively allied with a rise in financial development for the emerging seven economies. An average rise in financial development caused by increasing trade one percent is 0.091. Most of the emerging seven economies have a large trade volume with the rest of the world. Increasing trade openness help these economies to expand their manufacturing and industrial sectors, which in turn contributes to the development of the financial sector for accessibility, depth and efficiency (Sinha and Sengupta, 2019; Shahbaz et al., 2019; Zafar et al., 2019).

The volume of trade for each of these economies as per Simoes and Hidalgo, 2011 database is $2.41 trillion exports for China with $1.54 trillion imports, 292 billion dollars' exports for India with $417 billion imports, 341 billion us dollars exports for Russia with 221 billion imports, 418 billion dollars exports and $356 billion imports for Mexico,

Table 3
Pesaran (2007) Unit root test.

Level Variables	CIPS$_{constant}$	CIPS$_{trend\ \&\ constant}$	Order
Financial Development Index	−3.08**	−3.05**	I(0)
Human Capital	−1.919	−1.431	–
Natural Resources	−1.805	−2.374	–
Trade Openness	−2.559***	−2.794*	I(0)
Gross Domestic Product	−1.591	−1.234	–
Difference			
Financial Development Index	–	–	–
Human Capital	−2.32*	−2.802*	I(1)
Natural Resources	−5.315***	−5.375***	I(1)
Trade Openness	–	–	–
Gross Domestic Product	−3.215***	−3.496***	I(1)

Note: P<0.01, 0.05 & 0.1 shows significance at 1%, 5% and 10%.

Table 4
Westerlund (2007) Panel cointegration test.

	Constant and Trend	Constant with no Trend
G_t	−5.401***	−5.167***
G_a	−13.317*	−13.44*
P_t	−49.796***	−44.411***
P_a	−44.596***	−32.163***

Note: P<0.01, 0.05 & 0.1 shows significance at 1%, 5% and 10%.

Table 5
Augmented mean group long-run results.

Variables	Coefficient	Z-Stats	P-Value
Natural Resources	−0.046***	−3.79	0.000
Human Capital	0.017***	3.29	0.000
Trade Openness	0.091***	3.64	0.000
Constant	−1.14***	−2.82	0.005
Wald-test	28.85***	–	0.000

Note: P<0.01, 0.05 & 0.1 shows significance at 1%, 5% and 10%.

166 billion dollars exports and 214 billion dollar imports for Turkey, 188 billion dollars exports and 153 billion dollars imports for Indonesia, $219 billion exports and 140 billion dollars imports for Brazil, respectively. Trade openness is vital to develop the financial sector. It helps improve the financial markets, improve institutional quality, promote competition, and also internationalization in the host countries. Moreover, opening-up also helps to attract foreign direct investment, promote physical and human capital exchange, promoting technological innovation, which in turn positively affects the financial sector (Rodrik, 2007). These results for trade openness support the findings of Ibrahim and Sare (2018); Pradhan et al. (2016), and Zhange et al. (2015). Moreover, the overall model significance is tested through Wald-test, which indicates that the overall model is statistically significant.

The short-run results estimated using augmented mean group (AMG) tests are given in table-6. The results suggest a negative link amid natural resources and financial development. In contrast, human capital and trade openness are both found to help promote financial in the emerging seven economies. An average, −0.035% decline caused in financial development is due to natural resources abundance, while an increase of 0.037% and 0.16% in financial development is mainly attributed to human capital and trade openness, respectively. All the results are statistically significant at conventional 10%, 5%, and 1%, in turn. Moreover, the error correction term, which is denoted by ECM(-1), shows the adjustment speed for equilibrium. It is found that around 0.56% adjustment every year shall be corrected, or the speed of converting towards equilibrium is 0.56% for every period.

The robustness check estimates are provided in table-7 by using robust regression analysis. The estimated results suggest a negative association for natural resources abundance and financial development. While human capital, trade openness, and an additional variable to measure the effect of economic growth, i.e., gross domestic product, are positively related to financial development. The results found that an average of −0.085% decline in financial development is due to natural resources abundance, while human capital, trade openness, and gross domestic cause an average increase of 0.015%, 0.028%, and 0.163%, respectively. All the estimated results for robustness checks are statistically significant at a conventional 10%, 5%, and 1% level, respectively.

Table 6
Augmented mean group short-run results.

Variables	Coefficient	Z-Stats	P-Value
Natural Resources	−0.035**	−2.28	0.023
Human Capital	0.037*	1.67	0.095
Trade Openness	0.16***	4.54	0.000
Constant	−1.12***	−2.65	0.008
ECM(-1)	−0.56***	−7.91	0.000

Note: P<0.01, 0.05 & 0.1 shows significance at 1%, 5% and 10%.

Table 7
Robustness check.

Variables	Coefficient	Z-Stats	P-Value
Natural Resources	−0.085***	−5.44	0.000
Human Capital	0.015***	4.01	0.000
Trade Openness	0.028***	2.91	0.000
Gross Domestic Product	0.163***	7.54	0.000
Constant	−4.00***	−8.36	0.000

Note: P<0.01, 0.05 & 0.1 shows significance at 1%, 5% and 10%.

5. Conclusion and policy recommendations

The discourse on the issue of the resource curse, especially linking natural resources abundance with financial development, is extensively available. However, this is the only study that is based on using a comprehensive index for financial development covering the depth, accessibility, and efficiency in the case of emerging seven (E−7) economies. The selected countries are China, Brazil, India, Mexico, Turkey, the Russian Federation, and Indonesia, with a time period ranging from 1990-2017. Moreover, for human capital, this study also uses a more refine index which covers information for the labor market and also provided adjusted estimated returns to education. The empirical analysis is performed through second-generation panel econometrics tools, which is suitable for heterogeneous panel and cross-section dependence.

The empirical outcomes confirm the presence of the resources curse hypothesis for the emerging seven economies. The results found that natural resources abundance adversely affects financial development. In contrast, trade openness and human capital positively affect financial development in the case of emerging seven economies. Moreover, the robustness test validates the relationship among all the variables. Further, a new covariate for robustness check is also included to measure the effect of economic growth, i.e., gross domestic product (GDP). Gross domestic product (GDP) is positively allied with the expansion of financial development.

Based on our estimated findings, this study suggests: first, in order to upsurge the efficiency of the financial sector's depth, accessibility and efficiency more investment should be allocated to the manufacturing and industrial sectors to effectively benefit from the abundance of the natural resources of the emerging seven (E−7) economies. Second, investment in human capital should be stimulated to equip the labor market with skills to channelize the benefits from trade and also to effectively reap the benefits from natural resources abundance for the promotion of financial development. Lastly, these countries are one of the leading exporters of goods and services in the world, and these countries can earn by exporting natural resources through trade, which in turn should help to promote financial development in these emerging markets.

CRediT authorship contribution statement

Yanpeng Sun: Conceptualization, Methodology, Formal analysis, Investigation, Resources, Data curation, Writing - original draft, Writing - review & editing, Visualization. **Aysegul Ak:** Conceptualization, Software, Formal analysis, Writing - review & editing. **Berna Serener:** Project administration, Supervision, Writing - review & editing. **Deping Xiong:** Supervision, Validation, Visualization, Writing - original draft.

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Appendix A. Supplementary data

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