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Financial development, openness in financial services trade and economic growth

A panel data analysis in BRICS economies

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Abstract

Purpose – The purpose of this paper is to examine the relationship between financial development, openness in financial services trade and economic growth in BRICS countries for the period 1990–2012.
Design/methodology/approach – An index for financial development has been constructed using principal component analysis technique by including banking sector development, stock market development, bond market development and insurance sector development. For the robustness of the result, the long-run cointegrating relationship amongst the variables has been analyzed.
Findings – Overall financial development has a positive and significant impact on economic growth. To take the full advantage of openness in financial services trade, countries need to put more emphasis on the development of their stock markets, bond markets and the insurance sector. The result shows that openness in financial services trade has a positive impact on economic growth when the stock market, bond market and insurance sector are included in the system.
Research limitations/implications – The policy implication of the findings is that policymakers should focus more on developing all four areas of finance to get the full benefit of the financial system on the process of economic growth.
Originality/value – The authors have constructed the better indicators of financial development in the case of BRICS economies. Most of the studies in BRICS economies have measured the development of the financial sector as either banking sector development or stock market development. However, the present study includes all four areas of finance (banking sector development, stock market development, insurance sector development and bond market development) into account.

Keywords Financial services, Panel cointegration, Economic growth, Financial development, Principal component

Paper type Research paper

1. Introduction

Financial services trade has very important role in the overall development of financial sector. The financial services sector consists of users, suppliers and the regulators of financial services. The major financial services include banking, insurance, mortgage services, stock trading and brokerage, micro-finance and other similar activities. In recent past, most of the developing countries have counted on liberalization policies of both financial and trade systems to increase the economic growth, where on the one hand, trade sector focuses on barriers imposed on both trade in goods and services between the countries to reduce it, on the other hand, the financial

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sectors focuses transforming the financial system by reducing cost and increasing efficiency in the production process. Schneider (2005) revealed that high-technology imports are relevant in explaining domestic innovation both in developed and developing countries.

In fact, financial liberalization directly reduces financing constraints in the sense that more foreign capital becomes available, and foreign investors may insist on better corporate governance which indirectly reduces the wedge between internal finance and external finance. Hence, the cost of capital may go down because of improved risk sharing or because of the reduction in financing constraints or both (Bekaert *et al.*, 2005). Levine (2001) argued that liberalizing restrictions on international portfolio flows accelerates productivity growth by enhancing the efficiency of the domestic banking industry.

It is worthy to note that though the literature agreed upon the importance of international trade for economic growth, the findings are not conclusive. Keho (2017) found a positive and strong complementary relationship of trade openness and capital formation with economic growth. Huang and Chang (2014) found that in countries with higher stock market development, trade openness enhances economic growth, while in countries with less developed stock market, the ability of trade to facilitate growth is feeble. Likewise, Rajan and Zingales (2003) argued that simultaneous opening up of the trade and capital accounts is necessary for financial development. However, Baltagi *et al.* (2009) note that this view is in sharp contrast to most of the previous literature (e.g. McKinnon, 1991) that promotes an approach where trade liberalization should be pre cursor for financial liberalization.

The prime aim of the current study is to empirically examine the nexus between financial development, openness in financial services trade and economic growth in the BRICS economies. The main rationale behind pursuing this objective is to show how BRICS countries can benefit from development of financial sector and liberalization of trade in financial services. If indeed, the liberalization of trade in financial services has a positive impact on economic growth, then the BRICS governments can remove certain regulatory restrictions in trade in services to provide an impetus to their economic growth. Therefore, it needs to examine the relationship amongst financial development, openness in financial services trade and economic growth.

Some studies as such have analyzed this relationship; however, majority were conducted on time series data of individual BRICS economies. But, Christopoulos and Tsionas (2004) argued that the times series studies are not as robust as panel studies because unavailability of large time series may distort the validity of the estimates. In this regard, the literature shows that it lacks the studies on finance, trade in finance and economic growth in a panel of five BRICS countries. Therefore, this paper contributes to the literature by providing recent evidence on the relationship amongst financial development, trade in financial services and economic growth using a panel data set of BRICS economies. In fact, after relaxing the issue of cross sectional dependence, we find that openness in financial services trade affects growth with respect to the development of financial sector. For example, the result of openness in financial services trade turn out to be positive when financial development is measured as stock market development, bond market development and insurance sector development. Therefore, it can be argued that in countries with higher stock, bond and insurance market development more openness in financial services enhances economic growth, while in countries with less stock, bond and insurance market development the ability of financial openness to facilitate growth is feeble. Similarly, the study also argues that to get the full benefit of financial development, it is important to give equal emphasis on all the markets of financial system (banking sector, stock market, insurance sector and bond market) because we find that only overall financial development (the combination of all banking, stock market, bond market and insurance sector development) has a causal relationship with economic growth. Besides, our study departs from earlier work and contributes to the literature in following aspects:

(1) We have constructed the better indicators of financial development in the case of BRICS economies. One of the major issues with earlier studies on finance and growth

in selected area is the measurement of financial development. Most of the studies in BRICS economies have measured development of financial sector as either banking sector development or stock market development[1]. However, only the development of stock market and banking sector do not give a clear picture of overall financial system. Therefore, since our study is based on BRICS countries and this group consists both the developed and developing economies, bond market development and insurance sector are also considered as the major markets of financial system. Hence, present study includes all four areas of finance (banking sector development, stock market development, insurance sector development and bond market development) into account. Therefore, following Creane *et al.* (2004), we have used principal component analysis to develop a summary measure for financial depth to better represent the financial development.

(2) We also analyzed the relationship between trade in financial services and economic growth. To the best of our knowledge, barely, any study as such has performed this relationship in a panel of BRICS economies in a most efficient manner[2]. The present study considers trade in banking and insurance services as a trade in financial services.

(3) We take the issue of cross-sectional dependence to produce the valid results. We apply second generation panel unit root test on the heterogeneous panels with cross-sectional dependence. Likewise, the study used a pairwise panel causality test by Dumitrescu and Hurlin (2012) to account the dependency among the countries and heterogeneity. Similarly, the long-run estimates are also free from the issue of cross-sectional dependence.

The rest of the paper is organized as follows: Section 2 consists of a brief review of earlier studies. Section 3 presents measurement and description of the data. The analytical framework and empirical results are discussed in Section 4 and the conclusions and implications of the study findings are drawn in the final section.

2. Review of literature

2.1 Openness in financial services trade and economic growth

The relationship between openness in financial service trade and economic growth has long been studied but the relationship remained controversial. Generally, there are two views trying to explain the nexus between openness in financial services and economic growth: financial openness helps to enhance economic growth and it actually weakens the economic system of an economy. The advocates of first view assume that openness in financial services trade enhances the access to financial services, and indirectly through increasing competitiveness of domestic financial markets. For example, Bayraktar and Wang (2008) argued that banking sector openness may directly affect growth by improving the access to financial services and indirectly by improving the efficiency of financial intermediaries, both of which reduce the cost of financing, and in turn, stimulate capital accumulation and economic growth. Cross-country empirical evidence from Asia suggests that limited openness in the financial sector results in slower institutional development, greater fragility and higher cost of financial services (Claessens and Glaessner, 1998).

Bekaert *et al.* (2005), in the case of five developed countries: Japan, Iceland, Malta, New Zealand and Spain, concluded that equity market liberalization leads to increase in economic growth. They further argued that liberalization leads to an approximate 1 percent increase in annual real per capita gross domestic product (GDP) growth over a five-year period. A similar result has also been accounted by Henry (2000), Henry (2003) and Bekaert and Harvey (2000), who argued that stock market liberalization promotes investment by decreasing the cost of capital.

In line with this, Levine (2001) concluded that financial liberalization has positive influence on economic growth. Levine shows indirect effect of financial liberalization on economic growth in two ways: first, he argued that liberalizing restrictions on international portfolio flows leads to enhanced market liquidity, which in turn accelerates the economic growth. Second, Levine argued that presence of foreign bank tends to enhance the efficiency of the domestic banking and hence accelerates productivity growth.

Similarly, using a wide array of measures of international financial integration on 57 countries, Edison *et al.* (2002), do not find any evidence against the hypothesis that international financial integration does not accelerate economic growth even when controlling for particular economic, financial, institutional and policy characteristics. Quinn and Toyoda (2008) analyzed the relationship of capital account liberalization and financial current account openness with growth in 94 nations. Using pooled time-series, cross-sectional OLS and system generalized method of moments (GMM) estimators, they concluded that capital account liberalization had a positive association with growth in both developed and emerging market nations. Further, they argued that equity market liberalization has an independent effect on economic growth. Similarly, Sala-i-martin (1992) found that financial repression has negative consequences for growth. Claessens *et al.* (2001) using bank level data for 80 countries for the 1988-95 periods find that relaxation of restriction on foreign bank entry in developing countries tends to improve the functioning of national bank system, with positive welfare implications for customers.

However, the advocates of second school of thoughts argue that openness in financial services reduces the stability in economic growth. Their argument is that openness in financial services transfers the financial crisis from one country or region to another country or region. Stiglitz (2000) argued that financial liberalization without proper regulatory guidelines is a major problem in financial openness of an economy. He further provided the evidence to support this view that crisis spread from East Asia to Russia, and then to Latin America, became clear that even countries with good economic policies and relatively sound financial institutions (at least as conventionally defined) were adversely affected. In line with this, Eichengreen (2001) argued that capital account liberalization can be counterproductive if it takes place before severe policy related distortions have been removed and before domestic markets and the administrative capacity of the prudential authorities have developed enough to generate confidence that foreign finance will be channeled in productive direction. In line with this, it is argued that the Asian financial crisis was created by the international financial system (Radelet and Sachs, 2000).

2.2 Financial development and economic growth

The extant literature shows that though none of the scholars have ignored the importance of financial development for the growth of an economy, the arguments are not conclusive. The theoretical debate started since Schumpeter (1911). He forwarded the argument of finance, savings, technological innovations and growth. According to Schumpeter, financial development enhances technological innovations through its intermediary services and hence economic growth. Empirically, Goldsmith (1969), first time, supported the view that finance is important for economic growth. However, economists like Robinsons argued that finance is not that important for economic growth. His argument is that finance simply follows the growth (King and Levine, 1993a). In fact, Lucas (1988) argued that the relationship between finance and economic development is over-stressed. The debate does not ended at this point. Since Goldsmith (1969) conducted first empirical study on finance growth nexus, a number of studies have been conducted to analyze finance-growth relationship using either cross-sectional data, panel data or the time series data[3].

The findings of these studies have taken this debate into three directions: the relationship, causality and the system or the source through which finance affects the growth.

The advancement in econometric tools and techniques and readily availability of the large sample of the data have further provided new ways to recent studies to look after these issues from the aspects of cointegration, causality and error correction phenomenon. Khan and Senhadji (2000) analyzed the relationship between financial development and economic growth using a cross-section of 159 countries for the period of 1960–1999. They concluded that the effect of financial development on growth is positive, the size of the effect varies with different indicators of financial development, estimation method, data frequency and the functional form of relationship. A pioneer work by Beck *et al.* (2000) using cross-country data for 1960–1995 within a GMM framework to account the possible endogeneity of the regressors concluded that there is a statistically significant relationship between financial intermediary development and both real per capita GDP growth and total factor productivity growth. They further concluded that better functioning financial intermediaries improve resource allocation and accelerate total factor productivity growth with positive repercussions for long-run economic growth. Likewise, using the same technique of data analysis, Levine *et al.* (2000) found that the exogenous component of financial intermediary development is positively associated with economic growth. A similar finding has also been observed by Christopoulos and Tsionas (2004). They found that financial development has positive impact on economic growth and there exists a unidirectional long-run causality from financial development to economic growth. Likewise, a number of recent studies have also found positive relationship between financial development and economic growth[4].

On the other hand, recent studies on finance and growth have also accounted a negative relationship between financial development and economic growth. Narayan and Narayan (2013), Ductor and Grechyna (2015), Grassa and Gazdar (2014) and Mhadhbi (2014) found weak relationship between financial development and economic growth.

Another important view that has been emphasized in recent literature is the issue of causality. Ever since the debate started on finance growth nexus, Patrick (1966) is the first who coined the issue of causality with two well-known hypotheses on finance growth nexus: the supply leading and demand following hypotheses. The supply leading hypothesis argues that finance causes economic growth. However, the demand following hypothesis supports the Robinsons's view that economic development creates demand for the financial sector to grow. Similarly, the recent literature further provided the third view; feedback effect. The feedback effect argues that finance and growth cause one another, more specifically, the bidirectional causality. Thus, the recent stock of knowledge on finance and growth has also provided some empirical evidences on supply leading[5], demand following and feedback effect hypotheses. Ghirmay (2004) argued that causality nexus is sensitive to the individual country in 13 sub-Saharan African countries. A more recent study by Pradhan *et al.* (2017) accounted a unidirectional causality from banking sector development to economic growth and a bi-directional causality between stock market development and economic growth, and insurance sector development and economic growth. However, Menyah *et al.* (2014) using a data set of 21 African countries do not find strong support for finance-led-growth evidence. Likewise, Hassan *et al.* (2011) show a feedback effect between finance and growth for most of the regions and one-way causality from growth to finance for the two poorest regions. Similarly, Bist (2018), Hassan *et al.* (2011) and Kar *et al.* (2011) supported the demand following hypothesis.

In the context of BRICS economies, the export of financial services has been growing in recent years and it now constitutes to a rising share of their total services exports. In the recent years, several banks in these countries have been gradually expanding their presence overseas mostly through branches, representative offices, and subsidiaries. The major

activities carried out by these entities include, acceptance of deposits, lending, financial leasing, payment and money transmission services, money market instruments, trading in foreign exchange, derivatives, and other negotiable instruments and financial assets, money broking, asset management, advisory and auxiliary financial services, settlement and clearing services for financial instruments (Chanda, 2005).

Applying Autoregressive Distributed Lag (ARDL) approach for cointegration and the Granger causality tests for the period from 1990 to 2017, Shayanewako (2018) found the presence of a long-run relationship between trade openness and economic growth in BRICS countries. Further, the study also found existence of bi-directional causality from trade openness to economic growth. Khatun (2016) revealed a long-run relationship between financial services and economic growth. The study also confirmed both short-run and long-run unidirectional causality running from trade in financial services to economic growth. In this line, Banik and Bhaumik (2010) also suggested that a competitive and well-regulated financial sector leads to the efficient transformation of savings into investments, which is one of the essential features of growth. Rani and Kumar (2018) analyzed the relationship between financial development, trade openness and economic growth. The study used Pedroni's panel cointegration test to examine the existence of long-run relationship along with the panel granger causality test. The study accounted a long-run relationship among the variables. They also found that financial development has positive effect on economic growth. However, their study is not free from cross-sectional dependence as they have not accounted the issue of cross-sectional correlations, which the present study found amongst the BRICS economies.

To this effect, the above discussion shows that the literature is lacking on financial development, openness in financial services trade and economic growth in BRICS countries. There are a few studies as such in BRICS that analyze the relationship between trade in financial services and economic growth. However, the methodologies and econometrics techniques followed by these studies suspect the generalization of the findings for the policy implications. Most of the studies in this area can be categorized in two groups: one applying the econometric techniques for time series data and other applying the econometric technique of panel data. It is argued in the literature that result from time series techniques in small sample are not robust. Similarly, the studies on panel data set are also subject to a number of concerns. For example, the findings of these studies are barely free from the issue of cross-sectional dependence. Since, BRICS is a mix of both developed and developing countries, cross-sectional dependence is important to relax before estimating relationship between financial openness and economic growth. Moreover, since the present study also observed the presence of cross-sectional dependence amongst the BRICS economies, the result of previous studies, therefore, are under suspect whether they present valid inferences. Therefore, taking these issues to be of greater importance, the present study contributes to this debate by providing the evidence on openness in financial services and economic growth using the econometric techniques that most fit the available data.

3. Data and measurement

3.1 Data description

Our study examines the relationship amongst financial development, openness in financial services trade and economic growth in BRICS countries. The sample includes Brazil, China, India, Russian Federation and South Africa. For this purpose, we have utilized data for 23 years from 1990 to 2012. The data have been collected from the World Development Indicators. The empirical period depends on the availability of data. The variables used in this study are banking sector development, stock market development, bond market development, insurance market development, openness in financial services trade, labor force, gross capital formation and GDP. Table I presents the average figures of the variables used in this study.

Variables	Brazil	China	India	Russian Federation	South Africa
MBACA	80.43	96.55	85.48	80.31	97.52
M3	42.62	121.72	53.84	24.56	44.7
BAGDP	60.87	103.26	45.24	24.39	67.41
PRVT	35.29	97.2	30.77	18.45	61.24
MC	34.23	29.77	46.16	31.6	170.51
TVGDP	17.8	44.78	30.06	18.01	36.07
SMTR	69.71	161.29	101.02	34.33	21.31
PRBMC	13.96	14.49	1.5	3.01	16.12
PBBMC	38.24	9.63	9.31	4.49	32.72
IDS	8.87	1.42	1.92	6.3	7.33
LIFEGDP	0.69	1.15	1.89	0.49	11.74
NLIFE	1.2	0.68	0.44	0.74	2.17
FOPS	0.125	0.194	0.445	0.130	0.374
GCF	19.16	40.35	32.06	23.41	18.46
LF	64.94	75.58	59.01	62.57	53.36
GDP	1,652.52	3,056.43	965.8	1,194.13	290.14

Notes: This table presents a 23-year average of all the variables used in this study. COC is the percentage of deposit money bank assets to deposit money plus central bank assets, M3 is the liquid liabilities to GDP ratio, BAGDP is the deposit money bank assets to GDP, PRVT is the credit to private sector by banks to GDP ratio, MC is the ratio of stock market capitalization to GDP, TVGDP is ratio of stock market total value traded to GDP, SMTR is the stock market turnover ratio defined as ratio of the value of total shares traded to average real market capitalization, PRBMC is the ratio of private bond market capitalization to GDP, PBBMC is the ratio of public bond market capitalization to GDP, IDS is the ratio of total outstanding international debt securities to GDP, LIFEGDP is the ratio of life insurance premium volume to GDP, NLIFEGDP is the ratio of non-life insurance premium volume to GDP, FOPS is the openness in financial services trade, GCF is the gross capital formation to GDP ratio, LF is the labor force defined as percentage of economically active population (ages 15 and older) to the total population and GDP is the real gross domestic product measured in 2010 with the US dollar in trillion

Table I.
Descriptive statistics

The descriptive statistics in Table I shows that China has the largest banking industry followed by South Africa. The statistics shows that variables of banking sector development MBACA, M3, BAGDP and PRVT are largest for the China, 96.55, 121.72, 103.26 and 97.2 percent, respectively. However, the Russian Federation remains at the bottom among BRICS countries in the case of banking sector development. The statistics on stock market development can be distributed among the sample countries on the basis of individual variable. For example, when market capitalization to GDP ratio is highest for South Africa (170.51 percent), stock market turnover ratio is highest for China (161.29 percent). Regarding the bond market, Brazil has largest ratio of domestic bond market capitalization (including both public and private) to GDP ratio (about 42.2 percent) whereas it is lowest for India (10.81 percent). However, China has the lowest amount of international outstanding debt (1.42 percent of GDP). The development indicators of insurance sector show that South Africa has higher ratio of insurance premium to GDP amongst BRICS economies.

Another important variable in this study is the openness of financial services trade. The statistics shows that India (0.445 percentage of GDP) has the highest value of financial sector openness amongst the BRICS countries followed by South Africa (0.374 percent), indicating the reforms taken by India such as 90 percent of the key economic sectors where FDI is allowed are on the automatic route, and in the banking segment, the FDI policy limits foreign participation to 74 percent (earlier only 49 percent) of equity and permits foreign banks to operate in India only through branches. But now RBI has also allowed foreign banks to come as wholly owned subsidiary (WOS), which helps foreign companies/banks to start business operations in India without facing much barriers. Brazil (0.125 percent) on the other hand remains at the bottom. This indicates that Brazil is relatively closed economy in

comparison with its BRICS partners. Similarly, China, an exporting giant, also remained below Russia and South Africa in the case of trade openness.

Regarding the productivity output, the statistics indicate that China left all BRICS counterparts far behind with the real GDP $3056.43 trillion. In fact, it is important to note that total sum of GDP of any combination of other three BRICS economies is below China's GDP. However, the GDP is lowest for South Africa ($290.14 trillion) amongst the BRICS economies. Similarly, the statistics shows that capital formation is also highest for China (40.35 percent) and lowest for South Africa (18.46 percent). The labor force defined as aged 15 and older to total population ratio is also highest for China (75.58 percent) and lowest for South Africa (53.36 percent).

Overall, the descriptive statistics shows that China remains ahead amongst the BRICS economies in most of the development indicators. Now, it is to be noted that the China is the country having highest figures regarding banking sector development, stock market development, the labor force and the capital formation. This clearly shows the importance of financial development for economic growth of an economy.

3.2 Measurement of the variables

3.2.1 Measurement of financial development. Since the pioneering work on financial development and economic growth by Levine (1997), the measurement of the financial sector development is getting changes over the period of time. Initially, measures were limited to money aggregates such as M1 and M2 (Khan and Senhadji, 2000). However, these are not very good proxies for financial development since they reflect the extent of transaction services provided by financial system rather than the ability of the financial system to channel funds from depositors to investment opportunities (Ang and McKibbin, 2007). Therefore, literature has proposed other measures like, liquid liabilities, deposit liabilities, total money bank assets to GDP, money bank assets to central bank assets and credit to the private sector (Beck *et al*., 2000; Christopoulos and Tsionas, 2004; King and Levine, 1993a, b; Levine *et al*., 2000). The problem with these measures is that a single indicator is not enough to account overall development of financial sector (Beck and Levine, 2004; Levine and Zervos, 1996; Liang and Teng, 2006; Naceur and Ghazouani, 2007). These indicators are also known as the indicators of banking sector development. However, in order to measure financial development, studies have also used stock market development, bond market development and insurance sector development as the indicators of financial sector development. Thus, the selection of variables is related to the country's financial system, depending on whether the country features a financial system oriented on banks or on the capital market (Pradhan *et al.*, 2017). Since our study is based on BRICS countries and this group consists both the developed and developing economies, the present study includes all four areas of finance into account. More specifically, following Pradhan *et al.* (2017), the present study constructed an overall index of financial sector development including banking sector development, stock market development, insurance sector development and bond market development. The rationale behind including all four sectors of finance is that selecting one sector will ignore another, which will not be sufficient to account overall development of the financial sector. Second, because sample countries are mix of developed and developing economies, including all these four sectors of finance will give more robust proxy for the development of financial market. Third, even if we use different indicators in a study, these variables are highly correlated and yet there is no uniform argument as to which proxies are most appropriate for measuring financial development. This justifies the need to construct an index as a single measure that represents the overall development in the financial sector by taking the relevant financial proxies into account (Ang and McKibbin, 2007). Creane *et al.* (2004) argued that a comprehensive index or a principal

component better represents "what is broadly meant by financial development". Therefore, we have used principal component analysis to develop a summary measure for financial depth. This approach has long been used to reduce a large set of correlated variables into a smaller set of uncorrelated variables, known as principal components (Stock and Watson, 2002). Principal component analysis also deals with the problems of multicollinearity by constructing an index of highly correlated variables.

Therefore, taking the complexity of measuring financial development into account, the variables used in our study are banking sector development, stock market development, insurance market development and bond market development. Following Beck *et al.* (2000), Levine *et al.* (2000) and Khan and Senhadji (2002), the present study measured development of banking sector in terms of liquid liabilities (M3), the ratio of money bank assets to the sum of commercial bank and central bank assets (MBACA), deposit money banks assets to GDP (BAGDP) and credit to private sector (PRVT). Liquid liabilities measure the overall size of the financial intermediary sector (Levine *et al.*, 2000). Likewise, deposit money banks assets to GDP (BAGDP) also measure the size of the financial sectors (Beck *et al.*, n.d.). Similarly, the ratio of commercial bank assets to the sum of commercial bank and central bank assets (MBACA) is a proxy for the advantage of financial intermediaries in channeling savings to investment, monitoring firms influencing corporate governance and undertaking risk management relative to the central bank (Huang, 2006; Jalil *et al.*, 2010). In line with this, Beck *et al.* (2000) argued that private credit isolates credit issued to the private sector, as opposed to credit issued to governments, government agencies and public enterprises.

Similarly, following Demirgüç-Kunt and Levine (1996) and Levine and Zervos (1996), we used three measures of stock market development; market capitalization to GDP (MC), total volume traded to GDP (TVGDP) and stock market turnover ratio (SMTR). According to Levine and Zervos (1996), the ratio of market capitalization divided by GDP measures the size of the stock market. Similarly, total volume traded to GDP and stock market turnover ratio measured as total value traded to market capitalization ratio are the indicators of liquidity in the stock market. The present study used all these three variables to construct an overall index of stock market development using principal component analysis.

As the indicators of the bond market, we used three measures, namely, private bond market capitalization to GDP, public bond market capitalization to GDP and total outstanding international debt securities to GDP. These variables measure the size of the domestic bond market (Beck *et al.*, n.d.). Similarly, following the literature on finance and growth, we used these three indicators to construct an overall index of bond market development (see Pradhan *et al.*, 2017). According to Pradhan *et al.* (2017), bond market development is defined as a process of improvements in the quantity, quality and efficiency of debt services. Table II presents the definition for the indicators of financial development.

We made a use of all these variables to construct an individual index for banking, stock market, bond market, insurance sector development and overall index for financial development (including all the variables) using a principal component analysis. Principal component analysis is based on a linear transformation of the individual variables so that they are orthogonal to each other (Lewis-Beck, 1994 as cited in Pradhan *et al.*, 2017)[6]. Table III presents the results obtained from principal component analysis.

The eigenvalues presented in Table III indicate that first component explains most of the variance. Therefore, the first component has been used as the index for concerned variables.

3.2.2 Measurement of openness in financial services trade. Many different measures of trade openness have been proposed and used in empirical analyses of the relationship between openness and growth. Some authors have retained measures based on trade restrictions/distortions, such as average tariff rates, average coverage of quantitative

Variables	Definition
Banking sector development	
PRVT	Private credit to stock market to GDP
M3	Liquid liabilities to GDP
MBACA	Money bank assets to money bank and central bank assets
BAGDP	Money bank assets to GDP
Stock market development	
MC	Stock market capitalization to GDP
TVGDP	Total volume traded to GDP
SMTR	Stock market turnover ratio
Bond market development	
	Outstanding domestic debt securities to GDP
PRBMC	Private bond market capitalization to GDP
PBBMC	Private bond market capitalization to GDP
IDS	Total outstanding international debt securities to GDP
Insurance sector development	
LIFEGDP	Life insurance premium volume to GDP
NLIFEGDP	Non-life insurance premium volume to GDP

Table II.
Definition of financial development variables and indices

barriers and frequency of non-tariff barriers or collected tariff ratios (see e.g. Pritchett, 1996; Harrison, 1996; Edwards, 1998; Yanikkaya, 2003). However, trade dependency ratios are the most popular of these measures (see e.g. Frankel and Romer, 1999; Irwin and Tervio, 2002; Frankel and Rose, 2002; Dollar and Kraay, 2004). Openness in financial services trade is defined as the ratio of trade in financial services to the Real GDP. Trade in financial services is defined as sum of trade in banking services and insurance services. Trade in banking services is defined as the sum of export and import. Similarly, trade in the insurance services is defined as sum of export and import of insurance services.

In addition to the measure of financial development and openness in financial services trade, we defined economic growth as real GDP (2010 $= 100$). For the estimation purpose, values were converted into natural logarithm. Similarly, following the literature the present study uses several control variables associated with economic growth: labor force defined as aged 15 and older to total population ratio and gross capital formation to GDP.

4. Analytical framework and empirical results

4.1 Testing for integration

The estimation technique in present study starts with the test of stationarity of the variables. In order to test the stationarity of the data, we have applied panel unit root tests. More specifically, we have applied Im *et al.* (2007) and Maddala and Wu (1999), denoted by IPS and MW, respectively, panel unit root tests to measure the order of integration within the variables. The IPS statistic is based on averaging individual Dickey–Fuller unit root tests. Likewise, the MW unit root test is Fisher-type test; it combines the p-values from individual ADF tests. The P-test is distributed as χ^2 with degrees of freedom twice the number of cross section units. The null hypothesis is that of a unit root. The rationale behind using these two tests is that these tests are the majorly used unit root tests in a set of heterogeneous panels. However, one of the most important assumptions of these tests is that the series are cross-sectionally independent. Thus, these tests for a unit root in panel data do not address the issue of cross sectional dependence, though they allow for individual unit root process in a panel (Pesaran, 2007). So, it is important to test for cross-sectional dependence before performing the first-generation unit root tests like Im *et al.* (2007) and

Principal components/variables				
Composite index of banking sector development (BSD)				
	Eigenvalues	% variation	% cumulative	
PC 1	3.315	0.829	0.829	
PC 2	0.520	0.130	0.959	
PC 3	0.115	0.029	0.987	
PC 4	0.050	0.013	1.000	
	PC 1	PC 2	PC 3	PC 4
BAGDP	0.530	−0.198	−0.461	0.684
M3	0.504	−0.422	0.753	−0.005
MBACA	0.423	0.879	0.210	0.068
PRVT	0.535	−0.101	−0.419	−0.727
Composite index of stock market development (SMD)				
	Eigenvalues	% variation	% cumulative	
PC 1	1.467	0.489	0.489	
PC 2	1.234	0.412	0.900	
PC 3	0.299	0.100	1.000	
	PC 1	PC 2	PC 3	
MC	0.765	−0.137	0.629	
SMTR	−0.284	0.806	0.520	
TVGDP	0.578	0.576	−0.578	
Composite index of bond market development (BOND)				
	Eigenvalues	% Variation	% Cumulative	
PC 1	1.879	0.626	0.626	
PC 2	0.800	0.267	0.893	
PC 3	0.321	0.107	1.000	
	PC 1	PC 2	PC 3	
PRBMC	0.571	−0.599	0.562	
PBBMC	0.659	−0.075	−0.748	
IDS	0.490	0.797	0.352	
Composite index of insurance market development (ISD)				
	Eigenvalues	% Variation	% Cumulative	
PC 1	1.763	0.882	0.882	
PC 2	0.237	0.119	1.000	
	PC 1	PC 2		
NLIFEGDP	0.707	−0.707		
LIFEGDP	0.707	0.707		
Composite index of overall financial development (FD)				
	Eigenvalues	% Variation	% Cumulative	
PC 1	4.857	0.405	0.405	
PC 2	3.487	0.291	0.695	
PC 3	1.200	0.100	0.795	
PC 4	0.812	0.068	0.863	
PC 5	0.544	0.045	0.908	
PC 6	0.451	0.038	0.946	
PC 7	0.284	0.024	0.970	
PC 8	0.157	0.013	0.983	
PC 9	0.110	0.009	0.992	
PC 10	0.060	0.005	0.997	
PC 11	0.026	0.002	0.999	
PC 12	0.013	0.001	1.000	

Table III.
Construction of financial development indices

Notes: Individual variables are defined in Table II. The PC1…PCn indicate the principal components

Maddala and Wu (1999). To this end, this study used a second generation panel unit root test, cross-sectional augmented IPS (CIPS), by Pesaran (2007) to address the cross-sectional dependence. The results are presented in Table IV.

The result in Table V indicates that all the variables used in this study except labor force have rejected the null hypothesis of no cross-sectional dependence (correlation) at 1 percent level of significance. This indicates that labor force and openness in financial services do not have cross-sectional correlations. Therefore, taking into account presence of cross-sectional dependence, we used second generation unit root test (CIPS) proposed by Pesaran (2007) to analyze the stationarity process of the variables. The result of IPS, MW and CIPS indicate that all the variables used in this study have unit root at the level. However, the results of first difference show that variables are stationary at first difference. Therefore, these results support the contention that variables under investigation are all *I* (1) variables.

4.2 Testing for cointegration and estimating the long-run relationship

Having indicated the order of integration within the variables, in the next step, we perform the cointegration test amongst financial development, openness in financial services, economic growth and control variables. The literature shows that there are a number of cointegration tests for a panel data set. However, the mostly used and common cointegration techniques among the researcher are Engle and Granger's (1987) single-equation residual-based cointegration tests like Pedroni (2004) and Kao (1999) and maximum likelihood system-based Fisher's cointegration test. Thus, taking into consideration the panel data and the time period of the study, this study used all these three tests of the panel cointegration for the robustness of the results.

Pedroni (2004) cointegration test provides seven test statistics; first four are known as panel cointegration statistics and that are within-dimension statistics: the panel v-statistic, panel ρ-statistic, panel PP-statistic (nonparametric) and panel ADF-statistic (parametric); and the last three are known as group mean panel cointegrating statistics and that are between-dimension statistics: group ρ-statistic, group PP-statistic (nonparametric) and group ADF-statistic (parametric). The seven test statistics allow heterogeneity in the panel, both in the short-run dynamics as well as in the long-run slope and intercept coefficients (Neal, 2014). The Kao (1999) unit root test follows the same basic approach as the Pedroni

		Level			First difference		
Variables	Pesaran CD	IPS	MW	CIPS	IPS	MW	CIPS
FD	14.043***	1.865	2.524	−2.074	−5.815***	50.917***	−3.917***
BSD	11.984***	1.671	4.948	−2.422	−5.318***	44.987***	−2.789***
SMD	10.969***	−0.279	8.791	−1.686	−6.118***	52.446***	−3.23***
ISD	2.825***	0.453	10.037	−2.263	−7.581***	65.784***	−5.015***
BOND	6.890***	1.605	3.272	−1.792	−7.784***	67.123***	−3.939***
lnFOPs	9.831***	0.142	10.141	2.094	−8.578***	75.382***	−4.784***
lnGDP	12.969***	3.646	4.630	−2.628	−4.107***	35.673***	−2.787***
LnGCF	5.148***	−0.445	10.105	−1.933	−7.407***	63.220***	−4.229***
lnLF	−0.129	−1.288	16.048		−4.703***	42.805***	

Notes: Pesaran CD denotes cross-sectional dependence test statistics. The model used to test the unit root hypothesis is the one with intercept and trend. CIPS is the panel unit-root statistics developed by Pesaran (2007). The FD, BSD, SMD, ISD and BOND indicate the index for overall financial development, banking sector development, stock market development, insurance sector development and bond market development, respectively. Likewise, lnFOPS is the logarithm of openness in financial services, lnGCF is the logarithm of gross capital formation to GDP ratio, lnLF is the logarithm of labor force defined as percentage of economically active population (ages 15 and older) to the total population and lnGDP is the logarithm of real GDP measured in 2010 with the US dollar in trillion. ***Significant at the 1 percent

Table IV.
Results of cross-sectional dependence and panel unit root tests

Table V.
Results of panel cointegration tests

Test	Measures of financial development				
	FD	BSD	SMD	ISD	BOND
Pedroni cointegration results					
Case 1					
Panel v-statistic	11.056 [0.000]***	13.341 [0.000]***	12.325 [0.000]***	12.245 [0.000]***	12.767 [0.000]***
Panel ρ-statistic	0.891 [0.814]	1.111 [0.867]	0.891 [0.813]	0.942 [0.827]	0.922 [0.964]
Panel PP-statistic	−2.793 [0.003]***	−2.781 [0.003]***	−2.973 [0.002]***	−2.901 [0.000]***	−3.436 [0.000]***
Panel ADF-statistic	−2.794 [0.003]***	−2.547 [0.005]***	−3.127 [0.001]***	−3.521 [0.000]***	−4.956 [0.000]***
Case 2					
Group ρ-statistic	1.916 [0.972]	1.803 [0.964]	2.017 [0.978]	2.099 [0.982]	1.977 [0.976]
Group PP-statistic	−5.503 [0.000]***	−5.494 [0.000]***	−4.259 [0.000]***	−5.293 [0.000]***	−4.571 [0.000]***
Group ADF-statistic	−2.725 [0.003]***	−3.501 [0.000]***	−2.413 [0.008]***	−3.286 [0.001]***	−2.453 [0.007]***
Fisher χ^2 cointegration test (From Max-Eigen Test)					
$r = 0$	75.02 [0.000]***	81.87 [0.000]***	63.42 [0.000]***	63.47 [0.000]***	67.27 [0.000]***
$r \leqslant 1$	37.72 [0.000]***	46.42 [0.000]***	41.30 [0.000]***	35.65 [0.001]***	56.55 [0.000]***
$r \leqslant 2$	34.30 [0.000]***	37.20 [0.000]***	18.39 [0.048]***	23.42 [0.009]***	25.33 [0.005]***
$r \leqslant 3$	27.74 [0.002]***	23.53 [0.009]***	17.10 [0.072]*	19.02 [0.040]**	19.57 [0.034]**
$r \leqslant 4$	6.087 [0.808]	2.755 [0.987]	4.952 [0.894]	4.081 [0.9436]	9.135 [0.519]
Kao Cointegration					
ADF	−4.392 [0.001]***	−2.909 [0.002]***	−2.757 [0.003]***	−2.610 [0.005]***	−2.874 [0.002]***

Notes: Trend assumption: deterministic intercept and trend (Pedroni). Automatic lag length selection based on SIC. The FD, BSD, SMD, ISD and BOND indicate the index for overall financial development, banking sector development, stock market development, insurance sector development and bond market development, respectively. The values in the square brackets are p-values. *,**,***Represents that null hypothesis of no cointegration can be rejected at 1, 5 and 10 percent level of significance, respectively, which shows that the variables under consideration share long run relationship

tests, but specifies cross-section specific intercepts and homogeneous coefficients on the first-stage regressors.

Likewise, Fisher's test aggregates the *p*-values of individual Johansen maximum likelihood cointegration test statistics to obtain test statistic for the full panel (Maddala and Wu, 1999). For example, if p_i denotes the *p*-value of the Johansen statistic for the *i*th unit, then we have the result $-2\sum_{i=1}^{N} log\, p_i \sim \chi^2_{2N}$. The test does not assume homogeneity of coefficients in different countries (Christopoulos and Tsionas, 2004). The results of the cointegration tests are presented in Table V.

The results of Pedroni panel cointegration test show that out of the seven statistics, five are statistically significant. It indicates that there exists a cointegrating relationship amongst the variables. The result of Fisher's cointegration results also shows that there are at most four cointegrating vectors. Likewise, the result of Kao's cointegration result shows that ADF statistics is significant at 1 percent level of significance. Therefore, all in all the result of Pedroni's, Kao's and Fisher's cointegration tests indicate that financial development, openness in financial services, gross capital formation, labor force and economic development shared a long-run equilibrium relationship.

Having established the long-run cointegrating relationship amongst the variables, we proceed to estimating long-run effect of financial development, openness in financial services, gross capital formation and labor force on economic growth. Thus, the long-run model used in the present study takes the following form:

$$\ln \mathrm{GDP}_{it} = \alpha_{0i} + \alpha_{1i} F_{it} + \alpha_{2i} \ln \mathrm{FOPS}_{it} + \alpha_{3i} \ln \mathrm{GCF}_{it} + \alpha_{4i} \ln \mathrm{LF}_{it} + \mathrm{e}_{it}, \quad (1)$$

where $\ln \mathrm{GDP}_{it}$ is the logarithm of real GDP (2010 = 100), F_{it} the vector of financial development measures, which include overall financial development, banking sector development, stock market development, insurance sector development and bond market development, $\ln\mathrm{FOPS}_{it}$ the logarithm of openness in financial services, $\ln\mathrm{GCF}_{it}$ the logarithm of investment share, $\ln\mathrm{LF}_{it}$ the logarithm of the labor force defined as percentage of economically active population (ages 15 and older) to the total population and e is an error term. The subscripts i and t indicate the country and year, respectively. Similarly, α_{0i} is the country-specific fixed effect and α_{1i}, α_{2i}, α_{3i} and α_{4i} are the country-specific long-run coefficients.

Since our study is based on a dynamic panel of five BRICS countries, endogeneity and heterogeneity are the major issues as argued by Beck *et al.* (2000) and Levine *et al.* (2000), that must be taken care of while estimating the long-run coefficients. Beck *et al.* (2000) and Levine *et al.* (2000) proposed GMM technique to account endogeneity in a dynamic panel. However, there are certain assumptions of GMM estimation techniques that will not fit in the context of present study. For example, Roodman (2006) argued that GMM estimator is designed for situations with small time period (T) and large number of cross sections (N). However, in the case of our study, number of the cross-sections or countries are lower than the time period. Likewise, Christopoulos and Tsionas (2004) argued that since GMM does not take integration and cointegration properties of data into the system, the estimates are not reliable. Therefore, we made a use of fully modified OLS (FMOLS) and dynamic OLS (DOLS) estimation techniques to estimate Equation (1). According to Christopoulos and Tsionas (2004), FMOLS addresses the problem of non-stationary regressors, as well as the problem of simultaneity bias raised by Levine *et al.* (2000). Similarly, Kao and Chiang (2001) argued that DOLS adjusts the errors by augmenting the static regression with leads, lags and contemporaneous values of the regressor in first differences.

The estimated results of Equation (1) using FMOLS OLS and the DOLS are reported in Table VI. The result shows that both the FMOLS and DOLS produce similar results for each variable. The estimates indicate that all four constructs of financial development have positive and significant coefficients. The development of the banking sector,

Variables	FMOLS	DOLS
Overall financial development		
FD	0.239 [0.000]***	0.214 [0.000]***
lnFOPS	−0.056 [0.103]	−0.013 [0.819]
lnGCF	0.750 [0.000]***	0.828 [0.001]***
lnLF	−2.968 [0.000]***	−2.089 [0.032]***
R^2	0.979	0.997
Banking sector development		
BSD	0.285 [0.000]***	0.198 [0.101]***
lnFOPS	−0.008 [0.863]	0.088 [0.524]
lnGCF	0.884 [0.000]***	1.088 [0.011]***
lnLF	−3.602 [0.000]***	−4.434 [0.005]***
R^2	0.970	0.991
Stock market development		
SMD	0.211 [0.000]***	0.286 [0.000]***
lnFOPS	0.142 [0.001]***	0.073 [0.218]
lnGCF	0.650 [0.001]***	0.502 [0.063]**
lnLF	−2.881 [0.006]***	0.326 [0.796]
R^2	0.962	0.996
Insurance sector development		
ISD	0.021 [0.842]	0.069 [0.644]
lnFOPS	0.258 [0.000]***	0.333 [0.000]***
lnGCF	0.889 [0.000]***	0.923 [0.018]***
lnLF	−4.454 [0.001]***	−0.916 [0.539]***
R^2	0.944	0.992
Bond market development		
BOND	0.165 [0.000]***	0.167 [0.000]***
lnFOPS	0.129 [0.001]***	0.175 [0.009]***
lnGCF	1.122 [0.000]***	2.393 [0.000]***
lnLF	−4.744 [0.000]***	−5.415 [0.000]***
R^2	0.965	0.995

Notes: Dependent variable: lnGDP. This table presents the results of long-run estimates of DOLS and FMOLS, dynamic and fully modified ordinary least square methods, respectively. The FD, BSD, SMD, ISD and BOND indicate the index for overall financial development, banking sector development, stock market development, insurance sector development and bond market development, respectively. Likewise, lnFOPS is the logarithm of openness in financial services, lnGCF is the logarithm of gross capital formation to GDP ratio, lnLF is the logarithm of labor force defined as percentage of economically active population (ages 15 and older) to the total population and lnGDP is the logarithm of real GDP measured in 2010 with the US dollar in trillion. The values in the square brackets are *p*-values. **,***Significant at the 10 and 1 percent levels, respectively

Table VI.
Fully modified OLS and dynamic OLS estimates

development of stock market, development of insurance sector and development of bond market pose a positive and significant impact on real GDP. It clearly indicates that development of financial sector plays an important role on economic growth. This finding is further supported by the fact that the coefficients for the construct of overall financial development (including all banking, insurance, stock and bond market) are positive and significant at 1 and better percent level of significance. Therefore, these results leave little ground to argue that financial depth has no impact on economic growth. The results are similar to the findings of Khan and Senhadji (2000), King and Levine (1993a, b), Beck *et al.* (2000), Levine *et al.* (2000) and Christopoulos and Tsionas (2004). However, the results are against Narayan and Narayan (2013), Ductor and Grechyna (2015), Grassa and Gazdar (2014) and Mhadhbi (2014).

The result in Table VI also shows that investment share has positive and significant impact on real GDP. However, the result shows that labor force has negative effect on GDP. The coefficients are significant at 1 percent level of significance. This finding is against the standard Cobb-Douglas production function in which labor and human capital enter as factors of production. Nelson and Phelps (1966) argued that the negative relationship between labor force and economic growth is the result of treating human capital simply as another factor in growth accounting and miss-specifying its role. A similar finding was also observed by Benhabib and Spiegel (1994). Similarly, the result shows that openness in financial services tradeshows mixed results. In first case, first equation in Table VI shows that it has negative impact on economic growth. However, we find that openness in financial services trade affects growth with respect to the development of financial sector. For example, the result turns out to be positive when financial development is measured as stock market development, bond market development and insurance sector development. Therefore, it can be argued that the effect of openness in financial services trade more depends on stock market, bond market and insurance sector development. One of the important policy implications of this finding is that countries need to development their stock, bond and insurance market prior indulging into financial liberalization policies. In other words, we argue that in countries with higher stock, bond and insurance market development more financial openness enhances economic growth, while in countries with less stock, bond and insurance market development the ability of financial openness trade to facilitate growth is feeble.

Since our study suspects the cross-sectional dependence in variables, the estimates of FMOLS and DOLS are checked whether cross-sectional dependence has effect on the estimated relationships. The results of residual diagnostic tests for cross-sectional dependence and normality are presented in Table VII.

The table shows that most of the tests for cross-sectional dependence have not rejected the null hypothesis of no cross-sectional dependence. The table shows that most of the tests in the case of FMOLS show presence of cross sectional dependence in the error term. However, the results in the case of DOLS show that the error term is cross-sectionally independent. This clearly shows that the results estimated in this study are free from cross-correlations. Therefore, the strong link between finance and growth does not appear to be driven by cross-correlational bias. Likewise, the result shows that the residuals from DOLS and FMOLS estimates are normally distributed.

After the estimation of long-run relationship amongst financial development, openness in financial services trade, investment, labor force and economic growth, in the next step, we have calculated the short-run causality amongst the variables. Taking into account the panel of five BRICS countries and presence of cross-sectional dependence, this study used a pairwise panel causality test by Dumitrescu and Hurlin (2012) to analyze the causality nexus. The significant advantage of this test is that it takes into consideration the dependence among the countries and heterogeneity. Dumitrescu and Hurlin's (2012) panel causality test statistic is based on the individual Wald statistics of Granger non-causality averaged across the cross-section units, and hence assumes all the coefficients to be different across the cross-sections. Dumitrescu and Hurlin defined average statistic associated with the null Homogeneous Non Causality (HNC) hypothesis as:

$$W_{N,T}^{\mathrm{Hnc}} = N^{-1} \sum_{i=1}^{N} W_{i,\,T},$$

where $W_{i,T}$ is the individual Wald statistic for the ith cross-section unit. At the meantime, it is also important to note that this test requires variables to be stationary at level. Therefore, the test was applied on first difference of the series, and hence, the results are considered as the short run causalities.

Table VII.
Diagnostic tests for the FMOLS and DOLS models

	Fully modified OLS (FMOLS)					Dynamic OLS (DOLS)				
	Measures of financial development									
	FD	BSD	SMD	ISD	BOND	FD	BSD	SMD	ISD	BOND
Error cross-sectional dependence test										
Breusch-Pagan LM	15.39	*40.31***	*33.44***	*37.46***	*21.86***	0.39	12.49	8.25	0.42	10.02
Pesaran scaled LM	0.09	*5.66***	*4.12***	*5.02***	1.53	0.32	−0.56	−1.5	0.28	−1.11
Bias-corrected scaled LM	−0.03	*5.54***	*4.00***	*4.90***	1.41	0.26	−0.69	−1.64	0.22	−1.23
Pesaran CD	1.29	−1.9	0.37	−0.68	−0.09	0.25	0.39	−0.72	0.13	−0.55
Normality test										
Jarque-Bera	0.39	0.41	*7.75***	*20.44***	*10.20***	1.48	0.92	0.6	12.81	2.14

Notes: Figures presented in the table represent asymptotic *p*-values associated with the tests. **Significant at the 1 percent

The results of Dumitrescu and Hurlin's (2012) panel causality test are presented in the Table VIII.

The results in Table VIII show that there exists a unidirectional causality from overall financial development to economic growth in BRICS economies. This finding supports the Patrick's supply leading hypothesis. However, when we breakdown the development of financial system into four sectors, banking, stock market, bond market and insurance sector, the result are mixed. It is found that causality is unidirectional from economic growth to banking sector development. It supports the demand following hypothesis. However, it is important to note that the result shows no short-run causality between stock market development, bond market development, insurance sector development and economic growth. It indicates that to get to take full advantage of financial development, countries need to develop their all the markets of financial system because we find that when overall financial development (that includes all banking, stock market, bond market and insurance sector development) is used, there is a causal relationship between finance and growth. Likewise, the study does not find any causal relationship between openness in financial services trade and economic growth. This further strengthens the finding in previous section that a country's ability to reap benefit from openness in financial services trade depends on the level of financial system development.

Null hypothesis	*W*-Stat.	$\overline{Z}$-Stat.	Prob.
FD does not homogeneously cause lnGDP	3.8423	3.4657	0.0005***
lnGDP does not homogeneously cause FD	1.4947	0.4715	0.6373
BSD does not homogeneously cause lnGDP	1.9353	1.0335	0.3014
lnGDP does not homogeneously cause BSD	4.3238	4.0799	0.0001***
SMD does not homogeneously cause lnGDP	0.2969	−1.0562	0.2909
lnGDP does not homogeneously cause SMD	1.4104	0.3640	0.7158
ISD does not homogeneously cause lnGDP	1.0212	−0.1323	0.8947
lnGDP does not homogeneously cause ISD	0.5750	−0.7014	0.4830
lnGDP does not homogeneously cause BOND	1.5241	0.5090	0.6108
BOND does not homogeneously cause lnGDP	1.5017	0.4805	0.6309
lnFOPS does not homogeneously cause lnGDP	1.4798	0.4525	0.6509
lnGDP does not homogeneously cause lnFOPS	1.4521	0.4172	0.6766

Table VIII.
Results of heterogeneous panel causality test

Notes: ***Represents null hypothesis FD does not homogenously causes LnGDP and LnGDP does not homogenously causes BSD can be rejected at 1 percent level of significance. This further represents that financial development causes economic growth and vice versa. In other words, there is bi-directional casual relationship between financial development and economic growth

5. Summary and conclusion

The study has been conducted to analyze the relationship amongst financial development, openness in financial services trade and economic growth in BRICS economies. The data have been collected for 23 years from 1990 to 2012 from World Development Indicators of World Bank and BOP statistics, International Monetary fund. This study has made the use of second-generation panel unit root test in the presence of cross-sectional dependence. The panel short-run causality test has further been used to analyze the direction of causality amongst the variables. The long-run parameters were estimated with the use of FMOLS and DOLS. This study used principal component analysis to construct an index for overall financial development, banking sector development, stock market development and insurance sector development.

The results of panel cointegration tests reveal that there exists a long-run cointegrating relationship amongst financial development, openness in financial services trade, gross capital formation, labor force and economic growth. The long-run estimates reveal that financial development has positive impact on economic growth. The study shows that all the areas of financial market, banking sector, stock market, bond market and insurance sector have positive and significant impact on real GDP output in BRICS economies. This clearly indicates that the development of financial system is important for economic growth. In fact, it can be argued that countries having developed financial markets are growing much faster than the countries with weak financial sector. For example, the result shows that China having highest figures in most of the indicators of financial sector development is way ahead than its BRICS counterparts in terms of real GDP. It is interesting to note that total sum of the average real GDP of any combination of other three BRICS economies for 1990–2012 is below China's GDP alone. Although the study finds significant impact of financial development on economic growth, the openness in financial services trade shows the mixed results. The estimates reveal that openness in financial services trade reveals positive effect only when stock market, bond market and insurance sector are included into the model. Therefore, we argue that the benefits of openness in financial services trade more depend on stock, bond and insurance market development. This argument is further supported by the causal relationship between openness in financial services trade and economic growth. The result shows when openness in financial services trade regressed alone on GDP for causality nexus, there is no causal relationship between these two variables. Thus, it can be argued that country's ability to reap benefit from openness in financial services trade depends on the level of financial system development. In other words, it shows that in countries with higher stock, bond and insurance market development more financial openness trade enhances economic growth, while in countries with less stock, bond and insurance market development the ability of financial openness trade to facilitate growth is feeble. One of the important policy implications of this finding is that countries need to develop their stock, bond and insurance market prior indulging into financial liberalization policies.

Likewise, the result of Dumitrescu and Hurlin's (2012) panel causality test shows that there exists a causal relationship between overall financial development and economic growth. The result shows that overall development of financial system causes the growth, supporting the supply leading hypothesis. However, when financial development is fragmented into different markets (stock, bond and insurance), the result shows that there is no causal relationship between financial development and economic growth. Therefore, in order to get full advantage of financial development, countries need to develop all the markets of financial system because we find that only overall financial development (the combination of all banking, stock market, bond market and insurance sector development) has a causal relationship with growth.

Notes

1. For example, Rani and Kumar (2018) analyzed the relationship between financial development, trade openness and economic growth. The study has taken banking sector development only as

the proxy for the financial development. It shows that taking banking sector alone as a financial development will not provide the clear picture for the overall development of financial sector in selected economies.

2. The literature shows that one study as such by Khatun (2016) has analyzed the relationship between trade in financial services and economic growth in BRICS countries. The used panel data set for the same objective. The data analysis approach used is Pedroni's cointegration and granger causality type and the long-run estimates were analyzed using FMOLS. However, the study has not taken the issue of cross-sectional dependence, one of the most important issues in a heterogeneous panel data set.
3. Gerschenkron (1962), Patrick (1966), Mckinnon (1973), Jung (1986), Greenwood and Jovanovic (1990), Bencivenga and Smith (1991), King and Levine (1993a, 1993b), Pagano (1993), Wood (1993), De Gregorio and Guidotti (1995), Bencivenga, Smith, and Starr (1995), Rajan and Zingales (1996), Levine (1997), Singh (1997), Luintel and Khan (1999).
4. Bojanic (2012), Durusu-Ciftci *et al.* (2017), Jedidia *et al.* (2014), Khan and Senhadji (2000), Muhammad *et al.* (2016), Samargandi *et al.* (2014), Uddin *et al.* (2013), Zhang *et al.* (2012).
5. Abu-Bader and Abu-Qarn (2008), Adu *et al.* (2013), Christopoulos and Tsionas (2004), Enisan and Olufisayo (2009), Hsueh *et al.* (2013), KhadraouiandSmida (2012), Masih *et al.* (2009) and Menyah *et al.* (2014) have provided the evidence for supply leading hypothesis.
6. For detail on the PCA, see Pradhan *et al.* (2017).

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