

## A Panel VECM Analysis of Competition, Access to Finance and Economic Growth in BRICS

Farai Kwenda<sup>1</sup>

**Abstract:** This study examines the interplay between competition, access to finance and economic growth in Brazil, Russia, India, China and South Africa (BRICS). It adds to the ongoing debate on the interdependence that exists among competition, access to finance and economic growth by exploring their causal relationship using the panel Vector Error Correction Model. The results obtained suggest that there is a long run causality running from the access to finance (proxied by interest rate spread) and competition to economic growth. This is not surprising because it is generally expected that the interplay between competition and access to finance has some influence on the growth of any economy. The study did not find any evidence to support any long run causality running from economic growth and competition to access to finance. Neither was there any evidence showing any causal relationship between economic growth and access to finance and competition.

**Keywords:** economic growth; competition; access; finance; panel VECM

**JEL Classification:** G32

### 1. Introduction

Bank competition, access to finance and economic growth have gained prominence in literature. (Beck, 2011; de Guevara & Maudos, 2011; Zhuang et al., 2009) Competition among banks opens up the banking landscape which should lower cost of funding and at the same time increase the availability of banking facilities for better access to the real sector of an economy. These are the principles that underline the market power hypothesis and the finance-growth model. (Beck, 2013; Beck, Demirgüç-Kunt, & Maksimovic, 2004; Denicolò & Zanchettin, 2010; Schumpeter, 1911) It is therefore expected that a country's economy should grow relative to the extent to which competition has been able to make finance available for investment business purposes.

---

<sup>1</sup>Senior Lecturer, Department of Accounting and Finance, Faculty of Commerce, University of Swaziland Kwaluseni Campus Private Bag 4, Swaziland, Address: Kwaluseni M201 Swaziland, Tel.: (+268) 2517-0000, Corresponding author: kwendaf28@gmail.com.

Brazil, Russia, India, China and South Africa were named BRICS by Jim O Neil in 2001. South Africa officially joined BRIC in December 2010 to form BRICS. BRICS is considered to be a formidable economic block given the current pace of their growth. It is forecast that by 2050 the combined wealth of BRICS may surpass the economies of the 7 richest economies (known as G7) of the world put together. According to Hawksworth and Cookson (2008), the GDP at purchasing power parity (PPP) of Brazil, Russia, India, China and South Africa will be 3.1%, 3.5%, 5.0%, 4.6% and 3.3%, respectively, exceeding the forecast G7 average of 1.9% by 2050.

BRICS countries have the following common denominators; their large geographical and demographic sizes, relatively fast-growing economies and their significance in regional and international affairs. In addition, they aim to harness alternative sources of finance for development to increase trade amongst member states while diversifying their economies to achieve development both domestically and internationally. The combined BRICS GDP account for approximately 25% of world GDP, which further showcases how potentially important this grouping is to the world economies.

We use data from BRICS countries as being representative of emerging markets over the period 2000 to 2015. BRICS represents an economic block of emerging market countries which have common economic agreements such as a preferential trade agreement and improving the institutional environment. (Kwenda, Oyetade, & Dobрева, 2017) BRICS countries are increasing their cooperation, promoting trade and investment and increasing intra-foreign direct investment (FDI). These countries hold more than 30% of global financial reserves, and have witnessed a threefold increase in FDI among themselves. (Wilson, Purushothaman, & Goldman, 2003) Furthermore, these countries have shown interest in promoting financial sector development, resource mobilisation and increasing access to finance. For example, in 2015 BRICS countries launched the New Development Bank (NDB) to mobilize resources for development projects; this is an important step in coordinating development within member countries. In addition, the BRICS group is well-organized and committed to reforming their financial sectors (Chittedi, 2010) through reducing governmental intervention in national financial sectors, privatizing banks and liberalizing their stock markets.

This study analyses the interplay between bank competition, access to finance and economic growth in the economic block of emerging market countries that have reformed their financial sectors, mobilized resources and increased cooperation with the aim of contributing to the 2050 growth forecast. It provides answers as to whether there is need for further strengthening of these countries' financial institutions for the purpose of achieving the 2050 forecast.

The study contributes to extant finance-growth nexus literature by offering new evidence on the interplay between bank competition, access to finance and economic growth. Second, from a methodological perspective, the current work improves on previous work by using the panel Vector Error Correction Model (panel VECM). This study, to the best of our knowledge is the first one to explore bank competition, access to finance and economic growth nexus using the panel VECM technique among BRICS economies. Our results show that competition and access to finance collectively cause economic growth of BRICS in the long run and the disequilibrium in the system being adjusted at the speed of 7.62%. Therefore, we conclude that formal finance and competition in the banking sector have been largely instrumental in the growth of these economies and recommend that while alternative source of financing may be plausible, policies that will further strengthen the formal financial system must be enhanced and consolidated.

The rest of the paper is structured as follows: Section 2 presents the literature review. The data and methodology are discussed in Section 3. Section 4 presents and discusses the estimation results and robustness checks. Section 5 concludes the paper.

## **2. Literature Review**

The relationship between access to finance and economic growth as well as between competition and economic growth are well-captured in literature. The finance-growth hypothesis and information hypothesis dominate the theories underscoring the interaction between access to finance and economic growth providing divergent views. Proponents of the finance-growth model argue that finance is necessary for economic growth. It is rooted in the supply-leading hypothesis (Ang, 2008; Beck, 2013; King & Levine, 1993; Levine, 2005; Patrick, 1966; Schumpeter, 1911, among others) that emphasized the importance of access to formal finance for economic development. The market power hypothesis predicts that low competition adversely affects access to finance which consequently reduces economic growth. This industrial organization theory posits that the cost of finance reduces with improved efficiency in a competitive banking environment which arguably increases access to finance given the drive to innovate and expand services in order to remain in the market. The theoretical model of Denicolò and Zanchettin (2010) substantiates this argument, where in modelling the effects of competitive selection process on economic growth submitted that the market selection effects of competition boost innovation incentives hence more access to finance with competition in the banking system.

The information hypothesis, however, has contested the general market power theorem that competition is beneficial to economic growth in the sense that market

power reduces access to finance that hampers the growth of industries. According to the information hypothesis theory, competition reduces access to finance because of the existence of information asymmetry and agency costs which make it difficult for banks to internalize the returns from investing in lending. (Léon, 2015) Stiglitz and Weiss (1981) argued that the risk of adverse selection and moral hazard is increased with information asymmetry resulting in credit rationing. Thus, the information hypothesis therefore insists that market power is necessary to ease the blockage that is occasioned by information asymmetry between borrowers and lenders through impacting both monitoring and screening activities.

Attempts to empirically test these theories have resulted in varied conclusions. Beck et al. (2004) investigated the effects of the banking market structure on the firms' access to bank finance in 74 countries using the ordered Probit model and concluded that competition improves access to finance. Their results provided evidence which showed that firms face more obstacles in accessing finance in more concentrated banking industry. However, they found this relationship to be influenced by the level of economic and institutional development. In an earlier study of the extent to which competition in credit market helps in determining the value of lending relationship, Petersen and Rajan (1995)'s conclusion did not support the market power hypothesis theory. Using the Tobit regression with two-sided censoring to analyse data collected from 3404 US firms survey for the period 1988 and 1989, as they found better credit to be associated with concentrated banks. They argued that creditors are more likely to finance credit-constrained firms when credit markets are concentrated because it is easier for these creditors to internalize the benefits of assisting the firms. However, Love and Martínez Pería (2014) affirmed the findings of Beck et al. (2004) in their study of 53 countries between 2002 and 2010. In exploring the impact of bank competition on firms' access to finance using the pooled ordinary least squares (OLS), they found that low competition hampers access to finance, although their results suggest that competition impact is influenced by quality and scope of credit information sharing mechanism, as better credit information mitigates the damaging effects of low competition. Meanwhile, Diagne (2011) rather found an ambiguous relationship between competition and firms' access to finance in his study of West African Economic and Monetary Union (WAEMU) area. In a fixed effects panel data analysis of WAEMU using interest rate spread for competition and current GDP per capital, Diagne (2011) investigated the effects of bank market entry of price lowering and access to finance on individual firms and found evidence to conclude that competition failed to improve access to finance, but did for medium and large firms.

Studies that have focused on competition and economic growth relationship are quite positive with pockets of unclear results. Investigating the causality among bank competition, financial innovation and economic growth in Ghana for the

period 1990-2009, Adu-Asare Idun and QQ Aboagye (2014) surrogate the Herfindahl-Hirschman Index (HHI) for competition and the natural log of GDP for economic growth. Using the Granger causality test, bound test Auto Regressive Distributive Lag (ARDL), the authors found a long run positive relationship between competition and economic growth, but negative relationship between them in the short run. Thus, suggest that competition in the banking system does not amount to an immediate gain for the economy as only a sustained competitive banking system will make the difference. This is in tandem with an earlier Ghanaian study that covered the same period, method and variables by Asante, Agyapong, and Adam (2011). They had found that competition granger causes economic growth and as such concluded that long run competition is positively related to growth. Whether competition boosts economic growth was the thrust of a panel of 10 African countries study by Banya, Banya, Biekpe, and Biekpe (2017). Employing the Boone indicator as a competition measure and growth rate of per capita GDP as a measure of economic growth for the period 2005 to 2012, and fixed and random effects panel data analysis, they provided evidence to show that competition in the banking system improves the economic growth of the countries studied. In a related study, Man (2015) confirms the competition growth hypothesis in a panel data analysis with nonparametric Kernel regression of 187 countries for the period 1988-2007. Man (2015) explored the possibility of a non-linear relationship between competition and economic growth by surrogating net interest margin for competition and average growth rate of real GDP for economic growth. He found that bank competition fosters growth and also found limited evidence to support nonmonotonicities such as inverted u-shapes, hence concluded a positive relationship between the duo. In a regional study of the effects of competition on economic growth, Valverdie, Humphrey, and Fernandez (2003) found rather an unclear relationship between competition and economic growth. Their conclusion was based on the Granger causality between competition by Panzar-Rosse H-Statistics and Lerner index and regional economic growth over the period 1986-1998 in five large regions in Spain. The authors found that the difference in competition has no link with improved regional growth and so could not arrogate improvement in competition with economic growth in the area.

In terms of industrial growth, several studies have investigated the link between competition and the growth of firms given the links the growth the latter has with the growth in an economy and have generally come to the conclusion that they are positively related. For instance, Claessens and Laeven (2005) studied the relationship between competition and industry growth of 16 industrial based countries for the period 1980-1990 and found that competition makes financially dependent industry grow faster. Furthermore, Caggiano and Calice (2016) support this argument with an empirical study of 23 Gulf economies manufacturing sector for the period 2002-2010 with the findings that financially dependent firms grow

faster with competition in bank. They further stressed that less activity restriction, better credit information and greater institutional effectiveness reduce the damaging effects of low competition in banks.

The other aspect to address is whether access to finance affects economic growth as theories suggests. The growing empirical literature in this respect is not inconclusive. Access to finance, an important force to cross-country non-convergence growth in an economy, was the finding of Abdmoula and Jelili (2013) who explored a non-linear relationship between access to finance and economic growth panel of 144 countries for the periods 1985-2009. They used a dynamic panel data analysis with the generalized method of moment (GMM) and threshold effects to analyse domestic credit to private sector (DCPS) as a percentage of GDP for access to finance and average growth of GDPPC GDP per capita for economic growth to arrive at the positive conclusion. This confirmed the results of an earlier panel vector auto regression (VAR) analysis of 109 developing and developed industrial countries conducted by Calderón and Liu (2003) for the period 1960-1994. Using similar data, Calderón and Liu (2003) investigated the direction of causality between financial development and economic growth and found a reverse causality between financial development and economic growth. In a similar study, but with ARDL, Iyoboyi (2013) conducted an empirical investigation of the impact of financial deepening on economic growth in Nigeria during 1981-2010 and concluded that a bidirectional causality between access to finance and economic growth existed. Meanwhile, P.O. Demetriades and Hussein (1996) applied VAR and error correction model (ECM) to financial development and real GDP in 16 countries and concluded that the relationship between access to finance and growth is unclear. This is against the backdrop that their results provided little evidence to support the fact that access to finance leads to growth as well as bidirectional or reverse causality between the variables even as causality patterns vary across countries, they argued. Similarly, Hassan, Sanchez, and Yu (2011)'s conclusion on the role of financial development in enhancing growth of low- and middle-income countries was mixed. They analyzed data on annual GDP per capita growth and DCPS as a percentage of GDP using OLS with robust-heteroscedastic error, weighted least square regression and VAR for 168 countries for the periods 1980-2008. They found a positive relationship between access to finance and economic growth in developing countries. Though they found a reverse causality between economic growth and access to finance in much of the region, they argued that the relationship is unidirectional in the two poorest countries. Furthermore, Inoue and Hamori (2016) found that access to finance to be significant and robust in explaining economic growth in Sub-Saharan Africa in a GMM analysis of the nexus for the period 2004-2012. An early single country study of the causal relationship between financial development and economic growth in Korea for the period 1971-2002 yielded a positive relationship as well.

(Yang & Yi, 2008) On the contrary, a country study of Italy by Capolupo (2017) over the period 1965 to 2009 found evidence to conclude a negative relationship between access to finance and economic growth. He investigated the finance-growth nexus in Italy using OLS, two-stage least squares (2SLS) and instrumental variable (IV) regression to analyse DCPS as a percentage of GDP for access to finance and rate of growth of real income per capital to surrogate economic growth.

Notably, Law and Singh (2014) argued with evidence from 87 developed and developing countries for the period 1980-2010 that threshold effects exist in finance growth relationship, that is, finance is beneficial to growth only but to a certain extent. Hence, they argued for an optimal finance in an economy as more finance is not necessarily good for economic growth. Firm-level studies of Rahaman (2011) in investigating why some firms grow faster than the others in London and Ireland explored data from 5214 firms for the period 1991-2001 and concluded that financing has a significant influence on firms' growth.

Even though literature is rather inconclusive as regards the relationship between competition and access to finance on the one hand and competition and economic growth as well as access to finance and economic growth on the other hand, there appeared to be a large pool of evidence supporting a positive relationship between among these pairs of variables resulting in a growing consensus. To the best of our knowledge, no literature has explored these relationships in the individual or in a pool of the BRICS countries. Given the strategic importance of these countries in the emerging market world that have prompted researchers alike to investigate factors that have placed these countries on the stead of economic prosperity, this study seeks to fill the gap in literature of what role access to finance and competition have played in the economies of the economic block.

### **3. Methodology**

#### **3.1. Data and Variable Description**

Data for BRICS countries; the GDP annual growth, interest rate spread and domestic credit to private sector were sourced from the World Bank Development Indicators (WDI) for years 2000 to 2015. Data for interest rate spread for India were not available on WDI and were sourced from Asian Development Bank by collecting data on deposits and lending rates and netting them following WDI definitions as we could not get an already computed IRS for India even on the Asian Development Bank (ADB). As our data is for short time period for the purpose of panel VECM analysis we carried out frequencies conversion by converting the data for each variable per country on a quarterly basis based on the

work of,<sup>1</sup> IRS has been used in literature to proxy the competitiveness of the banking sector, as it is believed that a competitive banking sector will be reflected in how much margin a bank will be able to charge higher and above its deposits rate. (Diagne, 2011; Man, 2015) Literature used DCPS, domestic credit to private sector to surrogate access to finance in most economies<sup>2</sup>. DCPS defines the proportion of credits granted per period by banks to the private sector to finance the real sector of the economy.

### 3.2. Data Analysis

The aim of this study is to investigate the existence of a causal relationship among competition, access to finance and economic growth in BRICS based on the theoretical underpinning of the three concepts in literature. A lot has been done in this area that has seen varied methods explored. These methods include OLS (Caggiano & Calice, 2016; Capolupo, 2017; Claessens & Laeven, 2005; Diagne, 2011; Love & Martínez Pería, 2014), Tobit and Probit regressions (Beck et al., 2004; Petersen & Rajan, 1995), Granger causality with ARDL (Adu-Asare Idun & QQ Aboagye, 2014; Asante et al., 2011; Iyoboyi, 2013; Valverdie et al., 2003), fixed and random effects (Banya et al., 2017; Diagne, 2011), 2SLS, IV regression and GMM,<sup>3</sup> PVAR, VAR and ECM (Calderón & Liu, 2003; P. O. Demetriades & Hussein, 1996). These methods have their merits and shortcomings. This study seeks to employ the panel VECM to study the causality among these variables in BRICS. This is borne out of the fact that panel VECM, according to Rahman and Mustafa (2015), has the ability to differentiate short and long run relationships while producing more efficient estimates than ordinary VAR. It has also been adjudged to automatically convert variables to first difference with E-Views. Moreover, the error correction term (ECT), which is the cointegration term built in VECM makes it possible for deviation from the long-run equilibrium to be corrected with a gradual speed of short-run adjustment.

#### 3.2.1. Model Specification

We follow Wang, Zhou, Zhou, and Wang (2011) and Mahadevan and Asafu-Adjaye (2007) to test for causal relationship between economic growth, competition and access to finance among BRICS countries. Standard procedures require us to conduct panel unit root test, panel cointegration test, panel VECM and lastly Wald test.

---

<sup>1</sup> See (Borys, Horváth, & Franta, 2009; Cheng, 2006; Kutu & Ngalawa, 2016; Ngalawa & Vieg, 2011).

<sup>2</sup> See, (Adu-Asare Idun & QQ Aboagye, 2014; Capolupo, 2017; Claessens & Laeven, 2005; Law & Singh, 2014).

<sup>3</sup> See (Capolupo, 2017; Inoue & Hamori, 2016; Law & Singh, 2014; Rahaman, 2011) among others).



The relationship between, economic growth, competition and access to finance among BRICS countries can be expressed as;

$$gdp_{it} = \eta_{it} + \xi_{1i}irs_{it} + \xi_{2i}dcps_{it} + \varepsilon_{it} \dots\dots\dots \text{Equation 1}$$

Where  $i = 1, 2 \dots N$  denotes the BRICS countries in the panel,  $t = 1, 2, \dots, t$  equals the time period,  $gdp$  is gross domestic product annual growth, representing economic growth of BRICS countries,  $irs$  is interest rate spread which is a competition measure and  $dcps$  is domestic credit to private sector, a proxy for access to finance in the various BRICS economies. The task is estimating the parameters in the model which are the respective long run elasticity estimates of regulation, competition and stability and undertake some panel test of causality relationship between the variables.

### 3.2.2. Unit Root Test

First, test for the order of integration in the economic growth, competition and access to finance will be performed. This will be done by panel unit root test considering the IPS test (Im, Pesaran & Shin, 2003), LLC test (Levin, Lin, & Chu, 2002) and the augmented Dickey-Fuller (ADF) test. The essence is to ensure comparison and validation of results with a view to further engender consistency. (Demetriades & Fielding, 2012; Ishibashi, 2012)

### 3.2.3. Cointegration Test

Where the unit root test gives variables that are of order one integration, then cointegration analysis will be applied to determine the presence of a long run relationship among the variables following the Maddala and Wu (1999) approach to identify the number of cointegration relationships between the three variable in the study. Maddala and Wu (1999) relied on the Johansen (1988) test for cointegration to consider the suggestion of Fisher (1932) to combine trace test and max-eigen statistics to test for cointegration in full panel by combining individual cross sections for cointegration. Johansen Fisher Panel Cointegration test type aggregates p-values of individual Johansen maximum likelihood cointegration test statistics. (Maddala & Kim, 1998; Maddala & Wu, 1999) This test, unlike Pedroni (2004) and Kao (1999) whose cointegration tests are residual based taken from Engle Granger two step test that are both one way cointegration, is system based cointegration for the whole panel. This will be based on the following model;

$$gdp_{it} = \beta_i + \zeta_1irs_{it} + \zeta_2dcps_{it} + \varepsilon_{it} \dots\dots\dots \text{Equation 2}$$

Where;  $gdp$ ,  $irs$ , and  $dcps$  are the variables described in Equation 1 above.

**3.2.4. Estimation Technique**

Finally, the direction of causality will be identified by estimating the panel-based VECM and used to conduct the causality test on the variables relationship. The empirical model is represented by the following VECM equations;

$$\Delta gdpg_{it} = \lambda_{1j} + \sum_{k=1}^m \varphi_{11ik} \Delta gdpg_{it-k} + \sum_{k=1}^m \varphi_{12ik} \Delta irs_{it-k} + \sum_{k=1}^m \varphi_{13ik} \Delta dcps_{it-k} + \psi_{1i} \varepsilon_{it-1} + \mu_{1it} \dots \dots \dots \text{Equation 3}$$

$$\Delta irs_{it} = \lambda_{2j} + \sum_{k=1}^m \varphi_{21ik} \Delta irs_{it-k} + \sum_{k=1}^m \varphi_{22ik} \Delta gdpg_{it-k} + \sum_{k=1}^m \varphi_{23ik} \Delta dcps_{it-k} + \psi_{2i} \varepsilon_{it-1} + \mu_{2it} \dots \dots \dots \text{Equation 4}$$

$$\Delta dcps_{it} = \lambda_{2j} + \sum_{k=1}^m \varphi_{31ik} \Delta dcps_{it-k} + \sum_{k=1}^m \varphi_{32ik} \Delta irs_{it-k} + \sum_{k=1}^m \varphi_{33ik} \Delta gdpg_{it-k} + \psi_{1i} \varepsilon_{it-1} + \mu_{1it} \dots \dots \dots \text{Equation 5}$$

Where  $\Delta$  denotes first differences and  $k$  is the optimal lag length to be determined. The Equations (3) - (5) allow this study to test for short run and long run causality. The presence or absence of a long run causality is determined by investigating the significance using the probability value on the coefficient,  $\psi$ , of the error correction term,  $\varepsilon_{it-1}$  in the equations.

**4. Empirical Results**

The results of our long run and short run causality tests among economic growth, competition and access to finance among BRICS countries using panel VECM are presented in this section. The usual procedure is to start by testing for presence of unit root which must be stationary at order 1 as a precondition for testing for long run cointegration.

**Table 1. Summary Statistics**

	DCPS	GDPG	IRS
Mean	62.89788	5.323348	10.89932
Median	52.61074	5.553772	4.924115
Maximum	161.8798	14.57967	45.68628
Minimum	12.00273	-8.660945	2.324885
Std. Dev.	33.97067	3.827615	12.43641
Skewness	0.927343	-0.577145	1.58694
Kurtosis	2.943924	4.105132	3.902529

Jarque-Bera	45.9067	34.0494	145.1744
Probability	0.00000	0.00000	0.00000
Sum	20127.32	1703.471	3487.781
Sum Sq. Dev.	368128.1	4673.553	49337.95
Observations	320	320	320

*Source: Authors' estimation, 2017*

This process is followed by the VECM for long run analysis and finally Wald test for a short run causality. In addition to these, we present results of summary statistics, correlation between our variables as well as some post estimation tests. Table 1 shows the summary statistics of the variables considered in this study. These results indicate that the variables are fairly normally distributed given the Jarque-Bera statistics, and having a skewness around -1 and 1 is considered symmetric as well as Kurtosis around 3.0. The Spearman's rank correlation between the variables seems quite significant especially between DCPS and IRS which is quite high and negative. This suggests an inverse relationship between DCPS and IRS. This is unexpected as increased competition is deemed to be favourable for access to finance as this has the tendency to reduce the margin between the lending and the deposit rate. But this result may subsist where there is concentration and banks possess market power with the ability to widen this margin between lending and deposit rates. An increase in the distance difference between lending and deposits rate may cause dissaving which may eventually reduce how much is available for credit. The same explanation may suffice for the negative correlation between IRS and GDPG. As expected, the correlation between DCPS and GDPG is positive implying that increasing access to finance available to fund the real sector of an economy should have a positive and significant influence on the economic growth. Further analysis in this study will clarify this relationship.

**Table 2. Spearman's Rank Correlation**

	DCPS	GDPG	IRS
DCPS	1.000000000	0.179988208	-0.745248563
GDPG	0.179988208	1.000000000	-0.351263369
IRS	-0.745248563	-0.351263369	1.000000000

*Source: Author's estimation, 2017*

For consistency and comparison, we used three approaches for testing panel unit root, IPS, LLC and ADF, see Table 3 below. The results of IPS and ADF are not significant for both GDPG and DCPS at levels  $I(0)$  signifying the presence of unit root. In the case of IRS, while IPS and ADF are both not significant at  $I(0)$ , we found LLC to be significant at less than 5%. Given the ratio of significance, we could conclude that this variable has unit root at  $I(0)$  and thus not significant at levels. Overall, GDPG, IRS and DCPS are all non-stationary at  $I(0)$  and must be

tested at first difference, I(1). At I(1) all our variables are stationary for all the approaches employed signifying absence of unit root at order 1 and meeting the conditions for testing for long run cointegration tests.

To test for long run cointegration among our variables, we adopted the system based Fisher type Johansen panel cointegration test. The use of the Fisher type Johansen panel cointegration tests is borne out of the motivation stated in the foregoing. In Table 4, the corresponding probabilities of the Trace statistics and the Max-Eigen tests show that there are at most one and at most two cointegration equations (CEs) among GDPG, IRS and DCPS. This is true as we could not accept the null hypothesis of the none that says there is none number of cointegration equations among the variables. Hence, we support the evidence suggesting the existence of a stable long run relationship among the variables. This validates the use of panel VECM to better capture and predict results about causality. In Table 5 below are the results of our Panel Vector Error Correction estimates for the cointegrated equation, since the

**Table 3. IPS, LLC and ADF Panel Unit Root Test**

Variables	At Level						At first Difference					
	IPS		LLC		ADF		IPS		LLC		ADF	
	Statistic	P-value	Statistic	P-value	Statistic	P-value	Statistic	P-value	Statistic	P-value	Statistic	P-value
GDPG	-0.31063	0.378	-1.00026	0.1586	10.1356	0.4287	-3.67495	0.0001	-6.87607	0.0000	56.2856	0.0000
IRS	-0.19987	0.4208	-1.86455	0.0311	10.4116	0.4052	-3.29202	0.0005	-7.36739	0.0000	66.9864	0.0000
DCPS	-0.95882	0.1688	1.83617	0.9668	1.12803	0.9997	-2.08259	0.0186	-3.85557	0.0001	29.736	0.0009

*Source: Author's estimation, 2017*

**Table 4. Johansen Fisher Panel Cointegration Test (GDPG, IRS DCPS)**

Hypothesized	Fisher Stat.		Fisher Stat.	
No. of CE(s)	(from trace test)	Prob.	(from max-	Prob.
None	25.84	0.004	17.09	0.724
At most 1	14.86	0.1371	11.13	0.3479
At most 2	10.84	0.3697	10.84	0.3697

*Source: Author's estimation, 2017*

objective of this study is to determine whether there is the existence of a long-run causality among the variables being considered in BRICS. However, there are two implications to the coefficients of the cointegration equations in Table 5, one could be that there would be a long run causality and the other would mean speed of adjustment towards long run equilibrium. The guideline is, when the cointegration equation's coefficient is negative and significant, there is a long run causality running from the independent variables to the dependent variable as well as speed of adjustment towards long run equilibrium. Our analysis has three models, based on the dependent variable corresponding to each of the three variables. For the first

model where GDPG is the dependent variable, we found the cointegration equation's coefficient to be negative and significant at -0.076187 giving a probability value of 0.0000. The implication of this is that there is a long run causality running from the independent variables, IRS and DCPS to the dependent variable GDPG. This is not surprising as we expected the interplay between competition and access to finance to have some influence on economic growth. The result is consistent with finance-growth and the industrial organisation market power hypothesis. It also supports the findings of Banya et al. (2017), Caggiano and Calice (2016), Inoue and Hamori (2016), Rahaman (2011), among others who found that competition as well as access to finance to cause economic growth.

The second implication is the error correction term implying that the speed of adjustment is 7.62% annually. Hence, we can say that the whole system is getting back to long run equilibrium at the speed of 7.62% annually. This meant that there has been some disequilibrium in the past that is now been corrected at the speed of adjustment stated.

**Table 5. Vector Error Correction Estimates**

	Coefficient	Standard Error	t-Statistic	Prob.	Dependent variable
CointEq1	-0.076187	0.017976	-4.238268	0.0000	GDPG
CointEq2	-7.44E-05	0.000555	-0.133954	0.8935	IRS
CointEq3	-0.001232	0.000841	-1.465892	0.143	DCPS

*Source: Author's estimation, 2017*

In the case of Models 2 and 3, even though their error correction terms are negative, they are not significant at 0.8935 and 0.143 for IRS and DCPS dependent variables respectively. Therefore, we do not have any evidence to support any long run causality running from GDPG and DCPS to IRS, neither can we say the same for IRS and GDPG to DCPS. These also do not have any implication for speed of adjustment.

The final procedure is to test for a short run causality using Wald test as set out in Table 6 below. The results of the tests for the three models show that there is no short run causality running from the independent variables to the dependent variables respectively. For want of generality, Model 1 shows there is no short run causality running from IRS and DCPS to GDPG, for Model 2, GDPG and DCPS to IRS and Model 3, IRS and GDPG to DCPS. This is a validation of our panel VECM model. Overall, the summary of the models is that there is a long run causality running from IRS and DCPS to economic growth in the BRICS countries. In other words, access to finance and bank competition can cause their economic growth in the long run.

**Table 6. Wald Test**

Test Statistic	Value	df	Prob.
Chi-square	3.39745	4	0.4936
Chi-square	1.568016	4	0.8145
Chi-square	0.358491	4	0.9857

Source: Author's estimation, 2017

Overall, our results support the fact that economic growth is being caused by access to finance and competition. Thus, suggest the need for the economic policies in these countries to pursue activities that will liberalise the banking system such that they become more competitive and make finance more available to the real sector of the economy for a purposeful economic growth and transformation. Competition is not only able to drive expansion of the financial institutions, but also drive down finance cost that is a requisite for business disposition to taking more finance for further investment.

We carried out some post-estimation test to validate the results of our model; the Jarque-Bera test shows that none of the residuals of our model suffers from any normality issues. The same for heteroskedasticity test.

## 5. Summary and Conclusion

The basic assumptions underlying this study are the market power hypothesis and the finance-growth model that presupposed that competition in banks should engender access to finance which in turn should impact positively on the economy. The BRICS economies have emerged overtime and hence our investigation as to the role of these phenomena in contributing to those economic gains. We employed panel VECM to analyse competition, access to finance and economic growth surrogates and found a unidirectional causality among the variables suggesting that competition and access to finance cause economic growth in BRICS. Hence, the conclusion that the finance-growth hypothesis holds for the economies. We therefore recommend that policies that will enhance the further robustness of the financial institution of the constituent economies should be promoted. Institutions such as a common regulatory bank may play a substantial role in this regard.

## 6. Bibliography

- Abdmoulah, W. & Jelili, R.B. (2013). Access to finance thresholds and the finance-growth nexus. *Economic Papers*, 32(4), pp. 522-534.
- Adu-Asare Idun, A. & Aboagye, Q.Q.A. (2014). Bank competition, financial innovations and economic growth in Ghana. *African Journal of Economic and Management Studies*, 5(1), pp. 30-51.

- Asante, S.; Agyapong, D. & Adam, A.M. (2011). Bank competition, stock market and economic growth in Ghana. *International Journal of Business Administration*, 2(4), pp. 33-41.
- Banya, R.M.; Banya, R.M.; Biekpe, N. & Biekpe, N. (2017). Bank competition and economic growth: Empirical evidence from selected frontier African countries. *Journal of Economic Studies*, 44(2), pp. 245-265.
- Beck, T. (2011). *The role of finance in economic development: Benefits, risks, and politics*.
- Beck, T. (2013). Finance, growth and fragility: the role of government. *International Journal of Banking, Accounting and Finance*, 5(1-2), pp. 49-77. doi: 10.1504/IJBAAF.2013.058088
- Beck, T.; Demirgüç-Kunt, A. & Maksimovic, V. (2004). Bank competition and access to finance: International evidence. *Journal of Money, Credit and Banking*, 36(3), pp. 627-648.
- Borys, M.M.; Horváth, R. & Franta, M. (2009). The effects of monetary policy in the Czech Republic: an empirical study. *Empirica*, 36(4), p. 419.
- Caggiano, G. & Calice, P. (2016) Bank competition, financial dependence, and economic growth in the Gulf Cooperation Council. *World Bank Policy Research Working Paper*, 7687.
- Calderón, C. & Liu, L. (2003). The direction of causality between financial development and economic growth. *Journal of Development Economics*, 72(1), pp. 321-334. doi: [http://dx.doi.org/10.1016/S0304-3878\(03\)00079-8](http://dx.doi.org/10.1016/S0304-3878(03)00079-8)
- Capolupo, R. (2017). Finance, investment and growth: Evidence for Italy. *Economic Notes*.
- Cheng, K.C. (2006). *A VAR analysis of Kenya's monetary policy transmission mechanism: How does the Central Bank's repo rate affect the economy?* International Monetary Fund.
- Chittedi, K.R. (2010). Global stock markets development and integration: With special reference to BRIC countries. *International Review of Applied Financial Issues and Economics*(1), pp. 18-36.
- Claessens, S. & Laeven, L. (2005). Financial dependence, banking sector competition, and economic growth. *Journal of the European Economic Association*, 3(1), pp. 179-207.
- de Guevara, J.F. & Maudos, J. (2011). Banking competition and economic growth: cross-country evidence. *The European Journal of Finance*, 17(8), pp. 739-764.
- Demetriades, P. & Fielding, D. (2012). Information, institutions, and banking sector development in West Africa. *Economic Inquiry*, 50(3), pp. 739-753. doi: 10.1111/j.1465-7295.2011.00376.x.
- Demetriades, P.O. & Hussein, K.A. (1996). Does financial development cause economic growth? Time-series evidence from 16 countries. *Journal of development economics*, 51(2), pp. 387-411.
- Denicolò, V. & Zanchettin, P. (2010). Competition, market selection and growth. *The Economic Journal*, 120(545), pp. 761-785.
- Diagne, M.F. (2011). *Bank competition, interest rates and access to finance in the WAEMU*.
- Fisher, R. (1932). Statistical methods for research workers. Edinburgh: Oliver and Boyd, 1925. *Fisher Statistical Methods for Research Workers, 1925*.
- Hassan, M.K.; Sanchez, B. & Yu, J.-S. (2011). Financial development and economic growth: New evidence from panel data. *The Quarterly Review of Economics and Finance*, 51(1), pp. 88-104. doi: <http://dx.doi.org/10.1016/j.qref.2010.09.001>.
- Hawthornthwaite, J. & Cookson, G. (2008). *The world in 2050: Beyond the BRICs: A broader look at emerging market growth prospects*: PricewaterhouseCoopers.
- Im, K.S.; Pesaran, M.H. & Shin, Y. (2003). Testing for unit roots in heterogeneous panels. *Journal of econometrics*, 115(1), pp. 53-74.

- Inoue, T. & Hamori, S. (2016). Financial access and economic growth: evidence from Sub-Saharan Africa. *Emerging Markets Finance and Trade*, 52(3), pp. 743-753.
- Ishibashi, S. (2012). The segmentation of loan interest rates by regional financial institutions: A panel cointegration analysis. *International Review of Business Research Papers*, 8(5), pp. 95-110.
- Iyoboyi, M. (2013). Bank and non-bank financial deepening and economic growth: The Nigerian experience (1981–2010). *Economic Notes*, 42(3), pp. 247-272.
- Johansen, S. (1988). Statistical analysis of cointegration vectors. *Journal of economic dynamics and control*, 12(2-3), pp. 231-254.
- Kao, C. (1999). Spurious regression and residual-based tests for cointegration in panel data. *Journal of econometrics*, 90(1), pp. 1-44.
- Kutu, A.A. & Ngalawa, H. (2016). Monetary policy shocks and industrial output in BRICS countries. *SPOUDAI-Journal of Economics and Business*, 66(3), pp. 3-24.
- Kwenda, F.; Oyetade, D. & Dobрева, R. (2017). Factors affecting the long-term post-acquisition performance of BRICS firms engaging in cross-border mergers and acquisitions. *Acta Universitatis Danubius. Æconomica*, 13(2), pp. 122-138.
- Law, S.H. & Singh, N. (2014). Does too much finance harm economic growth? *Journal of Banking & Finance*, 41, pp. 36-44. doi: <https://doi.org/10.1016/j.jbankfin.2013.12.020>.
- Léon, F. (2015). *What do we know about the role of bank competition in Africa*. Retrieved 27 August 2015 [http://cerdi.org/production/show/id/1695/type\\_production\\_id/1](http://cerdi.org/production/show/id/1695/type_production_id/1).
- Levin, A.; Lin, C.-F & Chu, C.-S.J. (2002). Unit root tests in panel data: asymptotic and finite-sample properties. *Journal of econometrics*, 108(1), pp. 1-24.
- Love, I. & Martínez Pería, M.S. (2014). How bank competition affects firms' access to finance. *The World Bank Economic Review*, 29(3), pp. 413-448.
- Maddala, G.S. & Kim, I.-M. (1998). *Unit roots, cointegration, and structural change*. Cambridge: Cambridge University Press.
- Maddala, G.S. & Wu, S. (1999). A comparative study of unit root tests with panel data and a new simple test. *Oxford Bulletin of Economics and statistics*, 61(S1), pp. 631-652.
- Mahadevan, R. & Asafu-Adjaye, J. (2007). Energy consumption, economic growth and prices: a reassessment using panel VECM for developed and developing countries. *Energy Policy*, 35(4), pp. 2481-2490.
- Man, G. (2015). Bank competition, economic growth, and nonlinearity: A nonparametric approach. *Scottish Journal of Political Economy*, 62(3), pp. 310-324.
- Ngalawa, H. & Viegli, N. (2011). Dynamic effects of monetary policy shocks in Malawi. *South African Journal of Economics*, 79(3), pp. 224-250.
- Pedroni, P. (2004). Panel cointegration: asymptotic and finite sample properties of pooled time series tests with an application to the PPP hypothesis. *Econometric theory*, 20(3), 597-625.
- Petersen, M.A. & Rajan, R.G. (1995). The effect of credit market competition on lending relationships. *The Quarterly Journal of Economics*, 110(2), pp. 407-443.
- Rahaman, M.M. (2011). Access to financing and firm growth. *Journal of Banking & Finance*, 35(3), pp. 709-723.



Rahman, M. & Mustafa, M. (2015). *Financial deepening and stock market returns: Panel cointegration analyses*.

Schumpeter, J. (1911). *The Theory Of Economic Development* Harvard Uni. Press, Cambridge, MA.

Stiglitz, J.E. & Weiss, A. (1981). Credit rationing in markets with imperfect information. *The American economic review*, 71(3), pp. 393-410.

Valverdie, S.C.; Humphrey, D. & Fernandez, F.R. (2003). Deregulation, bank competition and regional growth. *Regional Studies*, 37(3), pp. 227-237.

Wang, S.; Zhou, D.; Zhou, P. & Wang, Q. (2011). CO 2 emissions, energy consumption and economic growth in China: a panel data analysis. *Energy Policy*, 39(9), pp. 4870-4875.

Wilson, D.; Purushothaman, R. & Goldman, S. (2003). *Dreaming with BRICs: The path to 2050*, Vol. 99, Goldman, Sachs & Company.

Yang, Y.Y. & Yi, M.H. (2008). Does financial development cause economic growth? Implication for policy in Korea. *Journal of Policy Modeling*, 30(5), pp. 827-840. doi: <http://dx.doi.org/10.1016/j.jpolmod.2007.09.006>.

Zhuang, J.; Gunatilake, H.M.; Niimi, Y.; Khan, M.E.; Jiang, Y.; Hasan, R. & Huang, B. (2009). *Financial sector development, economic growth, and poverty reduction: a literature review*.