Capitalization - profitability nexus: Applicability of capital theories in banking sector of BRICS Countries

Nikita Singhal (nikitagoyal.nikki@gmail.com)
IIMT UNIVERSITY
Shikha Goyal
Amity University
Sapna Kumari
Vidya Knowledge Park
Humaira Fatima
BS Abdur Rahman University: B S Abdur Rahman Crescent Institute of Science & Technology
Shweta Nagar
GNIOT: Greater Noida Institute of Technology

Research

Keywords: Capital theories, BRICS, Profitability, Banking, ARDL estimation, VECM Models

Posted Date: May 11th, 2022

DOI: https://doi.org/10.21203/rs.3.rs-1508528/v1

Abstract

The purpose of this research is to assess the nexus between capitalization and profitability in context of prevailing five theories of capitalization and profitability nexus. For testing the prevalence of capital theories in the banking sectors of the BRICS, the ARDL and VECM/VAR Granger causality tests are used in panel and individual setting on the data of BRICs banking sector from 2000 to 2020. Long-term empirical findings of the study corroborate the signalling theory and the bankruptcy cost hypothesis for the BRICS, Brazil, Russia, and India. While capitalization appears to have a significant negative impact on profitability in China and South Africa, this supports the agency theory. Profitability appears to have a significant favourable impact on capitalization in the long run, consistent with pecking order theory of Myers and Majluf (1984) theory for BRICS and Brazil. Profitability has a negative impact on capitalization in India and South Africa, confirming the findings of Modigliani and Miller (1958), and Miller (1977). The short-term estimation results are similar to the long-run results, although the significance is lower in most cases. The short-run and long-run assessments of the interrelationship between capital and profitability are especially important for the development of "macroprudential" measures.

1. Introduction

The capitalization-profitability nexus can be examined under five hypotheses, namely, the signalling hypothesis, the bankruptcy cost hypothesis, the Agency hypothesis, the pecking order hypothesis, and the Modigliani and Miller (1958) and Miller hypotheses (1977).

Capital management is essential to the operation of modern banks. Banks are compelled to comply with severe international and national standards in this respect. Capital requirements for banks seek to increase the profitability and solvency of financial institutions (banks and other financial intermediaries) in any country. By implementing several Basel Accords, regulators change capital requirements in response to changing economic situations and adjust capital requirements according to the risk profile. Capital adequacy defends against negative shocks and enhances the possibility of better earnings and profitability (Almaqtari, et al., 2019; Goddard, Molyneux & Wilson, 2004; Pasiouras and Kosmidou, 2007). According to the signalling theory, increasing capital of a bank conveys to the market favourable information about the bank's prospects and profitability, which eventually increases the bank's business and leads to better profitability. Furthermore, in the same context, the bankruptcy cost theory says that a well-capitalized bank is less reliant on borrowing and hence has a lower cost of funding. This not only minimizes the risk of bankruptcy but also boosts profitability. Some researchers, on the other hand, backed agency theory and argued that there is a negative relationship between capitalization and profitability because equity is an expensive source of funds due to high agency costs, which reduces profitability due to the higher returns required by shareholders (Herrero, Gavila, & Santabarbara, 2009; Berger, 1995). According to agency theory, a greater capital ratio raises the agency cost, which limits managers' capacity to invest more effort into improving shareholder value, resulting in poorer bank profitability.

Some Researchers such as Annor, Obeng, and Nti (2020), Polat and Al-khalaf (2014), Abusharba, Triyuwono, Ismail, and Rahman (2013), Saunders and Wilson (2001), Konishi and Yasuda (2004), Keeley (1990), Mili, Sahut, Trimeche, and Teulon (2017) support pecking order theory. They contended that a prosperous company may readily retain regulatory capital as needed. According to pecking order theory, internal funds are the least information-intensive source of funds, therefore a more profitable company may keep revenues to finance known investment possibilities, resulting in greater capital ratios. While Modigliani and Miller (1958) and Miller (1977) showed that more prosperous banks may opt to keep lower capital ratios, a negative relationship exists. A more prosperous bank may also choose a lower capital buffer since it believes it will be able to fund anticipated investment opportunities with internal money. High profitability may also reduce the value of the tax deductibility advantage provided by debt because a company that is not profitable does not pay taxes on payments to stockholders (Modigliani and Miller, 1958; Miller, 1977). These arguments have been discussed by Modigliani and Miller (1958), and Miller (1977), and have been supported by studies in various developed and developing countries (Alajmi & Alqasem, 2015; Mekonnen, 2015; Brown & Octavia, 2010).

The nexus between capitalization and profitability is a contentious issue, and the available literature presents contradictory findings on this topic in different sectors and settings, necessitating more research in this field. This study's contribution and novelty may be seen in numerous areas. From a theoretical standpoint, this study tested five major theories on capitalization and profitability (signalling hypothesis, bankruptcy cost hypothesis, Agency hypothesis, pecking order hypothesis, Modigliani and Miller (1958) and Miller (1977) hypothesis) that contribute to the study's novelty. From a geographical standpoint, this is the first attempt to assess the nexus between capitalization and profitability in BRICS countries. It is a well-known fact that the banking industry has contributed to the remarkable financial development of several emerging nations, especially the BRICS (Brazil, Russia, India, China, and South Africa), which have seen deep economic and financial upheavals in recent decades. To secure a well-capitalized position, most nations, including the BRICS, require banks to maintain the required minimum capital as well as the required capital adequacy ratio. In terms of methodology, this study utilizes two alternative capitalization and profitability indicators to provide strong conclusions about bank capitalization and profitability nexus. We employed two capitalization measures: bank capital to total assets (CR) and bank regulatory capital to risk-weighted assets (CAR). We also utilized two profitability measures, bank return on assets (ROA) and bank return on equity (ROE), which are extensively used to assess a bank's profitability.

The main goal of this article is to empirically investigate the nexus between capitalization and profitability in BRICS nations utilizing yearly data for BRICS countries from 2000 to 2020 in the panel and individual settings. This study adds to the body of knowledge on the nexus between capitalization and profitability by employing a variety of ideas, samples, procedures, time periods, and factors. This study's empirical findings are based on the more acceptable approach of the VECM/VAR Granger causality test and ARDL estimation, which delivers consistent and robust results. We anticipate that the findings of this article will assist policymakers in making capitalization and profitability choices. Long-term empirical findings of the study corroborate the signalling theory and the bankruptcy cost hypothesis for the BRICS, Brazil, Russia, and India, implying a positive influence on capitalization from profitability. While capitalization appears to have a significant negative impact on profitability in China and South Africa, this supports the agency theory, which contends that capitalization has a significant negative impact on profit. Profitability appears to have a significant favourable impact on capitalization in the long run, consistent with pecking order theory of Myers and Majluf (1984) theory for BRICS and Brazil that higher profitability may support higher capital ratios since profits are a source of capital. Profitability has a negative impact on capitalization in India and South Africa, confirming the findings of Modigliani and Miller

(1958), and Miller (1977). Profitability has no influence on capitalization in Russia and China. The short-term estimation results are similar to the long-run results, although the significance is lower in most cases.

We may also utilize our findings to make policy recommendations. Our findings are important for BRICS bank regulators who are attempting to adjust capital requirements. The short-run and long-run assessments of the nexus between capital and profitability are especially important for the development of so-called "macroprudential" policies since our findings show that banks may boost their profitability by increasing their capital ratios and vice versa.

Section 2 includes a study of relevant literature. Section 3 describes the data and methods used, as well as the variables. Section 4 reports on the study's findings. Finally, Section 5 presents the paper's conclusions and underlines its implications.

2. Literature Review

Many nations have implemented the Basel capital requirements, recognizing the necessity of capital adequacy. However, some researchers are still conflicted on whether capitalization adds to banks' financial well-being. Berger (1995), for example, proposed the signalling hypothesis and the bankruptcy cost hypothesis as the two key reasons for capitalization's favourable influence on bank profitability. Berger (1995) elaborated by stating that a bank's increased equity conveys to the market favourable information about the bank's prospects and profitability. The bankruptcy cost theory, on the other hand, contends that a well-capitalized bank is less reliant on debtors and, as a result, has a lower cost of funding. This not only lowers the expense of bankruptcy but also boosts profitability. Dietrich and Wanzenried (2011) contended that well-capitalized banks are safe, lucrative, and can become resilient, even during economic downturns, relying less on external funding. Almaqtari et al. (2019) recently showed that by expanding their equity, banks can absorb the negative effects of increased non-performing loans caused by excessive lending during economic boom periods. They also stated that a large level of regulatory capital reflects creditworthiness, which lowers borrowing costs. Belaid et al. (2017) backed this up by giving evidence that increasing the regulatory capital ratio decreases the risk of loan defaults. Molyneux and Thornton (1992) found a favourable link between bank capitalisation and profitability in eighteen European nations. Goddard et al. (2004) observed a favourable impact on the profitability of 665 banks in six European nations using the Capital to Asset Ratio as a measure of capitalization. Pasiouras and Kosmidou (2007) discovered that the equity-to-asset ratio had a beneficial influence on the profitability of 284 commercial banks operating in 15 European countries. Berger (1995) also offered empirical evidence of a positive association between bank capitalization and profitability in the United States. Sufian and Habibullah (2009) suggested that a strong capital position is critical for banks in developing economies because it promotes depositor protection in adverse macroeconomic situations by giving additional resilience to withstand financial crises. The authors used static regression to discover that the equity to assets ratio had a beneficial influence on the profitability of Chinese banks. Furthermore, Garca-Herrero et al. (2009) and Tan and Floros (2012) discovered a favourable association between the equity-to-asset ratio and profitability in Chinese banks. Zarrouk et al. (2016) showed that the equity to assets ratio has a beneficial influence on the profitability of 51 banks in the Middle East and North Africa (MENA) area.

Furthermore, according to the agency theory, a greater capital ratio raises the agency cost, reducing profitability (Jensen and Meckling 1976). A bank with a larger level of equity tends to be too conservative, missing out on possible growth possibilities (Goddard et al. 2004; Maudos 2017). Martins et al. (2019) discovered that the equity to asset ratio has a detrimental influence on the profitability of 108 banks from the United Kingdom, Germany, and the United States. Masood and Ashraf (2012) discovered that the equity-to-asset ratio had a detrimental influence on the profitability of 25 banks in 12 countries. Tan and Floros (2012) showed a negative association between a greater equity-to-asset ratio and profitability in 101 Chinese banks. According to the authors, increasing capitalisation in the Chinese banking system precedes reduced interest margins. The literature on this subject is extensive, and multiple studies have found a negative association between capitalization and bank performance in various regions of the world (see, for example, Altunbas et al., 2007; Goddard et al., 2004; Saunders and Schumacher, 2000; Dietrich and Wanzenried, 2011)

Another body of literature examines how profitability influences capitalization. Internal funds are the least information-intensive source of funding, according to the pecking order hypothesis, and hence a more prosperous corporation may keep revenues to finance known investment possibilities (Myers and Majluf, 1984). As a result, because earnings are a source of capital, increased profitability may result in larger capital ratios. High earnings may also improve the perceived charter value of the bank, giving an incentive to maintain greater capital ratios (Polat & Al-Khalaf, 2014; Keeley, 1990; Saunders & Wilson, 2001). These variables indicate that earnings have a positive causality/impact on capital. Annor, Obeng, and Nti (2020) investigated the drivers of capital adequacy across selected Ghanaian commercial banks and concluded that ROA was significant and positively linked to the capital adequacy ratio. As a result, increased ROA is a boost to capital adequacy as well as a means to embark on riskier but profitable initiatives. To put it another way, banks are risk-averse and will always devise investment strategies that protect capital while mitigating the impact of growing risk levels. Banks are fully aware that raising their risk level increases their danger of company failure, and typically, the riskier a venture is, the more it pays on the return as such, banks seek to strengthen their capital base to take on more risks. Abusharba, Triyuwono, Ismail, and Rahman (2013) found the same finding when studying the factors of the capital adequacy ratio in the Indonesian Islamic banking market. They discovered that profitability (ROA) has a substantial positive association with CAR, implying that as generated earnings grow, Islamic banks may have a greater incentive to preserve their owners' money.

A highly prosperous bank, on the other hand, may prefer a lower capital buffer since it believes it will be able to rely on internal reserves to fund anticipated investment possibilities or escape regulatory criticism. High profitability may also reduce the value of the tax deductibility advantage provided by debt because a company that is not profitable does not pay taxes on payments to stockholders (Modigliani and Miller, 1958; Miller, 1977). These two elements, as explored by Modigliani and Miller (1958), and Miller (1977), show that more profitable banks may opt to keep lower capital ratios, indicating a negative relationship. Berger and Patti (2006) and Williams (2004) investigated hypotheses of reverse causation from profitability to capital. According to their findings, profitable banks prefer lesser equity capital because increased efficiency reduces the cost of insolvency and financial turmoil (a substitution effect). Gropp and Heider (2010) investigate the drivers of leverage for the significant US and European banks from 1991 to 2004. They include return on assets as well as return on assets multiplied by a dummy variable equal to 1 if the bank is near to meeting its regulatory requirements. A more profitable bank may anticipate to

have better ROE in the future and so chooses to keep a lower precautionary buffer, knowing it would be able to rely on internal funds to guarantee it reaches the necessary levels in the future.

3. Data And Methodology

3.1 Model specification and data

Because capitalization and profitability are inextricably linked, our model examines the influence of capitalization on profitability and vice versa for the BRICS nations as a whole and each BRICS country.

In this study, the following basic specifications are used to empirically investigate the long-run and short-run effects of capitalization on profitability in the panel and individual county settings:

$Capitalization_{it} = \alpha_{0+} \alpha_1 Profitability_{it} + F_i + \varepsilon_{it}$ (Eq. 1a)

$Capitalization_t = \alpha_{0t+} \alpha_1 Profitability_t + \varepsilon_t$ (Eq. 1b)

The relationship in Eq. 1a for the BRICS panel and Eq. 1b for individual nations might be positive or negative. With a positive sign, Equations 1a and 1b represent the signaling hypothesis and the bankruptcy cost hypothesis, respectively, because increased capital provides a positive signal or information about the bank and lowers the bankruptcy cost (Berger, 1995). Eq. 1a and 1b with negative sign is the agency theory suggests that a higher capital ratio increases the agency cost, thus negatively affecting profitability.

$Profitability_{it} = \alpha_{0+} \alpha_1 Capitalization_{it} + F_i + \varepsilon_{it}$ (Eq. 2a)

$Profitability_t = \alpha_{0t+} \alpha_1 Capitalization_t + \varepsilon_t$ (Eq. 2b)

Profitability can have a positive or negative impact on capitalization. As a result, the sign-in Eq. 2a for the BRICS panel and Eq. 2b for individual nations might be positive or negative. Equations 2a and 2b with a positive sign is pecking order theory. Equations 2a and 2b with a negative sign represent the Modigliani and Miller (1958) and Miller (1977) hypotheses, which postulated that more profitable banks may opt to keep lower capital ratios.

Subscripts t and i in the above equations denote time and country, respectively. The Capital Adequacy Ratio (CAR) and the Capital Ratio (CR) are two variables used to measure capitalization (CR). The Capital Adequacy Ratio (CAR) is the proportion of regulatory capital to total risk-weighted assets (Belaid et al. 2017; Tan, Floros, and Anchor, 2017). It is a proportion of total regulatory capital to assets held, weighted by the risk of those assets. The CAR has been widely researched in the literature and is a regulatory issue based on the BASEL principles designed to measure and increase the capital position of banks and other financial institutions. Capital Ratio (CR) is the ratio of bank capital and reserves to total assets expressed as a percentage. Owner contributions, retained profits, general and special reserves, provisions, and value adjustments are all included in capital and reserves. All nonfinancial and financial assets are included in total assets.

Profitability is measured by two variables: bank return on assets (ROA) and bank return on equity (ROE), which are extensively used to determine a bank's profitability. Bank return on assets (ROA) is the ratio of commercial banks' after-tax net income to total assets on an annual basis, whereas bank return on equity (ROE) is the ratio of commercial banks' after-tax net income to equity yearly.

The study empirically examined existing capital theories in the context of banking sector of BRICS and individual BRICS nations. The analysis utilises annual data on the four variables mentioned above from 2000 to 2020. The statistics were derived from the World Bank's global financial development indices.

3.2 Methodology and Estimation procedure

3.2.1 Unit Root Test

We begin our analysis by running the panel unit root tests provided by Levin, Lin, and Chu (LLC) (2002) for BRICS panel to examine the stationary features of the relevant variables. According to the LLC (2002), the null hypothesis is that each series has a unit root as opposed to the alternative hypothesis that some of the individual series have a unit root. These statistics have an asymptotic distribution that is similar to a typical normal distribution.

We employed the Augmented Dickey-Fuller Test under the null hypothesis of the presence of a unit root against the alternative hypothesis of no unit root to analyze the stationary property in the case of individual countries in the BRICS panel.

3.2.2 ARDL Cointegration Test:

After validating that the series in our panel and individual countries are integrated in a mixed order of integration, the next step is to look for cointegration. To that end, we employ the ARDL bounds test method developed by Pesaran et al. (2001) to test for the existence of a long-run relationship among variables by performing an F-test for the joint significance of the coefficients of the lagged levels of variables, i.e. H0 (null hypothesis of no cointegration) versus H1 (alternative hypothesis of cointegration). The null hypothesis of no long-run relationship can be rejected if the F-statistics is greater than the upper critical value. In contrast, the null hypothesis cannot be rejected if the test statistics fall within the lower and upper bounds of critical values. Once the co-integration is established, the conditional ARDL long-term model for capitalization and profitability will be calculated in the second stage. This entails utilizing SIC to determine the ordering of ARDL models. In the third and last stage, we estimate an error correction model (ECM) using the long-run estimations to derive the short-run dynamic parameters. The method has been applied for three reasons. First, unlike other co-integration techniques such as Johansen (1992), the

bound test is simple. The Johansen (1992) technique demands that all variables be integrated into the same sequence (I(1)), or else the predictive value is lost. The ARDL approach, on the other hand, is effective regardless of whether the model's regressor is I (0) or I (1). The process, however, will fail in the presence of the I (2) series. Second, with small sample data sizes, like in this study, the ARDL test is substantially more efficient. Third, the error correction technique combines short-run dynamics with long-run equilibrium without compromising long-run information.

3.2.3 Panel ARDL model

The panel ARDL PMG estimator is used to investigate the long-run and short-run relationship between capitalization and profitability. Traditional estimating approaches do not allow for the investigation of variable adjustments to short- and long-term equilibrium conditions. The Panel ARDL PMG estimator appears to be required in the control of heterogeneity in the relationship that exists between variables while incorporating individual-specific effects (Pesaran & Shin, 1996). There are three commonly used estimating methods: the MG created by Pesaran and Smith (1995), the PMG produced by Pesaran et al. (1999), and the DFE estimator. We employed the Hausman test, which allows us to evaluate the hypothesis of long-run coefficient homogeneity, the result of which is available on demand. The Hausman test allows you to choose between the MG and the PMG on the one hand, and the PMG and the DFE on the other. We showed that the PMG estimator is more consistent and efficient based on the Hausman test.

3.2.4 ARDL Diagnostic Tests

Diagnostic and stability tests are used to examine the robustness of the ARDL results. Some of the tests used in these applications are the Breusch Godfrey serial correlation LM test, the Breusch–Pagan Godfrey Heteroskedasticity test or the White test, and the Jarque–Bera test. Furthermore, the Ramsey reset test is used to determine the model's functional form or stability.

Table 4 summarises the results of the diagnostic test for the ARDL model. These results revealed that there was no serial correlation or heteroscedasticity. The Ramsey RESET test and Jarque Bera test statistics were used to assessing the results' stability and normality. The testing revealed that the calculated model was stable and that the data was normal.

3.2.5 VECM/VAR Granger Causality:

After the cointegration methods have been used to estimate the long-run relationship between the variables, the Granger causality test is used to evaluate the direction of the causation. When the cointegration test shows the long-run connection, a Granger-type causality may be evaluated by supplementing the model with a single period lagged error correction term. As a result, the vector error correction model (VECM) can be employed. If there is no evidence of cointegration among the variables, the Granger causality specification will be a vector autoregression (VAR) in the first difference form. We employed VAR/VECM Granger Causality in both panel and individual settings.

4. Empirical Results And Discussion

Before proceeding with the estimate of the ARDL model and the VECM/VAR Granger causality test in a panel and individual context, the stationarity of the variables must be investigated. To investigate the order of integration of the variables, the ADF (Augmented Dickey-Fuller Test) and LLC (Levin, Lin, and Chu) unit root tests were applied. The ARDL technique can theoretically be used to variables with I (0), I (1), or a mixed order of integration. As a result, in order to implement the ARDL test, we applied unit root tests to analyse the order of integration of the variables and confirm that none of them were I(2).

Table 1 shows the ADF estimates for individual countries and the LLC models panel of BRICS countries. The results of unit root tests revealed that the series in our panel and individual countries are integrated in a mixed order; hence, the next step is to test for the presence of cointegration using ARDL models.

The results of the ARDL bounds test, as shown in Table 2, provided strong evidence for cointegration between the variables for models 1 to 6 for Brazil, model 5 to 8 for Russia, all models for India, model 6 to 8 for China, and all models for South Africa except model 2, 4, 8 because the F-statistic value of the bounds test is greater than the upper critical bounds value at 5%, which rejects the null hypothesis of no cointegration.

After the bound test revealed long-run cointegration for individual countries, we generated Tables 3 (ARDL Model) and 5 (VECM/VAR Granger causality model) to depict the short-run and long-run relationships between the variables.

The results of the long-run estimation under the ARDL framework in Table 3 show that CAR and CR have a significant positive impact on profitability for BRICS, Brazil, Russia, and India, confirming the signalling hypothesis and the bankruptcy cost hypothesis, which assume a positive impact of capitalization on profit. This means that an increase in capitalization leads to an increase in bank profitability. This might be because a bank's capital adequacy indicates to the market favourable information about the bank's future prospects and profitability, and a well-capitalized bank is less reliant on borrowing and, as a consequence, has a lower cost of funding. This not only lowers the expense of bankruptcy but also boosts profitability. While CAR and CR appear to have a considerable negative influence on profitability for China and South Africa, this confirms the agency theory, which argues that capitalization has a major negative impact on profit. Banks with a greater capital ratio incur higher agency costs and operate more conservatively, missing out on possible growth possibilities.

While analysing the impact of profitability on capitalization, it is revealed that ROA and ROE have a considerable and favourable impact on CAR and CR in BRICS and Brazil in all models from 5-8, as shown in Table 3. This is consistent with the pecking order hypothesis, which states that greater profitability may lead to higher capital ratios since earnings are a source of capital. While ROA and ROE have a negative influence on CAR and CR capitalization in India and South Africa across all models from 5-8, Table 3 verifies the Modigliani and Miller (1958) and Miller (1977) theory. However, significance is missing in the case of the impact of ROE on CAR and CR in South Africa. Profitability has no impact on capitalization in Russia and China. Table 3 also contains the results of short-run dynamics using the ECM version of ARDL. The signs of the short-term estimates persist in the long run. As a consequence, in addition to the long-run

results, the short-run estimation within the ARDL framework corroborated the positive impact of ROA and ROE on CAR and CR in BRICS, Brazil, and Russia, as shown in model 5-8 Table 3. ROA and ROE have a negative impact on CAR and CR in India and South Africa, while this is not the case in India. Capitalization (CAR and CR) had no effect on profitability (ROA and ROE) across all models in Table 3. However, capitalization has a favorable short-term impact on profitability.

Diagnostic and stability tests are used to examine the robustness of the ARDL results. Table 4 summarises the diagnostic test findings for the ARDL model. These results revealed that there was no serial correlation or heteroscedasticity. The Ramsey RESET test and Jarque Bera test statistics were used to assess the results' stability and normality. The testing revealed that the estimated model was stable and that the data was normal. The reliability and validity of the ARDL estimations were validated by all of the estimated diagnostic test data.

The VECM/VAR Granger causality was also used in this study to evaluate the direction of the causal relationship between the variables. According to Granger (1969), VECM Granger causality gives evidence showing whether the variables have a causal relationship in both the long and short term. Table 5 depicts the causal relationship between the CAR and ROA, the CAR and ROE, the CR and ROA, and the CR and ROE, as well as the short-run and long-run causality results. The VAR Granger causality was also used to evaluate the direction of the short-run causal relationship between variables where cointegration is not found using the ARDL bound test. According to Granger (1969), VAR Granger causality gives evidence showing whether the variables have a causal relationship in the short term.

The results in table 5 (VECM/VAR) are consistent with the results in table 4 (ARDL). In many cases, there is evidence for a long-run Granger causal relationship between the variables since a negative and significant lagged error correction term was uncovered. The long-run estimation results under the VECM framework reveal that there is a bi-directional causal relationship between profitability and capitalization for the BRICS in panel and Brazil, India, and South Africa in individual estimation. Unidirectional causality runs from capitalization to profitability in Russia and China. In the short term, we observe that unidirectional causality runs from profitability to capitalization for the BRICS in panel and Brazil, Russia, and South Africa in individual estimation.

5. Conclusions And Policy Implications

To ensure the solvency of the banking sector, it is mandatory for all types of banks operating in BRICS to keep a minimum amount of required capital to remain solvent and profitable. On the other side, a profitable firm can easily maintain regulatory capital as required. Several studies have examined the impact of capitalization on profitability and vice versa. There are several hypotheses on the relationship between capitalization namely signaling hypothesis, bankruptcy cost hypothesis, Agency hypothesis, pecking order hypothesis, and hypothesis of Modigliani and Miller (1958) and Miller (1977).

This paper seeks to strengthen the existing literature by examining the nexus between capitalization and profitability for 5 emerging countries, namely; Brazil, Russia, India, China, and South Africa in both panel and individual settings covering the period 2000–2020. ARDL model and Granger causality test using VAR and VECM framework are applied to investigate the interrelationship between capitalization and profitability in five BRICS countries. The empirical findings of the study in the long-term validate the signalling hypothesis and the bankruptcy cost hypothesis, for the BRICS, Brazil, Russia, and India, all of which imply a positive impact on capitalization from profitability. While capitalization appears to have a considerable negative influence on profitability in China and South Africa, this confirms the agency hypothesis, which argues that capitalization has a strong negative impact on profit. In the long term, profitability seems to have a considerable beneficial influence on capitalization agreed with the pecking order hypothesis for BRICS and Brazil that greater profitability may promote larger capital ratios since earnings are a source of capital. Profitability has a detrimental influence on capitalization in India and South Africa, validating the premise of Modigliani and Miller (1958). In Russia and China, profitability has no bearing on capitalization. The result from short-term estimation is parallel to the results in the long run, but the significance is less in most cases.

We also use our results to draw policy implications. First, our findings are relevant for bank regulators in BRICS seeking to calibrate minimum capital requirements, and the short-run and long-run effects of capital on profitability are especially relevant for the design of so-called “macroprudential” tools. Regulators should strictly monitor the minimum capital requirements of all banks to boost their solvency and profitability aspects and should avoid any exemptions given to banks that failed to achieve the necessary minimum capital requirement. Our results indicate that banks can increase their profitability by increasing their capital ratios. The wider implications of this fact could motivate banks to pay closer attention to the level of capitalization while considering changes to their capital level. Second, in certain cases, the study showed that higher capitalization can impede the profitability of the banking sector. Hence, before extending any specified regulatory requirements on capitalization, regulators should consider that capital amount beyond a certain limit can impede the profitability of the banking industry. Third, this study also showed that banks with higher profitability can easily maintain adequate capital. There, the regulators should consider the profitability of banks before extending any specified regulatory requirements on capitalization. Banks with higher profit can retain profit to finance their investment opportunities rather than holding capital ratios beyond the minimum capital requirements. The findings of this paper will be of interest to academics, policymakers, investors, and bank management.

Although this study is based on a large fraction of time series and cross-sectional data, a comprehensive set of variables, and robust econometric techniques, it has some limitations. For instance, the study period of 2000–2020 was due to the lack of availability of all necessary data beyond 2020. Our study was based on the BRICS banking sector, but future studies could provide similar evidence from other countries as well. Moreover, the same set of variables used in this study could be replicated in studies on other emerging and developed economies.

Declarations

Availability of data and materials

The datasets for the present study are available electronically and publicly.

Competing interests

There is no competing interests.

Funding

Not Applicable.

Authors' contributions

Contribution of all authors is acknowledged.

Acknowledgements

Not Applicable

References

Abusharba M T, Triyuwono I, Ismail M, Rahman A F (2013) Determinants of Capital Adequacy Ratio (CAR) in Indonesian Islamic commercial banks. Global Review of Accounting and Finance 4: 139- 170.

Alajmi M, Alqasem K (2015) Determinants of Capital Adequacy Ratio in Kuwaiti Banks. Journal of Governance and Regulation 4: 315-322.

Almaqtari F A, Eissa A, Homaidi A, Tabash M I, Farhan N H (2019) The determinants of profitability of Indian commercial banks: A panel data approach. International Journal of Finance & Economics 24: 168-185.

Altunbas Y, Santiago C, Edward P M, Gardener M P (2007) Examining the Relationships between Capital, Risk and Efficiency in European Banking European Financial Management 13: 49–70.

Annor E S, Obeng F S, Nti N O (2020) Determinants of capital adequacy among the commercial banks in Ghana. Journal of Economics, Management and Trade 26: 88-95.

Belaid F, Rim B, Belguith H (2017) Bank-firm relationship and credit risk: An analysis on Tunisian firms. Research in International Business and Finance 42: 532–543.

Berger A (1995) The Profit-Structure Relationship in Banking–Tests of Market-Power and Efficient-Structure Hypotheses. Journal of Money, Credit and Banking: 27: 404-431.

Berger A N, Patti E B D (2006) Capital structure and firm performance: A new approach to testing agency theory and an application to the banking industry. Journal of Banking & Finance 30: 1065–1102.

Brown R, Octavia M (2010) Determinants of bank capital structure in developing countries: regulatory capital requirement versus the standard determinants of capital structure. Journal of Emerging Markets 15: 50-62.

Dietrich A, Wanzenried G (2011) Determinants of bank profitability before and during the crisis: Evidence from Switzerland. Journal of International Financial Markets, Institutions and Money 21: 307-327.

Fadzlan S, Habibullah M S (2009) Bank specific and macroeconomic determinants of bank profitability: Empirical evidence from the China banking sector. Frontiers of Economics in China 4: 274–291.

Fotios P, Kosmidou K (2007) Factors influencing the profitability of domestic and foreign commercial banks in the European Union. Research in International Business and Finance 21: 222–237.

García-Herrero A, Gavilá S, Santabárbara D (2009) What explains the low profitability of Chinese banks? Journal of Banking & Finance 33: 2080–2092.

Goddard J, Molyneux P, Wilson J O S (2004) The profitability of european banks: a cross-sectional and dynamic panel analysis. The Manchester School 72: 363-381.

Granger C W J *(1969)* Investigating Causal Relations by Econometric Models and Cross-Spectral Methods. Econometrica 37: 424-438.

Gropp R, Heider F (2010) The Determinants of Bank Capital Structure. *Review of Finance*14: 587–622.

Herrero A G, Gavila S, Santabarbara D (2009) What explains the low profitability of Chinese banks? Journal of Banking & Finance 33: 2080-2092.

Jensen M C, Meckling W H (1976) Theory of the firm: Managerial behavior, agency costs and ownership structure. Journal of Financial Economics 3: 305–360.

Johansen S (1992) Determination of cointegration rank in the presence of a linear trend. Oxford Bulletin of Economics and Statistics 54: 383-397.

Keeley M (1990) Deposit insurance, risk and market power in banking. The American Economic Review 80: 1183–1200.

Konishi M, Yasuda Y (2004) Factors affecting bank risk taking: Evidence from Japan. Journal of Banking & Finance 28: 215–232.

Levin A, Lin, Chu, C J (2002) Unit root tests in panel data: Asymptotic and finite-sample properties. Journal of Econometrics 108: 1–24.

Mekonnen Y (2015) Determinants of Capital Adequacy of Ethiopia Commercial Banks. European Scientific Journal 11: 315-326.

Mili M, Sahut J M, Trimeche H, Teulon F (2017) Determinants of the Capital Adequacy Ratio of Foreign Banks' Subsidiaries: The Role of Interbank Market and Regulation. Research in International Business and Finance 42: 442-453.

Miller E M (1977) Risk, Uncertainty, and Divergence of Opinion. The Journal of Finance 32: 1151-1168.

Modigliani F, Miller M H (1958) The Cost of Capital, Corporation Finance and the Theory of Investment. The American Economic Review 48: 261-297.

Myers S C, Majluf N S (1984) **Corporate financing and investment decisions when firms have information that investors do not have.** Journal of Financial Economics 13: 187-221.

Pasiouras F, Kosmidou K (2007) Factors influencing the profitability of domestic and foreign commercial banks in the European Union. Research in International Business and Finance 21: 222-237.

Pesaran H M, Shin Y, Smith R J (2001) Bounds testing approaches to the analysis of level relationships. Journal of Applied Econometrics 16: 289-326.

Pesaran M, Shin Y (1996) Cointegration and speed of convergence to equilibrium. Journal of Econometrics 71: 117-143.

Pesaran H M, Smith R (1995) Estimating long-run relationships from dynamic heterogeneous panels. Journal of Econometrics 68: 79-113.

Pesaran H M, Shin Y, Smith R P (1999) Pooled Mean Group Estimation of Dynamic Heterogeneous Panels. Journal of the American Statistical Association 94: 621-634.

Polat A, Al-Khalaf H (2014) What determines capital adequacy in the banking system of kingdom of saudi arabia? A panel data analysis on Tadawul banks. Journal of Applied Finance & Banking 4: 27-43.

Saunders A, Wilson, B (2001) An analysis of bank charter value and its risk-constraining incentives. Journal of Financial Services Research 19: 185–195.

Saunders A, Schumacher L (2000) The determinants of bank interest rate margins: An international study. Journal of International Money and Finance 19: 813–32.

Williams J (2004) Determining management behaviour in European banking. Journal of Banking & Finance 28: 2427-2460.

Zarrouk H, Ben J K, Moualhi M (2016) Is Islamic bank profitability driven by same forces as conventional banks? International Journal of Islamic and Middle Eastern Finance and Management 9: 46–66.

Tables

Table 1. Unit root tests results

	Variables		Intercept		Trend and Intercept		None	
			Level (P values)	First Difference (P values)	Level (P values)	First Difference (P values)	Level (P values)	First Difference (P values)
BRICS	Levin, Lin & Chu test	CAR	0.188	0.000***	0.114	0.000***	0.627	0.000***
		CR	0.058*	0.000***	0.060	0.000***	0.971	0.000***
		ROA	0.060*	0.000***	0.766	0.000***	0.054*	0.000***
		ROE	0.050*	0.000***	0.110	0.000***	0.077*	0.000***
Brazil	Augmented Dickey-Fuller Test	CAR	0.058*	0.021**	0.197	0.045**	0.822	0.001***
		CR	0.177	0.000***	0.106	0.000***	0.400	0.000***
		ROA	0.084*	0.000***	0.157	0.001***	0.597	0.000***
		ROE	0.061*	0.000***	0.117	0.001***	0.572	0.000***
Russia	Augmented Dickey-Fuller Test	CAR	0.644	0.014**	0.124	0.045**	0.223	0.001***
		CR	0.451	0.000***	0.061*	0.003**	0.480	0.000***
		ROA	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***
		ROE	0.406	0.000***	0.018**	0.000***	0.383	0.000***
India	Augmented Dickey-Fuller Test	CAR	0.388	0.049**	0.513	0.021**	0.904	0.005***
		CR	0.898	0.000***	0.367	0.002***	0.973	0.000***
		ROA	0.837	0.000***	0.605	0.000***	0.438	0.000***
		ROE	0.807	0.002***	0.474	0.004***	0.242	0.000***
China	Augmented Dickey-Fuller Test	CAR	0.772	0.084*	0.902	0.023**	0.822	0.022**
		CR	0.746	0.000***	0.187	0.003***	0.999	0.007***
		ROA	0.025	0.000***	0.543	0.023**	0.581	0.000***
		ROE	0.080*	0.000***	0.382	0.000***	0.629	0.000***
South Africa	Augmented Dickey-Fuller Test	CAR	0.639	0.000***	0.028**	0.000***	0.759	0.000***
		CR	0.221	0.000***	0.576	0.002***	0.576	0.000***
		ROA	0.021**	0.000***	0.054*	0.001***	0.132	0.000***
		ROE	0.156	0.003***	0.456	0.000***	0.654	0.000***

Notes: *, ** and *** denote significance at the 10%, 5% and 1% levels, respectively,

Source: Authors' estimations using STATA

Table 2: ARDL Bound Test

Models	Variables	Statistics	Brazil	Russia	India	China	South Africa
Model 1	DV: CAR	Upper Bound	4.16	4.16	4.16	4.16	4.16
	IV: ROA	Lower Bound	3.62	3.62	3.62	3.62	3.62
		F. Statistics	4.28**	2.97	4.568**	1.810	4.771**
Model 2	DV: CAR	Upper Bound	4.16	4.16	4.16	4.16	4.16
	IV: ROE	Lower Bound	3.62	3.62	3.62	3.62	3.62
		F. Statistics	4.23**	4.006	4.652**	3.132	1.008
Model 3	DV: CR	Upper Bound	4.16	4.16	4.16	4.16	4.16
	IV: ROA	Lower Bound	3.62	3.62	3.62	3.62	3.62
		F. Statistics	6.671**	0.895	4.214**	1.769	6.843**
Model 4	DV: CR	Upper Bound	4.16	4.16	4.16	4.16	4.16
	IV: ROE	Lower Bound	3.62	3.62	3.62	3.62	3.62
		F. Statistics	6.167**	0.959	4.240**	1.927	1.558
Model 5	DV: ROA	Upper Bound	4.16	4.16	4.16	4.16	4.16
	IV: CAR	Lower Bound	3.62	3.62	3.62	3.62	3.62
		F. Statistics	4.542**	4.72**	4.469**	5.228**	4.232**
Model 6	DV: ROE	Upper Bound	4.16	4.16	4.16	4.16	4.16
	IV: CAR	Lower Bound	3.62	3.62	3.62	3.62	3.62
		F. Statistics	4.686**	4.833**	4.408**	4.947**	13.80**
Model 7	DV: ROA	Upper Bound	4.16	4.16	4.16	4.16	4.16
	IV: CR	Lower Bound	3.62	3.62	3.62	3.62	3.62
		F. Statistics	2.005	4.940**	4.199**	4.749**	4.329**
Model 8	DV: ROE	Upper Bound	4.16	4.16	4.16	4.16	4.16
	IV: CR	Lower Bound	3.62	3.62	3.62	3.62	3.62
		F. Statistics	1.505	5.405**	4.482**	4.143**	2.389
	Level of Significance (%)	5%	5%	5%	5%	5%	5%

Notes: *, ** and *** denote significance at the 10%, 5% and 1% levels, respectively,

DV represents Dependent variable and IV represents Independent variable.

Source: Authors' estimations using STATA

Table 3: ARDL Model

Models	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6		Model 7	
Variables	DV: ROA		DV: ROE		DV: ROA		DV: ROE		DV: CAR		DV: CAR		DV: CR	
	IV: CAR		IV: CAR		IV: CR		IV: CR		IV: ROA		IV: ROE		IV: ROA	
Statistics	Coef.	Prob.	Coef.	Prob.	Coef.	Prob.	Coef.	Prob.	Coef.	Prob.	Coef.	Prob.	Coef.	Prob.
Long run														
BRICS	0.037	0.000***	0.580	0.010**	0.060	0.016**	0.119	0.081*	1.877	0.000***	1.125	0.000***	1.966	0.000
Brazil	0.457	0.000***	4.440	0.003***	1.923	0.604	18.75	0.066*	1.823	0.006**	0.187	0.002**	1.817	0.000
Russia	0.030	0.065*	1.027	0.022**	0.036	0.024**	1.241	0.054*	4.291	0.191	0.086	0.325	0.437	0.769
India	0.091	0.059*	2.243	0.036**	0.444	0.024**	1.184	0.091*	-1.048	0.048**	-0.241	0.043**	-1.362	0.021
China	-0.085	0.058*	-3.367	0.046**	-0.064	0.029**	-3.713	0.026**	49.24	0.981	2.072	0.337	1.179	0.867
South Africa	-0.067	0.093*	-3.016	0.000***	0.076	0.043**	-1.831	0.031*	-1.456	0.020**	-0.254	0.072*	-2.105	0.000
Short run														
BRICS	0.074	0.116	1.005	0.108	0.038	0.348	0.217	0.653	0.988	0.019**	0.086	0.034**	0.365	0.061
Brazil	0.431	0.114	5.052	0.116	0.353	0.247	3.461	0.299	1.163	0.014**	0.105	0.019**	0.402	0.094
Russia	0.031	0.649	0.580	0.011**	0.038	0.726	1.871	0.065*	0.114	0.079*	1.018	0.024**	0.125	0.766
India	0.016	0.788	0.226	0.815	0.112	0.183	2.452	0.099*	-0.380	0.151	-0.394	0.110	-0.080	0.370
China	-0.010	0.138	-0.670	0.318	0.030	0.401	1.308	0.117	2.582	0.191	0.131	0.111	0.065	0.874
South Africa	-0.760	0.100	-0.273	0.234	0.073*	0.458	3.907	0.416	-1.315	0.019**	-0.084	0.024**	-0.021	0.074

Notes:*, **, *** indicates the rejection of the null hypothesis at the 10%, 5% and 1% significance level.

DV represents dependent variable and IV represents independent variable.

Source: authors' estimations using STATA

Table 4: ARDL Diagnostic Test

Models	Variables	Statistics	Brazil	Russia	India	China	South Africa
Model 1	DV: ROA	Normality J-B value	0.751	2.494	1.579	0.502	1.655
	IV: CAR		(0.686)	(0.287)	(0.453)	(0.777)	(0.437)
		Serial correlation LM test	0.351	0.679	0.582	1.487	0.141
		(F statistics)	(0.715)	(0.522)	(0.571)	(0.276)	(0.870)
		Heteroscedasticity test (Breusch-Pagan-Godfrey)	1.101	0.333	0.477	0.506	0.364
		(F statistics)	(0.4301)	(0.721)	(0.628)	(0.765)	(0.861)
		Ramsey reset test (F statistics)	0.933	1.522	0.379	1.872	0.308
			(0.377)	(0.148)	(0.709)	(0.090)	(0.765)
Model 2	DV: ROE	Normality J-B value	0.571	0.598	0.359	0.944	1.390
	IV: CAR		(0.751)	(0.741)	(0.835)	(0.623)	(0.499)
		Serial correlation LM test	0.259	1.042	0.038	1.279	0.132
		(F statistics)	(0.777)	(0.396)	(0.962)	(0.336)	(0.877)
		Heteroscedasticity test (Breusch-Pagan-Godfrey)	0.773	0.906	0.541	1.639	2.719
		(F statistics)	(0.590)	(0.513)	(0.592)	(0.240)	(0.084)
		Ramsey reset test (F statistics)	0.975	0.359	0.435	0.091	1.012
			(0.354)	(0.327)	(0.669)	(0.929)	(0.329)
Model 3	DV: ROA	Normality J-B value	0.225	1.331	2.707	1.090	1.134
	IV: CR		(0.893)	(0.513)	(0.258)	(0.579)	(0.567)
		Serial correlation LM test	1.921	0.784	0.772	0.351	1.268
		(F statistics)	(0.240)	(0.475)	(0.480)	(0.709)	(0.311)
		Heteroscedasticity test (Breusch-Pagan-Godfrey)	2.069	0.761	0.218	0.098	4.083
		(F statistics)	(0.176)	(0.483)	(0.806)	(0.906)	(0.036)
		Ramsey reset test (F statistics)	1.164	1.075	0.747	1.428	0.412
			(0.288)	(0.316)	(0.466)	(0.590)	(0.685)
Model 4	DV: ROE	Normality J-B value	0.147	0.032	2.025	0.363	7.094
	IV: CR		(0.928)	(0.983)	(0.363)	(0.833)	(0.064)
		Serial correlation LM test	0.258	0.380	0.465	0.364	0.679
		(F statistics)	(0.782)	(0.695)	(0.637)	(0.703)	(0.522)
		Heteroscedasticity test (ARCH)	1.217	0.981	1.109	1.608	3.260
		Breusch-Pagan-Godfrey	(0.404)	(0.474)	(0.353)	(0.235)	(0.985)
		(F statistics)					
		Ramsey reset test (F statistics)	1.595	2.073	0.197	0.163	1.298
			(0.161)	(0.068)	(0.846)	(0.873)	(0.213)
Model 5	DV: CAR	Normality J-B value	0.264 (0.876)	3.080	3.866	0.734	0.191
	IV: ROA			(0.171)	(0.144)	(0.692)	(0.908)
		Serial correlation LM test	0.988 (0.418)	1.846	0.286	0.340	0.590
		(F statistics)		(0.212)	(0.755)	(0.719)	(0.574)
		Heteroscedasticity test (Breusch-Pagan-Godfrey)	0.488	0.276	2.770	0.490	0.970
		(F statistics)	(0.801)	(0.916)	(0.092)	(0.777)	(0.476)
		Ramsey reset test (F statistics)	0.576	0.683	1.376	0.373	0.710
			(0.469)	(0.510)	(0.188)	(0.702)	(0.493)
Model 6	DV: CAR	Normality J-B value	0.322	8.788	3.592	1.826	0.419
	IV: ROE		(0.850)	(0.123)	(0.165)	(0.401)	(0.810)

		Serial correlation LM test	0.765	1.828	0.273	1.237	0.254
		(F statistics)	(0.500)	(0.141)	(0.764)	(0.319)	(0.782)
		Heteroscedasticity test (Breusch-Pagan-Godfrey)	0.456	0.573	2.727	0.927	3.085
		(F statistics)	(0.823)	(0.743)	(0.095)	(0.415)	(0.063)
		Ramsey reset test (F statistics)	0.841	0.857	1.206	0.490	1.092
			(0.385)	(0.415)	(0.246)	(0.101)	(0.306)
Model 7	**DV: CR**	Normality J-B value	0.654	0.826	1.529	2.236	1.762
	IV: ROA		(0.720)	(0.661)	(0.465)	(0.326)	(0.414)
		Serial correlation LM test	0.005	0.230	0.733	0.062	2.129
		(F statistics)	(0.994)	(0.797)	(0.497)	(0.939)	(0.189)
		Heteroscedasticity test (Breusch-Pagan-Godfrey)	0.652	0.328	0.126	0.195	0.699
		(F statistics)	(0.666)	(0.724)	(0.882)	(0.936)	(0.657)
		Ramsey reset test (F statistics)	0.759	0.060	0.038	1.080	1.038
			(0.465)	(0.952)	(0.970)	(0.302)	(0.329)
Model 8	**DV: CR**	Normality J-B value	0.599	1.433	1.507	2.638	1.960
	IV: ROE		(0.741)	(0.488)	(0.470)	(0.090)	(0.078)
		Serial correlation LM test	0.0131	0.407	0.683	0.103	0712
		(F statistics)	(0.986)	(0.673)	(0.521)	(0.903)	(0.507)
		Heteroscedasticity test (Breusch-Pagan-Godfrey)	1.193	0.062	0.094	0.565	0.206
		(F statistics)	(0.373)	(0.939)	(0.910)	(0.779)	(0.815)
		Ramsey reset test (F statistics)	0.697	0.003	0.060	0.805	0.469
			(0.501)	(0.996)	(0.952)	(0.451)	(0.645)

Notes: *, ** and *** denote significance at the 10%, 5% and 1% levels, respectively.

DV represents Dependent variable and IV represents Independent variable.

Source: Authors' estimations using STATA

Table 5: VECM/VAR Granger Causality Test

Models	Model 1: CAR does not Granger Causes ROA		Model 2: CAR does not Granger Causes ROE		Model 3: CR does not Granger Causes ROA		Model 4: CR does not Granger Causes ROE		Model 5: ROA does not Granger Causes CAR		Model 6: ROE does not Granger Causes CAR		Model 7: ROA does not Granger Caus CR	
Statistics	Coef.	Prob.	Coef.	Prob.	Coef.	Prob.	Coef.	Prob.	Coef.	Prob.	Coef.	Prob.	Coef.	Prol
Long run														
BRICS	0.008	0.847***	0.006	0.349**	-0.291	0.014**	0.039	0.025*	-0.151	0.000***	-1.121	0.000***	-0.177	0.0(
Brazil	-0.277	0.064*	-0.405	0.054*	0.227	0.0674*	0.139	0.081*	-1.823	0.004**	-1.370	0.004**	-0.941	0.0(
Russia	-0.277	0.064*	-0.405	0.054*	0.227	0.0674*	0.139	0.081*	1.355	0.104	1.370	0.104	0.941	0.1(
India	-0.130	0.039**	-0.079	0.053*	-0.389	0.048**	-0.411	0.043**	-0.522	0.039**	-0.669	0.028**	-0.178	0.01
China	-0.742	0.055*	-0.158	0.000***	-0.469	0.104	-0.338	0.002***	0.012	0.867	1.012	0.890	0.020	0.11
South Africa	-0.065	0.030**	-0.422	0.137	-1.008	0.011**	-0.415	0.021**	-0.065	0.505*	-0.422	0.0137**	-1.008	0.01
Short run														
BRICS	2.419	0.298	2.242	0.325	3.839	0.146	0.402	0.817	0.233	0.089*	0.609	0.073*	7.222	0.02
Brazil	0.409	0.814	0.285	0.867	0.243	0.885	0.306	0.857	7.330	0.025**	8.138	0.017**	14.06	0.0(
Russia	0.409	0.814	0.285	0.867	0.038	0.726	0.306	0.857	7.330	0.025**	8.138	0.017**	14.06	0.0(
India	1.373	0.503	1.052	0.590	0.100	0.950	0.097	0.952	1.708	0.425	1.264	0.531	2.058	0.35
China	1.527	0.465	2.786	0.248	0.945	0.623	0.551	0.759	2.732	0.255	1.568	0.456	2.550	0.27
South Africa	5.128	0.070*	6.111	0.047**	1.850	0.396	1.825	0.401	5.128	0.077*	6.111	0.047**	1.850	0.03

Notes:*, **,*** indicates the rejection of the null hypothesis at the 10%, 5% and 1% significance level.

Source: Authors' estimations using STATA