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The drivers of economic growth in China and India: globalization or financial development?

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The drivers of economic growth in China and India: globalization or financial development?

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Abstract

Purpose – Using annual data from 1970 to 2013 for China and India, this paper aims to examine the impact of globalization and financial development on economic growth by endogenizing capital and inflation and drawing comparisons between the two fastest growing emerging market economies.

Design/methodology/approach – In the long run, co-integration test results indicate that financial development increases economic growth in China and India.

Findings – The results also reveal that globalization accelerates economic growth in India but, surprisingly, impairs economic growth in China, as it increases competition for exports. The results furthermore disclose that acceleration in capitalization and inflation, as a proxy for aggregate demand, are positively linked to economic growth in China and India.

Originality/value – Causality test results indicate that both financial development and economic growth are interdependent. In contrast, causality runs from higher economic growth to increased globalization in India, while the results do not support long-term causality between globalization and economic growth in China.

Keywords China, Globalization, India, Economic growth, Financial development

Paper type Research paper

1. Introduction

From the welfare and sustainable economic development perspectives, it has been of paramount importance for any country to have a better understanding of growth dynamics over time. Without knowing the scope of economic growth, it is difficult for any fiscal government to design welfare and sustainable development policies. Moreover, unless we understand the sources of growth dynamics over time, it is difficult for the policymakers of any economy to draw an effective policy for increasing welfare, reducing poverty and prioritizing sectors in support of the higher growth momentum.

There are substantial amounts of studies that have focused on the drivers of economic growth. More specifically, many studies in the literature have emphasized the role of globalization on real output growth in the long run (Mah, 2002; Dreher, 2006; Rao and

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Vadlammanti, 2011; Gurgul and Lach, 2014; Chang *et al.*, 2015), whereas another group of studies have focused on the effects of financial development on economic growth (King and Levin, 1993a, 1993b; Arestit and Demetriades, 1997; Beck *et al.*, 2000; Wolde-Rufael, 2009; Hassan *et al.*, 2011; Greenwood *et al.*, 2013; Law and Singh, 2014). The combined evidences regarding the impacts of globalization and financial development on long-run growth for developed and developing countries appear to be mixed and conflicting. Hence, the question of whether globalization and financial development promote economic growth in developing countries is somewhat unresolved and needs further empirical examination. To unravel this question, our study makes an empirical attempt in examining the dynamic impacts of globalization and financial development on economic growth for China and India by endogenizing other macroeconomic factors, such as capital and inflation, as a proxy for aggregate demand.

This study contributes to the existing literature in various ways. First, to the best of the authors' knowledge, the impacts of globalization and financial development on economic growth of China and India have not been analyzed in details. Against this backdrop, we aim to study the impacts of globalization and financial development on economic growth in China and India over the long time series from 1970 to 2013[1] by considering other important macroeconomic factors, including capital and inflation, in the co-integration and causality frameworks. Second, we have used Bayer and Hanck's (2013) combined cointegration technique to test the long-run relationship among the series. In addition, we have also used Pesaran *et al.* (2001) bounds testing cointegration test to check the robustness of the empirical results. Third, our empirical analysis uses an art of the new advanced time series technique which is primarily consistent with the novel idea of Karanfil (2009)[2]. In line of Smyth and Narayan (2014), our study provides policymakers with the maximum information emanating from the comparative perspectives across China and India when it comes to designing sustainable development and welfare policies.

Interestingly, we find that financial development and globalization stimulate economic growth in India. Although financial development contributes to growth in China, surprisingly, globalization impairs economic growth. The results furthermore disclose that acceleration in capitalization and inflation, as a proxy for aggregate demand, are positively linked to economic growth in China and India. Causality test results also indicate that both financial development and economic growth are interdependent in China and India. In contrast, causality runs from higher economic growth to increased globalization in India, while the results do not support long-term causality between globalization and economic growth in China.

The remainder of this study is organized as follows: Section 2 discusses an overview of literature survey on the nexus between globalization-finance, globalization-growth and finance-growth. Section 3 provides an assessment of the financial systems in China and India. Section 4 briefly provides conceptualization of theoretical issues, data collection and description of econometric methodology used in the analysis. Section 5 provides a discussion of the empirical results for both countries. The last section concludes and draws policy implications of the analysis and also suggests directions for future research.

2. Review of related literature

The content of this section may be divided into three parts: globalization-finance nexus, globalization-growth nexus and finance-growth nexus.

2.1 Globalization-finance nexus

Globalization has been variously defined and interpreted from different perspectives. Generally speaking, globalization implies that countries are becoming more integrated into

the multinational economy, increasing people's interaction, information exchanges, technology transformations and convergence in cultural activity (Chang *et al.*, 2015). As a result, countries are likely to benefit from the process of globalization in terms of facilitating bilateral trade, transferring goods and services, mobilizing physical and human capitals and transferring new ideas and managerial skills. In addition, Stiglitz (2004) argues that globalization results in faster communication of ideas and leads to a greater integration to bridge the knowledge gap as well as to expedite the process of closing the gap among capital markets, affecting the growth in developing countries, in particular. Clearly, Stiglitz (2004) looks at the advantage of globalization from the perspectives of investors toward minimizing downsizing risk.

In that perspective, it is important to analyze the impact of globalization on financial development, as such consequence carries larger policy implications for growth and development of developed and developing countries. In this sense, Cheng and Mittelhammer (2008) argue that it is important for a country to have efficient domestic financial markets and quality human capital to capitalize on the spillovers induced by globalization.

Subsequently, Mishkin (2009) in his recent seminal paper conceptually argues that globalization makes financial institutions sound and promotes an economy to achieve higher growth and development. Falahaty and Law (2012) empirically investigated globalization-finance nexus for Middle East and North Africa countries by applying panel vector autoregressive and fully modified ordinary least squares approaches and found that globalization does have an effect on institutional quality that impacts financial development and economic growth. Shahbaz and Rahman (2012) also note that foreign direct investment and imports promote economic growth that leads financial development. Kandil *et al.* (2015) examined the linkages between financial development and globalization, and they noted that financial development significantly and positively affects economic growth, but globalization impairs financial development.

2.2 Globalization-growth nexus

After the Second World War, international interactions have progressed drastically toward trade and economic openness around the world, as it is evident in the recent study by Wacziarg and Welch (2008). They report that 22 per cent of the countries have liberalized trade policies in 1960, and their proportion has increased to 73 per cent by 2000, indicating that most of the countries engaged actively in the rapid space of globalization helping them to experience phenomenal changes in the field of economic, social, cultural, political and technological progress.

There are perennial arguments regarding whether globalization is a positive phenomenon, particularly, as it relates to developing countries. According to the "Washington Consensus" [World Bank (WB) and International Monetary Fund (IMF)], globalization is considered as a tool for promoting higher economic growth through the process of creating trade and generating a new avenue of investment opportunities for the purpose of employment generation that ultimately leads to minimizing the gap between haves and have-nots and enabling economies to reduce the levels of poverty. Sachs and Warner (1995) also identified that trade openness reduces inherent income inequality between the rich and the poor that leads to higher growth rates for lower income countries. As a result, the gap between rich and poor countries in terms of their per capita income is expected to be low. This reality happens to be true for India and China which have documented rapid economic growth and poverty reduction as a result of their outward open economic policies since the 1990s.

Mishkin (2009) in his seminal paper established the vital role of globalization in enhancing financial development that in fact leads to a higher economic growth in developing countries. In contrast, several conflicting evidences indicate that globalization may actually harm the developing countries in various ways. Slaughter (1997) indicates that trade liberalization facilitates income divergence between rich and poor countries which has also been supported by UNCTAD (1995). Lustig (1998) goes against trade liberalization, as differential wages between skilled and unskilled workers are found on account of free trade. Agenor (2004) also finds the adverse growth effects of globalization especially on poor countries. Rodriguez and Rodrik (2000) also have challenged the robustness of openness-growth correlations found by Dollar (1992); Ben-David (1993); Sachs and Warner (1995) and Edwards (1998). Rejecting the positive hypothesis between trade openness and economic growth, they argue that some of these studies did not control for other important growth inducing variables and infer some limitations in their narrow measure of openness. Moreover, it is interesting to highlight the outstanding defenders of globalization like Blinder (2006) and Krugman (2007) who have emphasized that globalization also has an adverse effect on growth and increases social inequality, insecurity and causing risk and hardships.

Against the backdrop of conflicting arguments, the review of various existing studies is important for the present study. Vamvakidis (2002) and Clemens and Williamson (2004) investigated longer period of historical data during 1870-2000 and 1865-1950, respectively, and reached the findings that the existing correlation between trade openness and economic growth has become significant only in recent decades. Dreher (2006) argued that countries that are more globalized experience higher economic growth compared to countries that are less globalized. Rao and Vadlammanti (2011) also examined the nexus between globalization and economic growth for 21 low income African countries and provided an optimistic view of significant positive long-run growth effects of globalization. According to them, the role of globalization in determining economic growth is found to be more rapid especially for low income countries.

Moreover, Rao and Vadlammanti (2011) made an extensive empirical attempt of examining the growth effects of globalization with country-specific time series data and found a similar empirical result indicating the positive impact of globalization on economic growth of five Asian countries (Singapore, Malaysia, Thailand, India and Philippines). They document that the growth effect of globalization is also found to be the highest for India and the lowest for Philippines. Similarly, Gurgul and Lach (2014) recently examined the impact of globalization on economic growth for transition economies and found a positive effect of globalization on economic growth. Subsequently, Chang *et al.* (2015) examined the non-linear cointegration relationship between real output and the overall globalization index for G7 countries (Canada, France, Germany, Italy, Japan, the United Kingdom and the USA). With the use of advanced quantile method, they found positive and significant long-run real growth effects of overall globalization and three other dimensions of globalization.

2.3 Finance-growth nexus

The finance-growth nexus has received extensive attention in economic research following the seminal studies of Schumpeter (1911); Goldsmith (1969); McKinnon (1973) and Shaw (1973). Schumpeter (1911) primarily proposed a finance-led growth hypothesis, indicating that a well-functioning system will spur technological innovations (growth) through the efficient allocation of resources from unproductive to productive sectors. Patrick's (1966) supply-leading hypothesis stipulates that the development of a robust financial sector can induce higher economic growth. In contrast, Robinson (1952) also offers a differential view on finance-led growth postulation, asserting that an overheating real sector will reflect into a

high demand for the services of financial sector. Hence, a developed financial sector mitigates the growing demand of the real sector in an economy as both the financial sector and growth seem to be complementary for each other.

However, the mixed and conflicting results found in the literature underlie the debate regarding whether financial development is the cause or the effect of the growth process in developed and developing countries. Empirically, King and Levin (1993a, 1993b) studied 77 countries over the period 1960-1989 and found that financial development causes economic growth in the early stages of economic development. This result was also supported by Fase (2001) for The Netherlands in the twentieth century. Moreover, Levin *et al.* (2000) by using the panel data of 71 countries for the period ranging from 1960 to 1995 examined the growth-finance nexus and found a positive relationship between growth and finance. Similarly, Kargbo and Adamu (2009) examined the causal linkage between economic growth and financial development in Sierra Leone for the annual data period from 1970 to 2008. Their empirical results strongly support the finance-led growth hypothesis due to the positive effect of financial development on economic growth. More importantly, they also show that the financial development is capable of having a positive impact on economic growth through the investment channel.

In the case of Ghana, Quartey and Prah (2008) analyzed the causal relationship between financial development and economic growth and strongly supported the evidence of demand-following hypothesis, i.e. demand growth helps support economic development. In this line, Odhiambo (2009) examined the dynamic relationship between interest rate reforms, financial development and economic growth in South Africa and found a causal relationship between financial depth and growth. Wolde-Rufael (2009) re-examined the causal relationship between financial development and economic growth in Kenya. By using the multivariate vector autoregressive (VAR) framework and modified Granger causality tests, they found evidence of bidirectional causality between financial development and economic growth, indicating that both financial development and economic growth are mutually determined for Kenya. Subsequently, Adu *et al.* (2013) examined the long-run growth effects of financial development in Ghana and found that the growth effect of financial development is sensitive to the choice of proxy. Furthermore, their findings show that both the credit to the private sector as ratios to gross domestic product (GDP) and total domestic credit are growth-enhancing financial development indicators.

In a similar fashion, Demetriades and Hussein (1996) examined the various causality tests for financial development and economic growth nexus for 16 developing countries and found the evidence of bidirectional causal relationship between them. Abu-Badar and Abu-Qarn (2008) examined the causal relationship between financial development and economic growth in Egypt during the period 1960-2001. By using the Granger causality tests within the framework of cointegration and vector error correction methodology, they found mutual causality between financial development and economic growth. Subsequently, Calderon and Liu (2003) examined the direction of causality between financial development and economic growth for 109 developing and industrial countries covering the period from 1960 to 1994. Using pooled data, the Granger causality test shows that financial deepening propels economic growth through the channels of rapid capital accumulation and productivity growth. Rousseau and Vuthipadadorn (2005) analyzed panel data from 84 countries and used the rolling regression approach to examine the relationship between financial development and economic growth during the period from 1960 to 2003. They found that the less developed countries showed clearer relationships, whereas the reverse was holding true for more developed ones. Similarly, Kemal *et al.* (2007) surveyed panel data from 19 highly developed countries and found no causality between financial development and economic growth.

In Table AI, the conflicting results are summarized on the linkages between financial development and economic growth for China and India. To the best of our knowledge, in the case of the Indian and Chinese economies, no studies looked at the impact of financial development on economic growth or the impact of globalization index on economic growth by endogenizing other macroeconomic factors, such as capital and inflation, as a proxy for aggregate demand, in a multivariate time series framework.

In greater curiosity, this study aims to capture the empirical linkages between globalization, financial development and economic growth in the context of developing Asian economies, in general, and China and India, in particular[3]. Moreover, the extraordinary economic achievement and drastic financial sector reform in India and China over the past three decades offer a great opportunity to test the theories empirically and also draw relevant policies for sustainable growth and welfare-driven development of both economies in the future. We believe that the present study would contribute to the existing literature on globalization-growth nexus and finance-growth nexus.

3. Financial systems in China and India

3.1 An overview of China's financial system

China's financial system did not exist before 1949[4]. After the foundation of the People's Republic of China in 1949, all of the pre-1949 capitalist companies were nationalized by 1950. Between 1950 and 1978, China's financial system was managed by a single bank – the People's Bank of China (PBOC). In this regard, a central bank appears to be an active agent of controlling banks under the Ministry of Finance, which served as regulatory body for all commercial banks, controlling about 93 per cent of the total financial assets of the country and having the capacity to handle almost all financial transactions.

With the purview of the central government mandate of social policies, PBOC extended credit to producers and consumers markets (Allen *et al.*, 2012). The actual path to financial development in China itself appears to have undergone many structural changes since the onset of economic reforms in December 1978 (Chen *et al.*, 2013). During that time, China's financial system has been dominated by a large banking system. It clearly shows that banks dominate the Chinese financial system, providing about three-fifths of total credit to the private sector[5]. The Chinese banking system is fairly concentrated, with five banks splitting almost half the total loan market. Another important feature of the Chinese banking system is that it is controlled by state ownership and social policy. The five largest Chinese banks are largely owned by the central government, and there are significant government stakes in many of the other banks. On behalf of government active policy, these banks have extended loans to firms, various sectors and different regions.

An additional structural change began in 1978 and ended in 1984. By the end of 1979, the PBOC departed the Ministry and became a separate entity, while three state-owned banks took over some of its commercial banking businesses. The Bank of China (BOC)[6] was given the mandate to look at the transactions related to foreign trade and investment. Finally, the fourth state-owned commercial bank, the Industrial and Commercial Bank of China, was formed in 1984 and took over the rest of the commercial transactions of the PBOC. In 1980, the development of the financial system was characterized by financial intermediaries outside of the "Big Four" banks including regional banks, rural credit cooperatives and urban credit cooperative banks and Trust and Investment Corporations non-bank financial intermediaries (Allen *et al.*, 2012).

The most significant event for China's financial system in 1990s was the inception and growth of China's stock market. Two domestic stock exchanges, the Shanghai Stock Exchange (SHSE) and Shenzhen Stock Exchange (SZSE), were established in 1990. The

average annual turnover rate in the Chinese stock markets over the past 5 years was 205 per cent, reaching a recent high of 293 per cent. This high turnover rate is shrinking because they are owned by the government entities. The government has self-imposed restrictions on share sales to alleviate fears that their shares will flood the market, reducing prices. In parallel with the development of the stock market, the real estate market also grew gradually in 1990s and is currently comparable in size with the stock market[7]. Both the stock and real estate markets have experienced major corrections during the past decade, and thereby are characterized by high volatilities and speculative short-term behaviors by many investors (Allen *et al.*, 2012; Elliott and Yan, 2013).

3.2 An overview of India's financial system

India has a long history of financial system development. In the beginning of the twentieth century, India's financial system was primarily a bank-based system. Even before setting up the Reserve Bank of India (RBI) in 1935 as well as before independence in 1947, the Indian financial system was fairly advanced by developing country standards, and featured the significant presence of foreign banks, domestic commercial banks, cooperative banks and a stock market. Moreover, the process of development of financial institutions and markets during the post-independence period was largely guided by the process of planned development pursued in India. As a result, two nationalization waves in 1969 and 1980 left the banking sector largely in public hands because of the criticality of social control policy. Until the reforms of 1991, the banking industry in India was highly regulated by social control policy that mandated the adoption of bank dominated financial development needs with an aim to meet the needs of disadvantaged agriculture and other priority sectors.

Driven largely by public sector initiative, nationalized commercial banks established as a priority mobilization of households' savings into the various investments. As corporate firms are assumed to be financially constrained, they are supported by the emergence of the banking sector and capital market. The RBI is regulating the money and credit markets, while the capital market falls within the purview of Securities and Exchange Board of India (SEBI).

In the context of the balance of payments crisis of 1991, a comprehensive structural and financial sector reform process was initiated in India which became the starting point for gradual deregulation of the banking industry and its integration with the rest of the financial markets (Report on Currency and Finance, 2006, RBI). The reforms of 1991 eliminated the rural branch and priority sectors lending. With an increasing pressure from the path of liberalization and globalization, new regulations encouraged various lending practices based on market forces, despite the fact that bank ownership was still in public hands (Kendal, 2012; p. 1557). Subsequently, expansion of the financial sector in India provided some barriers to financial services that, in turn, hindered the extension of credit to poor households and collection of deposits by banks. This was evidenced by the recent WB report in which Kumar (2008) concluded that India still suffers from some of the longest wait times and highest document requirements for deposit accounts despite having the lowest fee. These shortcomings constitute barriers to financial services accessed by poor households; therefore, the notion of financial inclusion seems to be a distant dream for the economy as a whole.

Any discussion on reforms in the Indian financial system will remain incomplete without mentioning the capital market reform. Capital market reform was part of the financial sector reforms. The oldest stock exchange in India – the Bombay Stock Exchange (BSE) – initiated its operation in 1875. Before 1992, the capital market in India was highly regulated under the purview of social control and planned economy policies. Gradually following the onset of

economic reforms that too helped the emergence of financial sector reforms, SEBI assumed an apex regulatory body for the capital market in India. Furthermore, SEBI is celebrated in the Indian capital market not only for being a potential regulator but also as a regulatory platform for ensuring investors protection, providing fair return on their investment, lamenting higher disclosure and greater transparency. An additional reform seen in the Indian capital market was the introduction of the National Stock Exchange (NSE) in 1994 that facilitates nationwide stock trading, electronic display and clearing and settlements process. On account of realizing competitive environment from NSE, BSE was no more exception in the gradual set up of electronic and rolling settlement systems in 1995 (Chakraborty, 2008).

4. Theoretical issues, data collection and econometric methodology

In reality, it is widely believed that an integration of developing economies with the rest of the world is enhanced through the channels of financial investment flows, trade flows and bilateral and multilateral linkages. Such real integration of developing economies with the developed countries is found to be practically true due to the policies and guidelines of the IMF and the WB. The novel idea of "Washington consensus" is to help developing countries through the process of economic integration by accepting various implications of globalization, privatization and liberalization. In this sense, it is practically tempting to believe that globalization has several facets of implications on economic, social and political activities.

From the economic view point, Dreher (2006) argues that globalization contributes an increasing aggregate investment as well as an overall level of economic activities of the world economy via transferring new endogenous and exogenous ideas or technology, as well as helping migration of skilled human capital from developed economies to developing countries. Despite being the engine of economic growth, globalization promotes economic activity in emerging economies by boosting financial depth and capitalization in their own territory. Subsequently, globalization influences financial development by strengthening institutions. In this connection, Mishkin (2009) articulates that globalization increases access to capital by opening domestic financial markets to foreign capital within the country and by lowering the loan cost in support of investment in productive products. Globalization also provides potential trading and exchange-related hedging markets to trading partner countries for their products (exports), and each and every country can purchase their products (imports) to promote economic activity in the context of more integrated international markets.

As a consequence of economic integration, globalization often benefits developing countries by providing employment opportunities to human capital, not only in the developing world but also in developed countries. More importantly, globalization has assumed significance in attracting foreign capital inflows to the developing world toward promoting various sectoral activities (agriculture, industry and service) and hence economic growth. This entails that an increasing economic growth in emerging economies is backed up by increasing total factor productivity (TFP) through the process of globalization.

Against the above background, it is clearly evident that our discussion largely emphasizes the prolonged impacts of globalization and financial development on the growth of real output in the economy. But in reality, it is again tempting to believe that globalization and financial development taken together cannot primarily determine the long-run growth of real output in the economy due to ignoring other essential factors of production which seem to be necessarily important for helping economic activities as well. In this regard, we use Cobb–Douglas (C–D) production function by incorporating capital and labor as major

contributing factors of production (Mankiw *et al.*, 1992). The general form of production function is given below:

$$Y(t) = A(t)\,K(t)^{\beta}\,L(t)^{1-\beta} \quad 0 < \beta < 1 \tag{1}$$

where Y is domestic product, A is advancement in technology, capital stock is indicated by K and labor is L. The C–D production function is modified to account for the importance of technology. Conceptually, technology refers to creation of new ideas that can be of two types, such as endogenous and exogenous. Fundamentally, endogenous technology is the product of inside the system of production process, and exogenous technology is the result of outside the production process. This is because the use of these technologies plays a vital role in enhancing the productivity of labor and capital in the modern production system. Essentially, both labor and capital are considered as potential inputs for helping the production process and boosting the economic activities through the effective utilization of these inputs. For instance, when we talk about endogenous technology in the production process of enhancing real output in the economy, we naturally define the new ideas embodied in the mind of labor. This new innovative idea generated by labor helps them in increasing TFP as well as growth of the intermediate and final output in the short and long runs. As a result, an increasing TFP emanating from endogenous technology can help the producers or entrepreneurs in shifting their own designed production function in the long run.

On the other hand, exogenous technology is a dynamic concept which is emerging from outside the system, and more specifically, it is the new idea coming from outside the continent. For instance, when we use skilled labor importing from the outside country, it can help in expanding our production process through proper managerial skills and training. Moreover, exogenous technology can be another form of importing new advanced techniques from outside the domestic economy that in fact enhances the production process and increases the long-run real growth of output. In general, technology is determined by a developed financial sector, trade openness and skilled human capital.

Financial development attracts producers by giving incentives to enhance domestic production as well as exports capacity and trade openness. Financial development determines the trade flows and structures. A well-developed financial sector enhances the capacity of an economy to reap fruits from international trade by diffusing technological advancements to stimulate economic growth. Similarly, globalization may affect economic growth via technique effect, income effect and composite effect. For example, globalization would help developing countries in the form of importing new technology and managerial skills. Once such imported new technology is used in the process of production, it leads to higher growth of productivity and, in turn, provides higher growth of real output in the economy, via the technique and income effects. Finally, a combination of both technique and income effects are necessary to better understand the dynamics of economic growth in the developing economies, for which we have selected both India and China. To that end, we construct the empirical equation:

$$A(t) = \phi\,.\,G(t)^{\alpha}\,F(t)^{\delta} \tag{2}$$

where ϕ is a constant parameter which remains the same over the period of time, G (*EG*, *PG*, *SG*) is a meter of globalization (economic globalization, political globalization and social globalization) and F is for financial development. Surrogating equation (2) from equation (1):

$$Y(t) = \phi\,.\,G(t)^{\delta_1}\,F(t)^{\delta_2}\,K(t)^{\beta}\,L(t)^{1-\beta} \tag{3}$$

We have divided both sides by population (except indices of globalization) and transformed all the series into logarithmic form. So equation (2) is modeled as follows:

$$\ln Y_t = \varphi_1 + \varphi_2 \ln G_t + \varphi_3 \ln F_t + \varphi_4 \ln K_t + \varphi_5 \ln L_t + u_i \quad (4)$$

where, $\varphi_1 = \log \phi$ is a constant term, $\ln Y_t$ is log of real GDP per capita, $\ln G_t$ is log of globalization, $\ln F_t$ is real domestic credit to private sector per capita, $\ln K_t$ is real capital stock per capita, $\ln L_t$ is skilled labor proxies by secondary enrollment and u_i is error term assumed to be constant.

The study covers the annual period of 1970-2013 for China and India. We have further combed world development indicators (CD-ROM, 2014) for all the variables. Economic growth is measured by real GDP per capita (US$). We have used real domestic credit to private sector (US$) per capita. Globalization is measured by the globalization index borrowed from Dreher (2006)[8]. Real capital per capita is measured by using real gross capital formation (US$). We have used consumer price index to measure inflation[9]. All the variables are transformed into natural log-form. The log-linear specification provides efficient results compared to simple-linear specification (Shahbaz, 2012).

For the above analysis, we have used the recent advanced time series technique developed by Bayer and Hanck (2013). This is regarded as suitable econometric technique which is able to explain the dynamic long-run relationships between globalization, financial development and economic growth by endogenizing other macroeconomic factors, such as capital and labor in a multivariate framework. In this perspective, Bayer and Hanck (2013) cointegration technique differs from other traditional econometric methodology in the application of macroeconomic variables. Moreover, this technique assumes to be superior to Engle and Granger (1987) residual-based co-integration technique in several aspects[10]. In this sense, it is important for us to understand the implications and various steps of Engle and Granger (1987) co-integration test. It goes without saying that Engle and Granger (1987) developed the residual based cointegration test which is one of the most widely used tests for testing cointegration between macroeconomic variables. This involves a three-step procedure test[11].

The limitations of the Engle-Granger cointegration test were addressed by Engle and Yoo (1991). The Engle and Yoo (1991) cointegration test provides more efficient empirical results due to its power and size, and this test can also be applicable if the distribution of estimators from the cointegrating vector is not normally distributed. The cointegration test proposed by Philips and Hansen (1990) was also used to eliminate the biasedness of ordinary least squares (OLS) estimates[12].

Once we have the unique order of integration in the system of equations, then we can easily apply the Johansen and Juselius (1990) maximum likelihood cointegration approach to examine the cointegration between the variables. In other words, this is regarded as single-equation-based cointegration technique. The empirical exercise of investigating cointegration between the variables becomes invalid if any variable is integrated at I(0) in the VAR system or happens to be of mixed order of integration. Johansen and Juselius' (1990) maximum likelihood cointegration results are sensitive if variables are exogenous and endogenous in the model. This test only indicates the presence of cointegration between the variables in the long run but provides no information on short-run dynamics. Partially in response to these issues, Pesaran *et al.* (2001) suggested a bounds testing approach for cointegration using an autoregressive distributive lag (ARDL) model to scrutinize the long-run relationship between the series. This cointegration approach is applicable if the series are integrated at I(1) or I(0) or I(1)/I(0). The ARDL bounds testing approach provides simultaneous empirical evidence on long run as well as short-run relationship between the variables. The major problem with the ARDL bounds testing is that this

approach provides efficient and reliable results if a single equation cointegration relation exists between the variables[13].

In summary, there are several different approaches to testing for co-integration, and it is possible that different approaches give different results. In such circumstances, it becomes difficult to obtain uniform results because one cointegration test rejects the null hypothesis, while a different test equally accepts it. In the energy economics literature, a variety of cointegration tests have been used in practice: Engle and Granger's (1987) residual-based test, Johansen's (1991) system-based test, Boswijk's (1994) and Banerjee *et al.*'s (1998) lagged error correction-based approaches to cointegration. It is further pointed out by Pesavento (2004) that the power of cointegration tests may be sensitive to the presence of nuisance parameters.

To overcome some of these issues, Bayer and Hanck (2013) developed a new dynamic cointegration technique by combining all non-cointegrating tests to obtain uniform and reliable cointegration results. This cointegration test provides efficient estimates by ignoring the nature of multiple testing procedures. This implies that the application of non-combining cointegration tests provides robust and efficient results compared to individual *t*-test or system-based test. The Bayer and Hanck (2013) cointegration test follows Fisher's (1932) critical tabulated values formula to combine the statistical significance level, i.e. *p*-values of single cointegration test and the formula is given below:

$$EG - JOH = -2[\ln(P_{EG}) + \ln(P_{JOH})] \tag{5}$$

$$EG - JOH - BO - BDM = -2[\ln(P_{EG}) + \ln(P_{JOH}) + \ln(P_{BO}) + \ln(P_{BDM})] \tag{6}$$

The probability values of different individual cointegration tests such as Engle and Granger (1987); Johansen (1991); Boswijik (1994) and Banerjee *et al.* (1998) are shown by P_{EG}, P_{JOH}, P_{BO} and P_{BDM}, respectively. To decide whether cointegration exists between the variables, we follow Fisher (1932) critical statistic values. We may conclude in favor of cointegration by rejecting the null hypothesis of no cointegration once critical values generated by Bayer and Hanck (2013) are found to be less than those calculated in Fisher (1932).

4.1 The vector error correction model granger causality

The vector error correction model (VECM) is a model derived from the cointegration test. In other words, the VECM is a causality model of examining the direction between variables. In this sense, it would be useful to test the Granger causality between the variables. Suppose co-integration exists between the series, the VECM can be developed as follows:

$$\begin{bmatrix} \Delta\ln Y_t \\ \Delta\ln g_t \\ \Delta\ln FD_t \\ \Delta\ln K_t \\ \Delta\ln IN_t \end{bmatrix} = \begin{bmatrix} b_1 \\ b_2 \\ b_3 \\ b_4 \end{bmatrix} + \begin{bmatrix} B_{11,1} B_{12,1} B_{13,1} B_{14,1} B_{12,1} \\ B_{21,1} B_{22,1} B_{23,1} B_{24,1} B_{25,1} \\ B_{31,1} B_{32,1} B_{33,1} B_{34,1} B_{35,1} \\ B_{41,1} B_{42,1} B_{43,1} B_{44,1} B_{45,1} \\ B_{51,1} B_{52,1} B_{53,1} B_{54,1} B_{55,1} \end{bmatrix} \times \begin{bmatrix} \Delta\ln Y_{t-1} \\ \Delta\ln G_{t-1} \\ \Delta\ln FD_{t-1} \\ \Delta\ln K_t \\ \Delta\ln IN_{t-1} \end{bmatrix} + \ldots + \begin{bmatrix} B_{11,m} B_{12,m} B_{13,m} B_{14,m} B_{15,m} \\ B_{21,m} B_{22,m} B_{23,m} B_{24,m} B_{25,m} \\ B_{31,m} B_{32,m} B_{33,m} B_{34,m} B_{35,m} \\ B_{41,m} B_{42,m} B_{43,m} B_{44,m} B_{45,m} \\ B_{51,m} B_{52,m} B_{53,m} B_{54,m} B_{55,m} \end{bmatrix}$$
$$\times \begin{bmatrix} \Delta\ln Y_{t-1} \\ \Delta\ln G_{t-1} \\ \Delta\ln FD_{t-1} \\ \Delta\ln K_t \\ \Delta\ln IN_{t-1} \end{bmatrix} + \begin{bmatrix} \zeta_1 \\ \zeta_2 \\ \zeta_3 \\ \zeta_4 \\ \zeta_5 \end{bmatrix} \times (ECM_{t-1}) + \begin{bmatrix} \mu_{1t} \\ \mu_{2t} \\ \mu_{3t} \\ \mu_{4t} \\ \mu_{5t} \end{bmatrix} \tag{7}$$

where Δ represents the difference operator and ECM_{t-1} denotes the lagged error correction term, found from the long-run association. The long-run causality is also obtained in the

VECM model by looking at the significance of the estimated coefficient on the lagged error correction term. The joint χ^2 statistic for the first differenced lagged independent variables is used to investigate the direction of short-run causality between the variables. For example, $B_{12,i} \neq 0 \forall_i$ shows that globalization Granger causes economic growth and vice versa if $B_{21,i} \neq 0 \forall_i$.

5. Empirical results and discussion

Our study uses various unit root testing criterions, such as augmented Dickey and Fuller (ADF) (1979) and tests by Zevot and Andrews (1992) as shown in Tables I and II to check the presence of stationarity of the level variables used in the present empirical investigations for India and China. The rationale behind using the ADF test is that it can capture the higher possibility of auto-correlation embodied among variables of the estimated models in a multivariate framework. But in the presence of structural breaks, ADF unit root test is widely known to provide wrong inferences. This is because this unit root test does not accommodate the qualitative information about the unknown structural break dates stemming from the series which weakens the test of stationarity. To overcome such visible

	India		China	
Variables	*t*-statistic	Prob. value	*t*-statistic	Prob. value
ln Y_t	−0.4896 (1)	0.9807	−1.9528 (1)	0.6108
ln FD_t	−1.2128 (2)	0.8800	−2.4747 (2)	0.3386
ln G_t	−1.6937 (2)	0.7381	−1.2277 (1)	0.8929
ln K_t	−1.4899 (1)	0.8191	−1.6923 (3)	0.7387
ln IN_t	−2.2506 (2)	0.4514	−2.8527 (2)	0.1928
Δln Y_t	−5.5941 (1)*	0.0002	−5.2072 (2)*	0.0006
Δln FD_t	−3.6469 (2)**	0.0366	−4.7829 (2)*	0.0019
Δln G_t	−4.9643 (1)*	0.0011	−4.6613 (1)*	0.0026
Δln K_t	−5.1511 (2)*	0.0006	−5.4011 (3)*	0.0003
Δln IN_t	−3.9123 (2)**	0.0195	−3.7088 (1)**	0.0405

Notes: *and **represent significance at 1 and 5% level; () show lag length

Table I.
ADF unit root analysis

	Level			1st difference		
Variable	*t*-statistic	Time break	Decision	*t*-statistic	Time break	Decision
India						
ln Y_t	−2.650 (2)	1978	Unit root	−8.278 (3)*	1974	Stationary
ln FD_t	−3.859 (1)	1989	Unit root	−6.806 (3)*	1998	Stationary
ln G_t	−2.731 (3)	1991	Unit root	10.478 (2)*	1988	Stationary
ln K_t	−3.279 (2)	1990	Unit root	−9.777 (3)*	2003	Stationary
ln IN_t	−4.189 (2)	2002	Unit root	−6.394 (4)*	1974	Stationary
China						
ln Y_t	−2.299 (2)	2002	Unit root	−5.946 (2)*	1995	Stationary
ln FD_t	−4.331 (1)	2005	Unit root	−6.390 (1)*	2009	Stationary
ln G_t	−3.586 (2)	1990	Unit root	−10.866 (2)*	1998	Stationary
ln K_t	−1.084 (1)	1999	Unit root	−5.860 (1)*	2009	Stationary
ln IN_t	−4.476 (2)	1994	Unit root	−5.847 (2)*	1998	Stationary

Note: *Represents significant at 1% level of significance. Lag order is shown in parenthesis

Table II.
ZA unit root test

problem, we have also added another novel unit root test developed by Zevot and Andrews (1992) which necessarily accommodates the information about a single unknown structural break present in the level time series data. Interestingly, when it comes to analyzing estimated results, it is always worth noting the used variables' notations, as it will provide more clarity as well as wide readership in the field of international growth and financial development literature. The level variables used in the present analysis include real output (Y_t), financial development (FD_t), globalization index (G_t), capital formation (K_t) and inflation (IN_t). ADF test results in Table I show that all of the macroeconomic variables for both India and China are not only found to be non-stationary at their levels but also found to be stationary in their first differences, suggesting that variables are integrated of order 1, i.e. I(1). In other words, it also reveals that these level variables have the tendency of moving together in the long run.

Moreover, the results reported in Table II for India and China show that all of the variables have unit roots in their levels along with the presence of structural breaks in levels and also found to be stationary in their first differences. Accordingly, all the chosen level series for both economies are integrated in the order of I(1), suggesting the mutual connection of these series in the long run. In the case of India, structural breaks are found in 1978, 1989, 1991, 1990 and 2002, in the series of economic growth, financial development, overall globalization, capital formation and inflation, respectively. The structural break occurring in the growth variable for the Indian economy, which is mainly associated with the end period of constant "Hindu growth rate" (3.5 per cent), is expected to occur around the period 1978 or 1980, following India's economic backwardness, physical and financial resources constraints, as well as looking at the liberal welfare views of the WB and the IMF.

On account of the financial resource constraint as seen in the Indian economy especially during the period of Hindu growth rate, financial development took some time to adapt, and as a result, the break happened toward the latter part of the twentieth century (1989). Furthermore, the structural break that occurred in the period 1991 is associated with overall globalization. Because of this, the Indian economy had pressed ahead with liberalization initiatives to insulate the country from the looming risks of exponential twin deficits, i.e. a wider fiscal and current account deficit. In addition, the structural break that occurred in the period 1990 for the Indian economy in terms of capital formation could be due to the presence of India's open economy policy toward making liberalization more effective as well as enhancing needed physical and financial infrastructures. Finally, the structural break that occurred in India in 2002 could be due to the lag impact of greater globalization, liberalization and privatization. As a result, the growth of real output at the aggregate and disaggregate levels is expected to be higher, but in the mean time, the aggregate demand for goods and services in the growing Indian economy has increased since 2002.

Putting this situation in equilibrium framework shows the higher chance of market disequilibrium due to the excess of aggregate demand for commodities and investments over the aggregate real output and savings in the Indian economy. Finally, we tend to conclude that the Indian economy we saw in the past (during the 1980s) and after the 1990s onwards till the current time has exhibited variations in terms of various fundamentals and structural changes. These changes have already been reflected in our analysis of testing for structural break.

Similar details for the Chinese economy are shown in Table III. In this regard, five structural break points (2002, 2005, 1990, 1999 and 1994) are found for China, which are primarily associated with the variables chosen for our empirical purpose, such as economic growth, financial development, overall globalization, capital and inflation. The structural break point that occurred for the growth of real output in China during the period 2002 could

be due to the presence of higher trade flows (exports plus imports) and financial openness. Second, the structural shock occurring during the period 2005 for financial development of China could be due to the higher integration of the Chinese economy in the globalized world, as it geared to attract both types of foreign short-term and long-term investors to enhance the financial base. Third, a structural break point happened in 1990 for China which is mainly associated with the growing space of globalization. It was the period in which the Chinese economy opened up its markets to foreign investors as well as integrated with the rest of the world in terms of trade and financial openness. As a result, such open economy model has provided the Chinese economy the qualitative status of BRICS economies and is considered as one of the fastest growing economies among 22 emerging markets in the world. Subsequent structural breakpoints which occurred for capital and inflation during the periods 1999 and 1994 could be due to the lag impact of South Asian economic and financial crises. Moreover, it is interesting to note that these break points also produced some sort of consistency in the pattern of several events occurring in the Chinese economy.

The results from the above unit root tests show that all the level variables are found to be stationary in their first differences, indicating that they are integrated in the order one, i.e. I (1). In this perspective, we can claim that the combined cointegration test developed by Bayer and Hanck (2013) is a suitable empirical method.

Table III documents the combined cointegration test results for India and China including E-JOH and EG-JOH-BO-BDM. We find that Fisher statistics for EG-JOH and EG-JOH-BO-BDM tests exceed the critical values at 1 per cent level of significance when we use economic growth, financial development, capital and inflation as dependent variables for India. On the basis of this, we reject the null hypothesis of no cointegration among the variables. Hence, one can conclude that there is a long-run relationship between economic growth, financial development, globalization, capital and inflation in India.

It is again interesting to note for India that Fisher statistics for EG-JOH and EG-JOH-BO-BDM tests do not exceed the critical values at 1 per cent level of significance when we use globalization as dependent variable for India, confirming the absence of cointegration between globalization and other variables. Moreover, we also find that Fisher statistics for EG-JOH and EG-JOH-BO-BDM tests exceed the critical values at 1 per cent level of significance when we use economic growth, financial development, globalization and capital as dependent variables for China. It suggests that they reject the null hypothesis of no co-integration among the variables, indicating the presence of long-run relationship between the variables, except for inflation. From this perspective, we conclude that these results are consistent with the inference of the above unit root tests.

The Bayer and Hanck (2013) combined cointegration approach is also known to provide efficient parameter estimates but fails to accommodate the structural breaks embodied in the

	India		China	
Estimated models	EG-JOH	EG-JOH-BO-BDM	EG-JOH	EG-JOH-BO-BDM
$Y_t = f(FD_t, G_t, K_t, IN_t)$	18.871*	84.175*	57.493*	58.407*
$FD_t = f(Y_t, G_t, K_t, IN_t)$	19.140*	74.455*	55.880*	63.180*
$G_t = f(Y_t, FD_t, K_t, IN_t)$	8.439	18.672	55.390*	63.303*
$K_t = f(Y_t, FD_t, G_t, IN_t)$	22.530*	94.016*	60.707*	64.824*
$IN_t = f(Y_t, FD_t, G_t, K_t)$	19.344*	32.210*	12.444	15.678

Note: *Represents significant at 1% level. Critical values at 1% level are 15.845 (EG-JOH) and 30.770 (EG-JOH-BO-BDM), respectively. Lag length is based on minimum value of Akaike information criterion (AIC)

Table III. The results of Bayer and Hanck cointegration analysis

macroeconomic time series data. This issue is overcome by applying the ARDL bounds testing approach to cointegration in the presence of structural breaks (Shahbaz *et al.*, 2015). The ARDL bounds testing approach is known to be sensitive to lag length selection, and, therefore, we have used the Akaike information criteria to select the appropriate lag length order. It is reported by Lutkepohl (2006) that the dynamic link between the series can be well captured with an appropriate selection of lag length.

The optimal lag length results are reported in Column 2 of Table IV. In this case, we use critical bounds values from Narayan (2005) study to draw the decision about the existence of cointegration in different models. The results show that the calculated F-statistic is found to be higher than the upper bounds critical values for India when we use economic growth (Y_t), financial development (FD_t) and capital (K_t) as dependent variables. Similarly for China, we also find that the calculated F-statistic is found to be higher than the upper bounds critical values when we use economic growth, financial development, globalization (G_t) and capital. Overall, this shows that the ARDL bounds test at least confirms the long-run relationships between the variables for both India and China.

However, the existence of long-run relationships among the variables allows us to examine the long-run growth impacts of globalization, financial development, capital and inflation in India and China. The long-run results reported in Table V indicate that there is a positive and significant relationship between financial development and economic growth for the Indian economy in all of the general models in the long run. A 1 per cent increase in financial development increases economic growth in the long run by 0.084 per cent by keeping other things constant. The long-run effect of financial development on economic growth could be due to the fact that available financial resources resulting from financial sector reforms and development will enable real economic activities in mitigating the required investments in the long run. As a consequence, the gap between aggregate

	Bounds testing approach to cointegration			Diagnostic tests			
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Estimated models	Lag length	Break year	*F*-statistic	χ^2_{NORMAL}	χ^2_{ARCH}	χ^2_{RESET}	χ^2_{SERIAL}
India							
$Y_t = f(FD_t, G_t, K_t, IN_t)$	2, 1, 1, 1, 2	1978	8.795*	0.7964	[1]: 2.5286	[1]: 2.7111	[1]: 0.9277
$FD_t = f(Y_t, G_t, K_t, IN_t)$	2, 2, 1, 1, 2	1989	11.087*	0.6071	[2]: 2.4181	[1]: 0.4709	[2]: 1.1206
$G_t = f(Y_t, FD_t, K_t, IN_t)$	2, 1, 2, 1, 1	1991	1.925	0.1653	[1]: 1.6686	[3]: 1.3846	[1]: 2.1603
$K_t = f(Y_t, FD_t, G_t, IN_t)$	2, 2, 2, 2, 1	1990	8.445*	2.0596	[1]: 2.5711	[2]: 0.0261	[1]: 0.1315
$IN_t = f(Y_t, FD_t, G_t, K_t)$	2, 1, 2, 2, 2	2002	5.699	1.8347	[1]: 4.7257	[1]: 2.3441	[1]: 0.3441
China							
$Y_t = f(FD_t, G_t, K_t, IN_t)$	2, 1, 2, 1, 2	2002	7.571**	0.2019	[1]: 1.0182	[1]: 1.6286	[1]: 3.2226
$FD_t = f(Y_t, G_t, K_t, IN_t)$	2, 2, 1, 2	2005	6.616*	0.6873	[1]: 1.1655	[1]: 2.8906	[3]: 1.0222
$G_t = f(Y_t, FD_t, K_t, IN_t)$	2, 1, 1, 2, 1	1990	5.947***	2.5514	[2]: 0.6697	[3]: 1.6182	[3]: 2.6259
$K_t = f(Y_t, FD_t, G_t, IN_t)$	2, 1, 2, 1, 2	1999	11.883*	0.0422	[1]: 2.4452	[1]: 2.5982	[1]: 1.8807
$IN_t = f(Y_t, FD_t, G_t, K_t)$	2, 2, 2, 1, 2	1994	0.795	1.1436	[1]: 2.0414	[1]: 2.3443	[3]: 4.0091
	Critical values ($t = 49$)						
Significance level	Lower bounds $I(0)$	Upper bounds $I(1)$					
1 per cent level	7.337	8.643					
5 per cent level	5.247	6.303					
10 per cent level	4.380	5.350					

Table IV.
The results of ARDL cointegration test

Notes: The asterisks * and ** denote the significant at 1 and 5% levels, respectively. The optimal lag length is determined by AIC. [ ] is the order of diagnostic tests

Dependent variable = ln Y_t	India				China			
Variables	Coefficient	Standard. error	*t*-statistic	Prob. value	Coefficient	Standard error	*t*-Statistic	Prob. value
Long-run analysis								
Constant	2.9037*	0.1209	24.013	0.0000	2.058*	0.2479	8.3045	0.0000
ln FD_t	0.0840**	0.0326	2.5730	0.0141	0.3621*	0.1035	3.4967	0.0019
ln G_t	0.3421*	0.0577	5.9298	0.0000	−0.8133*	0.0947	−8.5881	0.0000
ln K_t	0.3192*	0.0629	5.0727	0.0000	0.4464*	0.0981	4.5502	0.0001
ln IN_t	0.1918*	0.0281	6.8203	0.0000	0.0560*	0.0117	4.7863	0.0000
R^2	0.9780				0.9670			
Short-run analysis								
Constant	0.0021	0.0095	0.2281	0.8206	0.0696*	0.0069	10.0681	0.0000
Δln FD_t	0.1552**	0.0611	2.5375	0.0150	−0.1206**	0.0454	−2.6528	0.0149
Δln G_t	0.1898**	0.0875	2.1687	0.0358	−0.1143*	0.0220	−5.1909	0.0000
Δln K_t	0.2027*	0.0545	3.7194	0.0006	0.2719*	0.0151	17.9085	0.0000
Δln IN_t	0.0021*	0.0005	4.0162	0.0002	0.0938**	0.0004	2.2395	0.0361
ECM_{t-1}	−0.5188*	0.1256	−4.1300	0.0002	−0.4507*	0.0724	−6.2251	0.0000
R^2	0.5780				0.6115			
F-statistic	11.5087*				18.0446*			
D–W	1.9001				2.0089			
Short-run diagnostic tests								
Test	*F*-statistic	Prob. value			*F*-statistic	Prob. value		
$\chi^2 NORMAL$	1.6198	0.2744			1.7237	0.1200		
$\chi^2 SERIAL$	1.5010	0.2352			1.9107	0.1753		
$\chi^2 ARCH$	0.6353	0.4296			1.8122	0.2743		
$\chi^2 WHITE$	0.6967	0.6288			2.0119	0.1689		
$\chi^2 REMSAY$	0.2486	0.6207			0.0130	0.9101		

Note: * and ** show significant at 1 and 5% levels of significance, respectively

Table V.
Long and short run results

investments and savings in the developing economies like India will be minimized in the long run due to the process of financial development.

The short-run significant impact of financial development on economic growth is found to be positive as 1 per cent increase in financial development leads to an increase in economic growth by 0.155 per cent in the Indian economy. The short-run impact of financial development on India's economic growth is expected to be theoretically and practically possible because some of the intermediate input production can be facilitated by the availability of financial resources.

In addition, the positive and significant growth effects of overall globalization are found both in the short and long runs, as 1 per cent change in overall globalization tends to increase economic growth by 0.189 and 0.342 per cent in the short and long runs. The evidence interestingly suggests that overall globalization positively influences economic growth in India, both in the short and long runs. This further implies that the Indian economy has benefited due to opening up the economy to the rest of the world. Similarly, both acceleration in capitalization, as a proxy for enhanced productive capacity, and persistent rising price level (inflation), as a proxy for robust demand, are also found to be positively and significantly influencing Indian economic growth in both the short and long runs, respectively, as seen in Table V.

In the case of China, the empirical results in Table V reveal that financial development positively and significantly influences economic growth in the long run, but the adverse

significant growth impact of financial development is also found in the short run. A 1 per cent increase in financial development will lead to an increase in the short- and long-run economic growth in China by 0.326 and −0.120 per cent. It is important to note that the long-run positive growth effect of financial development in China could be due to the fact that the Chinese economy might have liberalized financial sector reform to a greater extent in the long run, and thereby the scope of development could be leading to increasing total savings in the economy. A rise in total savings may mitigate the rising aggregate investments required in the economy, by reducing private consumption and therefore domestic demand for goods and services. The concern about rising total financial savings could be countered if higher savings are mobilized through efficient use of financial resources, i.e. efficient intermediation, that might lead to higher productivity growth as well as the growth of real output in the economy. This explanation would lead to better prospects of China's growth on account of financial development in the long run, in contrast to the short-run evidence.

In addition, both short- and long-run significant growth effects of overall globalization are found for China. A 1 per cent increase in globalization will decrease economic growth by −0.114 in the short run and increase it by 0.813 per cent in the long run. The adverse effect of overall globalization on China's growth in the short run is worth noting. This indicates that China has faced tougher competition which slowed down the growth momentum on account of increased globalization. We also found the positive and significant effects of capital and inflation, as a proxy for aggregate demand, on China's growth rate. These findings are consistent with the results for India, solidifying the importance of enhanced capital endowment and growing demand to sustainable growth.

From the model robustness point of view, it is always important to discuss some of the coefficients obtained in the estimation. Therefore, the error correction coefficients for India and China are found to be negative (−0.518 and −0.450) which satisfy the high speed of adjustment from short-run disequilibrium to long-run equilibrium. Each year, following a cyclical change, both economies adjust back to long-run equilibrium at the annual rate of 51-45 percentage points. Moreover, the long-run R^2 (0.978 per cent) is found to be higher for India than the short-run R^2 (0.578 per cent). This indicates that all independent variables explain the growth of real output for India to the extent of 97 per cent in the long run, in contrast to the explanatory power of 57 per cent in the short run.

Similarly for China, 0.967 (R^2) per cent of real economic growth dynamics are explained by the explanatory variables in the long-run model followed by 0.611 (R^2) per cent in the short run, suggesting that greater dynamics of economic growth in China are well explained by the model deterministic factors, especially in the long run. We also note that the Durbin–Watson statistics for India and China indicate absence of autocorrelation in the estimated model, and ultimately, our estimated models seem to be unbiased and efficient. Other robustness criterions mentioned in Table V suggest that our models are free from serial correlation, heteroskedasticity and *ARCH* problems across both economies. In addition, *Ramsey* test also suggests that the functional form of the model is well defined and specified for both economies. Moreover, the stability of ARDL parameters is investigated by using cumulative sum of recursive residuals (CUSUM) and the CUSUM of square (CUSUMsq) suggested by Brown *et al.* (1975). Both CUSUM and CUSUMsq are widely used to test the constancy of parameters. Brown *et al.* (1975) pointed out that these tests help in testing the dynamics of the parameters. Hence, the expected value of recursive residual is zero leading to accept the null hypotheses of parameters constancy. The plots of both CUSUM and CUSUMsq are shown for India and China in Figures 1 to 4 at 5 per cent level of significance, and the results indicate that plots of both tests are within critical bounds at 5 per cent level of significance for both economies.

When cointegration is confirmed, there must be unidirectional or bidirectional causality among the variables. We examine this relationship within the VECM framework. Such knowledge is essential for formulating appropriate welfare policies for sustainable economic growth and development of two emerging economies, such as India and China.

Table VI presents the results on the direction of short-run causality in India and China. For India, we find that the feedback causality effects are evident between financial development and economic growth. It is in the sense that financial development Granger causes economic growth, while economic growth Granger causes financial development. One of the implications of this result is that in the short run, conservative financial development policy will hamper economic growth. In the short run, there is no statistically significant impact of globalization on economic growth, and in parallel, there is no globalization effect on economic growth for the Indian economy. In comparisons, capital and economic growth

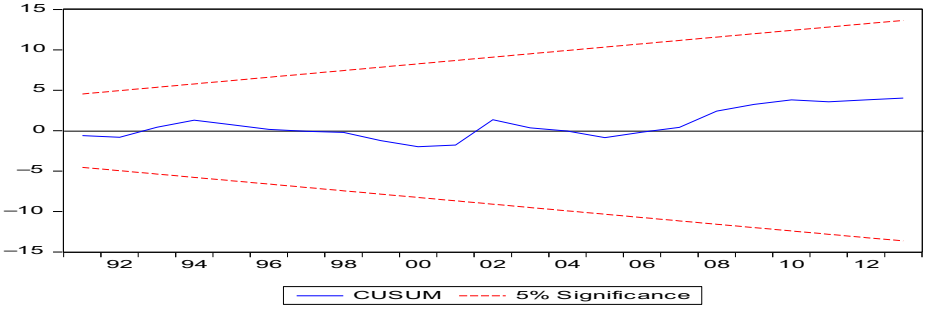

Figure 1.
Plot of cumulative sum of recursive residuals (India)

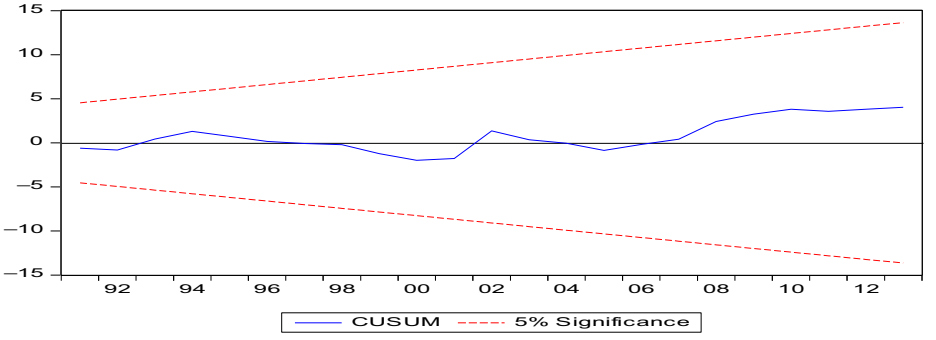

Figure 2.
Plot of cumulative sum of squares of recursive residuals (India)

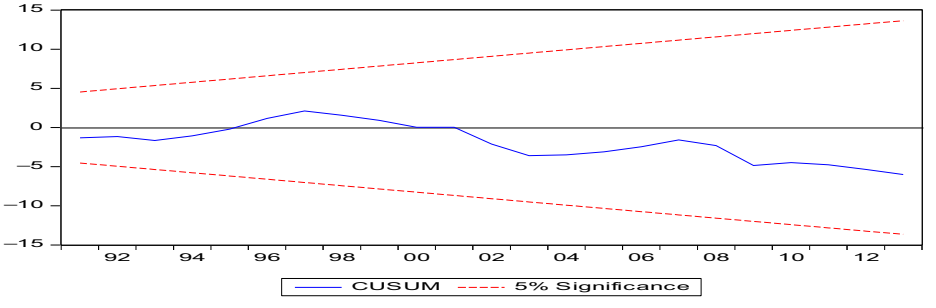

Figure 3.
Plot of cumulative sum of recursive residuals (China)

Granger cause each other, while economic growth Granger causes inflation, but inflation does not Granger cause economic growth in India in the short run. In this regard, India needs to enhance the capacity of its economy via greater expansion of physical and financial infrastructures which also requires a well-developed financial system activities and sound institutional reforms to realize the higher gains and full potential from the process of globalization.

Additionally for China, there is no evidence of feedback Granger causality effects between financial development and economic growth in the short run. Similarly, no statistically significant Granger causality feedback effects are found between globalization and economic growth in the short run. Similarly, there is no feedback causality effect for both inflation and economic growth, except for the evidence of bidirectional Granger causality between capital and economic growth in China especially in the short run.

The present analysis suggests that China is not gaining anything from the path of greater globalization and financial development, both in the short and long runs. From policy perspective, it can be said that China has accelerated the growth momentum in advance of acceleration of globalization and financial development. As a result, globalization could be introducing more competition that puts the growth momentum at risk and financial development could accelerate the pace of capital outflows, further undermining the capacity of the Chinese economy to reap the full benefits of financial resources in support of economic growth.

6. Concluding remarks, policy implications and future research directions

The linkage between economic growth and financial development are widely discussed in the previous literature. However, less attention has been paid on the growth effect of overall globalization in developing countries due to the notion of "New Economy" (Stiglitz, 2004) or "Modern Economy" (Prempeh, 2004). According to Stiglitz (2004) and Prempeh (2004), Boockmann and Dreher (2003) and Li and Reuveny (2003) globalization not only implies more trade and financial openness but induces rising information flows and cultural convergence across countries.

Stiglitz (2004) argues that globalization results in faster communication of ideas and leads to a greater integration to bridge the knowledge gap as well as to link disconnected capital markets in support of faster growth in developing countries. From a modern economy perspective, Prempeh (2004) argues that developing economies and societies have increased the tendency of integrating with each other and with developed countries in the process of globalization. Globalization can be widely understood as the interplay of technological innovations and rapid advances in accumulation of human capital (Gurgul and Lach, 2014).

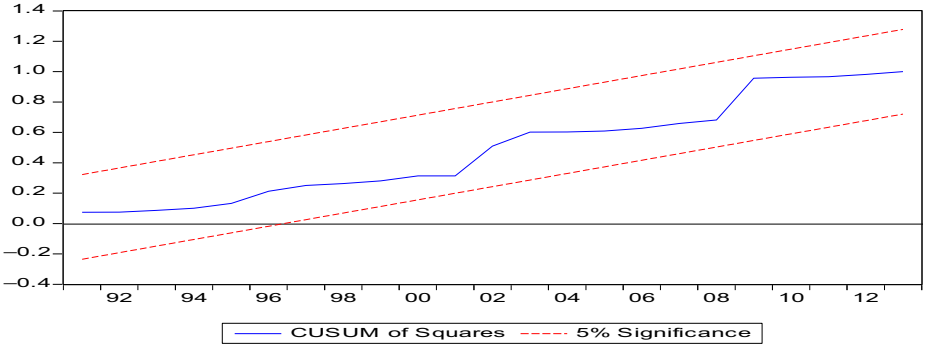

Figure 4.
Plot of cumulative sum of squares of recursive residuals (China)

Table VI.
VECM granger causality analysis

Dependent variable	Short run $\Sigma\Delta\ln Y_{t-1}$	$\Sigma\Delta\ln FD_{t-1}$	$\Sigma\Delta\ln G_{t-1}$	$\Sigma\Delta\ln K_{t-1}$	$\Sigma\Delta\ln IN_{t-1}$	Long run ECM_{t-1}
India						
$\Delta\ln Y_t$	…	3.1397*** [0.0553]	2.2408 [0.1210]	4.1800** [0.0223]	8.7200* [0.0008]	−0.3718** [−2.1402]
$\Delta\ln FD_t$	10.9881* [0.0002]	…	6.3545* [0.0043]	0.0607 [0.9511]	5.3159* [0.0095]	−0.0753* [−2.8459]
$\Delta\ln G_t$	1.5972 [0.2161]	1.2838 [0.2890]	…	0.9889 [0.3816]	1.5019 [0.2360]	…
$\Delta\ln K_t$	14.0987* [0.0000]	2.5216*** [0.0944]	0.0639 [0.9381]	…	2.8931*** [0.0684]	−0.5442* [−3.3791]
$\Delta\ln IN_t$	0.9341 [0.4022]	2.5272*** [0.0940]	4.8528** [0.0136]	3.8589** [0.0379]	…	−0.1135* [−2.8011]
China						
$\Delta\ln Y_t$	…	1.9842 [0.1720]	0.5721 [0.5761]	8.1383* [0.0022]	0.2051 [0.8168]	−0.1307** [−2.4236]
$\Delta\ln FD_t$	1.1048 [0.3568]	…	0.6872 [0.5181]	1.9472 [0.1771]	3.2429*** [0.0675]	−0.0641** [−2.5567]
$\Delta\ln G_t$	1.0449 [0.3759]	1.9885 [0.1714]	…	4.2017** [0.0356]	0.2311 [0.7964]	−0.7823* [−3.1558]
$\Delta\ln K_t$	4.1177** [0.0375]	2.9962*** [0.0804]	3.3878*** [0.0611]	…	0.4997 [0.6164]	−0.4775** [−2.1692]
$\Delta\ln IN_t$	0.4177 [0.6655]	2.2412 [0.1386]	0.1712 [0.8441]	0.9808 [0.3964]	…	…

Note: *, ** and *** denote the significance at the 1, 5 and 10% level, respectively

It is not surprising to admit the positive implications of globalization in helping technology spillovers and enhancing economic infrastructure as well as ensuring positive impacts on economic development (OECD, 2007). Given that globalization has become a hot topic in the academic professions, it is only timely to devote more attention to analyze the growth effects of globalization in emerging economies.

Motivated by the importance of globalization on economic performance as well as due to the existence of a current research gap on the topic, this study, for the first time, makes an empirical comparative analysis to examine the impacts of globalization and financial development on the economic growth of developing economies, such as India and China, by incorporating capital and inflation in an augmented growth equation covering the annual time series data from 1970 to 2013.

The evidence illustrates the growth effects of globalization and financial development for India and China from 1970 through 2013. We have used Bayer and Hanck's (2013) combined cointegration approach to investigate the long-run relationships between the macroeconomic variables, both in India and China. Apart from using traditional ADF (1979) unit root test for testing time series properties of the level variables, we have additionally used the dynamic structural break test developed by Zevot and Andrews (1992) that accommodates unknown structural break points stemming from the series. Furthermore, Pesaran *et al.* (2001) ARDL bounds testing cointegration approach is applied to test the robustness of our long-run estimates. The long-run estimates obtained from the bounds test validate the presence of cointegration between the macroeconomic variables which is also consistent with the results of the combined co-integration technique.

After confirming the existence of cointegration between the variables, the study finds that financial development increases economic growth of India, both in the short and long runs, while financial development only adds to the economic growth of China in the long run only. The study further finds that globalization accelerates economic growth in India but impairs economic growth in China. The result additionally discloses that acceleration in capitalization is positively linked with economic growth, while inflation, as a proxy for aggregate demand, adds to economic growth in India and China. The short-run causality results emanating from VECM model indicate that both financial development and economic growth Granger cause each other, but globalization does not Granger cause economic growth in India. In the case of China, no short-run feedback Granger causality effects exist between financial development and economic growth, as well as between globalization and economic growth.

The results emerging from the long-run estimates offer some tentative policy bearings for both emerging economies (India and China). The results reveal that both globalization and financial development contribute positively to the growth and development of the Indian economy, reinforced by the positive impacts of acceleration in capital and inflation, as a proxy for aggregate demand. In other words, globalization and financial development provide a win–win situation for India to increase its economic growth and become more environmentally sustainable. But in the case of China, despite realizing the positive effects of capital and inflation, financial development only appears to be a significant factor, positively contributing toward growth, while globalization has adverse effect on economic growth. China needs to further open up its economy by developing the banking sector, stock market and other institutional activities to reap the benefits of globalization and maximize its capacity to withstand increased competition from global competitors. The study further infers that more financial development increases the benefit of globalization on economic growth in countries that strive to stay more integrated in the global economy through trade and financial linkages.

Needless to say, there are some limitations to our study. While we have only used an overall globalization index, there are some advantages of looking at the impacts of various individual globalization subcomponents (social, economic and political) on the growth of real output in both India and China. Further, our study only uses domestic credit to the private sector as a proxy of financial development in India and China. However, stock market development can be used as another proxy for financial development because the equity market can also play an important role in channeling funds to the production and investment processes of firms.

Our empirical results should be interpreted with caution because we have selected only four key growth enhancing variables (globalization, financial development, capital and inflation, as a proxy for aggregate demand) in comparison to more than 50 such potential variables used in various empirical growth and development studies. Moreover, our augmented growth equation framework can be extended to incorporate additional variables subject to the availability of data and theoretical justifications. Despite these limitations, we believe that our study has provided well-suited findings for the needs of policymakers to understand the success growth stories in developing economies, like India and China. The validity or refutation of our findings for both India and China, therefore, needs further empirical investigations with consideration to disaggregated globalization measures and other newly developed time series and panel data techniques.

Our study offers some possible directions for future research that is likely to be carried out effectively to provide general policy implications for the sustainable growth and development of other developing economies. Possible future directions could be an extension of this research to other South Asian economies or to BRICS economies with the use of time series techniques. The second possibility could be an extension of this subject into the vintage of panel data analysis with the implementation of advanced panel techniques. Another direction that is vital to explore is the linear and non-linear effects of financial development index on economic growth of developing countries with a goal to examine the permanent and temporary effects of the overall financial development index on economic growth, especially in the presence of overall globalization index. In addition, it would be again useful for policymakers if future research focuses on exploring the efficient channels through which financial development affects economic growth in developing countries. It is hoped that this research and related agendas would inform policymakers to design an efficient policy framework for fostering sustainable growth and development in developing countries with a goal to further narrow the gap between the academic growth literature and necessary policies to foster sustainable growth and lasting development.

Notes

1. We have extrapolated data ranging from 2011 to 2013 for India and China.
2. Karanfil (2009) in his recent study argues that the use of advanced time series technique will produce accurate inference and contribute sufficient information to policymakers of developed and developing economies for forecasting sustainable growth and development.
3. Shahbaz (2012) argues that financial development helps an economy in reaping the fruits of trade openness.
4. For more description of the pre-1949 history of China's financial system, see AQQ (2008); for more anecdotal evidence on China's financial system in the same period, see Kirby (1995) and Lee (1993).
5. The Chinese central bank reports that domestic currency bank loans accounted for 52% of "Total Social Financing". This increases to 59% after excluding those sources that are not identifiable as credit (Elliot and Yan, 2013).

6. BOC, among the oldest banks currently in operation, was originally established in 1912 as a private bank and specialized in foreign currency-related transactions.
7. At the end of 2007, the total market capitalization of the two domestic exchanges (SHSE and SZSE) was around US$1.8tn, whereas total investment in the real estate market was around US$3.12tn (see the recent study by Allen *et al.*, 2012).
8. See Dreher (2006) for more details on construction of overall globalization index (economic globalization and political globalization indices).
9. We have used consumer price index to transform all the series into real terms, and then population series is used to convert the variable into per capita terms, except for the globalization index.
10. For details, follow Bayer and Hanck's (2013) original paper.
11. However, the main limitation with the Engle–Granger cointegration test is that if there is a mistake in the first step, then it feeds into the third step and ultimately provides biased empirical evidence. Once it provides biased and wrong empirical inference, then it also leads to misguiding policymakers about their policy making design for the sustainable growth and development in the economy.
12. Inder (1993), however, criticized the Philips and Hansen (1990) test and preferred to apply fully modified OLS for long-run estimates compared to estimates of an unrestricted error correction model.
13. This approach is unable to provide any conclusive empirical results if some of the variables are integrated at I(2).

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Study	Period covered/study area	Methodology	Major findings
Group A: Studies on finance-growth nexus in India			
Misra (2003)	(1981-2000) annual data are used for 25 Indian states	VECM model	The study significantly supports the credit-output nexus in the Indian states
Deb and Mukherjee (2008)	(1996Q4-2007Q1) quarterly data are used for India	Non-linear Granger causality test proposed by Toda and Yamamoto (1995)	The supply leading hypothesis is validated
Chakraborty (2008)	(1993Q2-2005Q2) quarterly data are used for the Indian economy	Johansen cointegration test	The stock market development plays a minor role in enhancing growth while bank credit contributes significantly to economic growth
Pradhan (2009)	(1993-2008) monthly data are used for India	Granger causality test in a VAR model	In long run, feedback effect is found between financial development and economic growth
Hye (2011)	(1978-2008) annual data are used for India	ARDL cointegration bounds-testing procedure	Financial development impairs economic growth
Saha (2012)	Theoretical study for India	Trend analysis	Financial sector reforms lead to economic growth
Kendall (2012)	(1991-2001) panel data are used for 209 districts of 9 states in India	OLS and 2SLS techniques	The non-linear relationship exists between local financial development and state level growth across nine districts of various states
Ray (2013)	(1990-1991 to 2010-2011) annual data are used for India	Granger causality test	Financial development causes economic growth

(*continued*)

Table AI. Summary on finance-growth nexus for India and China

Table AI.

Study	Period covered/study area	Methodology	Major findings
Group B: Studies on finance-growth nexus in China			
Allen *et al.* (2005)	(1990-2002) annual data are used for China	Theoretical study	Financial sector promotes economic growth
Liang and Teng (2006)	(1952-2001) annual data are used for China	Multivariate VAR framework	Economic growth causes financial development
Hassan *et al.* (2009)	(1986-2002) panel data are used for 31 provinces in Mainland China	OLS and two-step GMM techniques	Financial markets and institutional development add in economic growth
Jalil *et al.* (2010)	(1977-2006) annual time series data are used for China	Principal components and ARDL bounds testing approaches	Financial development fosters economic growth
Zhang *et al.* (2012)	(2001-2006) cross-sections and panel data are used for 286 Chinese cities	Cross sectional regression and panel GMM techniques	Financial development is positively associated with economic growth
Chen *et al.* (2013)	(1978-2010) cross sectional panel data are used for 28 high- and low-income provinces in China	Hansen's (1999) threshold regression model	Finance has positive impact on growth in high-income provinces, but negative impact in low-income provinces

Note: The definition of financial development varies across studies