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The analysis of 'Financial Resource Curse' hypothesis for developed countries: Evidence from asymmetric effects with quantile regression

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ABSTRACT

A vast body of literature either proxies natural resource abundance with total rents or focuses on the natural resource curse hypothesis. Furthermore, most empirical studies in the literature use traditional estimation methods. To fill the mentioned gaps, this study investigates the financial resource curse hypothesis by using the linkage between financial development and four natural resource rents (oil rents, coal rents, forest rents and natural gas rents) and applying the panel quantile regression with fixed effects on a dataset for a group of developed countries. This study finds that oil rents, coal rents, forest rents and natural gas rents have a positive effect on financial development, which supports financial resource blessing against financial resource curse for developed countries. In addition, a robust examination is conducted by applying the Canay two-step framework. The outcomes verify the main findings although the incremental effect on financial development of forest rents is greater than the other three proxies. This situation can be described as critical for the sustainability of developments related to natural resource rents in financial development and new set of suggestions can be made for policymakers.

1. Introduction

Most countries are heavily dependent on natural resources especially in the early stages of economic development. The natural resource abundance facilitates the import of capital and technology inputs required for domestic production, which causes an increase in labor efficiency (Barbier, 2005). Moreover, the export of primary goods made with natural resources provides a comparative advantage to countries and also contributes to obtaining foreign exchange revenues (Khan et al., 2019). Therefore, there is a common view that natural resources mean power, wealth and welfare. The basis of this view is the change in the use of energy sources, which is considered to be the most important cause of the industrial revolution (Kneese, 1988). However, the opposite evidence obtained in some studies turns the contribution of natural resources to develop into a dilemma (Sachs and Warner, 2001; Auty, 1993).

The function of natural resources in economic growth has a long history and undeniable significance, which is mainly addressed within the framework of the natural resource curse (NRC) hypothesis. The relationship between natural resources and growth/development is widely discussed in the literature (Gylfason, 2001; Stijns, 2005; Brunnschweiler, 2008; Arezki and Van der Ploeg, 2011; Bah, 2016; Moshiri and Hayati, 2017; Zalle, 2019). This relationship named as the NRC assumes that natural resource abundance is a risk for economic growth. Undoubtedly, the risks brought by natural resources addressed in four groups support this view. First, the natural resource abundance increases raw material exports and damages the export of other goods and services (Corden, 1984). The second is the proliferation of rent-seeking activities from natural resources raises the corruption, which causes institutional inefficiency (Bardhan, 1997; Baland and Francois, 2000; Peterman et al., 2007). Third, the natural resource abundance causes managers to feel excessive self-confidence, and thus leads to ineffective economy management (Sachs and Warner 1995). Last, it is not given enough importance to the investments such as human capital since natural resources cause an optimistic and reassuring view for future (Gylfason, 2001). However, the view on the effect of natural resources on growth is realized through financial channels that have recently gained an increasing interest (Shahbaz et al., 2018).

The more specific approach to the discussion in the context of financial development gains a new perspective on the literature by

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bringing the financial resource curse (FRC) hypothesis to the agenda. Studies investigating the FRC hypothesis are relatively more current and limited (Hattendorf, 2014; Badeeb, 2016; Mlachila and Oudraogo, 2019; Asif et al., 2020). Handling the resource curse in the context of financial development clarifies some problems. First, it brings a conceptual innovation. Second, the possible effects of natural resources on the financial market are also crucial for long run growth because financial development is an important dynamic of economic growth. Last, the relationship gives a new approach to the causes of differences in financial development among countries or regions (Yuxiang and Chen, 2011). The studies in the literature generally suggest that the resource-rich countries have lower financial development as seen in Beck (2011), and Bhattacharya and Holder (2014). This result is widely related to the inability to integrate resources with other sectors of the economy, weakness in governance, the prevalence of rent-seeking and corruption, and the ineffectiveness of financial and human resources management (Mlachila and Ouedraogo, 2019).

The FRC hypothesis evokes possible connections between natural resources and financial development. Resource revenues increase liquidity, making it easier for banks to provide credits to households and firms, and so contribute to financial development. A strong institutional and political infrastructure, which is beneficial for economic and financial development in a resource-rich country, may be expected. In this case, the negative influence of resource revenues on financial development is reduced through the control mechanisms provided for the issuance and implementation of contracts between creditors and debtors. On the contrary, in the absence of a well-functioning institutional system and political infrastructure, difficulties arise in the implementation of contracts and the repayment of debts (Dwumfour and Ntow-Gyamfi, 2018). Additionally, it is another possibility that in resource-rich countries, the development of the manufacturing sector, which is thought to be necessary to reach a better economic situation, is not given enough attention. The most important reason for this is that natural resources are an easier alternative to earn revenue. Admittedly, insufficient focus on sectoral development leads to the neglect of the credit system and the institutional infrastructure, and harms to financial development (Bhattacharya and Hodler, 2014). Moreover, although natural resources rents are an important income source for countries, poor institutional performance in the financial system prevent this income from being transferred to the private sector effectively and accurately (Asif et al., 2020). In other words, the existence of the natural resources-financial system-economic growth cycle can be mentioned. The reflection of natural resources on economic growth/development is realized mainly through the financial system. Thus, testing the FRC hypothesis gives a new direction to political decision processes for the management of natural resources and its revenues.

Some different proxies are used for natural resources in the FRC literature. For instance, total natural resource rents (Bhattacharya and Hodler, 2010; Dwumfour and Ntow-Gyamfi, 2018; Guan et al., 2020; Li et al., 2020; Sun et al., 2020; Khan et al., 2020a), natural resources exports (Beck et al., 2011), mineral extraction (Yuxiang and Chen, 2011), oil and gas rents (Quixina and Almeida, 2014; Badeeb et al., 2016), oil and gas prices (Rustamov and Adaoglu, 2018). In other words, a vast body of literature proxies the natural resource abundance with total natural resource rents and thus the use of disaggregated components of total rents is commonly neglected content in the literature (Asif et al., 2020). Therefore, to decide whether each of natural resource rents suggests financial development curse or blessing presents a robust evidence for policymakers. Another shortcoming of the literature is the coverage. These studies commonly cover developing countries to test both the NRC (Mavratos et al., 2011; Hamdi and Sbia, 2013; Ji et al., 2014; Bah, 2016; Hassan et al., 2019) and the FRC (Yuxiang and Chen, 2011; Quixina and Almeida, 2014; Badeeb et al., 2016; Rustamov and Adaoglu, 2018; Asif et al., 2020; Guan et al., 2020; Li et al., 2020; Khan et al., 2020a; Sun et al., 2020). However, natural resources are an important component of welfare in developed countries such as the UK and Ireland during the first industrial revolution. Overall, the literature on the testing the resource curse for developed countries is limited (Shahbaz et al., 2018) and thus especially analysis of the FRC hypothesis for developed countries is of great importance to the existing literature.

The other subject of consideration to discuss is the methodology that the existing studies use. The estimation methods widely used in the NRC/FRC literature is based on the ordinary least squares (OLS) (Gylfason, 2001; Stijns, 2005; Brunnschweiler, 2008; Arezki and Ploeg, 2011; Moshiri and Hayati, 2017; Hattendorf, 2014); the two-stage least squares (Brunnscweiler, 2008; Hattendorf, 2014); feasible generalized least squares (Mavrotas et al., 2011); the generalized method of moments (Mavrotas et al., 2011; Yuxiang and Chen, 2011; Hattendorf, 2014; Moradbeigi and Law, 2016; Dwumfour and Ntow-Gyamfi, 2018); the OLS with fixed and random effects (Alexeev and Chernyavskiy, 2015; Amini, 2018; Hattendorff, 2014; Moradbeigi and Law, 2016); the fully-modified OLS (Rustamov and Adaoglu, 2018); the augmented mean-group and the mean-group (Sun et al., 2020; Li et al., 2020). These parametric methods only provide the conditional expectation (mean value) of the dependent variable and thus fail to present the whole picture of a conditional distribution. However, a quantile regression more accurately estimates the effects of all independent variables on the variation range and the shape of the conditional distribution of the dependent variable (Apergis et al., 2018; Wang et al., 2019; Xi et al., 2020). Furthermore, the quantile regression approach is robust to outliers, skewed distributions and heteroskedasticity (Xi et al., 2020; Alsayed et al., 2020). Moreover, the quantile regression technique is not symmetric gives more effective results than the OLS when the structure of response variable is not symmetric. Despite its advantages, the application of the quantile regression method is limited in the FRC/NRC literature. (Gerelmaa and Kotani, 2016; Sinha and Sengupta, 2019; İke et al., 2020). Last, apart from the FRC/NRC literature, the quantile regressions have been recently used in the energy/environment/finance literatures (Zhu et al., 2016; Albulescu et al., 2019; Salman et al., 2019; Khan et al., 2020b).

In light above discussions and considerations, this study contributes to the existing literature in several aspects. **First,** as far as we are aware, this study is the first attempt to analyze the effects on financial development of natural resources by using different indicators such as coal rents, forest rents, natural gas rents and oil rents for a group of developed countries. In this way, the complex structure of the resources is elaborated to some extent and results thus provide relatively detailed implications in policy-making processes. **Second,** the financial resource curse hypothesis is investigated to put forward whether resource endowment is a curse or blessing towards the financialization of developed countries. **Third,** this paper methodologically contributes to the existing literature. This paper is an attempt to apply the asymmetric effect with panel quantile regression with fixed effect to explore the FRC hypothesis. This quantile method is preferred as the dataset is relatively small, non-normality exists especially in the dependent variable (financial development) and heterogeneity is detected in the analyzed dataset across the sample countries. This method has more comprehensive outcomes owing to the report of the conditional distribution not only at the mean levels (like traditional approaches) but also at the upper and lower levels. This insinuates that the policymakers will have a profoundly understanding of the connection between financial development and natural resources abundance. **Fourth,** this study focuses on developed countries unlike the existing body of literature. Addressing the financial performance of these countries, which are both economically and financially in good condition in terms of natural resources, gives information about whether these countries are exposed to the resource curse. The policies that need to be implemented in these countries turn the resource abundance into an economic advantage that is handled by policymakers in a more sophisticated approach, which allows for more successful policies to be implemented.

The study is constructed as follows. Section 2 covers a current empirical literature review natural resource curse and financial resource

curse hypothesis. In Section 3, the dataset and model are introduced, and the methodology is explained. In the fourth section, empirical findings are provided and discussed. The last section concludes the study and puts forward some policy implications.

2. Literature review

The relationship between natural resources and growth/development is widely discussed in the literature, but studies investigating the FRC hypothesis are relatively limited. In this section, studies examining these relations are examined under separate titles.

2.1. Literature review on the 'Natural Resource Curse' hypothesis

The natural resource curse hypothesis is widely discussed in the resource-growth literature. Sachs and Warner (2001) confirmed the existence of the NRC hypothesis, it means that resource-rich countries have lower growth rates. Gylfason (2001) investigated the nexus, including education; and their results in line with Sachs and Warner (2001). Accordingly, the greatest risk is that resource-rich countries over-trust this natural capital and neglect the development of human capital. Similarly, Arezki and Van der Ploeg (2011) reached conclusions that support the hypothesis of the curse of natural resources theoretically advocated. Mavrotas et al. (2011) searched the natural resources and economic growth nexus in developing countries for the 1970–2000 periods. The main findings illustrated that natural resource dependence harms to growth in the long run by delaying institutional development. Satti et al. (2014) researched the hypothesis in Venezuela by using the ARDL and the VECM methods for the 1971–2014 data period. Long-term analysis results supported the NRC hypothesis. Also, Tiba (2019) for 21 African countries, Tiba and Frikha, 2019 26 African countries, Ding and Field (2005) for 87 countries confirmed the NRC hypothesis.

On the contrary to the validity of NRC hypothesis, Alexeev and Chernyavskiy (2015) explored the relationship between natural resources and growth at the regional level for Russia, and no negative effect of natural resources on growth was found in the study. Stijns (2005) tested the low-income level caused by the richness of natural resources for the period from 1970 to 1990 by using Ordinary Least Squared (OLS) regression analysis. Accordingly, natural resources have both positive and negative effects on the economy. Brunnschweiler (2008) also investigated the relationship using OLS and 2SLS methods. Analysis results illustrated that a positive and direct empirical relationship among natural resource abundance and economic growth. Mideksa (2013) explored the economic impact of natural resources, and found that petroleum resources increase GDP. Ji et al. (2014) analyzed the nexus among natural resources, institutional quality and growth in China for the 1990–2008 data period. The empirical results proved that natural resources have a positive impact on growth due to institutional quality at the provincial level. Gerelmaa and Kotani (2016) illustrated that the natural resource abundance in 1990 had positive impacts on growth between 1990 and 2010. Bah (2016) reached same result for Sierra Leone. Jović et al. (2016) reinvestigated the same relationship for European Union countries. The results of this study, which focuses on five different categories of natural resource rents, showed that forest rents had the highest share in GDP. Hassan et al. (2019) discussed the effect of globalization and natural resources on economic growth in Pakistan for 1970–2014 data period. The results of the study using the ARDL analysis method suggested that natural resources contribute to economic growth. Moshiri and Hayati (2017) studied for 149 countries. Their results showed that the NRC hypothesis is invalid. A different result obtained by Sinha and Sengupta (2019). They used the human development index as proxy for economic development and analyzed the NRC hypothesis in the context of globalization, using panel quantile regression. Their results revealed that in absence of globalization, natural resources rents have positive impact on the human development index, whereas in presence of globalization, natural resources rents have a negative impact on development in 30 Asia Pacific countries.

Hamdi and Sbia (2013) dealt with the relationship in the context of causality for Algeria. Their results revealed that there is bidirectional causality between natural resources rents and economic growth both in the long and short run. Amini (2018) studied for 22 advanced countries and 61 underdeveloped and developing countries, and did not find any relationship between natural resources and growth. Zalle (2019) argued that African countries should invest in human capital and reduce corruption to reverse the NRC hypothesis.

2.2. Literature review on the 'Financial Resource Curse' hypothesis

Although studies that test the NRC hypothesis are frequently encountered in the literature, the subject of FRC has also become popular recently. Bhattacharyya and Hodler (2014) tested the FRC hypothesis in 133 countries for the period from 1970 to 2005. Their results explain the effect of natural resources on financial development with the institutional structure. Accordingly, the FRC hypothesis confirmed in institutionally weak countries. Beck (2011) explored this hypothesis for resource-based economies. Findings showed that the FRC hypothesis is valid in such countries. Yuxiang and Chen (2011) investigated the relationship among resource abundance and financial development by using provincial panel data of China, and found that a negative impact of mineral resource abundance on financial development. Hattendorff (2014) examined this hypothesis in the context of export concentration. They found that this abundance in resource-rich countries harmed private credits by increasing the export concentration. Quixina and Almeida (2014) analyzed the financial development-economic growth nexus for Angola, a resource-rich country. Evidence implied that there is an insignificant causal relationship between financial development and oil and non-oil revenues. Badeeb et al. (2016) searched the existence of an oil curse in the linkage between financial system and economic growth in Malaysia. They suggested that oil rent revenues have a weak and indirect impact on the finance-growth nexus. Moradbeigi and Law and Moradbeigi (2017) tested the relationship among growth volatility and the resource curse in 63 oil-producing countries for the 2000–2010 data period. Results illustrated that there is a negative link between oil terms of trade volatility and growth. Mlachila and Quendraogo (2019) argued the FRC hypothesis in 68 resource-rich countries, considering the role of commodity price shocks, and confirmed the FRC hypothesis after commodity price shocks. Dwumfour and Ntow-Gyamfi (2018) revealed that the impact of resource abundance on financial development depends on the indicator of financial development used in African economy for the 2000–2012 data period. Rustamov and Adaoglu (2018) investigated the relationship between fossil energy sources, oil production cost, financial development and economic growth in Russia. Their results demonstrated that a unidirectional causality between oil prices and economic growth, while a unidirectional causality from financial development to economic growth. Shahbaz et al. (2018) analyzed the role of natural resource abundance in financial development in the USA for the period from 1960 to 2016. Their results confirmed that natural resource abundance has a positive impact on financial development in the long run, provided that optimal resource utilization is available. Asif et al. (2020) discussed the relationship between financial development and natural resources using different financial development proxies in Pakistan over the period 1975–2017. Their main results revealed the negative impact of natural resources rents on domestic credit to the private sector (financial development). Empirical evidence stated the validity of the FRC hypothesis. Guan et al. (2020) tested the relationship with a new perspective in the context of globalization. The ARDL analysis results suggested that natural resource rents have a negative and statistically significant impact on financial development in China. The FRC hypothesis for China was also confirmed by Khan et al. (2020a). Similarly, Li et al. (2020) reached the same results for N-11 countries for the period from 1990 to 2017, using Augmented Mean Group and Mean Group estimators. Sun et al. (2020)

confirmed the validity of the FRC in E−7 countries.

3. Data and methodology

3.1. Data

A panel data of eleven developed countries is employed in order to investigate the underlying asymmetric behavior between financial development and the natural resource abundance for the period 2001–2017. The aforementioned developed countries are: Australia, Czech Republic, Germany, Italy, Japan, Korea, New Zealand, Norway, Spain, United Kingdom (UK) and United Stated (USA)[1]. Furthermore, our sample encompass ten covariates by adopting the specifications Sachs and Warner (1997), Yuxiang and Chen (2011), Shahbaz et al. (2018) and Asif et al. (2020). The dependent variable is the financial development (FD) measured from domestic credit to private sector (DCPS), and the main independent variables are coal rents (CRENTS), forest rents (FRENTS), natural gas rents (NGRENTS), and oil rents (ORENTS). Furthermore, control variables are gross fixed capital formation (GFCF), GDP per capita (GDPPC), trade openness (TOP), Chinn-Ito index of financial openness (FOP) due to Chinn and Ito (2006)[2], and this study uses the "world governance index (WGI)" and more accurately the "rule of law" (Gerelmaa and Kotani, 2016) to take into consideration a vital aspect that portray the transmission channels of the resources curse phenomenon such as the institutional quality (Sachs and Warner, 1999, 2001). All the variables are depicted as per capita level. We converted the annual series into quarterly series by employing a quadratic match-sum method[3], consequently, our sample contains 748 series. Last, all data have been drawn from the World Development Indicators (https://datacatalog.worldbank.org/).

3.2. Panel quantile regression with fixed effect

Koenker and Bassett (1978), extended the standard regression by proposing the quantile regression. Conducting an entire picture of the conditional distribution, quantile regression demonstrates adequate outcomes for the authors in contrast to the standard regression which measures only the conditional mean. Deeming two variables (d_i *and* c_i), the quantile regression can be displayed as follows:

$$Q_{d_i}(\tau|c_i) = c_i^T \beta_\tau, \tag{1}$$

Quantile regression can justify better the conditional distribution by investigating the interconnectedness between the variables in the upper and lower levels but it cannot account for the unobserved heterogeneity of a country. Hence, in our study we apply a panel quantile method with fixed effects so as to reckon the conditional heterogeneous covariance effects of FD and natural resources. According to the relevant literature many authors have documented panel quantile framework (Koenker, 2004; Harding and Lamarche, 2009; Lamarche, 2010; Galvao, 2011, Canay, 2011; Kato et al., 2012). By and large, we can describe a fixed effect panel quantile framework with the below form:

$$Q_{d_i}(T_k|a_{it}c_{it}) = a_i + c_{it}^{'}\beta(T_k), \tag{2}$$

Although, the vital issue by employing that pattern is the incidental parameters since it includes a large number of fixed effects (Lancaster, 2000). The estimator will be inconsistent when the number of cross-sectional units goes to infinity while the number of observations for each cross-sectional unit is fixed (Galvao and Kato, 2016). The standard demeaning (or differencing) approaches to eliminate unobserved fixed effects is unfeasible in the quantile regression model. These methods rely on the fact that expectations are linear operators, which is not the case for conditional quantiles (Canay, 2011). In order to eliminate this issue, Koenker (2004) calculated the unobservable fixed effects as parameters. By using this approach, the author reckoned the parameters with the covariate effects for different quantiles. Precisely, parameters can be defined as:

$$\min_{(\alpha,\beta)} \sum_{k=1}^{K} \sum_{t=1}^{T} \sum_{i=1}^{N} r_k z_{T_k} \left(d_{it} - a_i - c_{it}^T \beta(T_\kappa)\right) + \lambda \sum_{i}^{N} |a_i|, \tag{3}$$

in the equation (3), N is the countries, T is the dataset per country, K is the quantiles, c denotes the matrix of expository variables, z_{T_k} shows the quantile loss function and r_k displays the weighted quantiles. In addition and following Alexander et al. (2011) and Lamarche (2011) r_k is equal with $1/K$. Lastly, following Damette and Delacote (2012), we set $\lambda = 1$. Consequently, and in light of the above-mentioned analysis, the modified panel quantile regression pattern can be displayed as follows:

$$Q_{HP_t}(T_k|a_{it}c_{it}) = a_i + \beta_{1\tau} Y_t + \beta_{2\tau} PSHS_t + \beta_{3\tau} EM_t + \beta_{4\tau} POP_t \tag{4}$$

The description of the variables is yielded in the section (2.1). Finally, we defined three sections of quantiles, the lower quantiles (0.05, 0.10 *and* 0.25), mean quantile (0.50) and upper quantiles (0.75, 0.90 *and* 0.95).

4. Empirical findings

In the beginning, the descriptive statistics are tabulated in Table 1. Especially, observing the outcomes of the skewness and the kurtosis, we can mention that kurtosis coefficients of almost all covariates are bigger than three implying the unconditional distribution of the variables. Furthermore, we should examine more carefully the distribution of the dependent variable. Consequently, Fig. 1 plots the histogram (with the kernel density) of the financial development. The chart portrays the non-normal distribution of financial development. In conjunction with the previous evidence, we apply two normality tests: the Jarque–Bera test (p-value: 0.00) and the Shapiro-Wilk test (p-value:0.00). At 1% level of significance, both tests reject the null hypothesis of normality for the dependent variable (DCPS), which refers to the non-normal distribution of financial development. Hence, a quantile regression approach produces more robust estimation results than conventional panel data analysis (Koenker and Bassett, 1978; Koenker, 2004). Additionally, the stationary test is also depicted in Table 1. By applying two-unit root tests, lm et al. (2003) and Pesaran (2007), we discern that each examined variable (dependent and independent) is stationary (at first differences) as the hypothesis of unit root is rejected at 1% level of significance.

The next step is the estimation of long-run cointegration between the dataset for our sample countries. Therefore, we employ the heterogeneous panel cointegration test of Pedroni (1999). This test considers the heterogeneity among the covariates varied across developed countries and is based on seven tests. The findings are tabulated in Table 2. Arguably, all seven test statistics reject the null hypothesis of no cointegration at 1% significance level. The analyzed dataset thus has a long-run relationship.

The results from the OLS with fixed effects (FE, column 2) and the quantile regression (column 3–9) are illustrated in Table 3. The Hausman test is used in order to choose between fixed and random effects (Green, 2008). Primarily, the FE results show that all the variables, excluding for GFCF, TOP, WGI and FOP, have strong significant impacts on financial development. Hence, as noted, the FE results are not robust since calculates are solely the conditional mean. Therefore, panel quantile method with fixed effects is conducted and estimated in seven quantiles (0.05, 0.10, 0.25, 0.50, 0.75, 0.90 *and* 0.95). Moreover, we categorize these seven quantiles at five groups; lower quantiles (0.05 *and* 0.10), middle lower quantile (0.25), middle quantile (0.50), middle upper quantile (0.75) and upper quantiles (0.90 *and* 0.95). Ostensibly, the outcomes (Table 3) imply that the influences of the covariates on financial development are distinctly heterogeneous.

Particularly, a strong effect of CRENTS, FRENTS and NGRENTS on DCPS is disclosed at lower (only at 0.05 level), middle lower and middle quantiles. When it comes to ORENTS the findings have a slight

Table 1
Descriptive statistics and unit root test.

	DCPS	CRENTS	FRENTS	NGRENTS	ORENTS	GFCF	GDPPC	TOP	WGI	FOP
Mean	117.941	0.182	0.095	0.299	0.799	22.989	38123.86	62.079	1,41	1,973
Std. dev	44.413	0.397	0.16	0.641	1.983	4.182	18.016673	28.752	0.458	0.57
Maximum	209.43	3.233	0.907	3.36	9.767	31.575	103.148245	160.265	2.04	2.346
Minimum	21.747	−0.001	0.003	−0.05	−0.03	15.351	6.345393	19.61	0.262	0
Skewness	−1.000	−0.336	0.469	−0.330	−0.178	0.013	−0.397	−0.077	−1.001	−0.337
Kurtosis	1.901	−2.671	−2.650	−3.029	−3.091	−2.892	2.774	−3.072	0.902	−0.671
Pesaran (2007) unit root test Level	−1.261	−1.651*	−1.419	−1.656*	−1.023	−1.576*	−0.956	−1.757**	−0.903	−1.113
Pesaran (2007) unit root test First difference	−4.207***	−5.013***	−4.839***	−4.038***	−3.963***	−4.111***	−4.179***	−4.233***	−4.565***	−4.961***
Im et al. (2003) unit root test Level	−2.845**	−1.065	−2.121*	−2.790**	−1.997*	−2.421*	−1.549	−1.331	−1.106	−1.003
Im et al. (2003) unit root test First difference	−13.940***	−12.844***	−15.113***	−14.513***	−11.030***	−13.645***	−15.003***	−12.565***	−11.352***	−12.862***

Note: ***, ** and * denote significant at 1%. 5% and 10% level.

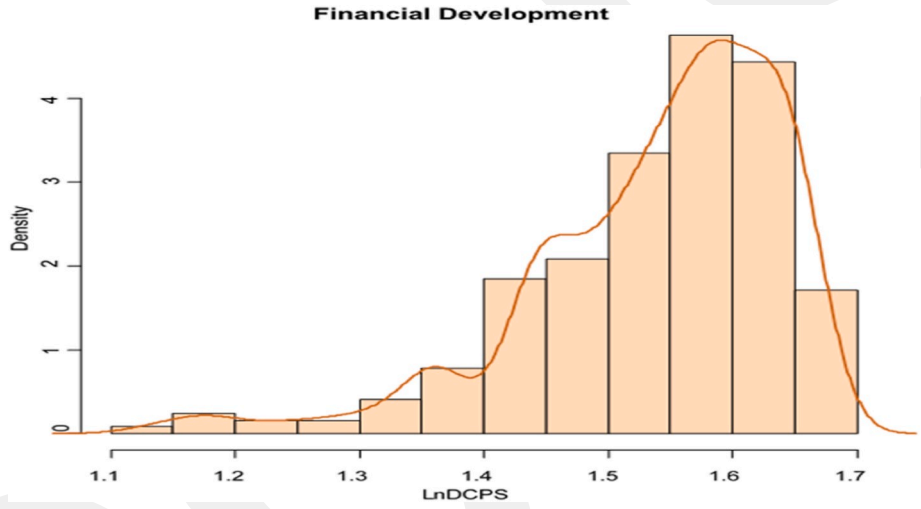

Fig. 1. Histogram and kernel density for financial development.

Table 2
Pedroni (1999) panel cointegration tests.

Panel test statistics		Group mean panel test statistics	
Panel v-statistic	40.13*	Group p-statistic	−41.74*
Panel p-statistic	−41.43*	Group PP-statistic	−42.81*
Panel PP-statistic	−41.91*	Group ADF-statistic	−7.90*
Panel ADF-statistic	−7.79*		

Note: * denotes the rejection of the null hypothesis of no cointegration at the 1% percent significance level.

difference. We can also observe a strong impact of natural resources on financial development at middle upper quantile (0.75). These findings are opposition to the FRC hypothesis and in line with the financial resource blessing hypothesis such that there is a positive linkage between financial development (FD) and the natural resource abundance (natural resource rents). Moreover, our outcomes endorse the results of Kurronen (2015), Moradbeigi and Law (2016) and Shahbaz et al. (2018). This result implies that the liquidity provided by the revenues from natural resources is effectively channeled into the economy. In other words, natural resources rents mean a capital flow for the group of developed countries. This flow strengthens banks' ability to provide funds by increasing their deposits. Thus, natural resources rents lead to credit expansion in a way to support the financial development of the sample countries. However, the impact of institutional development is undeniable in this blessing. Also, this blessing disappears in middle upper and upper quantiles. This result indicates that the natural resource rents obtained by countries with high financial development above the middle quantile level may damage the deposit mechanism. Therefore, with the increase in the level of financial development, developed countries should more seriously manage to natural resource rents. Concerning the control variables, initially the variables WGI and FOP have hardly the same reaction on financial development. In particular, we can observe that both variables have positive and significance effect on financial development at middle lower, middle and middle upper quantiles, also, FOP has same effect at upper quantiles. When the heterogeneous effects of both variables are considered together with the effects of natural resource variables, it is noteworthy that natural resource rents in middle lower and middle quantiles have an effect supported by the institutional structure. Besides, as a result of financial openness at high quantiles, the decline of the impact of natural resources within the complex structure of the financial system is acceptable. Moreover, intriguingly, the outcomes of the variables GDPPC and TOP have positively significant on DCPS (financial development) at lower (0.05 *and* 0.10), middle lower (0.25), middle (0.50), and middle upper quantile (0.75), however, GDPPC has weak effect (only at 10% level) at

Table 3
Panel quantile regression results for developed countries.

	Fixed Effects	Quantiles					
	FE	0.05	0.10	0.25	0.50	0.75	0.90	0.95
intercept	2.002***	2.687***	2.496***	2.186***	2.251***	2.621***	2.857**	3.009**
CRENTS	0.048***	0.017**	0.023*	0.027**	0.031***	0.037	0.033	0.024*
FRENTS	0.165***	0.009**	0.007*	0.008**	0.010***	0.006	0.005	0.005*
NGRENTS	0.098**	0.004**	0.003*	0.001**	0.001***	0.001	0.001	0.002*
ORENTS	0.047***	0.011*	0.015*	0.016*	0.015**	0.014**	0.012	0.014*
GFCF	0.093	0.156***	0.157***	0.118***	0.201**	0.207	0.200	0.119
GDPPC	0.245***	0.334***	0.378***	0.324***	0.300***	0.274*	0.231*	0.241*
TOP	0.047	0.008***	0.015**	0.019***	0.106***	0.141**	0.185	0.194
WGI	0.031	0.150	0.155	0.085***	0.055***	0.064***	0.162	0.186
FOP	0.012	0.053	0.076	0.126***	0.232***	0.286***	0.291**	0.289**
$H_o : \beta_{1\tau} = \beta_{2\tau}$	4.44**	12.12***	22.12***	28.90***	28.44***	24.66***	3.23**	3.01**
$H_o : \beta_{1\tau} = \beta_{2\tau} = 0$	32.96***	93.83***	60.54***	24.06***	44.64***	72.83***	3.12**	2.99**

Note: ***, ** and * denote significant at 1%. 5% and 10% level.

upper quantiles. Also, they have strong significance at 5% level at least, implying the effect of GDPPC and TOP on FD. On the other hand, GFCF emerges powerful positive influence on DCPS and significant at lower, middle lower, middle levels of quantiles, impact on financial development. A conceivable interpretation of these results is that heterogeneity or that quantile regression measures profoundly the conditional distribution (with lower and upper quantiles). The results are in tandem with the anticipated hypothesis that there is a positive connection between per capital income or/and trade openness and country's FD. Furthermore, this result supports the findings of Papryrakis and Gerlagh (2004), Asif and Majid (2018), Elhedded (2019) and Asif et al. (2020) who verified the positive relationship between the aforementioned variables. Lastly, the graph analysis is conducted by assessing the standard errors via the bootstrapping (10,000 replications) process. The results are depicted in Fig. 2.

In order to double check, the heterogeneity of the parameters, the Wald test is implemented. Thereby, two null hypotheses are postulated, $H_o : \beta_{1\tau} = \beta_{2\tau}$ and $H_o : \beta_{1\tau} = \beta_{2\tau} = 0$. The first one implies non-linearity at all quantiles and the second one insinuates that the coefficients $\beta_{1\tau}$ *and* $\beta_{2\tau}$ are equivalent to zero. Albeit the results of Table 3 delineate mainly non-linearities at lower and middle quantiles, although, we have strong positively significant (at 5% level) behavior at the upper levels due to the natural resources variables (weak evidence but still significance at 10% level). Consequently, this latter outcome proves the nonlinearity of two Wald tests at all levels.

Conducting a robust examination in our inquiry, we can have more valid results. Hence two panel quantiles regressions are performed. First, by applying the two-step framework according to Canay (2011) and second, by carrying out various λ values. Regarding the results based on Canay (2011) pattern (Table 4) are almost unchanged except for slight differences. Notably, it is statistically insignificant at lower quantiles and middle lower quantiles (or weak significant, only at 10% level) for the natural resource variables. Moreover, the WGI variable reveals strong evidence at middle upper quantiles and weak significance at 90th quantile. Concerning the λ values estimated with various prices from 0.1 to 1. Due to the limitation of the space, in Table 5 is reported only the estimation of $\lambda = 1\lambda$. Interestingly enough, studying the outcomes for $\lambda = 1$ is the attitude of the intercept, changing in contrast to principal results (Table 3). We can observe that is positively significant at the lower and mean levels and do not support the significance at upper quantiles. Moreover, variables FRENTS and GDPPC (except for 90th quantile) are significance at all levels, albeit FRENTS has weak significance at upper quantiles. Finally, both robustness checks emerge non-linearity at lower and middle quantiles for both null hypothesis ($H_o : \beta_{1\tau} = \beta_{2\tau}$ and $H_o : \beta_{1\tau} = \beta_{2\tau} = 0$).

5. Conclusions and policy implications

Natural resources play an active role in developed countries to reach current technology and welfare level. Developed countries with abundant capital and natural resources are more successful in making effective use of natural resources. Moreover, developed countries can attract and process natural resources to their countries thanks to their technical and economic infrastructure. However, despite this importance of natural resources, its possible unexpected effects on both the real sector and the financial sector are discussed in the literature. In this study, the link between natural resources and financial development is examined for developed countries using panel quantile regression approach with fixed effect during the period 2001–2017. In other words, the financial resource curse (FRC) hypothesis is investigated, which implies that natural resources have a decreasing effect on financial development.

The results confirm the invalidity of the FRC hypothesis in developed countries. Thus, it is understood that natural resource rents have a positive effect especially in middle lower and middle quantiles. This result means that developed countries with financial development at these quantiles effectively channel their natural resource revenues into the financial structure. It also shows that at these quantile levels, natural resources rents do not harm the institutional structure and that the current institutional structure is not adversely affected by the increase in liquidity caused by natural resource rents. In broad terms, the findings imply heterogeneity linkage between the natural resource abundance and financial development in developed countries and that asymmetry may be one of the keys of the FRC hypothesis. When this positive effect is compared in terms of size, the improving effect of forest rents is greater than the other three proxies. This result confirms once again the existence of a strong institutional structure of developed countries at middle lower and middle quantiles. On the other hand, it can be said that this positive impact becomes insignificant at high quantile levels. This situation can be described as critical for the sustainability of developments related to natural resource rents in financial development and new set of suggestions can be made for policymakers. Respecting the control variables, notably, on one hand are the results of the capitalization and growth factor, both of them have positively significant on financial development at lower, middle lower, middle and middle upper quantile, however, capitalization has weak effect at upper quantiles. Lastly, a robust examination is conducted applying the Canay two-step framework. The outcomes verified the main findings, although the improving effect of forest rents is greater than the other three proxies.

The overall empirical investigations developed in this study draw several interesting findings and some general policy recommendation. Additionally, the reflection of natural resources on economic growth/development is realized mainly through the financial system. Therefore,

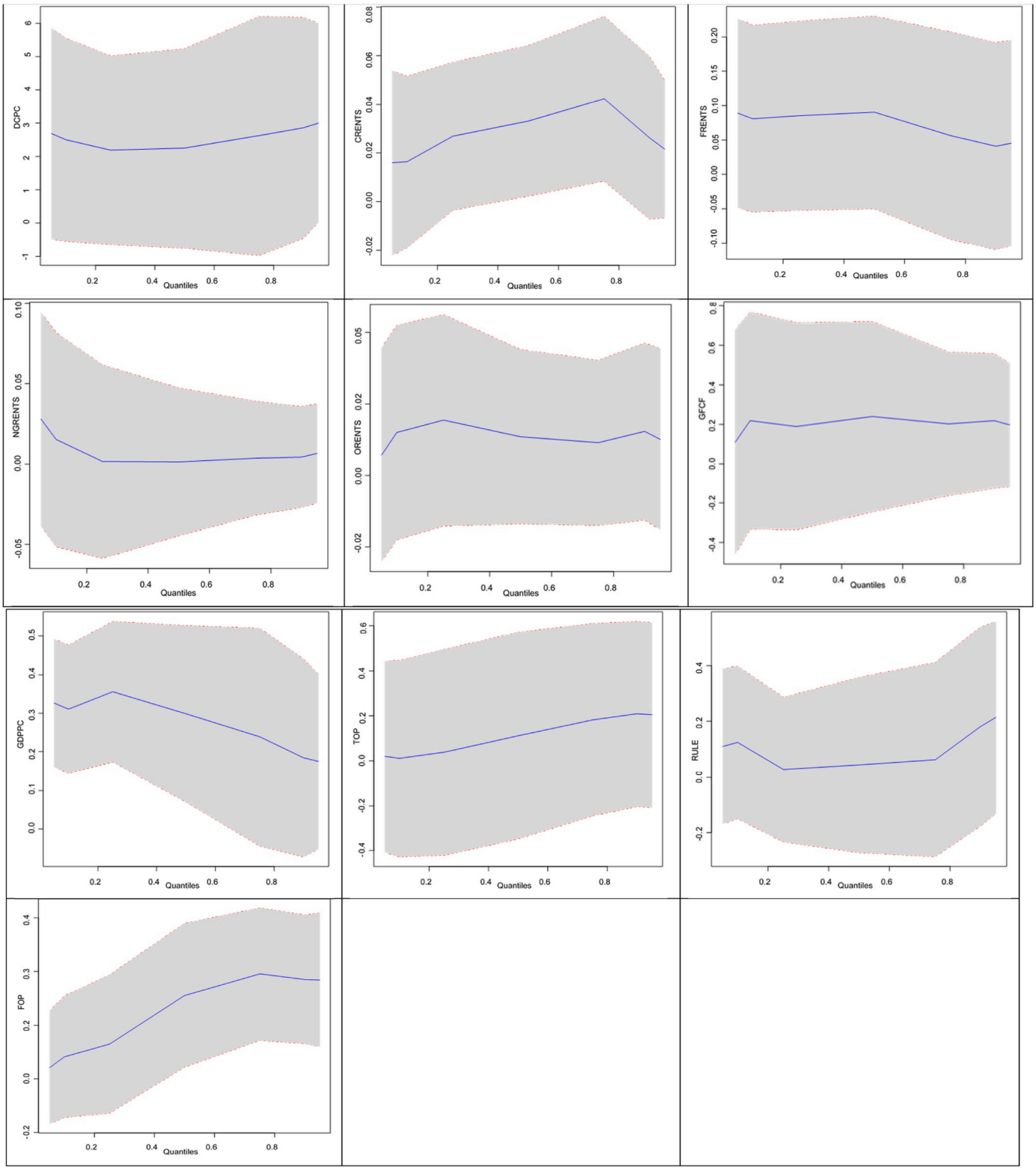

Fig. 2. Quantile regression estimates with 95% confidence intervals for the impacts of covariates on DCPS. Vertical axes divulge coefficient estimates of variables over the DCPS distribution.

testing the FRC gives a new direction to the political decision processes for the management of natural resources and its revenues. First of all, it should be ensured that natural resources rents are directed from traditional sectors to modern sector. In this way, instead of using resource rents inefficiently in non-productive areas, productive sectors are offered the opportunity to grow and develop. Consequently, it is vital that the country optimized productive investments-. For this purpose, government authorities and regulators should incorporate with private partners to invest more on human capital and training programs to educate people towards financial development optimization. Such an improvement inevitably increase orientation to the financial sector and support financial development. In addition, it should be ensured that the

Table 4
Panel quantile regression results based on Canay (2011).

Quantiles	0.05	0.10	0.25	0.50	0.75	0.90	0.95
intercept	1.513**	1.341*	1.695*	2.455***	2.783**	2.749*	2.992**
CRENTS	0.023	0.052*	0.041**	0.033**	0.039	0.032	0.012
FRENTS	0.103*	0.115*	0.117*	0.113**	0.110	0.085	0.112
NGRENTS	0.063	0.043*	0.020**	0.006*	0.007	0.016	0.014
ORENTS	0.042	0.072*	0.032	0.021***	0.039	0.045	0.034
GFCF	0.112**	0.075**	0.155	0.063***	0.132	0.196	0.187
GDPPC	0.333*	0.373*	0.346	0.285***	0.332**	0.251*	0.232*
TOP	0.165***	0.144**	0.121**	0.043***	0.020	0.009	0.005*
WGI	0.089	0.075	0.174*	0.157***	0.138***	0.018*	0.014
FOP	0.079	0.059	0.035***	0.056***	0.095**	0.085*	0.014*
$H_o : \beta_{1\tau} = \beta_{2\tau}$	3.33*	69.12***	90.84***	79.00***	55.96***	0.95	0.75
$H_o : \beta_{1\tau} = \beta_{2\tau} = 0$	2.10*	23.54***	62.13***	24.23***	49.43***	1.11	0.62

Note: ***, ** and * denote significant at 1%. 5% and 10% level.

Table 5
Panel quantile regression results.$\lambda = 1$.

Quantiles	0.05	0.10	0.25	0.50	0.75	0.90	0.95
intercept	2.615**	2.327**	2.016**	2.275***	2.517**	2.811	2.863
CRENTS	0.000	0.000	0.007*	0.017***	0.026	0.010	0.007
FRENTS	0.161**	0.152**	0.151**	0.152**	0.129*	0.114*	0.115*
NGRENTS	0.031	0.015	0.002	0.002*	0.002	0.004	0.005
ORENTS	0.035	0.016	0.004*	0.014**	0.026	0.018	0.021
GFCF	0.121	0.033*	0.089**	0.058***	0.014	0.049	0.005
GDPPC	0.367***	0.346***	0.357***	0.312***	0.263**	0.201	0.206*
TOP	0.165	0.176	0.161*	0.089**	0.021*	0.002	0.003
WGI	0.127	0.116	0.156**	0.161***	0.129**	0.017	0.003
FOP	0.092	0.057	0.019	0.048**	0.112*	0.111*	0.104*
$H_o : \beta_{1\tau} = \beta_{2\tau}$	8.61***	51.26***	53.44***	12.59***	14.67***	1.61	0.47
	77.69***	50.56***	22.51***	25.12***	12.34***	0.60	1.23

Note: ***, ** and * denote significant at 1%. 5% and 10% level.

rents obtained are kept within the domestic banking system. Hence, credits extended to the private sector increase with the expansion of banks' deposits. Finally, it is necessary to accurately determine how the natural resource abundance affects institutional developments. Accordingly, given the dependence of the financial system on the institutional structure in developed countries, it would be inevitable for natural resources to prevent financial development. Therefore, a choice should be made according to the current situation of the country between reducing the dependence of the financial sector on the institutional structure or preventing the natural resources from damaging the institutional infrastructure.

In addition to general useful policy recommendations, it is possible to make some specific suggestions based on asymmetric effect results. Primarily, developed countries with medium and medium lower quantile levels of financial development should maintain the blessing effect of natural resource rents and make this effect beneficial to increase the economic growth rate. Converting the bank deposits, which increase with natural resource revenues, into credits for use in productive areas of the economy should be the primary priority. That is, it is necessary to channel the increase in credit facilities into a production-oriented structure rather than consumption. In particular converting these revenues into investments through the financial system to support the development of the manufacturing industry is important in terms of contributing to economic development. This may also prevent negligence of the manufacturing sector, which is considered to be the engine of economic development, due to natural resources. In addition to all of the mentioned measures, more different measures emerge for upper middle and upper quantiles. Developed countries with financial development at these quantile levels should turn to stricter institutional arrangements in their banking system. Contracts between borrowers and creditors should guarantee reimbursements without compromising the sustainability of the credit system. Moreover, financial deepening may have started with the increase in consumer credit demand in these countries. Against this demand, a restriction should be applied with contractual arrangements.

As a further exploration, we deem that the asymmetric aspect between the natural resource abundance and financial development cannot be neglected and it is at the beginning, hence, researchers can scrutinize this association with accuracy.

CRediT authorship contribution statement

Eyup Dogan: Writing - review & editing, Supervision. **Buket Altinoz:** Writing - review & editing. **Panayiotis Tzeremes:** Formal analysis, Methodology.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.resourpol.2020.101773.

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