

Do Capital Adequacy Ratios of the Banking System Affect the Taxation Performance: Novel Evidence from BRICS Nations

Ahmed Samour¹ & Ilker Yilmaz²

^{1&2}Dhofar University, Salalah, Sultanate of Oman.

ABSTRACT: The empirical studies on the potential interconnection between tax and financial growth have gathered a great deal of attention from scholars and policymakers. However, the impact of regulatory capital on taxation performance has been ignored. In this context, the study aims to provide new discussion by assessing the linkage between capital adequacy and taxation revenues in the case of Brazil, Russia, India, China, and South Africa (BRICS) economies. We aim to find out the impact of capital adequacy ratios on the taxation performance of BRICS countries. We hypothesize that a stronger banking system is positively associated with higher taxation performance. A sound banking and financial system promotes economic development and growth, also resulting in the firms' profitability and ultimately increasing the government's tax revenues. Using the advanced quantile panel technique of the Methods of Moments Quantile Method (MM-QR), the study showed that capital adequacy positively influences taxation sustainability in the BRICS economies. Besides, the findings illustrated that economic growth positively increases taxation revenues in the BRICS economies. The study suggests that regulatory capital policies can positively influence financial stability by mitigating bank risk-taking incentives and offering a buffer against losses. Hence, an increase in capital adequacy will promote financial stability, which in turn leads to increased taxation revenues. However, higher capital adequacy may increase the franchise value of core banks' activities, which in turn allows banks to attract new investments and funds that can be used for investment in risky market-based activities. Based on the empirical analysis, the study concludes that policymakers should focus more on capital regulation and sustainable taxation revenues.

KEYWORDS: Capital Adequacy Ratio, Stronger Banking System, Taxation, Economic Development, BRICS.

INTRODUCTION

Tax is the most important source of income for many countries, and it is an important public finance policy tool for governments [1]. Tax is collected from individuals and corporations as a responsibility, and it is used for the benefit of the whole society [2]. However, there has been a discrepancy between the increasing demand for governmental expenditures and the level of tax income collected, especially for developing countries [3] and it has been a challenge as well as a primary policy to increase tax to gross domestic product (GDP) ratio [4].

There have been significant differences in tax income across the countries. The determinants of the taxation performance of governments are varied and can be categorized in several ways, such as economic and financial, social, and institutional. Economic and financial factors might include public finance policies [5], GDP per capita [6], the level of export/import transactions and foreign direct investment (FDI) [7], the changes in macroeconomic conditions [8], the volatility of exchange rates [9], and the strength of financial sector [10]. Social and institutional factors are education level [11], the growth rate of the country's population [12], political stability, freedom, and civil rights, and the efficiency of governmental mechanisms [7]. Among the financial factors, the strength of the financial sector, especially banks, play an important role in taxation performance. The financial sector performs as the intermediary between the parties in need of funds and the parties with a surplus of funds and contributes to economic growth [13] by providing funds to real sector companies. Banks also have roles in facilitating tax collections and providing information about the transactions subject to taxation.

Therefore, the banks' strength and healthiness can have a pivotal role in tax performance. Capital adequacy ratios are among the most essential tools to measure the strength of banks. In this context, this concept is defined as a bank risk exposure indicator. Banks' risks are re-categorized as

different risks, including (market risk, credit risk, interest and exchange rates risk).

The policy makers in the banking sectors used the capital adequacy ratio as an effective adequate and security" measure for banks and libraries since they regard capital as a guardian or cushion to take away losses [14]. The prime purpose of these ratios is to reinforce the financial stability of the banking sector [15] and therefore, the position of an individual entity in and around the world is financial stability since the system improves the amount of risk involved in bank operations.

One of the most critical discussions currently ongoing in financial sectors is the highly growing relationship between banking sector stability and the country financial development. We aim to find out the impact of capital adequacy ratios on the taxation performance of BRICS countries.

We hypothesize that a stronger banking system is positively associated with higher taxation performance. A sound banking and financial system promotes economic development and growth, also resulting in the firms' profitability and ultimately increasing the government's tax revenues.

This is the first empirical study searching for the impact of capital adequacy on the countries' taxation performance, and it has important contributions. The study uses BRICS countries as the sample. BRICS stands for the five emerging countries, Brazil, Russia, India, China, and South Africa. It is an informal group of countries with a total population of 3.2 billion as of 2021, 41% of the world population. All countries are also a member of G20, and their total GDP is approximately 33% of the global GDP. The main comparative advantage of BRICS countries is lower labor costs, demographics with a young population, and ample natural resources. They have been becoming a source of growth for trade, investments, and the international economy. They aim to work collectively on economic, social, and political issues.

Besides, BRICS are the leading economies that highly implement Basel capital requirements. According to Basel III, higher capital adequacy rates reinforce financial stability by mitigating the probability of banks' financial distress and reducing banks' losses given default.

The article contributes to literature in several aspects. Firstly, it aims to assess the impact of economic growth, and financial soundness on taxation performance. Unlike the previous studies, the article investigates the role of capital adequacy ratios in the linkage between economic, financial development and taxation performance. To the best of our knowledge, this is the first study that examines the impact of capital adequacy at the country level on the taxation performance of the countries.

Secondly, the article uses data from BRICS countries, the five leading emerging economies. The context of emerging economies is significantly different than that of developing countries in terms of economic and financial development, legal system, investor protection, taxation system, etc.

Thirdly, the article presents novel findings using the advanced technique of MMQR model. This approach captures the linkage among the selected variables through moment conditions. Therefore, the distributional and as well as heterogeneous impacts are confirmed across quantiles. Besides, this technique reflects factual observations about the connection amid the focused variables that takes into account the fixed influences of distribution heterogeneity.

The remainder of the article is organized as follows: the next section provides a brief review of the related literature. Section 3 presents the details of the data and methodology. Section 4 and reports the results and discussion and the last section conclude.

LITERATURE REVIEW

Tax is a mandatory, non-repayable remittance the firms and people make to the local government for services intermittently [16]. There are several factors affecting the countries' tax revenue and the prior literature provided empirical evidence in different contexts. Gross domestic product (GDP) growth is one of the most important determinants because a higher GDP growth

implies more capacity for the governments to collect tax [17] and a broader tax base or taxable income at both individual and firm levels [4].

Empirical studies have presented the evidence about the effect of GDP growth on tax capacity in different contexts such as in OECD countries [18], in Middle East countries [19], and in Nigeria [20].

For instance, Adefolake & Omodero [20] use the Vector Error Correction Model and evaluated the connection among tax revenue and economic growth in case of Nigeria. The author found a positive significant linkage between tax revenue and economic growth.

In addition to GDP, other macroeconomic indicators and conditions affect tax revenues, including the unemployment rate [21], foreign direct investment [22], the reforms promulgated to ease international trade [23], a foreseeable macro-economic environment [24], exchange rates [25], foreign trade and trade openness of the country [26].

Extant literature documented the relationship between financial sector development and economic growth in different contexts and presented empirical evidence at global level [27], in meta-analysis of several studies [28], or country level such as in European countries [29], and in Pakistan [30], for instance. The studies used several measures of financial development in different contexts, in single-country cases or multicountry cases, and different periods, by considering the effects of some events such as global crises.

However, there are some common indicators used in most of the studies such as the ratio of liquid liabilities to gross domestic product (GDP), which shows the size of financial institutions relative to the country's economy; the ratio of commercial banks' assets to GDP; the ratio of the market capitalization of listed companies to GDP, among others [31].

The size, development, and stability of the banking sector have a crucial role in the overall financial development of a country due to the capital mobilization function performed by the banking sector. Higher levels of capital improve the stability and soundness of the banking sector because capital plays a buffer role against financial crises and financial distress and reduces the potential bankruptcy costs [32], and leads to reductions in volatility [33], and systematic risk [34].

Therefore, it can be inferred that the capital levels of banks and the regulations of capital requirements are supposed to have a significant impact on economic growth via direct and indirect effects. In this context, the regulatory capital requirements have important implications, by protecting and improving the banking sector stability and by forcing the banks to implement a more effective screening in their lending decisions. Capital adequacy ratio (CAR) is one of the most important regulations for banks and has been adopted in more than 100 countries aimed to ensure and maintain stability in the banking sector. CAR which has been proposed by the Bank for International Settlements (BIS) has developed over time in response to financial crises; however, there exists a trade-off in setting the ratios.

Stricter ratios might improve the capability of banks in their operations, but on the other hand, might hinder the ability to have the maximum benefit from the potential loans, as a result, harming the performance. However, there is a consensus that capital requirements have a significant and value-adding impact on the banking sectors and overall macroeconomic stability.

An important concept in the context of financial sector development and economic growth is financial inclusion which can be defined as the availability and equality of opportunities to access financial services [35]. The regulatory authorities in a country have important responsibilities to promote the financial inclusion of individuals and businesses because the regulations like capital adequacy ratios affect all parties directly or indirectly.

Anarfo et al. [36] conducted a study to examine the effect of financial regulation on financial inclusion by using financial stability as the moderating variable for the sample of Sub-Saharan African countries. Their results showed that tightening the regulations and increasing capital adequacy requirements affects financial inclusion negatively because of the reduction in banks' capacity in extending financial resources to the parties in need. They also concluded that the interaction

between financial regulations and financial stability has a positive impact on financial inclusion. Credit facilities and extension mechanisms are crucial for economic growth and fore, the study aims to determine whether capital adequacy ratios significantly impact taxation performance via the hypothesized channel.

METHODOLOGY

The study aims to assess the impact of capital adequacy ratios, and economic growth on the taxation revenues in the case of BRICS states. The tested model of the current paper is structured as follows:

$$TR_{it} = f(CA_{it}, GDP_{it}), \quad (1)$$

where TR_{it} stands the taxation revenues of the BRICS nations over the focused period, CA_{it} stands the capital adequacy ratios, GDP_{it} stands for economic growth.

The data covers the period from 2002 to 2019. The description and data sources are presented in Table 1.

It is crucial to affirm that employed data and models are stationary and free of cross-sectional dependence to reinforce that the findings of the tested model are correct. Therefore, before conducting the link amid CA, GDP, and TR, the study performed a cross-sectional dependence (CD) statistical assessment.

Besides, the study performed an augmented cross-sectional IPS (CIPS) statistical test suggested by Pesaran [39] to assess cross-sectional dependence in the examined model and to get reliable findings.

In the next step, the work performed Pedroni co-integration technique to assess the longrun counteraction amid the selected variables. This technique relies on errorcorrection and considers cross-sectional dependence with robust critical assessment values by bootstrapping co-integration.

Besides, this technique is suitable when for small datasets and produces more reliable outcomes compared with classical co-integration assessments. This assessment is based on four different test statistics. With this technique, H_0 stands the absence of co-integration level amid the selected variables, while H_1 proves the existence of co-integration.

Table 1 Description and sources of data

Variables	Description	Source
TR_{it}	Annual taxation as a share of GDP (OECD)	
CA_{it}	Bank Regulatory Capital to Risk-Weighted Assets	Federal Reserve Economic Data
GDP_{it}	GDP (constant 2015 US\$)	

After assessing the cross-sectional dependency, and integration issues, the study employed a novel technique, namely the Method of Moment Quantile-Regression (MM-QR) as introduced by Machado & Silva [38]. Unlike classical techniques, this approach captures the linkage among the selected variables through moment conditions.

Therefore, the distributional and as well as heterogeneous impacts are confirmed across quantiles. Besides, this technique reflects factual observations about the connection amid the focused variables that takes into account the fixed influences of distribution heterogeneity. This assessment is important to capture the effects of the independent selected X variable on the Y dependent selected variables in different quantile domains.

The MM-QR technique is a suitable statistical approach to assess the impacts of heterogeneity at different quantiles. The conditional quantile model in terms of modified location and scale parameter estimations is structured as follows:

$$Y_{it} = \alpha_{it} + X'_{it}\beta + (\varphi_i + \partial_{it}\gamma)\mu_{it}, \quad (2)$$

where $Po_1 + d_{it}y > 0\} = 1$. The "I" is reflected by $(a_i, s_1) \mid = 1... n$, and ∂ represents "K-vector" employed components of X_{it} that could be observed in various formats with specified I structures as follows:

$$\partial_I = \partial_I(X'_{it}), I = 1, \dots, k, \quad (3)$$

Xit' means independently disposed of for any stabilized "I" and independent via time (t). μ_{it} means disposed of through time (t) and are orthogonal to "Xit' ". Therefore, equation number (2) is formulated by the equation stated below:

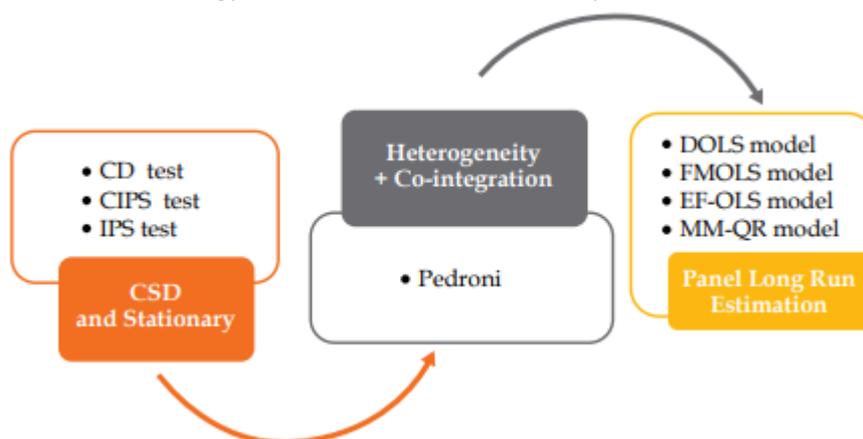
$$Q_y(\tau | X_{it}) = (\alpha_{it} + \varphi_{iq}(\tau)) + X'_{it}\beta + \partial_{it}\gamma'q(\tau). \quad (4)$$

The independent estimated variables are implied by, which estimated in log of CA_{it} , GDP_{it} . X_{it} means the quantile distribution of Y_{it} (the natural log of TR_{it}), stands the scalar estimated coefficient. The "τ" is implied through $q(\tau)$, which is structured by considering the optimization issue.

$$-\min_q \sum_i \sum_t \rho_\tau(R_{it} - (\varphi_i + \partial_{it}\gamma)q), \quad (5)$$

where A stands the check estimated function. To acquire robustness of the captured parameters, the current study initially utilized three techniques related to longrun interconnection analysis, namely, Fixed-Effect OLS (FE-OLS), Dynamic OLS (D-OLS) as developed by Pedroni [40], Fully Modified OLS (FM-OLS) techniques developed by Pedroni [40] (Figure 1).

Figure 1. Methodology structure of the current study



Empirical Results

The present section presents the empirical outcomes under cross-sectional dependence (CD) and unit root, co-integration, and estimating assessments. The outcomes of (CD) assessment displayed in Table 2 illustrate that the H0 of cross-sectional independence for each variable valid. This indicates that the BRICS economies are associated through various channels such as the similarity of economies policies across.

Besides, the outcomes of CIPS and IPS assessments displayed in Tables 3 and 4 which illustrated that (GDP_{it} , CA_{it} , TR_{it}) are statically integrated at I(1) level. Pedroni [40] assessment results are presented in Table 3, illustrating that employed panel data is statistically cointegrated. We employed the MM-QR assessments after affirming that the focused panel variables are cointegrated. Besides the study employed FMOLS, FE-OLS, and DOLS, approaches to affirm the findings of MM-QR. The findings of the used model are presented in Tables 4 and 5.

Table2. Results of the CD and CIPS unit root tests

Variables	CD test	p-value	CIPS test		IPS	
			I(0)	I(1)	I(0)	I(1)
TRit	18.44a	0.00	-2.01	-5.440a	-0.43	-5.55a
GDPit	12.83a	0.00	-1.46	-6.340a	-2.18	-6.60a

CAit	14.25a	0.00	-1.76	-5.435a	-1.77	-5.66a
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Note: a stands 1% level of significance.

Table 3. Results of Pedroni assessment

Test	Statistic	Prob
Panel v	1.505005	0.4032
Panel rho	-4.953261a	0.0000
Panel PP	-5.504870a	0.0000
Panel ADF	-1.008256	0.2043
Panel ADF	-3.339718b	0.0004
Group PP	-6.905059a	0.0000
Group ADF	-1.541226	0.0616

Note: a, b, c means significance level at 1%, 5%, and 10 % levels, respectively.

Table 4. Panel quantile estimations (MMQR) results

Variables	Quantiles								
	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90
GDPit	0.016a	0.046a	0.061a	0.084a	0.100a	0.115a	0.142a	0.260a	0.306
CAit	0.359a	0.323a	0.304a	0.2767a	0.256b	0.238c	0.205c	0.0611	0.004

Note: a, b, c means significance level at 1%, 5%, and 10 % levels, respectively.

Table 5. Results of panel estimation for BRICS nations

Variables	FM-OLS		D-OLS		FE-OLS	
	Coef	t-stats	Coef	t-stats	Coef	t-stats
CAit	0.268a	4.036	0.184c	1.729	0.105a	3.691
GDPit	0.058a	3.363	0.046b	2.107	0.077a	4.451

Note: a, b, c means significance level at 1%, 5%, and 10 % levels, respectively.

Table 6. The results of Granger heterogeneous

Null hypotheses	Z-bar	P-Value
GDPit does not homogenously cause TRit	1.977c	0.048
GDPit does not homogenously cause GDPit	0.621	0.530
CLit does not homogenously cause TRit	0.041	0.960
GDPit does not homogenously cause CLit	1.170c	0.293

Note: c stands the significance level at 1%.

The MM-QR outcomes showed that economic growth positively promotes taxation revenues in BRICS countries. For all captured quantiles, the outcomes show an upsurge effect of economic growth on taxation from 0.135 in quantile 10th to 0.306 in 90th quantile. The findings from FMOLS, DOLS, and EF-OLFS as presented in Table 4, displayed that economic growth significantly affects taxation revenues. The outcomes from FMOLS, DOLS, and EF-OLFS show that a 1% increase in capital adequacy in the tested economies led to increase the tax revenues by 0.268%, 0.184%, and 0.105% from FMOLS, DOLS, and EF-OLFS tests, respectively.

In addition, the findings from MM-QR showed that capital adequacy positively affects taxation revenues in BRICS countries. For all captured quantiles, the outcomes show capital adequacy has positive and significant impact on taxation. These findings affirmed the findings of MM-QR, which implied that economic growth significantly affects taxation revenues. Besides, the conclusions of the mentioned test showed that a one percent increase in capital adequacy ratios led to a rise in taxation revenues by 0.058%, 0.046%, and 0.077% from FMOLS, DOLS, and EF-OLFS tests, respectively. These findings affirmed the findings of MM-QR.

Finally, the heterogeneous causality assessment approach, as advanced by Dumitrescu &

Hurlin [41] is applied to explain the causality association among capital adequacy, economic growth, and tax revenues. The findings of this assessment, as displayed in Table 6, showed a unidirectional causal association between GDP and taxation revenues. These findings affirmed that economic growth has a powerful influence on taxation performance.

DISCUSSION

Most empirical studies focused on capital regulation's direct and indirect effects on the financial performance and financial market. However, the impact of capital regulations on taxation has been ignored. The present study aims to present a novel discussion on the link between capital adequacy and economic growth and taxation revenues in the case of BRICS economies.

The study uses a novel technique, namely the Method of Moment Quantile-Regression (MM-QR) as introduced by Machado & Silva [38]. In addition, the study uses, Fixed-Effect OLS (FE-OLS), Dynamic OLS (D-OLS) by Pedroni [40], Fully Modified OLS (FM-OLS) techniques to affirm the findings of MM-QR approach.

The outcomes of MM-QR approach show that economic growth positively promotes taxation revenues in BRICS countries for all captured quantiles. The outcomes from FMOLS, DOLS, and EF-OLFS approve these findings, and affirm that economic growth positively promotes taxation revenues in the tested countries.

The heterogeneous causality assessment findings show that there is a causal link among economic growth, and tax revenues. These findings approve that economic growth has a powerful influence on taxation performance. These findings are in line with Adefolake & Omodero [20], who found a positive significant linkage between tax revenue and economic growth.

On other hand, MM-QR, FMOLS, DOLS, and EF-OLFS approach showed that capital adequacy positively affects taxation revenues in BRICS countries. These findings are in line with Stewart et al. [37] investigated the impact of regulatory capital on economic growth by considering the role of credit extension.

However, the banking sectors in BRICS nations play an essential role in sustainable development. In this context, the primary concern of regulatory authorities is to promote the Banks' depositors' safety by using minimum capital adequacy to encourage the banking sector's efficiency.

One of the notable achievements of regulatory authorities was the capital adequacy standards that the Basel Committee had proposed. However, the primary purpose of capital Adequacy is to create a secured business environment to promote the quality of banking supervision that contributes to improving the banking sector's performance.

BRICS are the leading economies that highly implement Basel capital requirements. According to Basel III, higher capital adequacy rates reinforce financial stability by mitigating the probability of banks' financial distress and reducing banks' losses given default. Hence, an increase in capital adequacy will promote financial stability, which in turn leads to increased taxation revenues.

In this context, the study suggests that BRICS policymakers must design a regulatory framework to encourage investment, economic growth, and taxation. The main limitations of this work that we have focused on the BRICS nations. Therefore, future studies can focus on other regions.

CONCLUSION

Under Basel III the banking sectors face stricter capital requirements meaning that the ratio of equity to risk-weighted assets must rise to 8–12%. Some emerging economies such as BRICS nations impose even stricter capital regulations to boost banks' resilience to future financial and economic downturns.

Currently, there is a debate about whether such an increase in capital requirements benefits the economy. The present study is the first that assessed the impact of capital adequacy and economic growth on taxation revenues. In this context, the study aims to determine the impact of capital adequacy, and economic growth on taxation revenues in the case of BRICS countries.

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In addition, the study uses an advanced quantile panel technique, namely the Methods of Moments Quantile Method (MM-QR), to assess the link among the selected variables. Unlike classical techniques, this approach captures the linkage among the selected variables through moment conditions. Using the advanced quantile panel technique, the empirical findings showed that a 1% increase in economic growth promotes the taxation revenues across all captured quantiles (1st to 9th).

Similarly, the outcomes from MM-QR showed that a percent increase in capital adequacy positively impacted one taxation revenues across all captured quantiles (1st to 9th). The work affirms the findings by checking the robustness through the FMOLS, DOLS, and EF-OLS. The findings of these tests confirmed the results of the MM-QR technique. However, the conclusions affirmed that capital adequacy and economic growth promote taxation sustainability in the BRICS economies.

The study suggests that capital regulation may affect taxation revenues through the financial stability channel by mitigating the probability of banks' financial distress and reducing banks' losses given default. Hence, an increase in capital adequacy will promote financial stability, which in turn leads to increased taxation revenues. However, higher capital adequacy may increase the franchise value of core banks' activities, which in turn allows banks to attract new investments and funds that can be used for investment in risky market-based activities. Based on the empirical analysis, the study concludes that policymakers should focus more on capital regulation and sustainable taxation revenues.

The present work aims to determine the impact of capital adequacy, and economic growth on taxation revenues in the case of BRICS countries. However, the current paper has some limitations such as the study only focused on BRICS nations. Therefore, future studies can focus on other regions. The finding of this study may be debatable on various grounds as the selected variables do consider other variables such as interest rate, financial development, and foreign direct investment. Future empirical research can be done to incorporate the mentioned issues. In addition, the present work used MMQR testing models to capture the linkage among the studied variables. Hence, the future studies can employ other advanced approaches (linear and nonlinear) models. Future empirical research may improve the models by including new variables for corporate governance.

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