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The Role of Corruption in Natural Resource-Financial Development Nexus: Evidence from MENA Region

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Abstract: *This paper contributes to the literature on resource curse by investigating the impact of natural resource abundance on financial development while accounting for the interactive effect of natural resources and corruption in 11 resource-rich MENA countries over the period of 1987 to 2015. Using pooled mean group (PMG) estimation technique, our results show that abundance of natural resource weakens the pace of financial development in countries with high level of corruption. Thus, resource rich countries in the MENA region will boost the level of financial development through minimising the degree of corruption in their financial sectors. Therefore, policymakers should control the corruption, which plays a significant role to mitigate the adverse effect of natural resources on financial development. This is through building strong institutions, which help to check corruption, enhancing rule of law and protecting investors. Our results are consistent and robust to alternative measures of natural resource abundance and financial development.*

Keywords: Financial development; Natural resources; Corruption; Pooled mean group; MENA.
JEL Classification: O13, O16, Q32

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1. Introduction

Middle East and North Africa (MENA) region has one of the largest natural resource endowments in the world (Majbouri, 2015). The World Bank (2011) highlights that nearly 55% of the global oil reserves are concentrated in the Middle East. Within MENA region, the Middle East alone with only 2% of the world's producing wells, produces over 30% of the world's crude oil. Furthermore, it contains 43% of the world's conventional gas reserves (BP, 2013). In addition, the availability of oil and gas natural resources is the main notable characteristic among MENA countries (World Bank, 2007). Natural resources are the dominant source of revenue and wealth in the region (Apergis & Payne, 2014). Despite the strategic importance of natural resources in MENA region, there are limited studies on the impact of natural resources on economic development in this region, except for Apergis and Payne (2014) and Arezki and Nabli (2012) who studied the impact of natural resources on economic growth in MENA.

Based on the literature on natural resource-economic growth nexus, there are three strands, where the first strand stated that natural resource abundance hinders economic growth through the Dutch disease and rent seeking process (Mehlum et al., 2006; Gylfason 2001; Sachs & Warner, 1995, 1999, 2001). Corden and Neary (1982) originally described the Dutch disease model based on two effects, namely resource movement and spending effects. In the first effect, the resource boom increases demand for labour, which leads production to shift towards the booming sector away from the lagging one. However, this effect can be negligible due to the fewer workers in the mineral sectors. On the other hand, the spending effect increases demand for labour in the non-tradable sector at the expense of the lagging sector, but this increased demand for non-tradable goods increases their price. However, the prices of traded good sectors are set internationally. Hence, they cannot change. The increase in the price of non-tradable corresponds to a real exchange rate appreciation (Law & Moradbeigi, 2017). Unlike the Dutch disease model, rent seeking emphasises the role of power group and institutional frameworks. In this model, the natural resources sector is the one that is squeezed because of harmful rent-seeking activities, and there are no positive wealth shocks. Based on the rent-seeking model, it makes sense. However, the problem is that the rent-seeking model depends on institutions. Therefore, the quality of institutions is the determining factor for the resource curse rather than the rent-seeking. For this reason, the last explanation of natural resource curse is given by the institutions model, which combines both rent-seeking and institutions in the analysis, where the institutions are the decisive factor of how economic growth is affected by natural resources abundance. The illustrative examples that underpin the institutions model are Botswana and Norway, which have enhanced institutions and low level of corruption. Contrary to Botswana and Norway, countries such as Congo, Mexico, Venezuela, and Nigeria have worse economic performance due to their weak institutions. Researchers like Torvik (2009) indicated that economies that have higher growth rate are associated with few natural resources reserves. Since the price of natural resources increased over time, it is predictable that resource abundant countries have better growth performance. Surprisingly, evidence have shown the opposite (Frankel, 2010).

Researchers criticised this argument in the second strand of literature, which argued that the impact of natural resource abundance on economic growth is conditional because it depends on the governance's status and other factors (Van der Ploeg, 2011; Brunnschweiler, 2008). Researchers indicated in the third strand of literature that resource abundance enhance economic growth (Cavalcanti et al., 2011). Therefore, very little is known about how natural resources affect financial development in MENA region. In this regard, researchers highlighted that if a country is rich in terms of natural resources, the banking sector could raise liquidity through tax receipts from government and increase deposit mobilisation from private and public sectors. Hence, more bank credit to households and firms. The extractive or natural resource sector is one of the major sectors that can drive deposit of bank mobilisation to give loans to others. In fact, countries blessed with natural resources, like oil, gas among others, can leverage these natural resources for attracting private capital flows into the country. These capital flows are channeled through the financial sector, which cause the development of the financial system.

This paper aims to explore the role of corruption in the relationship between natural resource abundance and financial development in MENA region. This is motivated by the fact that MENA region has experienced a considerable amount of reformation in finance and trade during the last two decades. In the past, MENA countries have been labelled as growing at a slower rate compared to resource poor countries. During the last two decades, MENA region has undergone extensive liberalisation of the financial sector (Chebab et al. 2020; Boukhatem & Ben Moussa, 2017; Eltayeb Mohamed & Sidiropoulos, 2010; Ben Naceur et al. 2008), which includes lifting government restrictions on the banking system in terms of interest rate ceilings, high reserve requirements and launching of credit programmes. In addition, the MENA region witnessed significant progress in trade liberalisation, diversification, and improvement in business climate (Apergis & Payne, 2014). These elements enhanced financial development, and improved economic growth (Du & Wei, 2010; McKinnon, 1973).

However, it is argued that sustainable management of the region's natural resources and revenues for economic growth are the biggest challenge for their governments due to rent-seeking activities (Baland & Francois, 2000, Tornell & Lane, 2000). Furthermore, it is well-known that MENA has poor quality of institutions, regulations, red tape, and proliferation of laws have helped in creating opportunities for corruption (Karama & Zaki, 2018). Nabli (2007) reported that poor quality of administration, and weak political institutions like, civil liberties, political rights and press's freedom, are responsible for the low economic growth in MENA region. Moreover, the MENA region is characterised by a high level of corruption, despite that MENA countries are ranked below the world median in terms of corruption. Ali and Saha (2017) reported that according to the Transparency International, three out of the ten most corrupt countries are from the MENA region. Also, "the average score for the period 1984-2013 for the MENA region is around 4 out of the maximum corruption score of 6," according to the International Country Risk Guide (ICRG). Therefore, it is crucial to examine the impact of abundance of natural resources on financial development and how such impact varies with the degree of corruption in selected MENA countries. In addition, this study also intends to find the corruption threshold in the resource abundance-finance nexus.

This paper extends the existing literature in at least three ways. First, this paper contributes to the existing literature by examining the impact of natural resource abundance and its interactive effect with corruption on financial development in selected MENA countries. The interaction term is important given the conditional hypothesis regarding the relationship between resource abundance and financial development (Brambor et al., 2006). Therefore, we examine the resource -finance nexus by paying attention to the degree of corruption.[1] It is worth noting that less corrupt institutions, in resource rich MENA countries, may expedite the usage of natural resource revenues, such as oil and gas rents, for productive investments that improve their ability to influence the financial system. In view of this, it is relevant to determine whether the degree of corruption in the resource abundant MENA countries impact the use of resource revenues, and hence their capacity to foster the pace of financial development.

Although several recent studies provide empirical evidence on the importance of institutional quality for financial performance and risk (Le et al., 2016; Klomp & de Haan, 2014), only limited econometric evidence drew the interaction impact of corruption on the resource abundance-finance nexus. A notable exception is the study of Bhattacharyya and Hodler (2014), where they employed an interaction term between resource revenues and political institutions for a sample of panel dataset with a cross-sectional dimension of 133 countries and a time dimension for the 1970 to 2005 period. They found that if political institutions are weak, then revenues from natural resource can damage the contract enforcement. Since poor contract enforcement drive financial development to be lower, resource revenues might hinder financial system in countries associated with poor political institutions. However, this type of interaction term is incomplete without estimating its threshold value.

Second, this paper estimates the threshold level of corruption for MENA countries. It is important to find out the threshold level of corruption in the relationship between abundance of natural resources and financial development because there is no study that has determined the existence of threshold corruption and its impact on the pace of financial development in the MENA region. Additionally, understanding how resource revenues may affect financial development by conditioning the degree of corruption in resource rich MENA countries, it would lead the policy makers to propose appropriate strategies to boost the financial system.

Furthermore, this research will focus only on the corruption rather than institutions. This is because institutional quality involves other aspects, for instance, the rule of law, government repudiation of contracts and bureaucracy. Therefore, this paper measures the capacity of resource rich MENA countries to promote its financial system if its corruption threshold is decreased to a certain level. Third, this paper adopts the technique of Brambor et al. (2006) to calculate the marginal effects for interaction term. According to Brambor et al. (2006), only 10% of the articles included all constitutive terms, did not make the mistakes interpreting these terms, and calculated substantively meaningful marginal effects and standard errors.

2. Literature Review

Over the last decades, the relationship between natural resource abundance and economic growth has witnessed a huge debate. Empirical studies argued that natural resources positively affect the economic growth. For instance, Salha et al. (2018) utilised the pooled mean group (PMG) estimator to examine the relationship between natural resource rents and economic growth in the top resource rich countries for the 1970 to 2013 period. They found a long-run positive relationship between the variables, which supports the natural resource bless hypothesis. Moreover, Redmon and Nasir (2020) found a positive and significant relationship between natural resources and economic growth in 30 countries over the period of 1999 to 2016 by using Random Effects, Fixed Effects, Panel Dynamic Least Squares and Panel Fully Modified Least Squares.

In the same line, other studies have shown that the natural resource abundance is negatively related to economic growth in developing countries (Kim & Lin, 2017; Mavrotas et al., 2011; Gylfason, 2001; Sachs, 2007; Sachs &Warner, 1995). These studies suggested that the abundance of natural resources causes Dutch Disease (see, Matsen & Torvik, 2005; van Wijnbergen, 1984), reduces the private and public incentives for accumulation of human capital (Gylfason, 2001), and leads to corruption and rent-seeking (Petermann et al., 2007; Baland & Francois, 2000). There are also studies that examined the relationship between natural resources and financial development. For example, Erdogan et al. (2020) examined the impact of natural resource exports on economic growth by focusing on the level of financial development in selected 11 countries for the 1996 to 2016 period. Based on their nonlinear panel data results, for the first regime, there is insignificant impact of oil exports on economic growth, where the rate of financial development is below 45%. For the second regime, where financial deepening is over 45%, an increase in oil exports by one unit leads to an increase of 7% in economic growth.

In the same line, Shahbaz et al. (2017) investigated the effect of abundant natural resource on financial development, using Bayer-Hanck cointegration approach in the United States (US). They found that natural resources can be used as an economic instrument to enhance the performance of financial sector through the role of education and economic growth. Also, a study conducted by Yuxiang and Chen (2011), who applied a system generalised method of moments (GMM) estimator, found that an abundance of mineral resource negates financial development in provincial of China. The authors also noted that resource plenty regions tend to have a slow pace of financial development when compared to resource scarce ones. Empirical evidence has shown that resource-rich countries have low level of financial development (Elbadawi & Soto, 2012; Frenkel, 2012; Gelb, 2010, 1988; Mehlum et al., 2006; Sachs & Warner, 2001; Cordon & Neary, 1982). Although considerable research has been devoted for investigating the impact of natural resources on economic growth, rather less attention has been paid to the MENA region. Apergis and Payne (2014) investigated the impact of oil abundance on economic growth in MENA region during the period 1990 to 2013 and found that from 1990 to 2003, oil abundance affected the economic growth negatively. But, after 2003, this impact became positive where the authors referred this change to the enhancement of institutional quality.

A few studies have explored the role of institutional quality and corruption on abundant natural resources and economic growth. Bhattacharyya and Holder (2010) showed that the quality of political institutions can determine how the abundance of natural resource affects economic policy choices. They argued that rent-seeking activities in resource-rich countries are the major reasons for weak political institutions. In a more recent study using the GMM estimation technique, Bhattacharyya and Holder (2014) found that natural resource revenues negate effective enforcement of contract, which in turn retards financial development, especially in countries with poor political institutions. From the other side, Saha and Ali (2017) investigated the role of economic growth in reducing corruption by using the two-way fixed effects technique for selected 16 MENA countries for the 1984 to 2013 period. This research focused on political and economic freedom, and whether these channels lower corruption in resource rich MENA countries. They found lowering the corruption level can be due to the interaction between political and economic freedom and the size of government in selected MENA countries.

The abundance of natural resources leads to rent-seeking activities in developing countries, which undermines the efficiency of institutions and rule of law (Ganda, 2020; Leite & Weidman, 1999). In addition, corruption induces lack of government confidence and low policy credibility. This makes implementing reforms that boost economic growth in the financial sector to be difficult for governments that are faced with low policy credibility (Yuxiang & Chen, 2011).

3. Methodology

This paper employed the PMG, mean group (MG) and dynamic fixed effect (DFE) estimators, which were developed by Pesaran et al. (1999). The motivation behind choosing the PMG estimator in this research was first its' capability for estimating and producing consistent estimates of the long-run parameters of a dynamic heterogeneous panel. Second, the long-run effect of natural resource abundance and other related macroeconomic fundamentals are expected to be identical across MENA countries given their level of development, common geographic location and their abundance of natural resources, mainly oil and gas. However, fluctuations in the short-run are expected to reflect country-specific factors. Thus, the PMG estimator allows for this type of econometric specification by practically imposing common long-run effects with allowing short-run dynamics to be data driven for each country in the panel. Overall, using the PMG estimator, which allows heterogeneous dynamics in the short-run but assumes homogeneity in the long-run coefficients, has produced robust results. Unlike the MG estimator that assumes all slope coefficients to be heterogeneous, the PMG estimator assumes that some parameters are the same across countries. Moreover, the estimator overcomes heterogeneity bias often experienced when the DFE estimator is used (Pesaran et al. 1999).

3.1 PMG method

We utilised the PMG method to test whether the relationship between resource abundance and financial development depends on the degree of corruption. Assuming that the equation in the long-run is given in the following form:

$$\ln FD_{it} = \beta + \alpha_0 \ln FD_{I,t\text{-}1} + \alpha_1 \ln NR_{it} + \alpha_2 \ln K_{it} + \alpha_3 \ln HC_{it} + \alpha_4 \ln TO_{it} + \alpha_5 \ln C_{it} + \alpha_6(\ln NR_{it} * \ln C_{it}) + \mu_{it} \quad (1)$$

$i = 1,2 \ldots\ldots N \;\; t = 1,2 \ldots\ldots N$

where $\ln FD_{it}$ is the natural-log of financial development, $\ln NR_{it}$ is the natural-log of natural resources, $\ln K_{it}$ is the natural-log of capitalisation, $\ln E_{it}$ is the natural-log of human capital, $\ln TO_{it}$ is the natural-log of trade openness, $\ln C_{it}$ is the natural-log of corruption and μ_{it} is the residual term. We are mainly interested in the impact of a change in resource abundance as measured by (oil and gas rents), on financial development, as measured by (private credit, Pc) and how this impact depends on level of corruption (corruption index). Therefore, the impact of natural resource abundance and corruption on financial development is indicated by the coefficients of natural resource abundance, α_1, and corruption, α_5, respectively. In other words, the α_1 coefficient captures the effect of natural resource abundance on financial development when corruption does not exist. The same for the α_5 coefficient, it only captures the effect of corruption on financial development when natural resource abundance is zero. However, the coefficient of the interaction term between natural resource abundance and corruption, α_6, indicates the differential effect in countries which have more corruption.

Besides, this study also used another two alternatives proxy for financial development, namely domestic credit and liquid liabilities, and one alternative proxy for natural resources, i.e. total natural capital for robustness check. The marginal effects for the interaction term are then calculated. According to Brambor et al. (2006), the marginal effect can be expressed as in Equation (2):

$$\frac{\partial lnFD}{\partial lnNR} = \alpha_1 + \alpha_6 \ln C_{it} \quad (2)$$

The marginal effect is given by $\alpha_1 + \alpha_6 \ln C_{it}$. Both α_1 and α_6 are expected to be negative and significant, indicating that the negative impact of resource abundance on financial development increases with the degree of corruption in these countries.

This paper also estimates the threshold level of corruption for MENA countries. By considering the negative coefficient of resource rent (α_1) and that of the interaction term between resource rent and corruption (α_6) in Equation (2), the threshold effect can be defined as follow:

$$\ln C = -\frac{\alpha_1}{\alpha_6} \tag{3}$$

3.2 Data source

We employed annual panel data from 11 countries of the MENA region, namely Algeria, Bahrain, Iran, Egypt, Kuwait, Morocco, Oman, Qatar, Saudi Arabia, Libya, and United Arab Emirates (UAE), over a period of 28 years, from 1987 to 2015. The selection of this period was constrained by the availability of data.

The model utilised three indicators to measure financial development. The three banking sector development indicators have been designated as ratios of the gross domestic product (GDP). Private sector credit reflects the private sector value of financial intermediary credits. Liquid liabilities measure the overall size of financial intermediaries relative to the size of the economy. Domestic credit is credit provided by the banking sector to the public and private sectors. These indicators were utilised because the MENA region is bank based. The bank-based index is considered for measuring financial development for various reasons. Previous studies stated that developing countries relied more on bank-based financial systems. Therefore, the relationship between the private sector and a well-established bank system is strong, in a way that efficient information obtained by private sectors due to this relationship persuades them to pay their debts regularly and on time (Daouia et al., 2020; Rajan & Zingales, 2003).

Following the model proposed by Shahbaz et al. (2018) and Dwumfour and Ntow-Gyamfi (2018), trade openness and corruption variables are also added into the model specification, in addition to physical capital and human capital. Based on the studies of Elhannani et al. (2016), Javadi et al. (2017), Bhattachraya and Hodler (2014), Sarmidi et al. (2012) and Cavalcanti et al. (2011), resource rents are used to measure the abundance of natural resource. According to the World Bank (2018), these include rents from energy, minerals, and forestry. However, this study focused only on rents from oil and gas. This definition of natural resource abundance is used by many researchers, such as Shahbaz et al., (2018), Ahmed et al. (2016), Satti et al. (2014), Papyrakis and Gerlagh (2006), and it measures the role of rents relative to the size of a country's economy. The World Bank defined oil and gas rents as the difference between the value of crude oil and gas production at world prices and the total costs of production. It is constructed by estimating the world price units of oil and gas and subtracting estimates of average unit costs of extraction and harvesting costs, which includes a reasonable return on capital. The unit rents are then multiplied by the physical quantities of oil that countries extract to determine the rents as a share of GDP.

The reason behind using the above measure of natural resource rents can be summarised in the following points. First, several researchers highlight that using this proxy recognises that oil and gas are unique commodities whose production costs are typically a small share of the total revenues earned from its sale. Rents afford the country the luxury of foregoing bureaucracy-building and seeking appropriate policies that promote financial development, and hence economic growth by offering a source of revenue that is largely independent of the citizenry (Costello, 2018; Barma et al. 2012). Second, it has been used in several recent studies (e.g., Bhattacharyya & Hodler, 2014; Sarmidi et al., 2012; Bhattacharyya & Hodler, 2010; Ross, 2006). Therefore, the main measure for resource abundance in this study is oil and gas rents as well as the total natural resource rents in GDP.

Also, Levine et al. (2000) indicated that if an economy is associated with low transparency, the cost of production would be higher, which leads to an additional cost that burden the consumer. Corruption can make the financial market to be deficient and hinders the growth process in an economy. Thus, the bank willingness for lending money will be reduced due to uncertainty in getting repayment from the borrowers. This leads to low level of financial development. In such situations, resource abundance is linked with high-income inequality due to corruption and mismanagement, which impedes economic growth. This shows that government wastes natural resources, i.e. minerals, oil, metals and energy (Rutland, 2008). As such, the corruption variable will be used and measured by the ICRG index. According to Herzfeld and Wiss (2003), the ICRG index takes the value from 0 to 6 for measuring the corruption at all levels of bureaucracy where the higher value of this index corresponds to low level of corruption.

The gross secondary school enrolment variable was used to measure the human capital variable. It has been found that education stimulates innovation, which helps to create a positive spill-over impact, which enhances human capital and raise economic growth. The role played by education in enhancing human capital was advanced by the Human Capital theory, made popular by the "Chicago School", that is Becker (1964). Physical capital variable was also included in our model. Findings of Gylfason and Zoega (2001) demonstrated empirically that abundance of natural resources crowd out physical capital in the form of lower optimal savings and investments (small capital-output ratio), as well as slowing down the emergence of a well-developed financial system. This concurred with the findings of Atkinson and Hamilton (2003) who found diminishing rates of saving in resource-rich countries when compared to resource-poor countries.

All the variables and their definitions are presented in the Appendix Table A.1. Also, a summary of descriptive statistics and correlation matrix of the variables are displayed in Tables A.2 and A.3, respectively.

4. Results and Discussion

Before estimating our model, panel unit root test was conducted for all the series of our dataset. The results of Maddala and Wu (1999) and Im-Pesaran and Shin (2003) panel unit root test without and with trend are both presented in the appendix Table A.4. The results indicate that all the variables are integrated of order one, that is I (1). Therefore, we proceed to the long-run estimations by employing the PMG, MG and DFE methods. With the aid of the joint Hausman test, the homogeneity of the long-run coefficients was tested, and the results confirmed that PMG is the consistent and efficient estimator for all models. Only the results of PMG are reported[2] in Table 1.

In Table 1, Models 1, 2 and 3 show the results for financial development, measured by private credit, domestic credit and liquid liabilities, respectively. The results are presented for the models without interaction terms (Model 1a, Model 2a and Model 3a), and with interaction terms (Model 1b, Model 2b and Model 3b). For Model 1a, the PMG results show that financial development, measured by private credit, is negatively related with resource rents. In fact, the result suggests that a percentage point increase in resource rents, on average, causes the level of financial development to diminish by -2.033 in the long run. This finding suggests a significant negative relationship between resource rents and financial

Table 1: PMG Estimations

	Private credit		**Domestic credit**		**Liquid liabilities**	
	Model 1a (without Interaction term)	Model 1b (with Interaction term)	Model 2a (without Interaction term)	Model 2b (with Interaction term)	Model 3a (without Interaction term)	Model 3b (with Interaction term)
Long-run coefficients						
Resource rents (oil & gas)	-2.033*** (0.451)	-0.588*** (0.177)	-1.445*** (0.324)	-0.324* (0.176)	-2.08*** (0.356)	-0.862* (0.441)
Corruption	0.319 (0.347)	0.480* (0.258)	0.810** (0.342)	1.604*** (0.539)	0.069* (0.036)	-0.123 (0.357)
Resource rents*corruption	–	-0.69* (0.39)	–	-6.87*** (0.18)	–	-0.79** (0.40)
Physical capital	-0.451 (0.276)	0.219 (0.016)	-0.081 (0.277)	-0.199 (0.271)	0.024 (0.048)	-1.051* (0.545)
Human capital	1.782*** (0.467)	1.332*** (0.302)	2.166*** (0.390)	1.241*** (0.394)	0.612*** (0.111)	2.081*** (0.619)
Trade openness	3.098*** (0.802)	1.644*** (0.331)	3.118*** (0.907)	1.958*** (0.507)	0.499*** (0.066)	2.170*** (0.840)
Error correction coefficients	-0.052* (0.031)	-0.072* (0.047)	-0.074*** (0.031)	-0.059** (0.029)	-0.138** (0.054)	-0.044* (0.023)
Short run coefficients						
Δ Resource rents (oil & gas)	-0.097 (0.067)	-0.023 (0.105)	-0.110 (0.081)	-0.101 (0.194)	-0.118 (0.112)	0.062 (0.083)
Δ Corruption	0.117 (0.108)	0.260 (0.163)	0.191 (0.125)	0.283 (0.244)	-0.001 (0.077)	0.154 (0.149)
Δ Resource rents*corruption	–	-0.480 (0.480)	–	-0.579 (0.583)	–	-0.247 (0.245)
Δ Physical capital	0.174* (0.102)	0.106 (0.079)	0.238** (0.119)	0.222** (0.107)	0.050 (0.061)	0.096 (0.059)
Δ Human capital	-0.339 (0.475)	-0.471 (0.379)	-0.402 (0.503)	-0.272 (0.437)	-0.254 (0.349)	0.180 (0.363)
Δ Trade openness	-0.272 (0.168)	-0.093 (0.201)	-0.142 (0.238)	0.095 (0.135)	-0.218 (0.133)	-0.117 (0.183)
Constant	-0.493 (0.328)	-0.467 (0.395)	-0.365** (0.160)	-0.526* (0.300)	-0.122** (0.055)	-0.306 (0 .201)
Country	11	11	11	11	11	11
Observations	308	308	308	308	308	308
Marginal effects						
Mean	–	-2.34	–	-17.77	–	-2.87
Minimum	–	-1.28	–	-7.19	–	-1.65
Maximum	–	-3.35	–	-27.80	–	-4.02

Notes: 1*, **, and *** indicate significance at 10%, 5%, and 1%. 2. Standard errors are in parentheses.

development. It supports the hypothesis that countries that rely more on natural resource will have lower level of financial development. This result is compatible with that of Yuxiang and Chen (2011) who found that changes in mineral resource exploitation affect the pace of financial development negatively in China.

While this evidence may not be adequate given the nature of our arguments and econometric specification, it provides a groundwork to examine the impact of the interaction terms between resource abundance and corruption on the pace of financial development. Model 1b from Table1 shows the estimated results of the impact of resource rents on financial development after accounting for the interaction term between resource rents and corruption. Based on this model, resource rents impact negatively on financial development. The coefficient of the interaction term turns out to be negative and statistically significant with the following value, -0.69 when private credit is used as proxy for financial development. Since the coefficient of the interaction term is negative, it implies that the higher the level of corruption, the more negative the effect of resource rents on financial development. These data must be interpreted with caution, as higher score of indices indicates a lower level of corruption. Therefore, the marginal effect of resource rents on financial development falls as the degree of corruption increases, or the lower the score of the corruption perception index. This indicates that the relationship between resource rents and financial development varies across countries depending on the degree of corruption. A resource-rich but highly corrupt country can develop its financial system by fighting corruption. This empirical finding is again compatible with that of Yuxiang and Chen, (2011), which reveals that the abundance of natural resources may retard financial development by increasing opportunities for rent-seeking and corruption.

To shed more light on the relevance of the interaction term in the interpretation of the results, the marginal effect of financial development with respect to resource rents is computed at different levels of corruption. The estimated coefficients from the Model 1b of Table 1, where financial development is measured by private sector, and the mean, maximum and minimum levels of corruption from Table A.2 of descriptive statistics (in the appendix) are utilised to calculate marginal effects. The marginal effect of financial development with respect to resource rents at the mean level of corruption where financial development is measured by the private sector

(Model 1b) is -2.341, (-0.588- 0.69*2.54). Similarly, the same derivative (marginal effect) calculated at the maximum level of corruption takes the value of -3.348. Even when the marginal effect is examined at the minimum level of corruption, it turns out to be negative 1.278. This suggests that the marginal effect of resource rents on financial development falls as the degree of corruption increases or the corruption perception index drops in selected MENA countries.

Finally, this paper also estimates the threshold level of corruption for MENA countries. Given the negative sign of resource rents (α_1) and the negative coefficient of the interaction term (α_6) in Equation (3), the threshold value for private sector credit as the main proxy for financial development (Model 1b) is -0.85. Therefore, while more resource rents decrease the pace of financial development, the effect becomes worse when the country exhibits higher degree of corruption that pass the threshold. Furthermore, as lower score of indices indicates higher level of corruption, which confirm that selected MENA countries with lower scores of corruptions are associated with worse levels of financial development. Moreover, some of the control variables used in the estimation turn out to be significant determinants of financial development. For instance, the coefficients of gross secondary school enrolment and trade openness are both positive and highly significant at conventional levels, which is consistent with the theory. However, the coefficient of gross fixed capital formation is positive but insignificant.

4.1 Discussion of findings

Based on the estimated results, this paper provides empirical evidence on the negative link between natural resource and financial development in the resource-rich MENA countries. The paper argues that resource rent is negatively associated with financial development, and countries that are more dependent on natural resources tend to have lower levels of financial development. Therefore, the abundance of natural resources hampers the level of financial development and hence distorts allocation of capital, which slows down economic growth.

The interaction term between resource rents and corruption is found to be negative and statistically significant. It indicates that as the degree of corruption increases, the more negative the impact of resource abundance on the level of financial development becomes. That is the simultaneous interaction of natural resource abundance and corruption is harmful for financial sector growth, an effect akin to the resource curse phenomenon. This finding suggests that corruption reduces government confidence and policy credibility. This is because implementing reforms that boost economic growth in the financial sector becomes more difficult for governments that are faced with low policy credibility. Furthermore, Sachs and Warner (1999) argued that natural resource abundance may instil a false sense of security in people, which then leads the government to lose sight of the needful for financial reforms, which in turn is a prerequisite for the development of the financial system in developing countries. Comparably, these findings are in accord with the results of Leite and Weidmann (1999) who reported that the abundance of natural resources might intensify the level of corruption especially in developing countries, where the rule of law and institutions are inefficient due to rent seeking activities. Also, Robinson et al. (2006) stated that natural resource discovery is most likely to generate economic rents, which give rise to higher tendencies of corruption in the public sector.

Other control variables used in the regression have produced statistically significant coefficients at conventional levels. In the three models, where financial development was measured by three proxies: private credit, liquid liabilities and domestic credit respectively, trade is found to be positive and significant in boosting financial development. It implies that, on average, additional revenues received from trade are invested to promote the development of financial sector. Therefore, in a relatively closed economy, trade openness might serve as an efficient stimulus for financial development and growth. Our finding is in line with the outcomes of Rajan and Zingales (2003) who argued that when borders of a country are open to capital flows and trade, the objection to the pace of financial development quietens, and development will flourish.

Also, human capital is found to have positive and significant impact on the level of financial development in all specifications. This suggests that education stimulates financial development. This happens through a well-organised, management and governance of firms, which enhances their productive efficiency. Furthermore, education contributes to the development of finance through research activities, which affects factor productivity either directly or indirectly. Education enables the diffusion of knowledge in the financial sector, namely, to measure, access and manage financial stability by raising the flexibility of financial development for absorbing shocks that correlate with the intermediation process. Our empirical evidence is compatible with Hatemi-J and Shamsuddin (2016) who reported that education drives the pace of financial development through human capital. To test the sensitivity and robustness of our results, another set of regression was considered using alternative measure of abundance of natural resources, which is the total natural resource rent. Overall, the estimated results reinforce the earlier findings.

4.2 Robustness checks

To access the robustness of our results, in Table 1, Model 2 and Model 3, domestic credit as percentage of GDP and liquid liabilities as share of GDP are also used in the estimation as alternative measures of financial development. Similarly, the estimation results show that the coefficient of resource rents is negative and significant using both alternative measures of financial development. Based on the results, a percentage increase in resource rents mitigates the pace of financial development by -1.45 and -2.08 respectively. Compare with previous results where private credit is used to measure financial development, it is noticeable that the impact of the resource rents on financial development is higher when the domestic credit is used as a proxy for financial development.

Therefore, by employing two other measures of financial development namely, domestic credit and liquid liabilities, our findings confirm the significance of the negative relationship between resource rents and financial development, which implies that selected MENA countries reliant more on natural resource tend to have lower levels of financial development. The significance and the sign of the control variables do not alter by utilising domestic credit and the share of liquid liabilities in GDP as the alternative proxies for financial development. The exception is the corruption variable, which is found to be positive and significant in both Models 2a and 3a compared to the results obtained in Model 1a. This means that as the score of corruption is higher, the country should enjoy a higher development of finance. However, the higher score determines a lower level of corruption.

Models 2b and 3b from Table 1 illustrate the outcomes of the impact of resource rents on financial development including the interaction term, resource rents corruption. Again, the results indicate a negative impact of resource rents on domestic credit and liquid liabilities. This indicate that the higher the level of corruption, the more negative the effect of resource rents on financial development. Similar as previous results, the marginal effect was calculated in both Models 2b, 3b, at the mean, minimum and maximum levels of corruption and the values are reported in Table 1. In addition, the threshold values for financial development, measured by domestic credit and liquid liabilities, are -0.05 and -1.09 respectively. Thus, while more resource rents erode the financial system, the impact turn to be worse when the country exhibits higher degree of corruption that passes the threshold. Our empirical findings are robust to the alternative measure of resource abundance.

Additionally, an alternative measure of resource abundance, total natural capital, is used to check the robustness of the results, as reported in Table 2. The PMG results indicate a negative and statistical significance of the variable of interest, total natural capital in Models 1a, 2a and 3a, where financial development is measured by private credit, domestic credit and liquid liabilities. This implies that in the long-run, a percentage increase in total natural capital decreases the pace of financial development by -1.98, -0.039, and -0.023 in Models 1a, 2a and 3a, respectively. Again, our findings support the hypothesis stated that more reliant countries on natural resources tend to have a lower level of financial development.

Table 2 also presents the estimated results of the impact of total natural capital on the pace of financial development involving the interaction term between total natural capital and corruption. Based on these results, total natural capital is again found to have a significant negative impact on financial development (Models 1b, 2b and 3b) under the three proxies of financial development. The coefficients of the interaction term are negative and highly significant at 0.99, 0.04 and 1.25 for private credit, domestic credit and liquid liabilities, respectively. This denotes that the higher the level of corruption the more negative the effect of resource rents on financial development, and thereby confirming our results in Table1.

Like before, the marginal effects of financial development by respecting to the total natural capital are computed at various levels of corruption, only for Model 1b because the coefficients of total natural capital are not significant for Models 2b and 3b. The values of the marginal effect are, -3.77, -2.24 and -5.22 at the mean, minimum and at the maximum levels of corruption, respectively. These negative values denote that the marginal

Table 2: PMG Results – Robustness Checks with Total Natural Capital

	Private credit		**Domestic credit**		**Liquid liabilities**	
	Model 1a (without Interaction term)	Model 1b (with Interaction term)	Model 2a (without Interaction term)	Model 2b (with Interaction term)	Model 3a (without Interaction term)	Model 3b (with Interaction term)
Long-run coefficients						
Total natural capital	-1.980*** (0.413)	-1.251** (0.361)	-0.039*** (0.009)	0.045 (0.106)	-0.023*** (0.005)	-0.009 (0.009)
Corruption	0.231 (0.315)	1.045** (0.440)	0.083 (0.052)	1.042** (0.332)	-0.010 (0.035)	1.008*** (0.340)
Total natural capital*corruption	–	-0.992** (0.378)	–	-0.044*** (0.011)	–	-1.249*** (0.386)
Physical capital	-0.397 (0.256)	-0.201 (0.271)	0.556*** (0.123)	0.115 (0.138)	-0.114 (0.155)	-0.267 (0.363)
Human capital	1.666*** (0.420)	1.772*** (0.390)	0.799*** (0.195)	0.542* (0.308)	1.280*** (0.276)	2.610*** (0.659)
Trade openness	2.903*** (0.718)	2.379*** (0.617)	0.762*** (0.188)	1.381*** (0.244)	0.802*** (0.185)	1.062** (0.509)
Error correction coefficients	-0.061* (0.033)	-0.076* (0.043)	-0.119** (0.046)	-0.090** (0.039)	-0.078* (0.041)	-0.064* (0.037)
Short run coefficients						
Δ Total natural capital	-0.071 (0.079)	-0.118 (0.237)	-0.006 (0.001)	-0.291 (0.237)	-0.007*** (0.002)	-0.011*** (0.004)
Δ Corruption	0.087 (0.113)	0.008 (0.341)	0.0659 (0.059)	0.149 (0.240)	-0.009 (0.030)	-0.251 (0.168)
Δ Total natural capital*corruption	–	0.016 (0.249)	–	0.005 (0.007)	–	0.158 (0.121)
Δ Physical capital	0.189* (0.102)	0.165 (0.111)	0.111 (0.106)	0.181* (0.092)	0.088 (0.054)	0.066 (0.050)
Δ Human capital	-0.245 (0.467)	-0.577 (0.560)	-0.325 (0.349)	-0.382 (0.377)	-0.073 (0.047)	-0.372 (0.241)
Δ Trade openness	-0.321* (0.174)	-0.276*** (0.063)	0.043 (0.105)	0.223 (0.200)	-0.202* (0.116)	-0.060 (0.150)
Constant	-0.542* (0.306)	-0.755* (0.443)	-0.481** (0.202)	-0.335** (0.171)	-0.286* (0.170)	-0.655 (0.403)
Country	11	11	11	11	11	11
Observations	308	308	308	308	308	308
Marginal effects						
Mean	–	-3.77	–	–	–	–
Minimum	–	-2.24	–	–	–	–
Maximum	–	-5.22	–	–	–	–

Notes: 1*, **, and *** indicate significance at 10%, 5%, and 1%. 2. Standard errors are in parentheses.

effect of total natural capital on private credit falls as corruption increases or the corruption perception index declines in selected MENA countries. The estimate threshold value of corruption was also calculated and its value for private sector credit in Table 2, Model 1b is -1.26. Hence, while more total natural capital reduces financial development, the impact becomes worse when the country exhibits higher degree of corruption that passes the threshold. However, it is quantitively smaller than that was computed in Table 1, Model 1b, when the resource abundance is measured by resource rents (oil &gas) and private credit is a proxy for financial development.

Regarding the control-variables, All the other control variables have the same signs as those obtained previously in Table 1. The coefficient of gross fixed capital formation, however, has mixed signs but is not significant in all models of Table 2, while the coefficients of gross secondary school enrolment and trade openness are both positive and highly significant at conventional levels, which is consistent with the theory. Therefore, our empirical results are robust to the alternative measure for resource abundance.

5. Conclusion

The paper investigates the impact of natural resource abundance on the financial development by considering the interaction effect between resource abundance and corruption in the estimated models. Using the PMG estimator, our results indicate that resource abundance affects the development of finance negatively in selected MENA countries with high degree of corruption. Our results are robust to different measures of financial development and resource abundance. Our findings suggest that resource plenty countries tend to be financially underdeveloped due to high levels of corruption. This is because corruption may contribute to tax evasion, improper tax exemptions and weak tax administration.

Policymakers before taking any step to improve and foster the financial system should pay more attention to control the degree of corruption by building strong institutions that help to check corruption, enhance rule of law, and protect investors. This is important for deriving gains from natural resources since these institutions determine policy outcomes. In addition, resource abundant countries should centralise their attention on transparency mechanisms when allocating natural resources, such as oil and gas revenues, for enhancing the financial sector.

Notes

1. For this purpose, an interaction term was formed between resource abundance and corruption by taking the product of these two variables.

2. Although MG, PMG and DFE estimators are used to estimate the results, only the results of PMG estimations are presented in want of space. Results of MG and DFE are available from the authors upon request.

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APPENDIX

Appendix A.1: Definitions and Sources of Variables

Variable	Definition	Proxies	Unit of measurement	Source
Natural resource abundance	According to the Oxford Dictionary, the term "natural resources" refers broadly to natural assets such as minerals, materials, water, forests, and fertile land that occur in nature and can be used for economic gain. This research focused only on oil and gas.	1-Oil & gas rents 2-Total natural capital	% of GDP	World Bank, the World Development Indicators (WDI)
Financial development	Refers to the improvement in pooling and mobilising of savings for facilitating exchange of goods and services and enhancement of information regarding possible investments and monitoring investments by implementing of cooperate governance and managing risk through diversification and trading.	1-Private credit 2-liquid liabilities 3-domestic credit	% of GDP	World Bank, the World Development Indicators (WDI)
Physical capital	In economic theory, physical capital is one of the three primary factors of production. It is also known as inputs production function. This factor includes manmade goods that enable the production process such as machinery, buildings, computers and other goods needed for the production process to run smoothly.	Gross fixed capital information		
Trade openness	refers to the sum of exports and imports of goods and services relative to gross domestic products. It measures the level of economic integration of a country in the world economy through international trade.	The ratio of exports and imports		
Human capital	Human capital consists of the knowledge, skills, and health that people accumulate throughout their lives, enabling them to realise their potential as productive members of society.	Gross school enrolment, secondary	%	
Corruption	The World Bank calls corruption "the single greatest obstacle to economic and social development. It undermines development by distorting the rule of law and weakening the institutional foundation on which economic growth depends".	International Country Risk Guide	Score from 0 to 6	PRS Group (researcher's dataset)

Appendix A.2: Descriptive Statistics

Variable	Unit of Measurement	Mean	Std. Dev.	Min	Max
Private sector credit	% of GDP	39.55	20.33	4.14	114.08
Lagged dependent variable	% of GDP	38.72	19.67	4.14	114.08
Resource rents	% of GDP	22.62	15.97	0.002	85.74
Physical capital	% of GDP	23.41	7.83	8.15	58.81
Human capital	% of Gross	82.32	23.34	30.5	163.09
Corruption	Index (score from 0-6)	2.53	0.71	1.00	4.00
Trade Openness	% of GDP	79.96	36.58	15.51	210.16

Appendix A.3: Correlation Matrix

	Pc	Pc (lag)	RR	PhC	HC	COR	TR
Pc	1						
Pc(lag)	0.9459	1					
RR	-0.0650	-0.0311	1				
PhC	-0.0607	-0.1343	-0.0691	1			
HC	0.1344	0.0991	0.4565	0.0467	1		
COR	0.0833	0.1005	-0.1932	-0.2111	-0.0876	1	
TR	0.4236	0.3990	0.0904	0.0598	0.3485	0.0466	1

Notes: Pc= Private credit; RR=Resource Rents; PhC= Physical Capital; HC=Human Capital; COR= Corruption; TR=Trade Openness.