Corruption and banking soundness: does natural resource dependency matter?

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Abstract

Purpose – The natural resources curse theory argues the higher dependency on natural resources leads to many socio-economic problems. The purpose of this study is to examine the relationship between corruption and banking soundness and also to compare the extent of this effect between the two groups of rich and poor in natural resources countries.

Design/methodology/approach – To this aim, the authors apply a panel data set comprised of 98 countries from 2012 to 2015.

Findings – The results show that nations with a higher level of corruption have poorer banking soundness. The authors also find that by considering the resource curse theory and the effect of natural resource rents in the model, the adverse impact of corruption on banking soundness is more substantial in countries with a higher natural dependency level (rich in natural resources).

Originality/value – Though studies have been conducted on corruption and banking soundness, this paper, by using resources curse theory, articulates that corruption is one of the most critical factors affecting banking soundness and has a destructive effect on the health of the banking system and the economy of almost all countries, especially in natural resource-based economies. This study will appeal to banks authorities, governments, policymakers, oversight financial institutions and those who have a vested interest in regulating financial crimes globally. They can prevent financial and banking crises by cooperating in the fight against corruption worldwide.

Keywords Corruption, Panel data, Natural resources, Non-performing loans, Banking soundness, Resources curse theory, Cross-sectional data, Banking crises, Agency theory, Economic development

Paper type Technical paper

1. Introduction

Generally, corruption is the abuse of public office for private gain. Among the many forms of corruption, this definition focuses on political corruption as public officials seek illegitimate personal growth through bribery, extortion, cronyism, nepotism, patronage, graft and embezzlement, which prevails among some types of corruption (Park, 2012).

Almost all countries have signs of corruption, and it exists in all stages of economic development. As the banking system is a channel that transfers the impact of corruption on economic growth, it leads to a lower economic growth level (Son *et al.*, 2020). Corruption is the primary reason resource-rich countries perform poorly in their economies (Kolstad and Wiig, 2009).

As corruption has become a common target for international organizations, national governments, non-governmental organizations and other entities, it weakens political legitimacy, stability, economic development and social welfare. It seems that the lower level of corruption had a positive impact on the economy and bank stability. It is also associated with fewer credit losses and more moderate credit growth (Toader *et al.*, 2018).

The analysis of banking and financial crises indicates that the starting point for many of these crises at the national and international levels is the deterioration of the banks' balance



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sheets and the banking system (Frederic, 2012; Laeven and Valencia, 2012; Schoen, 2017). Corruption is one of the critical determinants of bank loans' quality, which causes increased non-performing loans and significantly decreases the quality of bank loans and, ultimately, leads to deterioration in bank balance sheets and a reduction in banking soundness (Park, 2012; Tran *et al.*, 2017; Bougatef, 2015). As a result, it can make the banking system more vulnerable to a financial crisis. Therefore, one of the most important factors preventing banking crises is maintaining banking soundness and recognizing the factors that affect it.

The natural resources curse theory argues that in natural resource-based economies, the extraction of natural resources by government officials and their dominance and easy access to the vast financial resources resulting from the export of natural resources lead to the formation of a large rentier state (Boutilier, 2017). According to the rentier state theory [1], the abundance of natural resources leads to weak and predatory institutions (Aslaksen and Torvik, 2006; Auty and Gelb, 2001; Bagaji *et al.*, 2011; Mähler, 2010; Waldner and Smith, 2014). It raises corruption [2], rent-seeking (Tullock, 2001) and the weakness of democracy (Collier and Hoeffler, 2009; Persson and Tabellini, 2006), which are prominent signs of institutional weakness and are the main differentiators between cursed and non-cursed countries (Boutilier, 2017; Butkiewicz and Yanikkaya, 2010). In countries where there are powerful, organized groups and a "honey pot," those groups all seek their rent share (Boutilier, 2017). Therefore, given the above reasons, it can be argued why rent-seeking and corruption behaviors are more common in countries rich in natural resources. Rentier states with a weak institutional system could increase financial institutions' inefficiency in this group of countries (Gazdar and Cherif, 2014; Khan *et al.*, 2019; Law and Azman-Saini, 2012).

As many countries with abundant natural resources do not have developed financial markets, their banking system accounts for a large share of their financing [3]; this could help increase the negative impact of corruption in these countries on the banking system's soundness.

The remainder of the paper is organized as follows. Section 2 includes the research background and a literature review on the relationship between natural resources, corruption and banking soundness. Section 3 describes the data and the variables used. Section 4 describes the empirical econometric models and the results. Section 5 tests the robustness of earlier analyses using alternative indicators. Finally, in the last section, conclusions and the results derived are presented with some policy implications.

2. Literature review

Agency theory is one of several theoretical approaches that have been taken to explain how financial crises are formed (Johnson and Droege, 2004). In an economic system, asymmetric information is an obstacle to the efficient transfer of funds from savers to households and firms with high investment opportunities. Economists are often referred to this barrier as financial friction (Giovannini *et al.*, 2013; Hahm and Mishkin, 2000; Mishkin, 1990; Ramos-Tallada, 2010). As economic friction increases, it becomes more difficult for lenders to determine the credibility of borrowers. In this situation, they have to apply for higher interest rates to secure themselves against the probability of non-payment of loans to increase the credit spread. Credit expansion means the difference between the interest rate on a business loan and the interest rate on a fully secured asset that is safe for reimbursement (Leitão, 2016).

In this context, the existence of corruption in the economy can exacerbate the problem of agency. In a widespread corruption system, the issue of adverse selection in borrowing and lending is more acute. The authorities' leverage overpayment of facilities (which is one of the most critical aspects of such corruption) and inadequate screening of loan applicants because of the spread of bribery and embezzlement among the experts and management

body of the banking system are two of the most important reasons for such an adverse Corruption and selection (Dinc, 2005; Hu et al., 2004; Ramos-Tallada, 2010). The results of such a process are the payment of subprime loans, increased non-performing loans and deterioration of the banks' balance sheets (Beck et al., 2013; Gertler and Karadi, 2011). In these circumstances, an incident such as a fall in the price of an asset, such as real estate, can trigger a crisis through the sharp decline in banks' net worth (Agur and Demertzis, 2010; Beck et al., 2013; Fostel and Geanakoplos, 2016; Geanakoplos and Zame, 2014; Ramos-Tallada, 2010).

This mechanism works even harder in economies dependent on the export of natural resources such as oil and resources subject to resource curse theory. According to the resource curse theory, the abundance of resources creates a large predatory state with weak institutions prone to corruption and rent-seeking in these countries (Aslaksen and Torvik, 2006; Auty and Gelb, 2001; Bagaji et al., 2011; Mähler, 2010). As institutional quality is an essential prerequisite for a country's financial development (Khan et al., 2019), as a result, more inefficient financial systems are seen in this group of countries (Gazdar and Cherif, 2014; Khan *et al.*, 2019; Law and Azman-Saini, 2012). For example, one of the weaknesses of institutional quality is the weakness of the property rights system, which, in turn, causes difficulties in collaterals and restrictive covenants, which are two essential tools for managing adverse selection in payment facilities (Brunnermeier, 2009: Delis, 2012: Dwumfour and Ntow-Gvamfi, 2018: Hartwell, 2018: Khan et al., 2019; Law and Azman-Saini, 2012).

In many natural resource-based countries, because of the inability of the legal system to enforce contracts and the lack of sensible and modern policies to obtain collateral, and also the widespread corruption of the judiciary, the procedure of right to use the collateral, pursue the judiciary and enforce binding documents is very difficult for lenders (Barry and Tacneng, 2014; Delis, 2012; Dwumfour and Ntow-Gyamfi, 2018; Gazdar and Cherif, 2014; Khan et al., 2019; Law and Azman-Saini, 2012; Marcelin and Mathur, 2014). Also, in such economies, centralized governments have a significant share of commercial banking. Governments often try to impose low-interest rates for specific types of loans, facilitate payment and direct credit to themselves or their desired departments. This goal is often pursued through the establishment of institutions called financial development institutions. Private institutions have a great incentive to reduce adverse selection and moral hazard issues and allocate loans to the most productive investment opportunities. In contrast, governments do not operate on a profit-driven basis and see the distribution of loans through these development agencies as opportunities to distribute rents and benefits to their target persons or groups. Therefore, the effect of corruption on banks' facility performance is intensified (Beck, 2008; Boyd and De Nicolo, 2005; Dinc, 2005; Hu et al., 2004).

Some other empirical studies have also examined the role of corruption in banking soundness; for example, Charumilind et al. (2006) indicated that companies with more relevance and influence over banks or politicians have more access to bank loans and even get loans without collateral. As a result, it deviates the bank's allocation of funds from desirable projects to undesirable projects, which usually increases the volume of deferred claims and endangers the banking system's health. Similar studies by Caballero and Yared (2010) and Tache and Lixandroiu (2006) found that rent-seeking situations affect individuals' economic behavior and reduce their savings. Chen et al. (2015) also found that rent-seeking redirects private sector resources to non-productive activities and reduces personal sector deposits, reducing the volume of bank deposits and subsequently reducing banks' creditworthiness. Bougatef (2015) indicated the impact of corruption on Islamic banks' soundness using a panel of 69 Islamic banks over the period 2008–2010. Park (2012) explores the effects of corruption on the banking sector and economic growth using 76 macroeconomic data from various countries over 2002–2004. The results evidence that

banking soundness corruption significantly aggravates the problems with bad loans in the banking sector and lowers economic growth. Detragiache *et al.* (2008) and Weill (2011) showed that corruption prevents lending by increasing lending costs. Reducing bank lending makes borrowers unable to pay their loans. As a result, it leads to an increase in the volume of deferred banking claims and reduces banking soundness.

The empirical evidence also supports the role of natural resources and corruption in financial institutions' soundness. Khan *et al.* (2019) examined US natural resource rent and ambiguous financial relationships, and institutional quality's critical role. They concluded that institutional quality is an essential prerequisite for US economic development and that natural resource rent requires an integral institutional framework to prevent corruption. Hartwell (2018) examined institutions' role in the interaction of natural resource income with financial development. It can be concluded that if institutions are weak in a country, this revenue may worsen the financial contracts and may result in significant losses to economic development.

Although some studies have shown the relationship between corruption and banking soundness, little empirical evidence exists in this field. We contribute to this strand of literature by re-examining the relationship between corruption and banking soundness of the current empirical literature using a different banking soundness index and the period, and using cross-sectional and panel data approach. We also used the resource curse theory to show the extent of this effect between the two groups of countries.

3. Variables and data

The data for variables included in this paper have been collected from a different source. This section introduces the variables used in our model and explains how they are collected from different sources for 98 countries, including poor and rich natural resources countries [4], from 2012 to 2015.

3.1 Dependent variable: banking soundness

The primary indicator of banking soundness, which we use, is "Soundness of Banking" (SB), which is one of the sub-indexes of the Global Competitiveness Index (GCI) published by the World Economic Forum (WEF). This index is created annually through a questionnaire for most countries. SB scores range from 1 to 7 and a higher score represents a higher level of soundness, as displayed in Table 1.

3.2 Explanatory variables

3.2.1 Corruption. This paper used "Favoritism in decisions of government officials" (COR) data from the WEF Executive Opinion Survey on corruption activities, ranging from 1 to 7. A higher score represents a lower level of corruption. Table 2 shows the results of this index for the sampled period. Singapore has always had the lowest level of corruption (highest score) during 2012–2015. According to the GCI, Singapore is one of the top 10 modernizers globally with high innovation capacity, good economic performance, high quality, efficient and transparent government agencies and the world's best infrastructure after Hong Kong. It also has a healthy macroeconomic environment. Additionally, the Dominican Republic in 2012, Lebanon in 2013 and 2014 and Argentina in 2015 have experienced the highest level of corruption (the lowest score).

The total natural resource rent [5] in each country is an indicator of the abundance of their natural resources. Based on this indicator's statistic features (median), we have divided the states into two equal groups of (49) rich and poor. Scattering graphs between the corruption index (CI) and banking soundness values for each group show the negative relationship

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| Year | SB index score | Canada | Ireland | Country Greece | Slovenia | Ukraine | Corruption and banking |
|-------------|-----------------------|-----------------|---------|-------------------|----------|---------|---------------------------|
| 2012 | Max | 6.8 | | | | | soundness |
| | Min | | 1.84 | | | | |
| 2013 | Max | 6.69 | | | | | |
| | Min | | | 2.29 | | | ~~~ |
| 2014 | Max | 6.71 | | | | | 297 |
| | Min | | | | 2.17 | | |
| 2015 | Max | 6.68 | | | | | |
| | Min | | | | | 2.57 | |
| 2012-2015 | Average | 6.72 | 2.71 | 2.79 | 2.72 | 2.92 | Τ-11-1 |
| Source: The | Global Competitivenes | ss Index (2018) | | | | | SB index statistics |

| Country | | | | | | |
|-------------|------------------------|----------------|---------|-----------|--------------------|----------------------|
| Year | COR index score | Singapore | Lebanon | Argentina | Dominican Republic | |
| 2012 | Max Min | 5.34 | | | 1.81 | |
| 2013 | Max Min | 5.42 | 1.75 | | 101 | |
| 2014 | Max Min | 5.36 | 1 74 | | | |
| 2015 | Max Min | 5.51 | | 1 73 | | |
| 2012-2015 | Average | 5.41 | 1.96 | 1.77 | 2.02 | Table 2. |
| Source: The | Global Competitiveness | : Index (2018) | | | | COR index statistics |

between the CI (COR) and banking soundness (SB). The steeper and positive slope in the chart for the group of countries rich in natural resources shows that the higher the level of corruption, the more significant decline in the degree of banking soundness. Therefore, as corruption in these countries is higher, the impact on banking soundness will be more significant (Figure 1).

3.2.2 Bank net interest margin. In this study, each bank's net interest margin (NIM) is used as an index for evaluating the effectiveness of the system's operations and banking soundness. A reasonable difference between the interest rates on deposit and the interest rates on concessional credits increases the bank's profit margin. The bank's profit margin can be used as one of the bank's internal resources to finance concessional lending. consequently improving its future profit margin (Saksonova, 2014). In general, from a literature review of the bank's NIM, it can be concluded that a high bank NIM is not always a good sign of banking performance. Indeed, bank resources can be provided through loans or stocks. Suppose the bank finances more through loans and facilities. In that case, the high-interest margin indicates a low deposit interest rate and a high-interest rate on loans, which reduces the deposit and increases the loan cost for depositors. An increase in NIM may indicate an increase in operational risk, which is a type of cost to the bank; therefore, it reduces the efficiency, performance and bank stability (Angori et al., 2019; Saksonova, 2014). If the bank is financed through stocks, the more developed the stock market is, the more available borrower information. Therefore, the bank should identify and manage credit risk. The bank's exchange value increases, which raises the NIM and the bank's profitability. Thus, a more developed financial market will lead to a rise in banks' financing through stocks. As a result, the problem of obtaining a loan and its failure is reduced (Borys *et al.*, 2009; Claeys and Vander Vennet, 2008; Doliente, 2005; Masoud, 2013; Maudos and Solís, 2009; Saksonova, 2014).

3.2.3 Deposit insurance. Deposit insurance has been put forward as an integral part of the set of financial stability strategies, as it plays both a preventive role through prudential supervision and a forward-looking role by guaranteeing public deposits (Ogunbado *et al.*, 2016; Alessi *et al.*, 2017; Anginer *et al.*, 2018; Demirgüç-Kunt and Huizinga, 2000; Nolte and Khan, 2017). Supporting micro-depositors, promoting financial stability, enhancing competitive conditions and promoting transparency are among the factors that illustrate the importance and role of the deposit insurance system in the health of a financial system (Demirgüç-Kunt and Huizinga, 2000). Therefore, this variable has been considered as another explanatory variable in the model.

3.2.4 Real gross domestic product growth. In this study, real gross domestic product (RGDP) growth has been included in the model for overall control of economic conditions. General economic conditions can have two interactions on deferred loans. On the one hand, if the economic conditions are right, the likelihood of classifying new or existing loans as deferred loans will be reduced because industrial companies will make more profit under favorable trading conditions. In this way, they will repay their loans without fail. On the other hand, companies usually increase their production and investment in the economic boom, increasing the demand for bank loans. Consequently, banks are more likely to approve loans for inappropriate projects (Louzis *et al.*, 2012; Park, 2012).

The following scatter graph used the available data from the two RGDP and SB indices to show their relationship. The graph indicates the higher the RGDP growth in a country leads to a higher level of banking soundness stemming from the lower amount of non-performing loans (Figure 2).

3.2.5 Institutional quality. The Global Governance Index contains six sub-indexes to measure six dimensions of quality of governance: voice and accountability (VA), political stability and absence of violence (PV), government effectiveness (GE), regulatory quality (RQ), rule of law (RL) and control of corruption (CC). All of which belong to the -2.5 to 2.5 range. In this paper, five dimensions (except the corruption control variable) were used to control each





Notes: Left – rich natural resource countries; right – poor natural resource countries

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country's institutional quality (Park, 2012). Institutional quality plays a significant role in shaping banks and non-bank financial institutions (Barry and Tacneng, 2014). Because it leads to better enforcement of financial contracts and preventing or resolving known problems related to them, such as inappropriate selection, the moral hazard arising from asymmetric information and the agency theory (Barry and Tacneng, 2014; Law and Azman-Saini, 2012).

The following scatter graph shows the positive relationship between banking soundness and each of the Global Governance Index (Figure 3).

4. Empirical analysis

4.1 Model specification

The data presented in the previous section have been used for the equations and have the following simple specifications to investigate the effect of corruption on banking soundness through the theoretical and empirical literature review and to follow Park (2012):

$$SB = \beta_1 COR + \beta_2 DI + \beta_3 NIM + \beta_4 RGDP + \beta^{\epsilon} X + \varepsilon$$
(1)

$$SB = exp \ exp \ (\beta_1 COR) + \ \beta_2 DI + \beta_3 NIM + \beta_4 RGDP + \beta^2 X + \mu$$
(2)

In which *X* represents a set of governance index variables that denotes institutional quality. As the use of prime numbers of these variables seems problematic because of their high correlation with the corruption variable (COR), these variables have become livestock variables, significantly reducing this problem. It is not easy to use all the model's governing indicators together because of their high correlation. So they will be used separately in the model, and the model was estimated five times (Park, 2012). According to the data and variables of the article (Section 3), it would be expected (Table 3).

To estimate the models for investigating the effect of corruption on banking soundness, following Park (2012), both linear and nonlinear models were used for reliability and accuracy. To this end, the cross-sectional data averaged over each variable for 2012–2015 was used. Also, to achieve the study's second objective, the total natural resource rent index, which represents the abundance of natural resources in the present study, was used. This



index is the sum of oil, natural gas, coal (hard and soft) rent, mineral and forest rent Corruption and extracted from the World Bank site as a percentage of each country's GDP. With this index's help, countries are divided into 2 groups of 49 countries with high rents above the mean, representing countries rich in natural resources. Countries with lower rents than the middle of this variable represent poor countries in terms of natural resources (Park, 2012). The models are then estimated separately for both groups of countries. Second, as the panel data are country-by-year, to be more specific, the estimation of the impact of corruption on banking soundness and the assessment of this effect between two groups of rich and poor countries in terms of natural resources was done using panel data. Next, the results of the model estimation were applied using cross-sectional and panel data. Lastly, the model estimation results using cross-sectional and panel data were compared. To this end, the panel type selection tests were first done. Table 4 shows the results of each test for both groups of countries.

Based on the results of Table 1, the random-effects model was selected as the panel model, which is explained as follows [equations (3) and (4)]:

$$Y_{it} = \beta_1 + \sum_{j=2}^k \beta_j X_{jit} + u_{it}$$
(3)

$$SB_{it} = \beta_1 + \beta_2 DI_{it} + \beta_3 NIM_{it} + \beta_4 RGDP_{it} + \beta_5 RQ_{it} + u_{it}$$

$$\tag{4}$$

Also, the LR variance homogeneity results and Wooldridge autocorrelation tests for both groups of countries indicate problems of heterogeneity of variance and autocorrelation in models (Table 5). The generalized least squares (GLS) estimation method was used to solve these two problems, which are reflected in Table 6.

| Independent variable | Expected sign | | |
|--|--|---|---|
| Corruption Bank net interest margin Deposit insurance Real gross domestic product growth Institutional quality | COR NIM DI RGDP VA PV GE RQ RL | + + + + + + + + + | Table 3 The sign of the used variables |

| Test | LM | Hausm | ian test | Chow | v test | |
|-------------------------------|----------------------|--------------------------------|-------------------|--------------------|------------------------------------|-------------------------------------|
| Poor country | Rich country | Poor country | Rich country | Poor country | Rich country | |
| $\chi^{2}(01)$ 204 (0.000) | 236.38 (0.000) | $\chi^{2}(4)$ 6.31 (0.1769) | 5.08 (0.2792) | F 26.75 (0.000) | Statistics 41.83 (0.000) Amount | Table 4. Results of model |
| Notes: Amoun | its represent all si | gnificant levels a | t 10, 5 and 1%. T | he numbers in pa | arentheses are <i>p</i> -values | selection tests |

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This section reports the results of the estimated model. Table 6 shows the cross-sectional regression model estimation results, both linear and nonlinear models, and the corruption coefficient results between two groups of countries. In the model estimation, the banking index's soundness (SB) is considered the dependent variable, and the COR index is the leading independent variable in the relevant model. It should be noted that the data for Iceland are identified as outliers and excluded from the model.

As mentioned before, the institutional quality variables are individually included in the models because of their high level of correlation, i.e. the model is estimated five times (Park, 2012). According to the estimation results of linear and nonlinear models, all the estimated models have close and similar results. Therefore, the results of one model (the model with RQ institutional quality variable) are given as an example, which can be generalized to the other models. In both linear and nonlinear models, the coefficient of corruption has a significant and positive sign at the 5% and 1% level, but this coefficient is very substantial in the linear model. Therefore, the linear model was used to assess better corruption's effect on the two group countries' banking soundness.

The coefficients of all the model variables are statistically significant and in line with expectations (as indicated in Table 3). Considering the positive and significant sign of corruption in linear model estimation results, controlling and reducing it can play an influential role in improving the banking system's soundness.

| | Wooldr | idge test | LR | test | | |
|--|---|------------------------------|-----------------------------|------------------------------|------------------|--|
| Table 5. | Poor country | Rich country | Poor country | Rich country | | |
| The results of heterogeneity of variance and | 41.915 (0.000) Autoco | 102.790 (0.000) rrelation | 222.95 (0.000) Heterosce | 214.80 (0.000) edasticity | Amount Result | |
| correlation tests | Notes: Amounts represent all significant levels at 10, 5 and 1%. The numbers in parentheses are <i>p</i> -value | | | | | |

| | Coefficients | | | Comparison of corruption coefficient between two groups (using a linear model) | | |
|--|--|---|--|---|---|--|
| | | Linear model | Nonlinear model | Rich country | Poor country | |
| Table 6. The results of models estimation and the | COR DI NIM RGDP RQ R^2 <i>Adj</i> R^2 <i>F</i> -statistics Iteration | $\begin{array}{c} 0.942 \ (0.000) \\ 0.608 \ (0.000) \\ 0.176 \ (0.000) \\ 0.15 \ (0.01) \\ 0.681 \ (0.01) \\ (0.9604) \\ (0.958) \\ (0.000) \end{array}$ | $\begin{array}{c} 0.267\ (0.000)\\ 0.659\ (0.000)\\ 0.2\ (0.000)\\ 0.21\ (0.01)\\ 1.139\ (0.000)\\ (0.959)\\ (0.957)\\ (0.002)\\ 7\end{array}$ | $\begin{array}{c} 1.21 \ (0.000) \\ 0.55 \ (0.062) \\ 0.14 \ (0.027) \\ 0.017 \ (0.92) \\ 0.34 \ (0.04) \\ (0.963) \\ (0.958) \\ (0.000) \end{array}$ | $\begin{array}{c} 0.68 \ (0.000) \\ 0.64 \ (0.016) \\ 0.21 \ (0.002) \\ 0.34 \ (0.000) \\ 1.2 \ (0.004) \\ (0.974) \\ (0.971) \\ (0.000) \end{array}$ | |
| comparison of corruption coefficient between groups | Obs. Notes: Amounts | 97 represent all significant | 97 levels at 10, 5 and 1%. | 48 The numbers in parenthe | 48 ses are <i>p</i> -values | |

The next factor that has a positive and significant sign is the quality level of the rules and Corruption and regulations, which indicates that institutional quality levels and better management reduce bad transaction problems and thereby improves banking soundness.

The deposit insurance system also shows a significant positive sign, meaning that the deposit insurance system reduces bad loan problems and increases the banking system's soundness. These results are consistent with some previous studies (Gropp and Vesala, 2001).

Also, the RGDP and the NIM variables have a weak positive sign, indicating that the RGDP and NIM are not very effective in enhancing the banking sector's soundness period.

Based on the estimation results, the correlation coefficient (COR) in natural resource-rich countries is almost twice as high as those in the opposite group, suggesting that corruption's negative impact on banking soundness is more severe in countries rich in natural resources. Corruption coefficients are also meaningful in both groups of countries; this shows that corruption is the global determinant of the banking system's soundness.

In general, in both groups of countries, the model variables' coefficients are significant (except for the RGDP variable in the group of countries rich in natural resources) and have signs consistent with economic theory.

Table 7 indicates the panel model estimation results using the GLS method when its heterogeneity problems and autocorrelation problems have been solved. The coefficient of the corruption variable is positive and statistically significant. According to the results, although in the panel model, the coefficient of corruption in the group of countries rich in natural resources is higher than in the other group, the difference between the coefficients of corruption in the two groups of countries is minimal.

5. Robustness tests

A similar analysis was done using the alternative indicators for the dependent variable (corruption) and the most important explanatory variable (banking soundness) to ensure the results' accuracy.

5.1 Alternative corruption index

An indicator used to measure corruption is the Corruption Perception Index (CPI) provided annually for different countries by Transparency International. This index measures the degree of corruption among government officials and politicians. The index ranges from zero (the highest level of corruption) to ten (the lowest level of corruption). The method of calculating this index changes each year and is based on the rating. Therefore, comparing

| Coefficients | Random effects model Rich countries | Poor countries | |
|--|--|--|---|
| COR DI NIM RGDP RQ Cons Obs. | $\begin{array}{c} 0.34 \ (0.000) \\ 0.27 \ (0.002) \\ 0.04 \ (0.000) \\ 0.01 \ (0.000) \\ 0.31 \ (0.000) \\ 3.4 \ (0.000) \\ 47 \end{array}$ | $\begin{array}{c} 0.31\ (0.000)\\ 0.29\ (0.019)\\ 0.005\ (0.771)\\ 0.001\ (0.851)\\ 0.31\ (0.015)\\ 3.49\ (0.000)\\ 48\end{array}$ | Table 7 Corruption coefficient comparison between two groups of |
| Notes: Amounts represent | all significant levels at 10, 5 and 1%. The numbers | in parentheses are <i>p</i> -values | countries |

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the index's annual change trends is misleading for countries and makes it difficult to analyze panel data (Park, 2012). Consequently, for cross-sectional analysis, the average CPI was used for the sample period. Moreover, for easier understanding and interpretation, the CI index was constructed to indicate that the higher the CI index is, the greater the level of corruption is (Park, 2012). Following Park (2012), the CI is defined as follows:

$$CI = 10 - CPI.$$
 (5)

5.2 Alternative soundness of the banking index

Another indicator used for the banking system's stability and soundness is the ratio of nonperforming loans to total loans (NPLR index). This index for different countries is extracted from the Global Financial Stability Report statistics published by the International Monetary Fund. This index is defined as equation (6):

$$NPLR = \frac{\sum NPLR}{\sum TL}$$
(6)

Therefore, the negative impact of corruption on banking soundness, despite an alternative indicator of corruption and banking health, is also strong and consistent with previous results.

Next, the effect of corruption on banking soundness was examined using the linear model and alternative corruption and banking soundness (CI and NPLR). The estimation results show that the relationship between the CI and the NPLR is positive and highly significant. Corruption significantly worsens the quality of bank loans, thereby reducing the level of banking soundness. Thus, despite the alternative index for corruption and banking soundness, the negative impact of corruption on banking health is still strong and consistent with previous results (Table 8).

6. Conclusion

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Corruption in the banking system is one of the contributing factors to the occurrence of financial crises that can exacerbate the financial crisis through the impact on the bank balance sheet (Park, 2012; Tran et al., 2017). In countries with abundant natural resources, corruption is more conducive. As the revenue from these resources helps to strengthen the role of the government in the economy, as a result, it creates corruption and rent-seeking opportunities and also a weak institutional system (Isham et al., 2005; Leitão, 2016). The rent

| | Coefficients | Amount |
|-----------------------------------|--|--|
| | CI | 1.99 (0.000) |
| | NIM | -1.94(0.053) -0.2(0.412) |
| | RGDP RQ | -1.14(0.000) -2.68(0.001) |
| | R-squared | 0.734 |
| T 11 0 | Adj. <i>R</i> -squared <i>F</i> -statistics | 0.719 0.000 |
| Table 8. The results of linear | Obs. | 96 |
| model estimation | Notes: Amounts represent all significant levels at 10, 5 and 1%. The num | bers in parentheses are <i>p</i> -values |

system causes bank loans to be paid based on bribes, leverage and advice, which, by default, Corruption and increases the amount of non-performing loans and exacerbates the deterioration of the bank balance sheet, and ultimately reduces the banking soundness (Park, 2012).

According to the importance of banking soundness in a country's economy and the significant role of corruption on it, especially in countries with abundant natural resources, this study has examined the effect of corruption on banking soundness across countries and has evaluated this effect between two groups of rich and poor countries in terms of natural resources.

The results of model estimation showed that corruption had a significant negative impact on banking soundness; hence, it is one of the most critical factors affecting banking soundness. Moreover, the negative effects of corruption on the banking soundness of the countries rich in natural resources is more serious because of the existence of resource rent and the lack of developed financial markets. Therefore, efforts to fight corruption should be the first step in enhancing the banking sector's soundness for rich natural resource countries. Otherwise, any regulatory measures will not be sufficient. The corruption coefficients are significant in both groups of countries, indicating that corruption is the global determinant of the banking system's soundness.

The results also show that improving institutional quality by reducing corruption and reducing bad loan problems leads to increased banking soundness levels.

Notes

- 1. As both the rentier state theory and the natural resource curse hypothesis focus on the abundance of natural resources in economies based on natural resources, and also, these two theories are interdependent, rentier state theory is derived from the extensive research group of natural resource curse, and it can be beneficial in explaining the cause of corruption; as a result, it is necessary to make a brief reference to this theory (Bagaji et al., 2011; Waldner and Smith, 2014). Of course, our main focus in this article is on the natural resource curse hypothesis.
- 2. Refer to (Acemoglu et al. 2004), (Brollo et al. 2013), (Koyama 2019), (Robinson et al. 2006) and (Sala-i-Martin and Subramanian 2013).
- 3. Refer to (Dwumfour and Ntow-Gyamfi 2018), (Laeven and Valencia 2012) and (Tran et al. 2017).
- 4. The difficulty of obtaining micro-level data on corruption leads us to use the aggregate data.
- 5. Total natural resource rent is the sum of oil, natural gas, coal (hard and soft) rent, mineral and forest rent extracted from the World Bank site as a percentage of each country's GDP.

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