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Revisiting the nexus of financialization and natural resource abundance in resource-rich countries: New empirical evidence from nine indices of financial development

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ABSTRACT

A great number of studies in the literature that estimates the impact of natural resource abundance on financial development proxies financialization with either domestic credit to the private sector or market capitalization of domestic companies. However, these proxies do not fully respond to the complicated structure of financial development. To fill the gaps in the existing literature, nine indices of financial development proposed by IMF are used in the links with natural resource abundance in resource-rich countries for the years 1980–2017. This study reveals reliable and robust empirical results by employing both traditional and second-generation econometric techniques for the dataset. First, the financial resource curse hypothesis is confirmed for the panel of resource-rich economies because natural resources have negative effects on each of the nine indices. Second, the negative impact of the abundance of natural resources on financialization decreases towards high quantile levels. Last, natural resource abundance has a greater negative impact on financial markets than financial institutions when indices of financial markets are compared to indices of financial institutions. Policy implications are further discussed in this study.

1. Introduction

This study explores the "financial resource curse (FRC)" hypothesis considering resource-rich countries, being more robust than previous studies exploring this hypothesis provided the consideration of nine financial development indices. Typically, commodity-dependent countries have lower levels of financial development than their peers (Bhattacharyya and Hodler, 2014; Mlachila and Ouedraogo, 2019). But, the availability of natural resources should enhance economic growth and financial development (Asif et al., 2020). Despite evidence found regarding the negative relation between natural resource abundance and financial development, no consensus has been reached thus far (Bhattacharyya and Hodler, 2014; Shahbaz et al., 2018; Zaidi et al., 2019; Niknamian, 2019; Nawaz et al., 2019; Mlachila and Ouedraogo, 2019; Canh and Thong, 2020; Asif et al., 2020).

The natural resource curse is surveyed in Badeeb et al. (2017), namely it is reviewed the mechanisms through which resource wealth might slow economic growth. As Auty (1993) argues resource-rich nations tend to grow at a slower rate than countries with fewer natural resources, thus suffering from what he named a "resource curse" (the inverse association between natural resource dependence and economic growth). The "oil curse" for example, has been attributed to countries whose economies are heavily reliant on oil production (Beck, 2011; Badeeb et al., 2017). But how is resource dependence linked to poor economic performance? The Dutch disease phenomenon (the decline of the Dutch manufacturing sector after the discovery of natural gas sources), commodity price volatilities, failures of economic policy and education neglect, are all evidence of this curse. The main political mechanisms are traced to rent-seeking, weak institutions and corruption (Yuxiang and Chen, 2011; Bhattacharyya and Hodler, 2014; Sahay et al., 2015; Badeeb et al., 2017; Dwumfour and Ntow-Gyamfi, 2018; Niknamian, 2019; Erdoğan et al., 2020). The resource curse assumption stipulates that the well-endowed economy's resources have better potential to perform worst for growth than the economies with no or limited

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resources endowment (Tiba and Frikha, 2019). To sum up, the "resource curse" refers to a phenomenon of penalizing growth rates generated by a set of negative effects linked to the excessive resource abundance, especially relevant in the context of non-renewable resources (Eisgruber, 2013; Niknamian, 2019). If the rents received from natural resources exceed economic growth, then it can be said that the nation is facing a resource curse (Shahbaz et al., 2019).

The previous literature presented two alternative and plausible resource theories: natural resource curse hypothesis and natural resource blessing (Shahbaz et al., 2019). The first hypothesis states that the country's natural resources impede economic growth due to institutional failure, political uncertainty, civil war, low financial development, and corruption. The second hypothesis assumes the viability of natural resources in economic agenda to help to restructure through sound financial development, accountability, transparency, and institutional support. Natural resources are very important contributors to economic growth. In some countries earnings obtained from natural resources like fossil fuels and minerals, are a significant share of GDP. Therefore, the higher abundance of natural resources leads to higher natural resources rents (the difference between the price of a commodity and the average cost of producing it). This is so, provided natural resources will drive to economic rents because they are not produced.

The FRC is another channel through which a surge in capital inflows can harm economic performance. This is since cheap access to foreign capital can produce a shift of productive resources towards non-productive or non-tradable sectors. Therefore, the FRC is associated with the link between cheap access to abundant foreign capital and weak productivity growth. Additionally, the FRC hypothesis is widely documented in resource-financing literature (Beck, 2011; Shahbaz et al., 2013, 2018, 2019; Mlachila and Ouedraogo, 2019; Asif et al., 2020), stating that resource-rich countries generally have lower levels of financial development, ceteris paribus (Mlachila and Ouedraogo, 2019). This seems contradictory to initial expectations provided these countries have high liquidity levels from export revenues (Bhattacharyya and Hodler, 2014). Beck (2011) confirmed the FRC hypothesis for resource-rich countries, evidencing supply constraints (in the form of loans) for firms using and exploring natural resources. In resource-rich countries, commodity price shocks reached the "financial resource curse" hypothesis under the mediating factors rule of law, export concentration, trade, and FDI inflows (Mlachila and Ouedraogo, 2019). Other factors are related to low human development, high government expenditures, and increasing price level reaching the FRC hypothesis across countries (Law and Moradbeigi, 2017). Usually, resource-abundant economies are characterized by lower financial development (Bhattacharyya and Hodler, 2014; Beck, 2011). We might find hypothesis advanced for this outcome as the lack of integration of the commodity sector to the rest of the economy, poor governance, mismanagement of both financial and human resources and prevalence of rent-seeking behavior (Asif et al., 2020; Mlachila and Ouedraogo, 2019; Shahbaz et al., 2018, 2019; Law and Moradbeigi, 2017; Bhattacharyya and Hodler, 2014; Beck, 2011).

The existing studies mention the relationship between financial development, natural resources, and economic development (Nawaz et al., 2019; Canh and Thong, 2020; Asif et al., 2020). But, the relationship between financial development and natural resources is far from generating consensus. Up to this moment, there are still misunderstandings about the existence or not of the FRC hypothesis and the present works try to bring new lights considering resource-rich countries, for which there are still different conclusions regarding its existence, as exists lack of consensus. Conclusions of Nawaz et al. (2019) point that financial development enhances domestic production and economic growth, but provided their reverse causality study, in the other direction doubts remained, especially in the mediating role of resource rents.

Exploring the FRC hypothesis in resource-rich countries (those with the availability of natural resources like oil, natural gas, and coal) is important for several reasons. First, resource-rich countries may use their revenues for consumption smoothing, weakening the incentive to build a financial system that works in full. Second, higher investment in the natural resource sector can lead to lower investment in the financial sector, drawing away from its important skills (Beck, 2011; Mlachila and Ouedraogo, 2019; Asif et al., 2020). Based on the works of Hattendorff (2014) and Mlachila and Ouedraogo (2019), these economies are more vulnerable to terms-of-trade shocks, which might lead to lower financial development due to higher exposition. Resource-rich sectors rely more on internal financing than over the banking/financial system. Most of their costs are paid abroad (Beck, 2011; Mlachila and Ouedraogo, 2019). Third, to the financial system, it will be given lower importance as a growth source, and economic growth will be less dependent of the financial system despite its proved importance in the economy (Nawaz et al., 2019; Shahbaz et al., 2018; Niknamian, 2019). Fourth, Nili and Mahdi (2007) conclude that in resource-rich countries governments are highly engaged in investment, weakening the strength of privates. Therefore, the demand decrease for broader financial services will weaken the financial sector, where this lower financial development in resource-rich countries is due to inadequate institutions for contract enforcement (Bhattacharyya and Hodler, 2014; Mlachila and Ouedraogo, 2019). Fifth, Yuxiang and Chen (2011) state that the strength and reliability of the financial sector reforms need credible and strong governments, whereas in resource-rich countries these are eroded by rent-seeking and corruption, lowering, even more, the development of the financial sector. Finally, exploring the FRC hypothesis in resource-rich countries is important due to the usual lower levels of education (human capital), social capital, institutional weakness, leading to lower incentives for financial development (Yuxiang and Chen, 2011; Sarmidi et al., 2014; Mlachila and Ouedraogo, 2019).

This study makes two contributions to the existing body of the literature. First, as far as we are aware, this paper is the first attempt to test the "financial resource curse" hypothesis in resources-rich countries using nine different indicators for financialization. Canh and Thong (2020) called attention stating that simpler measures of financialization as used in previous articles is not enough to analyze the FRC hypothesis, finding that financial institutions help reduce the natural resources rents, especially financial access and financial efficiency. Moreover, financial development has been mostly measured through credit supply (Rashid Khan et al., 2019). This research considers nine financialization indices by IMF to measure various dimensions of financialization, including financial institutions, markets, depth, access, and efficiency. A recent attempt made by Asif et al. (2020) considered only three indices (domestic credit to the private sector, broad money supply, and market capitalization) as representatives of financial development in their analysis for a single country case. The second contribution is the use of the method outlined. A quantile regression model makes it possible to account for heterogeneity and non-Gaussian distributions. Another feature of this method is that the quantile regression estimators are robust to outliers and skewed distributions while its facilities the estimation of slope effects at various percentage points (quantiles) of the relevant distribution. The quantile regression can model the entire conditional distribution of the response and it often leads to deep insights and valuable solutions in situations where the most useful information lies in the tails. The quantile process regression estimates the entire conditional distribution of the response, and it allows the shape of the distribution to depend on the predictors. It should be noted that Mlachila and Ouedraogo (2019) previously investigated the FRC hypothesis for resource-rich countries by using simple proxies and traditional econometric techniques thus our paper is more robust and advanced because of the use of nine financial development indices as well as the use of quantile regression analysis to test the FRC hypothesis.

The rest of the study develops as follows. Section 2 presents the theoretical and empirical evidence that has emerged studying the relationship between natural resources rents and financial development, while discusses the hypothesis underlying the goals of this study. Section

3 presents the model specification, the data, and the methodology employed. Afterward, empirical results and the respective discussion is presented in section 4, while section 5 concludes this work.

2. Theoretical and empirical evidence: hypothesis

Natural resources are essential to promote economic and financial growth (Asif et al., 2020). Still, previous literature demonstrates that resource-dependent countries evidence low levels of financial development (Asif et al., 2020; Canh and Thong, 2020). Resource-rich countries are pointed in the literature as being those suffering from a resource curse phenomenon provided they grow slower than those with fewer of those resources (Auty, 1993; Marques and Pires, 2019), face development failures, and generally have lower income. Beck (2011) showed that the finance and growth relationship is as important in resource-based economies as in others. Financial development may be conditioned in resource-rich countries, due to its straight connection with economic growth (Canh and Thong, 2020). To date, the natural resource abundance-financial development nexus remains unexplained and no straight conclusions were taken (Shahbaz et al., 2018). But it is pointed that better economic and political institutions can turn the "curse" (negative effects and appropriation of rental gains) into a "blessing" (Bhattacharyya and Hodler, 2014; Shahbaz et al., 2018, 2019; Sun et al., 2020). Therefore, deepening the analysis of the FRC hypothesis is even more important given that different conclusions have been reported. This may be because the hypothesis has been explored in different country contexts, using inappropriate proxies of financial development or due to different methodologies employed.

The FRC hypothesis (i.e. episodes of abundant access to foreign capital coupled with weak productivity growth (Benigno and Fornaro, 2014) is well identified and documented. The term, firstly introduced by Beck (2011) defends that resource-rich countries have less developed financial systems. This translates into fewer loans to the firms that use and explore natural resources, implying supply constraints, shortening economic rents. Bhattacharyya and Hodler (2014) results point that policies to lessen the resource curse in economic agenda would be beneficial if we can ensure well developed political institutions, to sustain financial resources. Therefore, to strengthen the financial market we need an optimum use of natural and economic resources across countries (Asif et al., 2020) to promote the capital market since this can be used as a policy instrument for financial progress (Shahbaz et al., 2018).

Different term impacts are detected in the empirical literature. In Pakistan, using ARDL and VAR methodologies from 1975 to 2017, in the short-run initial level of forest and oil rents supported the natural resource abundance hypothesis increasing financial development, but in the long-run, it is found a negative relationship of coal, forest, natural gas, and oil rents with domestic credit to private sector favoring the natural resource curse hypothesis (Asif et al., 2020). Previously, Beck (2011) confirmed the existence of the FRC hypothesis evidencing that resource-rich countries usually have a less developed financial system. For a large set of countries (133) in the period 1970–2005, Bhattacharyya and Hodler (2014) found that natural resources revenues have negative effects on financial development. For a sample of 38 African countries during 2000–2012, Dwumfour and Ntow-Gyamfi (2018) applied the generalized method of moment's model to study the relationship between natural resources, financial development, and institutional quality. They concluded that natural resources rents impact over financial development are ambiguous, that it has a positive effect over credit, and that institutional quality reduces its negative impact on financial development. Contrarily, in the work of Canh and Thong (2020) it was found that the increase in natural resources rents lead to positive effects on financial market depth but negative effects on financial institutions, overall inducing financial development. They also found the influence of financialization on natural resources rents and vice-versa in the long-run. Finally, the authors' confirmed that the link between financialization and natural resources rents is dominant in low- and middle-income economies and weak in high-income economies, validating the nonexistence of the FRC hypothesis for a panel of 86 countries. Also contradicting the FRC hypothesis, Shahbaz et al. (2018) examined the impact of natural resource abundance in financial development for the USA over 1960–2016, including into the analysis education, economic growth and capitalization, testing causality and cointegration, finding cointegration between financial development and its determinants. In the long-run, their results pointed out that natural resource abundance contributes to financial development. Nawaz et al. (2019) documented the same but for Pakistan (1972–2017). Moreover, Niknamian (2019) concluded that financial development is an unimportant channel in the resource-growth nexus provided financial development is unable to mobilize oil rent from the government to the private sector in oil-rich countries. Zaidi et al. (2019) evidenced that natural resources have Granger causality and positive effects on financial development in the OECD countries (1990–2016). Faisal et al. (2019) explored the nexus between financial deepening and natural resources, incorporating GDP, capital, education, and natural resources based on quarterly data (1990–2016) in an emerging economy, Turkey. Their long-run results confirmed a positive but insignificant impact of natural resources on financial deepening. Thus, financial development can have a positive effect contradicting the resource curse hypothesis (Law and Moradbeigi, 2017).

Overall financial development appears to increase the natural resources rents through the positive influence of financial market depth (Canh and Thong, 2020). There is also evidence that policymakers should strengthen the finance-growth link by using natural resources as an economic tool (Nawaz et al., 2019). Confirming the resource curse hypothesis only on the production side, Marques and Pires (2019) used panel data models for 25 natural-gas producer countries during 1993–2015. They established that natural gas consumption drove economic growth, but argue that natural gas is a transitional source, which does not fit the pattern of dependency as in oil producer countries.

As already stated, the negative effect of natural resources on financial development experienced by resource-rich countries as compared to resource-poor countries has been termed the FRC. Redmond and Nasir (2020) point different channels that may be responsible for this inverse relationship: lack of governance quality, low quality of institutions, fluctuations in natural resource revenues, deterioration of terms of trade, appropriation of rent-seeking, acute dependence on natural resources, lack of bargaining power to fix market prices, minimal savings, damaging rent-seeking practices, tariff protection, failing to develop human capital, and lower investment in capital and education, being just a few theoretical explanations able to explain low economic growth, as well as financial development (Yuxiang and Chen, 2011; Zaidi et al., 2019; Zameer et al., 2020; among many others).

Therefore, it is known that political institutions stabilize the resource market, leading to high financial development, and promoting democracy in resource-rich countries (Bhattacharyya and Hodler, 2014). Institutional efficiency, transparency, and resource sustainability help efficiently use natural resources (Mlachila and Ouedraogo, 2019; Bhattacharyya and Hodler, 2014). Sound capital markets help to reduce the negative effect of oil abundance on country economic growth (Moradbeigi and Law, 2017). Considering also African countries, Dwumfour and Ntow-Gyamfi (2018) stated that being highly dependent on primary commodity markets justifies the FRC hypothesis under the mediating channel of institutional quality and credit rating. Also, a strong institutional system provides opportunities for the implementation of contracts and payment of credits. Therefore, financial development needs to be a reality such that natural resource exports exert a positive effect on economic growth (Erdoğan et al., 2020). Many times, these problems are quite visible in resource-rich countries, leading us to raise our hypothesis 1.

H1. Natural resources rents have a negative influence over financial

development, favoring the "Financial Resource Curse" (FRC) hypothesis.

Primary commodity markets are necessary and desirable to enhance export activities, allowing economic resources available, to reap maximum resource rents and promote both economic and financial growth. There is evidence that better financial markets reap economic gains (through fossil fuel prices mostly), imperative for long-term growth (Asif et al., 2020). Financial development is closely connected to economic growth (Redmond and Nasir, 2020) provided that the development of a robust financial sector contributes to economic growth, and economic growth increases financial services' demand contributing to financial development (Canh and Thong, 2020). Shahbaz et al. (2013) conclude that financial development influences economic growth by increasing the rate of capital accumulation, mobilizing savings ad fostering foreign and domestic capital investments (Erdoğan et al., 2020). Moradbeigi and Law (2017) found that financial development helps nullify the negative effect of natural resources on economic growth. Redmond and Nasir (2020) investigate the impacts of natural resource abundance, international trade, financial development, trade openness, and institutional quality over economic development. Using a panel sample of 30 countries, during 1990–2016, their results evidence a stronger influence on economic growth than over human development where institutional trade and broad money demonstrate lower economic development.

Other empirical studies favor the straight link between natural resources, economic growth, and financial development, although results are not always conclusive. Niknamian (2019) found that oil rent augments economic growth in countries with good governance, using panel data models in 31 oil-rich countries during 1980–2015. By opposition, Asif et al. (2020) argued that an abundance of natural resources tended to decline economic growth in developed and developing countries. Shahbaz et al. (2018) argued for a positive relationship between economic growth and financial development, besides the positive feedback effect found between natural resource abundance and financial development. They even suggested that policymakers should use natural resources abundance as an economic tool to improve the financial sector performance, bearing in mind the important roles of economic growth and education. Zameer et al. (2020) evaluated the coupling coordination degree of natural resources, financial development, and ecological efficiency in China using a regional perspective for 2006–2018, concluding that regions with relatively backward economic development are over-reliant on natural resources.

Bidirectional causal relationships amid financial development and economic growth and between natural resources and economic growth are also reported in the literature (Nawaz et al., 2019). There is evidence that financial development, capital stock, and labor productivity promotes economic growth (Shahbaz et al., 2018; Nawaz et al., 2019) and domestic production (Nawaz et al., 2019). Faisal et al. (2019) argue in favor of positive bidirectional causalities between financial development and natural resources, suggesting that a significant investment in the banking sector for Turkey can leverage the natural resource sector. Nonetheless, using the same sample of 63 oil-producing countries (1980–2010) Moradbeigi and Law (2017) concluded that financial development lowers the impact of oil abundance leading to negative growth. Therefore, it can be argued that natural resource abundance entrenches financial development to increase the country's economic growth, but resource curse economies are unable to signify its positive impact on the country's financial resources. Provided the previous findings it is also hypothesized that:

H2. Income per capita increases financial development.

There existed also the opposite view of financial development being an unimportant channel in the resource-growth nexus because financial development is often unable to mobilize oil rents from the government to the private sector in oil-rich countries (Niknamian, 2019). Erdoğan et al. (2020) investigated the relationship between the impact of natural resource exports on economic growth and the level of financial deepening. The authors found that when the rate of financial deepening is under 45%, the increase in oil exports does not have a statistically significant effect on economic growth, but when over 45%, one unit increase in oil exports causes a 7% increase in economic growth. By opposition, Canh and Thong (2020) indicated that economic integration through trade openness induce domestic economic activities and leads to higher financial development (Kim et al., 2010).

It has also been explored in the literature whether capital stock promotes a country's financial development under the resource constraint environment. And it has been argued that domestic investment, measured by gross fixed capital formation, supports financial activities (Asif et al., 2020). Nawaz et al. (2019) conclude that financial development promotes domestic production and economic growth and validate natural resources as blessings in Pakistan through ARDL bootstrap and VECM Granger causality. Moreover, international trade promotes the diffusion of technology, innovation, and knowledge (Shahbaz et al., 2013; Wiedmann and Lenzen, 2018), enhancing economic growth (Kim et al., 2010; Redmond and Nasir, 2020), through more necessary domestic investment. Trade openness strengthens the finance-growth relationship (Nawaz et al., 2019; Redmond and Nasir, 2020), especially through learning-by-doing actions (Shahbaz et al., 2018). It also increases market size, stimulates domestic innovation, increases the gross capital formation, and heightens competition, positively influencing economic growth (Redmond and Nasir, 2020).

Trade openness is regarded as a good proxy for the degree of openness in terms of increasing or restricting trade with other countries, thus favoring financial development and economic growth (Sun et al., 2020). Redmond and Nasir (2020) found a negative and significant effect impact of international trade and broad money on economic development, and that trade openness' positive effect exceeds that of institutional quality. Thus, provided that some previous studies include in their analysis trade openness to be able to validate or contradict the FRC hypothesis (Shahbaz et al., 2019; Erdoğan et al., 2020; Redmond and Nasir, 2020), we also control for the impact of trade openness on the link between resources rents and the nine representatives of financialization. Globalization, measured by trade openness, represents additional demand for natural resources, leading to higher natural resources, economic growth, and financial development (Hajzler, 2014; Shahbaz et al., 2019; Redmond and Nasir, 2020; Canh and Thong, 2020). Wiedmann and Lenzen (2018) concluded that globalization has a severe social and environmental consequence, possibly explained by the greater intensification of international trade in terms of export production. However, globalization is good for countries and promotes economic growth (Nawaz et al., 2019). Provided all these previous conflicting results stated by the literature among the link between trade openness, gross fixed capital formation, and financial development, we explore the following last two hypotheses as well.

H3. Gross fixed capital formation stimulates financial development.

H4. Trade openness is expected to have a positive influence on financial development.

Provided that the literature presents ambiguous empirical findings, but there is still the need that these results could help policymakers, investigating the FRC hypothesis is still crucial among researchers. Comprehensive policies to use natural resources as an instrument for financial development, and economic growth by consequence, are extremely important. This paper fills the prevailing research gap which we believe is mostly due to the financial development measure used to analyze the relationship between natural resources and financial development. Notwithstanding, the effect of natural resources on financial development has been explored extensively, but using traditional and common measures, and, despite some differences as pointed previously, relative similar econometric techniques.

As concerning our first contribution to the empirical literature, we

may identify very common measures of financial development, which do not fully reflect the state of financialization of a country in our opinion. Nawaz et al. (2019) use principal component analysis to generate a financial development index. Shahbaz et al. (2018) use real domestic credit to the private sector per capita. Redmond and Nasir (2020) use broad money as a percentage of GDP and market capitalization of listed domestic companies as a percentage of GDP. Asif et al. (2020) use domestic credit to the private sector, broad money supply, and market capitalization. Erdoğan et al. (2020) use domestic credit to the private sector. Guan et al. (2020), for China, using several econometric models during 1971–2017, confirming the resource curse hypothesis, also use the domestic credit provided to the private sector as a percentage of GDP. Sun et al. (2020) used a new proxy for financial development arguing that conventional measures for financial development and human development ignore depth, accessibility, and efficiency. Their study suggests the provision of greater financial accessibility and efficiency to use better natural resources, when available, in the financial sector. They use the financial development index from the IMF and the human capital index from PWT as representatives of financial development. Finally, Canh and Thong (2020) called attention to the fact that these simpler financialization measures used in previous research not being enough to conclude for the FRC hypothesis. With this in mind, we propose to use in the present paper, nine different indicators for financialization.

3. Model specification, data, and methodology

In this paper, it is investigated the connection between financial development and natural resources rents, using a yearly dataset for the period from 1980 to 2017 for resource-rich countries (Australia, Brazil, Canada, China, Iran, Saudi Arabia, United States, and Venezuela). Our model is inspired by Canh and Thong (2020) and Shahbaz et al. (2018), taking into consideration in the model the function as follows:

$$FD_{it} = f(RENTS_{it},\ GDPPC_{it},\ OPEN_{it},\ GRFC_{it}) \quad (1)$$

where FD denotes financial development. As proxies of financial development, we used nine financial development (financialization) indices obtained from the IMF database. These are the financial development index (FDI), financial institutional index (FII), financial markets index (FMI), financial institutions depth index (FIDI), financial institutions access index (FIAI), financial institutions efficiency index (FIEI), financial markets depth index (FMDI), financial markets access index (FMAI) and financial markets efficiency index (FMEI), respectively. There are different indicators in the component of each index. While financial institutions are components of banking-related indicators, financial markets are more about stock market indicators. FIDI consist of private sector credit to GDP, pension fund assets to GDP, mutual fund assets to GDP, insurance premiums, life and non-life to GDP. FIAI includes bank branches per 100.000 adults and ATMs per 100.000 adults. FIEI is calculated using net interest margin, lending-deposits spread, non-interest income to total income, overhead costs to total assets, return on assets, and return on equity. FMDI consists of stock market capitalization to GDP, the stock traded to GDP, international debt securities of government to GDP, total debt securities of financial corporations to GDP, and total debt securities of nonfinancial corporations to GDP. FMAI is a component of percent of market capitalization outside of the top 10 largest companies and the total number of issuers of debt. Finally, FMEI is calculated using the stock market turnover ratio. The main explanatory variable RENTS are total natural resource rents (as % of GDP). Total natural resources rents are the sum of oil rents, natural gas rents, coal rents (hard and soft), mineral rents, and forest rents, calculated as the difference between the price of a commodity and the average cost of producing it. These unit rents are then multiplied by the physical quantities countries extract or harvest to determine the rents for each commodity as a share of gross domestic product (GDP). Control variables are gross domestic product per capita (GDPPC, as constant 2010 US$), trade (OPEN, as % of GDP), and gross fixed capital formation (GRFC, as % of GDP). Independent variables are obtained from the World Bank, the World Development Indicators, and the natural logarithm of all variables is calculated and used in the analysis as consistent with previous pioneering studies.

In the first stage, the stationarity of the series is tested. Cross-sectionally augmented Im-Peseran-Shin (CIPS) and cross-sectionally augmented Dickey-Fuller (CADF) second-generation panel unit root tests developed by Pesaran (2007) are employed to determine the degree of integration of the respective variables. Then, the long-run relationship between variables is explored, using a panel quantile estimation approach. To the best of our knowledge, this paper is the first attempt to apply panel quantile regressions to explore the association between financial development, natural resources rents, economic growth, trade openness, and gross fixed capital formation in resources-rich countries using different financialization indicators. In the choice of the method, several advantages of the panel quantile approach are taken into consideration. First of all, quantile regression models make it possible to account for heterogeneity and non-Gaussian distributions. Another feature of this method is that the quantile regression estimators are robust to outliers and skewed distributions, while its facilities the estimation of slope effects at various percentage points (quantiles) of the relevant distribution. Also, allowing for unobserved heterogeneity, this approach enables the exploration of differences in the dependent variable among low, medium, and high changes. However, the OLS methods only provide the conditional exception (mean value) of the dependent variable and present an incomplete picture of the conditional distribution. The panel quantile regression model is useful because it provides the stated advantages and overcomes the disadvantages of OLS methods.

The panel linear regression Eq. (1) is written in matrix notation and quantile regression form as follows:

$$y_{it} = \alpha_i + \beta(q)x_{it}^{'} + u_{it} \quad (2)$$

where i denotes the number of countries and t is the time dimension. The variable y is the dependent variable, while the vector x includes all independent variables. q denotes the quantile ($0 < q < 1$) of the conditional distribution, α shows the presence of fixed effects. The impact of the x drivers is allowed to depend upon the quantile q, but the fixed effects α_i does not. Following Koenker (2004), the estimation of Eq. (1) for several quantiles simultaneously is obtained by solving the following minimization problem:

$$min_{\alpha\beta} \sum_{k=1}^{\tau} \sum_{j=1}^{n} \sum_{i=1}^{m} w_k \rho_{qk}\left(y_{ij} - \alpha_i - \beta(q_k)x_{ij}^{'}\right) \quad (3)$$

where $\rho_{qk} = u\,(q - I\,(u < 0))$ is the piecewise linear quantile loss function provided by Koenker and Bassette (1978). The weights w_k control the relative influence of the τ quantiles ($q_1, \ldots, q_\tau$) on the estimation of the αi parameters. In the case where potentially the number of cross-sections n is large relative to the time dimension m (as in our case), then the estimates show a large number of fixed effects which can significantly inflate the variability of the other coefficient estimates. To this end, Koenker (2004) suggests a regularization or shrinkage of these individual effects toward a common value by considering a penalty. This method, called penalized quantile regression, takes the following form:

$$min_{\alpha\beta} \sum_{k=1}^{\tau} \sum_{j=1}^{n} \sum_{i=1}^{m} w_k \rho_{qk}\left(y_{ij} - \alpha_i - \beta(q_k)x_{ij}^{'}\right) + \lambda P(\alpha) \quad (4)$$

where $p(\alpha) = \sum_{i=1}^{n} |\alpha_i|$ is the penalty considered.

4. Empirical results

This study first presents a statistical analysis of analyzed variables.

Table 1
Descriptive statistics.

Var.	Obs#	Mean	Min	Median	Max	Std. Dev.	Skewness	Kurtosis	Pr. (JB test)
RENTS	304	1.71	−1.29	1.61	4.27	1.63	−3.40	28.97	0.00
GDPPC	304	9.52	5.84	9.63	10.93	1.14	−1.02	3.84	0.00
OPEN	304	3.66	2.51	3.72	4.60	0.47	−2.40	2.16	0.01
GRFC	304	3.17	2.60	3.13	3.82	0.24	0.59	3.18	0.00
FDI	304	−0.87	−2.22	−0.88	−0.05	0.51	−0.16	2.11	0.01
FII	304	−0.70	−1.74	−0.72	−0.04	0.42	−0.21	2.07	0.01
FMI	304	−1.24	−3.75	−1.06	−0.06	0.89	−0.70	2.85	0.00
FIDI	304	−1.28	−3.47	−1.07	−0.03	0.95	−0.26	1.77	0.00
FIAI	304	−0.92	−3.14	−0.68	−0.09	0.80	−1.30	3.96	0.00
FIEI	304	−0.51	−1.92	−0.40	−0.13	0.36	−1.63	5.74	0.00
FMDI	304	−1.55	−4.60	−1.46	0.00	1.21	−0.52	2.45	0.00
FMAI	304	−1.69	−5.61	−1.34	−0.12	1.34	−1.28	3.88	0.00
FMEI	304	−1.14	−5.93	−0.81	0.00	1.25	−1.54	5.77	0.00

Note: Natural logs of variables are presented.

Table 1 indicates descriptive statistics of total rents, per capita GDP, trade openness, and gross fixed capital formation, and nine different indices of financialization. Alongside the mean, median, smallest, and largest values of data, the table also shows skewness, kurtosis, and Jarque-Bera test statistics. It can be claimed that data are asymmetric and mostly highly-skewed because values of skewness statistics are different than zero and greater than one (in absolute value) in most cases. Also, data have heavier tails than a normal distribution because most of kurtosis statistics are greater than +3. Last, we can reject the null hypothesis of normality referring to the relevant probabilities of the JB test. Overall, the heterogeneous outcome of the descriptive statistics yields the use of panel quantile regression method in this study.

This study applies CIPS and CADF unit root tests, which consider the presence of heterogeneity in the dataset. These approaches test the null hypothesis of homogeneous non-stationarity against the possibly heterogeneous alternatives. The results are given in Table 2. RENTS, GDPPPC, OPEN, GRFC, and nine different indices of financialization have no unit root (stationarity) at their first differences at 5% level of significance. Thus, the possibility of spurious regressions has been declined.

Table 3 shows the outcome of OLS and quantile regression estimators in which nine different indices of financialization are regressed on natural resource abundance (total natural rents), trade openness, per capita GDP, gross fixed capital formation. In other words, there are nine models, and accordingly nine dependent variables (FDI, FII, FMI, FIDI, FIAI, FIEI, FMDI, FMAI, FMEI) and four independent variables (RENTS, GDPPC, OPEN, GRFC). To begin, the coefficient of natural resource abundance (RENTS) is negative from the lower quantiles to the higher quantiles. Most of which are statistically significant at 5% level of significance. This empirical result supports the 'financial resource curse' hypothesis for resource-rich countries. Although this result is incompatible with Shahbaz et al. (2018), Niknamian (2019) and Zaidi et al. (2019), it is compatible with the findings of Bhattacharyya and Hodler (2014), Beck (2011), Yuxiang and Chen (2011), Mlachila and Ouedraogo (2019) and Asif et al. (2020). Also, results similar to Canh and Thong (2020) in terms of financial institutions, but they revealed that natural resources have a positive impact on financial market depth. The outcome is robust and reliable as this study uses some financialization (financial development) indicators from financial institutions and financial markets based on dept, access, and efficiency.

Table 2
Unit root tests.

	CIPS		CADF	
	Level	Diff.	Level	Diff.
RENTS	−2.03	−6.12*	−1.59	−3.26*
GDPPC	−1.50	−3.91*	−2.14	−3.14*
OPEN	−2.27	−5.23*	−2.40*	−3.35*
GRFC	−2.34*	−4.92*	−2.10	−3.93*
FDI	−1.79	−5.39*	−1.72	−3.11*
FII	−1.61	−4.27*	−1.38	−2.88*
FMI	−2.63*	−5.07*	−2.75*	−3.25*
FIDI	−1.91	−4.72*	−1.78	−2.74*
FIAI	−2.09	−3.83*	−1.99	−2.63*
FIEI	−1.66	−5.86*	−1.10	−3.51*
FMDI	−2.78*	−5.76*	−3.04*	−3.56*
FMAI	−3.68*	−5.15*	−2.69*	−3.39*
FMEI	−2.65*	−5.89*	−2.29	−3.08*

Note: * represents a 5% level of significance.

Evaluating the results in more detail, the negative impact of natural resources rents on the financial development index decreases towards high quantile levels. However, beyond this general effect, considering financial development in terms of institutions and markets highlights the importance of the results. First of all, it can be said that the financial resource curse hypothesis is felt more in the financial markets index. Looking at the distribution of effects on both financial institutions and financial markets in terms of depth, access, and effectiveness, the greatest negative impact in financial institutions is on depth index, while in financial markets is on efficiency index. According to the IMF's financial development index accounts, while financial markets are more about stock market indicators, financial institutions are components of banking-related indicators. It is a fact that stock markets are more sensitive to natural resources in these countries, especially in terms of depth and efficiency. Besides, the negative impact in financial institutions is most often seen in the depth index of financial institutions. The depth index within financial institutions includes credit to the private sector. Therefore, the view that borrowers can avoid paying their debts in resource-rich countries in the absence of strong institutions has been confirmed. In other words, although natural resource rents are perceived as an extra liquid in the markets, it is inevitable that the resource abundance harm to financialization without strong institutions. The same is true for the stock markets. Given the dependence of the countries concerned on natural resources in general, this feature leads to the volatility of commodity prices in these countries and means an insecure environment for private investors. On the other hand, both banking and stock markets are closely related. The insufficiency of the institutional system and political infrastructure disrupts the balance of debt-credit. In this case, both banks that fails to guarantee their credits and companies that have difficulty in repayment are in financial stress. Hence, liquidity increase and credit expansion caused by resource rents are a financial advantage, but the execution of contracts in this process without being supported by institutional and legal infrastructure leads to the verification of the FRC hypothesis. When evaluated in terms of the results obtained, it is a fact that financial problems arising from institutional and pollical failure in the banking sector are reflected in the stock markets through borrowed companies. In addition, the relatively greater impact of the FRC in the financial markets is a result of resource revenues that lead to corruption and rent-seeking in these countries. In such an environment, it becomes difficult to transfer resource revenues to the

Table 3
OLS and panel quantile regression results.

	Dependent Var.: FDI				Dependent Var.: FII				Dependent Var.: FMI			
	OLS	0.25	0.5	0.75	OLS	0.25	0.5	0.75	OLS	0.25	0.5	0.75
RENTS	−0.25*	−0.32*	−0.26*	−0.12*	−0.17*	−0.19*	−0.18*	−0.09*	−0.45*	−0.60*	−0.48*	−0.11
GDPPC	0.17*	0.18*	0.18*	0.24*	0.19*	0.23*	0.16*	0.19*	0.12*	0.05	0.10	0.24*
OPEN	0.16*	0.20*	0.23*	0.04	0.04	0.06	0.06	0.02	0.32*	0.33*	0.39*	−0.06
GRFC	0.59*	0.67*	0.52*	0.42*	0.47*	0.54*	0.32*	0.19	0.86*	0.75*	0.65*	0.69*
CONST	−4.49*	−5.20*	−4.66*	−4.21*	−3.91*	−4.69*	−3.24*	−2.90*	−5.54*	−4.75*	−4.90*	−4.70*
	Dependent Var.: FIDI				**Dependent Var.: FIAI**				**Dependent Var.: FIEI**			
	OLS	**0.25**	**0.5**	**0.75**	**OLS**	**0.25**	**0.5**	**0.75**	**OLS**	**0.25**	**0.5**	**0.75**
RENTS	−0.62*	−0.71*	−0.62*	−0.59*	0.05	−0.03	−0.02	−0.02	−0.02	−0.04	−0.01	−0.02
GDPPC	0.22*	0.27*	0.26*	0.19*	0.62*	0.71*	0.59*	0.31*	−0.01	0.02	0.01	−0.03
OPEN	0.34*	0.65*	0.48*	0.22*	−0.57*	−0.42*	−0.22*	−0.22*	0.32*	0.31*	0.23*	0.18*
GRFC	0.37*	0.23	0.51*	0.45*	0.08	−0.04	0.09	−0.06	0.74*	0.66*	0.66*	0.47*
CONST	−4.73*	−6.03*	−6.11*	−4.02*	−5.11*	−6.32*	−6.10*	−2.55*	−3.93*	−3.96*	−3.44*	−2.13*
	Dependent Var.: FMDI				**Dependent Var.: FMAI**				**Dependent Var.: FMEI**			
	OLS	**0.25**	**0.5**	**0.75**	**OLS**	**0.25**	**0.5**	**0.75**	**OLS**	**0.25**	**0.5**	**0.75**
RENTS	−0.58*	−0.63*	−0.54*	−0.21*	−0.32*	−0.57*	−0.09	0.03*	−0.50*	−0.71*	−0.56*	−0.21*
GDPPC	0.44*	0.44*	0.54*	0.55*	0.45*	0.45*	0.58*	0.51*	−0.04	−0.16*	−0.13*	−0.06
OPEN	0.99*	1.12*	0.69*	0.26*	0.01	0.44	−0.07	−0.10*	−0.08	−0.19	−0.05	0.04
GRFC	0.23	0.25	0.73	1.06*	1.78*	1.78*	1.12*	0.28	1.26*	0.91*	0.99*	0.52*
CONST	−9.19*	−9.99*	−10.6*	−10.1*	−11.1*	−12.8*	−9.96*	−6.28*	−3.52*	−1.01	−1.78	−1.26

Note: * represents a 5% level of significance.

private sector effectively and accurately.

When we focus on the effects of control variables on financial development, GDP per capita has a positive coefficient in all models except the model that FMEI is the dependent variable. While trade openness harms financial institutions' access index, financial markets access index, and financial market efficiency index, it affects other financial development indicators positively. Finally, gross fixed capital formation has a positive impact on all financial development indices except the financial institutions' access index.

5. Conclusions

Natural resources are a necessary factor for production responsible for the growth and development of countries. Today, the development of countries depends on their rich resources, technology, labor, and capital accumulation. On the other hand, resource richness sometimes causes some disadvantages. Therefore, this issue intensely debates in the literature, and especially the role of natural resource abundance in financial development has increased interest. In this paper, we analyzed the relationship between natural resources rents and financial development in eight resource-rich countries for the period from 1980 to 2017 using a panel quantile regression approach. The results of the analysis, which used nine different proxies as indicators of financial development, confirmed the validity of the financial resource curse hypothesis in all models. Besides, the fact that the effect levels differ according to quantiles and to the proxy of financial development used to bring up some policy implications for the countries under consideration.

When a comparison is made between financial markets index and financial institutions index it is understood that natural resources rents have a greater negative impact on financial markets. In terms of financial markets, this result emphasizes that natural resource rents play an important role in the deterioration of fund transfer mechanisms. While this negative impact on financial markets is mostly reflected in the efficiency, also the negative impact on depth and access draws attention. Therefore, natural resources rents should be used in capital markets in a way that prevents the fall of the stock market turnover ratio. Accordingly, the use of resource rents not only for an economic income but also for establishing a trusted environment for investors can be considered as an alternative policy. This is related to a strong financial infrastructure. Therefore, the efficient use of these revenues is a prerequisite for financial development. As a result, in resource-rich countries, natural resources rents make the financial structure fragile in every respect. The best way to prevent this is to adopt policies that do not lean on this resource richness. Priority should be given preventing corruption and rent-seeking in resource-rich countries.

The results achieved in terms of financial institutions also raise similar policies. The important here is to ensure that resource rents are channeled into the economy in a way that does not harm the domestic credit system. That is, it may be necessary to eliminate the perception of extra liquidity arising from resource rents. Therefore, it may be suggested to use this revenue as an indirect contribution to financial development. The use of this revenue in policies that support sectoral (especially manufacturing) development, such as physical capital investment, is an option for financial development. In this way, it is ensured that extra liquidity is kept under control while rent revenue is transferred to the main sectors of the economy. Strengthening the economy at the sectoral level means guaranteeing the payments of the borrower companies in the domestic credit system. Beyond that, the primary way for resource-rich countries to use these resources to increase their economic and financial development is to create a strong institutional structure. An institutional infrastructure that facilities banks to provide credit to firms rather than households and protects the rights of lenders and borrowers undoubtedly relatively eliminates the effects of FRC in resource-rich countries.

When the effects on financial markets and institutions are evaluated together, the use of revenue obtained from natural resources rents as the financing of the private sector and/or investments in the private sector eliminates the negative impact on the stock market while combating the financial resource curse hypothesis in banking-side. With these proposed policies, an indirect contribution is provided especially for exporting companies to achieve a trade advantage. At the same time, a financially improving private sector means a strong stock performance. These developments also encourage foreign investments to enter the domestic markets. Hence, although the effect of FRC on the financial markets is more intense, it is inevitable to implement simultaneous policies for the stock markets and the banking sector.

Author statement

Eyup Dogan: empirical analysis, results, supervision; Mara

Madaleno: introduction, review; conclusion; Buket Altinoz: methodology, results; conclusion

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