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Revisiting linkages between financial development, trade openness and economic growth in South Africa: fresh evidence from combined cointegration test

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Abstract This study revisits the impact of financial development on economic growth in South Africa by incorporating trade openness in the production function. The paper covers the period of 1970–2011. We apply the Bayer–Hanck combined cointegration approach to examine the long run relationship between the variables. Our results indicate that financial development stimulates economic growth. Capital use adds in economic growth but trade openness impedes economic growth. The demand-side hypothesis is validated in South Africa. This paper suggests that government should redirect trade policies to reap optimal fruits of financial development for long run economic growth.

Keywords Financial development · Trade openness · Economic growth · South Africa

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1 Introduction

Determinants of economic growth remain a relevant and exciting topic in economics and almost stand unresolved as much as its effects on financial development and vice versa. Whether financial development induces economic growth or economic growth induces stock market capitalization and financial intermediation or whether there is a two-way relationship is discussed in different scales by using different methods. Theoretically, financial development is discussed from the threefold dimension: supply, demand and feedback hypothesis (Enisan and Olufisayo 2009). As policymakers struggle to have a stable economy and find a sustainable growth for their countries, finance and growth connection becomes more crucial. That is why the rate of growth of new research in this area is almost exponential (Murinde 2012). Financial development in a broad sense means the transfer of funds from savers to investors through financial intermediaries in an efficient way. Efficiency refers to accuracy and speed in transferring role of financial intermediaries (Hye and Dolgopolova 2011). Although the existing literature has different results on the individual country level or cross-country level, the weight of the evidence is in favor of the argument that growth and financial markets make a difference (Murinde 2012).

Our motivation is to examine the linkages between financial development, trade openness and economic growth in South Africa. South Africa has a well-developed financial sector, with a wide range of financial institutions and instruments. It includes various commercial banks, South African Reserve Bank, life insurance companies, Post Office savings bank, the Development Bank of Southern Africa, unit trusts and micro-lenders. In addition, there are investment firms and the Land Bank that provide finance primarily for agricultural investments. In 1997, the country had about 51 licensed banks and five mutual (community) banks. Currently, there are a total of about 77 banks these include about 12 local banks, 60 foreign banks, two mutual banks, two development banks, and a post bank. Even with the enormous banks, the market share of the banking sector is still ruled by a few banks. During the mid-1990s, four banking groups clutched more than 95 % of the banks' total assets (Odhiambo 2013).

The South Africa's stock market is measured to be one of the most developed markets as both money and capital markets are active in South Africa. But, the South African capital market is considered to be more robust. The expansion of the stock market, can be drawn to back as the nineteenth century. The Johannesburg Stock Exchange (JSE) was formed in 1887 and presently cited one of the largest stock exchanges in the world in terms of market capitalization. At present South African securities are traded concurrently in Johannesburg, New York, Frankfurt, Zurich and London. The JSE offers trading markets in equities, equity derivatives, commodity derivatives and interest rate products. The Bond Exchange of South Africa (BESA) was first licensed to trade in 1996, during 2001; it became one of the most liquid emerging bond markets in the world. The number of listed companies has also increased exponentially since the 1990s. In 2003, the number of listed companies on the JSE had climbed to 472, and the market capitalization was appraised at US$182.6 billion, while the average monthly traded value was US$6399 million. As of November 2011, the JSE had a market capitalization of US$799.7 billion. During 2011, JSE is considered to be 17th largest stock exchange in terms of bonds traded, just after the London Stock Exchange Group.

During 2010–2011, bonds value traded increased from US$2321 billion to US$2898 billion. Whereas, the JSE ranked number five worldwide in 2011 (in terms of single stock futures), which amounted to about 48 million contracts traded (World Federation of Exchanges 2012).[1] Accordance with international standards, the financial sector in South

[1] http://www.relbanks.com

Africa is wide-ranging, and highly sophisticated. During 1994, South Africa's total domestic credit to the private sector as a percentage of GDP was estimated at 114 %, while the total domestic credit to the private sector as a percentage of GDP (DCP/GDP) from all SSA countries was only 62 %. This later increased to 135 % in 2011, whereas the collective average DCP/GDP from all SSA countries was only 58 %. On the stock market development front, the total stock market capitalization of listed companies as a percentage of GDP (SCAP/GDP) was about 166 % in South Africa, while the collective average SCAP/GDP of all SSA countries was only 119 %, later increased significantly to about 279 % in 2010 (Odhiambo 2013).

This paper contributes in existing economic literature by revisiting financial development-economic growth nexus in the case of South Africa by incorporating trade openness in the production function. We apply structural break unit root test and combined cointegration test to examine integrating properties and long run relationship between the variables. The VECM Granger causality is applied to investigate the direction of the causal relationship between the series. We find that financial development and capital use add in economic growth but trade openness declines it. The causality is running from economic growth to financial development validating the demand-side hypothesis in South Africa.

2 Literature review

Financial development, a term usually refers to the development of stock market and credit channels, has been widely discussed in the existing literature from the economic growth perspective as well as from different perspectives. The idea first suggested by Schumpeter (1912) and then promoted by some others (Goldsmith 1969, McKinnon 1973, Shaw 1973, Levine 1997) that in order to achieve a high rate of economic growth, financial development is a necessary condition. However, in earlier theoretical stages, the connection between financial development and economic growth is also considered low or non-exist. For instance, Stern (1989) did not indicate the financial system's role in economic growth in his survey of development economics and Lucas (1988) argued that the role of financial factors in economic development is usually exaggerated. Robinson (1952) and Romer (1990) viewed financial development as the servant of economic development and responding passively to the demand for financial services. Asli Demirgüç-Kunt and Levine (1996b) found that initial level of stock market development is important for financing choices of the firms. Asli Demirgüç-Kunt and Levine (1996a) provides a broad array of indicators of stock market and financial intermediary development, using data of 44 developing and industrial countries over the period 1986–1993.

Levine and Zervos (1996) found in a cross-country analysis that stock market development is positively and robustly linked to long-run economic growth. Levine and Zervos (1998) extended the earlier research and showed that stock market liquidity and banking development predict growth, capital accumulation, and productivity improvements. Arestis et al. (2001) examined the cointegration between financial development and economic growth for five developed countries namely Germany, the United States, Japan, the UK and France by employing quarterly data of both banks and stock markets. For selected countries, they confirmed an evidence of long run positive impact of bank and stock market on economic growth. Bank and stock market promote economic growth but the effect of the former is stronger. They also suggested that the contribution of stock markets on development is overestimated in studies where cross-country growth regression is used. Beck and Levine (2004) used a panel data covering the period of 1976–1998 and applied generalized method of moments

techniques and confirm their earlier findings that stock markets and banks positively and without bias affect economic growth.

Some studies, including but not limited to Christopoulos and Tsionas (2004); King and Levine (1993); Neusser and Kugler (1998) and Rousseau and Wachtel (1998) documented a positive relationship between economic growth and financial development. Contrary to that, Jung (1986), view financial development is driven by economic growth. Luintel and Khan (1999) and Demetriades and Hussein (1996) documented the bidirectional relationship between financial development and economic growth. Arestis and Demetriades (1997) assessed the evidence of financial development and growth nexus and resulted that cross-country regression may not reflect country level occurrences as time-series estimation of single countries exhibit significant variation across countries regardless of the fact that the same variables and estimation methods are utilized. Bank development might lead economic development though bank legal codes are also important in bank development (Levine 1998). Therefore there are additional variables that might differentiate from one country to another.

There is country specific literature regarding financial development and economic growth. Chang (2002) studied the relationship between financial development and economic growth in Mainland China for the period of 1987–1999 by applying the Vector Error Correction Model (VECM) Granger causality approach and found a neutral effect between both variables. Shan and Jianhong (2006), on other hand, found by using an innovative accounting approach that financial development contributed to economic growth in China for the period of 1978–2001 and economic growth also improves the demand for financial services through feedback effect. By applying the Johansen-Juselius cointegration approach and using neo-classical production function in case of China, Hye and Dolgopolova (2011) found the availability of long run relationship between financial development and economic growth. Their analysis showed that financial development adds in economic growth together with capital and labor. Perera and Paudel (2009) analyzed causality between financial development and economic growth for Sri Lanka over the period of 1955–2005. They applied the VECM Granger causality approach and showed that financial development contributes economic growth meaning i.e. supply-side hypothesis and economic growth enhances financial development i.e. demand-side hypothesis.

Using structural vector autoregressive models (SVAR) approach, Rahman (2004) examined the association between financial development and economic growth and found that financial development support investment which further increases economic growth for Bangladesh between 1976–2005. Majumder and Eff (2012) examined the same relation by using district level data for Bangladesh and found that financial development does not have a conclusive role to promote economic growth as the financial resources are allocated to inefficient investment projects. Hossain and Kamal (2010) analyzed the long run causal link by using Engle-Granger and ML tests and found that stock market development in Bangladesh from 1976/1977 to 2008/2009 strongly influences the economic growth; however they found no causality between stock market development and economic growth. Marques et al. (2013) tested by using VAR modeling for Portugal if stock market causes economic growth over the period of 1993–2011 and no evidence of causality is found from bank financing to economic growth while there is evidence of Granger bidirectional causality between the stock market and economic growth.

Asante et al. (2011) analyzed Ghana over the period of 1992–2009 by applying Autoregressive Distributed Lag (ARDL) / Dynamic Ordinary Least Square (DOLS) model and find that bank competition is good for economic growth in long run while the stock market and economic growth has a disproportion. Dritsaki and Dritsaki-Bargiota (2005) found by using a multivariate VAR that over the period of 1988:1 to 2002:12 stock market and bank devel-

opment have a causal relationship with economic growth for Greece. Cheng and Degryse (2010) finds by using a fixed effects panel model controlling for the province and time fixed effects that banking development is significant and has a more sound influence on economic growth in China over the period 1995–2003. N'Zué (2006) found a long-run relationship between Gross Domestic Product (GDP) and stock market together with a unidirectional causality running from stock market development to economic growth for Côte D'Ivoire over the period from 1976 to 2002 by applying a time series analysis and single equation regression. Gurgul and Lukasz (2012) analyzed the financial development from pre-crisis and after crisis perspective for Poland for the period 2000Q1 to 2011Q4 by applying linear and nonlinear Granger causality between GDP and financial development. Before the crisis, causality runs from stock market development to economic growth and then to banking sector development while after crisis banking sector had a much more significant impact on economic growth than before the crisis. On other hand, stock market had a significant effect on economic growth before 2008 and a negative significant shock effect happened during the crisis.

Nurudeen (2009) and Ovat (2012) found that stock market development increases economic growth in Nigeria and the latter research found more emphases on market liquidity than market size. On other hand, following the earlier models of Levine and Zervos (1996) and using a data set over 1989–2009, Osamwonyi and Kasimu (2013) empirically found that there is no causal relationship between stock market and economic growth in Ghana and Nigeria while a bidirectional causal relationship is available between stock market development and economic growth in Kenya. Ageli and Zaidan (2012) found a positive relationship between financial sector development and economic growth in Saudi Arabia over the period 1970–2012 by using some proxies and applying several techniques including unit root tests, the cointegration test and the VECM Granger causality test. Carp (2012) analyzed Romania over the period 1995–2010 showed real investment which indirectly generate positive externalities on stock market indicators and in the real sector in Romania cause a higher rate of economic growth. Granger causality tests showed no impact on economic growth of market capitalization and stock value traded. Anwar and Nguyen (2011) examined the link between financial development and economic growth for the period of 1997 to 2006 by using a panel dataset of Vietnam. The endogenous growth theory based analysis reveals that financial development contributed to economic growth in Vietnam. There are several more research at country level. For instance Hondroyiannis et al. (2005) found a long run association between financial development and economic growth over the period of 1986–1999 for Greece. Similar results for long run impact of bank and stock market development on growth is confirmed by Nieuwerburgh et al. (2006) in case of Belgium.

Bolbol et al. (2005) find a positive impact of stock market development on total factor productivity and negative impact of banks development on total factor productivity for Egypt for the period 1974–2002. Abu-Bader and Abu-Qarn (2008) examined the period of 1960–2001 for causal relationship between financial development and economic growth in Egypt. By adding investment as an additional variable, they applied tri-variate VAR framework and their results strongly suggests a mutually causal relationship and that financial development causes economic growth through investment and increased efficiency. Ang (2008) investigates Malaysia by using annual data for the period 1960–2003 and finds that financial development causes growth by encouraging private savings and investments. The findings also suggest that finance leads higher growth through improved efficiency of investment. Utilizing the superexogeneity methodology, Yang and Yi (2008) for 1971–2002 data of Korea, they find that development control causes economic growth but not vice versa. The finding backs the "finance causes growth" view for Korea and reject "growth causes finance" view. In addition

to country specific literature, cross-country level literature is also very extensive. Kagochi and Al Nasser (2013) analyzed in their panel data analysis of 7 Sub-Saharan Africa countries over the period 1991–2007 and found that the stock market and bank sector development both add in economic growth while other financial intermediaries seems not to have any significance in economic development.

Caporale et al. (2005) have examined the said relationship in Chile, Korea, Malaysia and Philippines by using quarterly data for the period 1979Q1 to 1998Q4. These countries have consistent data series and in their different stages of stock market development. They found that stock market improves the economic growth in long run through investment productivity. Murinde (2012) analyzed global and African evidence on financial development and economic growth and suggest that foreign direct investment (FDI) exercise a serious and positive impact on African countries while cross-border bank lending has a larger impact than FDI. Enisan and Olufisayo (2009) investigated seven sub-Sahara African countries and found cointegrating relationship for Egypt and South Africa in long run and causality for all seven countries (Côte D'Ivoire, Egypt, Kenya, Morocco, Nigeria, South Africa, and Zimbabwe) for period 1980–2004 by applying an unrestricted error correction model. They also found unidirectional or bidirectional relations depending on the model they apply but not a good answer that fits all.

Wu et al. (2010) analyzed 13 European Union (EU) countries for the period of 1976–2005. They found a long run equilibrium relationship among banking development, stock market development and economic development through simple endogenous growth model application, a modified model of Pagano (1993). Stock market capitalization and liquidity have also a positive long run effect on economic development. They also found a short term negative effect between liquidity and economic development. Pagano (1993) also concluded that financial intermediation can affect growth through savings or through the marginal productivity of investment. Five Euronext countries (Belgium, France, Portugal, Netherlands and United Kingdom) investigated by Boubakari and Jin (2010) and they suggest a Granger causality relationship between stock market and economic growth for countries where stock market is liquid and highly active while they reject the causality relationship for countries where stock market is small and less liquid.

Masoud and Hardaker (2012) analyzed 42 emerging markets over 12 years from 1995 to 2006 and found that stock market development alone or after the influence of banking sector, has a significant effect on growth and effect remains strong even after the influence of banking sector and other control variables using an endogenous economic growth model. Barakat and Waller (2010) using a linear multivariate regression tested that a well-functioning banking system promotes economic growth for Middle Eastern countries while market based factors may hinder financial market's ability to play their roles. Adjasi and Biekpe (2006) found a positive relationship between stock market development and economic growth in 14 African countries by accommodating the framework of Levine and Zervos (1996) and adopting Generalized Method of Moments (GMM) dynamic instrumental variable modeling approach. What revealed from their study is that stock market development is significant for upper middle income economies while it is not for low income countries. So, for a better growth target to improve the stock markets might be a policy option for these low income countries. Andrianaivo and Yartey (2010) examined banking system and stock market development for Africa and indicated the main determinants of bank development as income level, creditor rights protection, financial repression, and political risk while they indicate stock market liquidity, domestic savings, banking sector development, and political risk as the main determinants of stock market development. They used panel data for 53 African countries for the period of 1990–2006. They highlight that high income countries with well-

developed institutions will benefit more from capital liberalization for their financial market development. Tachiwou (2010) found in the time series investigation they conducted for 1995–2006 that stock market development positively affect economic growth in West African monetary union both in short run and long run. Gregorio and Guidotti (1995) by using a cross-sectional samples of 98 countries validate a positive relationship between banking sector development and economic growth with a relatively weaker effect on high-income countries than that of low-income countries. Their findings also confirm that efficiency is the principal transmission channel from financial development to growth, rather than the volume of investment. Deidda and Fattouh (2002), on other hand found a positive effect of financial development on economic growth. The overall positive effect they found holds significantly only for higher per capita income countries while insignificant for low-income per capita countries by reusing King and Levine (1993) data.

Using VAR for a set of 47 countries over the period of 1980–1995 annual data Rousseau and Wachtel (2000) show important role of stock market liquidity: developing deep and liquid financial markets has potential gains in global economy. Calderón and Liu (2003) examined the direction of causality between financial development and economic growth by pooling data from 109 developing and industrial countries over the period of 1960–1990. They find that first, financial development pushes economic growth through more capital accumulation and productivity growth; second, the bidirectional Granger causality between financial developments to economic growth is sexist; third, contribution of financial deepening to the causal relationships is more in developing countries than developed countries; four, the effect of financial development on economic growth will be larger for the longer sampling interval. Demetriades and Hussein (1996) used a sample of 16 countries where they examined co-integration between banking and economic growth. To measure banking sector development, they used growth rate of financial service providers instead of liquid liabilities. The analysis found bidirectional causality, in most cases running from economic growth to financial development, between banking sector development and economic growth with a less support to supply leading hypothesis. Moreover, they displayed that the results of this nexus are very country specific.

Luintel and Khan (1999) also confirmed the bidirectional causality between financial development and economic growth by using multivariate VAR system and adding real interest and per capita stock to the bivariate VAR system for 10 sample countries. Christopoulos and Tsionas (2004) used a panel cointegration in 10 countries and report single cointegrating vector and confirm the long run relationship between financial development and economic growth. In same way, Apergis et al. (2007) concluded through panel cointegration estimation to a single hypothesized vector the bidirectional relationship between financial intermediaries development and economic growth. After controlling for stock market capitalization Naceur and Ghazouani (2007) verify a negative relationship between economic growth and bank development for 10 MENA countries. Kar et al. (2011) analyze MENA countries for the period 1980–2007 by applying a panel Granger causality testing procedure developed by Konya (2006) and they find no clear direction of causality between economic growth and financial development. For all measurements the observed findings are also country specific. Deidda and Fattouh (2008) used cross-country data set of Aslı Demirgüç-Kunt and Levine (2004) and modifying the standard growth regression to contain stock market and financial development and find that higher levels of stock market development has significant negative interaction effect while bank development to long-run growth is less positive. They add imperfect information about the quality of investment and moral hazard to their interaction between market and bank-finance. Cooray (2010) study 35 developing countries from medium to low income countries for the period 1992–2003 by augmenting the Mankiw–Romer–Veil (MRW)

model (Mankiw et al. 1992) with a stock market variable and their results show support for the stock market augmented model. His findings also evidence that there is a convergence among the economies.

Cole et al. (2008) analyzed panel data from 18 developed and 18 emerging market countries from 1973 to 2001 and find a positive and significant relationship in their fixed-effect dynamic model between bank stock returns and future GDP growth. As their research tie two strands of the growth literature by analyzing the stock returns of banking industry and future economic growth. Shen et al. (2011) employ four types of nonlinear tests and reject the linearity in financial development for the data from 46 countries over the period from 1976 to 2005. They also identify an inverted-U shaped relationship between banks and economic growth. Therefore, bank development and economic growth is positively related before a specific threshold while it is negatively related after the threshold. They also found that in contrast to bank–growth relation, an asymmetric $\surd$-shaped relationship is discovered between stock market development and economic growth. Beck et al. (2000) examined the impact of financial development on the sources of economic growth by using a cross-country sample over the period 1960–1995 and a panel technique to control for biases related with simultaneity and unobserved country specific effects. They conclude that relation between financial intermediary developments and real per capita GDP growth and total factor productivity growth are economically large and statistically significant.

Although a huge literature on the financial development is available, either country level or cross country level, the interest is still growing by also accommodating some other potential variables. For instance, whether trade openness hurts or spurs the relationship of growth and financial development is another dimension of the literature. Economic growth, trade liberalization and financial reform relationship are also covered in the literature. There is sufficient literature that supports the positive link between growth, trade openness and financial development. The more open trade and financial policies a county has the more likely grow faster compared to those who have repressed financial and trade policies (Jin 2000; Levine 1997; McKinnon 1973 and Shaw 1973). Yanikkaya (2003) concludes that trade liberalization does not have a straightforward relation with growth by using a panel data of over 100 countries both developed and developing from 1970 to 1997. Trade and financial liberalization policies aim to promote productivity by decreasing inefficiencies in investment. Shahbaz (2012, 2013) investigated the relationship between financial development and economic growth by incorporating trade openness in production using Pakistani data. Shahbaz reports that trade openness strengthen finance-growth relationship. Shahbaz et al. (2013) examined the relationship between financial Development, domestic Savings and poverty using Cointegration and Granger Causality Analysis and reported that feedback effect exists between financial development and poverty reduction in the long run but strong causality is running from fall in poverty to financial development in the short run. In the case of South Africa, Odhiambo (2010) applied the trivarite model to examine the causality between financial development, investment and economic growth by using the ARDL bounds testing approach to cointegration. The results revealed that investment leads economic growth which Granger causes financial development. The empirical findings by Odhiambo (2010) may be biased as he ignored the role trade openness while investigating the finance-growth nexus in South Africa. Trade openness not only stimulates economic growth but also strengthen the domestic financial sector by creating competition among local and foreign banks in the host country. Trade openness enables the country to reap optimal fruits of trade openness if the domestic financial sector is strong. This study is a humble effort to fill the gap regarding South Africa to investigate the relationship between financial development, trade openness and growth.

3 Theoretical background, model construction and data collection

Numerous literature is available investigating the relationship between financial development and economic growth using production function. The nature of the relationship between financial development and economic growth is an open question for academicians as well as for researchers. The vagueness in empirical findings may be due to use of a variety of indicators of financial development and misspecification of empirical models. The existing empirical studies reported 'finance-led growth hypothesis i.e. financial development Granger causes economic growth, growth-led finance hypothesis i.e. economic growth leads to financial development, feedback hypothesis i.e. financial development causes economic growth and in resulting, economic growth causes financial development and, neutral hypothesis i.e. no causality exists between financial development and economic growth. For example, production function by Uddin et al. (2013) for Kenya, Cobb-Douglas production function by Shahbaz (2012) for Pakistan, growth accounting equation by Odhiambo (2010, 2011) for South Africa and Tanzania, growth model by Acaravci et al. (2011) for Sub-Saharan Africa and many others who investigated the impact of financial development on economic growth ignoring the role of trade openness on financial development and hence on economic growth. We use Cobb-Douglas production function following Mankiw et al. (1992) and assuming marginal contribution of capital and labor in production, production function in period t is given below:

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

where Y_t is the real domestic output, A is technological progress, K is capital stock and labor is L. We extend the Cobb-Douglas production function by assuming that technology can be determined by the level of financial development and international trade. Financial development contributes economic growth by enhancing capital formation in an economy. This shows that financial development transfers the incentives of producers towards the goods with increasing returns to scale, the inter-sectoral specialization and therefore the structure of trade flows, is determined by the relative level of financial intermediation. Well-developed financial sector enhances the capacity of an economy to reap fruits from international trade by diffusing technological advancements to stimulate economic growth. International trade is also contributing economic growth by efficient allocation of internal and external resources, shift of technological advancements from developed countries to developing economies and less developed countries exploit innovations by developed countries i.e. learning by doing effects. This leads us to model the empirical equation as follows:

$$A(t) = \phi \cdot T(t)^{\alpha}F(t)^{\delta} \tag{2}$$

where ϕ is time-invariant constant, T is indicator of trade openness and F is financing development. Substituting Eq. 2 from Eq. 1:

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

Dividing both sides by population while keeping the impact of labor constant and taking logs, Eq. 2 can be modeled as follows:

$$\ln Y_t = \varphi_1 + \varphi_2 \ln F_t + \varphi_3 \ln TR_t + \varphi_4 \ln K_t + u_i \tag{4}$$

where, $\varphi_1 = \log \phi$ is the constant term, $\ln Y_t$ is log of real GDP per capita, $\ln F_t$ is real domestic credit to private sector per capita proxy for financial development, $\ln TR_t$ is log of

trade openness (exports + imports), ln K_t is a real capital stock per capita and u_i is an error term assumed to be constant.

The data on real GDP, real trade (exports + imports), real capital and real domestic credit to the private sector has been obtained from world development indicators (CD-ROM, 2011). The series of population is used to all the series of real GDP, real trade (exports + imports), real capital and real domestic credit to private sector into per capita terms. The study covers the time period of 1970–2011.

4 Methodological framework

Prior to testing for cointegration, it is the standard way to check the stationary properties of the series. The study period witnessed some major upheavals in the global stage which can cause structural breaks in the macroeconomic dynamics. The ARDL bounds test works regardless of whether or not the regressors are I(1) or I(0) / I(1), the presence of I(2) or higher order renders the F-test unreliable (See Ouattara 2004). We check the stationarity properties using Ng and Perron (2001) with intercept and trend keeping in mind that it is not appropriate in the presence of structural break in the series. So, we apply the Zivot and Andrews (1992).[2]

In econometric analysis, the time series is said to be integrated if two or more series are individually integrated, but some linear combination of them has a lower order of integration. Engle and Granger (1987) formalized the first approach of cointegration test which is a necessary criteria for stationarity among non-stationary variables. This approach provides more powerful tools when the data sets are of limited length as most economic time-series are. Later, another cointegration test called *Johansen maximum eigenvalue test* was developed by Johansen (1995). Since it permits more than one cointegrating relationship, this test is more generally more applicable than the Engle–Granger test. Another main approach of cointegration testing of which its technique is based on residuals is the *Phillips–Ouliaris cointegration test* developed by Phillips and Ouliaris (1990). Other important approaches include the Error Correction Model (ECM) based F test of Boswijk (1994), and the ECM based t test of Bannerjee et al. (1998).

However, different tests might suggest a different conclusion. To enhance the power of cointegration test, with the unique aspect of generating a joint test-statistic for the null of no-cointegration based on Engle and Granger, Johansen, Peter Boswijk, and Banerjee tests, the so called B*ayer-Hanck* test was newly proposed by Bayer and Hanck (2013). Since this new approach allows us to combine various individual cointegration test results to provide a more conclusive finding, it is also applied in this paper to check the presence of a cointegrating relationship between financial development and economic growth in the South African economy. Following Bayer and Hanck (2013), the combination of the computed significance level (p value) of individual cointegration test in this paper is in the Fisher's formulas as follows:

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

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

where p_{EG}, p_{JOH}, p_{BO} and p_{BDM} are the p values of various individual cointegration tests respectively. It is assumed that if the estimated Fisher statistics exceed the critical values provided by Bayer and Hanck (2013), the null hypothesis of no cointegration is rejected.

[2] For more details see (Zivot and Andrews 1992).

Table 1 Descriptive statistics

Variables	$\ln Y_t$	$\ln FD_t$	$\ln K_t$	$\ln TO_t$
Mean	10.3677	10.2815	8.5388	9.5585
Median	10.3606	10.1187	8.5562	9.5885
Maximum	10.5237	11.0215	9.0741	9.9988
Minimum	10.2556	9.5346	8.1390	9.2570
SD	0.0722	0.3904	0.2448	0.1883
Skewness	0.4846	0.4370	0.3271	0.3853
Kurtosis	2.4317	2.0985	2.2462	2.7999
Jarque-Bera	2.2089	2.7590	1.7433	1.1095
Probability	0.3313	0.2517	0.4182	0.5741
Sum	435.4466	431.8257	358.6321	401.4600
Sum Sq. Dev.	0.2141	6.2503	2.4589	1.4538

Once the long run relationship is established among the series, we test the direction of causality using the following error correction representation[3]:

$$(1-L)\begin{bmatrix}\ln Y_t\\ \ln F_t\\ \ln TR_t\\ \ln K_t\end{bmatrix} = \begin{bmatrix}\beta_1\\ \beta_2\\ \beta_3\\ \beta_4\end{bmatrix} + \sum_{i=1}^{p}(1-L)\begin{bmatrix}B_{11i}B_{12i}B_{13i}B_{14i}\\ B_{21i}B_{22i}B_{23i}B_{24i}\\ B_{31i}B_{32i}B_{33i}B_{34i}\\ B_{41i}B_{42i}B_{43i}B_{44i}\end{bmatrix} \times \begin{bmatrix}\ln Y_{t-1}\\ \ln F_{t-1}\\ \ln TR_{t-1}\\ \ln K_{t-1}\end{bmatrix} + \begin{bmatrix}\alpha_1\\ \alpha_2\\ \alpha_3\\ \alpha_4\end{bmatrix} ECT_{t-1} + \begin{bmatrix}\varepsilon_{1t}\\ \varepsilon_{2t}\\ \varepsilon_{3t}\\ \varepsilon_{4t}\end{bmatrix} \tag{7}$$

where, $(1-L)$ is the lag operator and ECT_{t-1} is the lagged residual obtained from the long run ARDL relationship; ε_{1t}, ε_{2t}, ε_{3t}, ε_{4t},and ε_{5t} are error terms assumed to be N(0, σ,). Long run causality requires a significant t-statistic on the coefficient of ECT_{t-1}. A significant F-statistic on the first differences of the variables suggests short run causality. Additionally, joint long-and-short runs causal relationship can be estimated by the joint significance of both ECT_{t-1} and the estimate of lagged independent variables. For instance, $B_{12,i} \neq 0 \forall_i$ shows that financial development Granger causes economic growth while Granger causality runs from economic growth to financial development is indicated by $B_{21,i} \neq 0 \forall_i$.

5 Results interpretations

Table 1 shows the descriptive statistics and we find that standard deviation is low in economic growths series as compared to a series of trade openness and capital. Financial development series shows the high standard deviation. The Jarque-Bera statistics show that all the series are normally distributed with zero mean and constant variance.

The integrating properties of the variables are investigated by applying Ng and Perron (2001) unit root test. This unit test is superior to ADF, PP, DF-GLS and KPSS due to its predicting power. This test is suitable for small sample data and provides efficient results regarding unit root properties of the variables. The results are reported in Table 2. We find

[3] If cointegration is not detected, the causality test is performed without an error correction term (*ECT*).

Table 2 Ng-Perron unit root test

Variables	MZa	MZt	MSB	MPT
$\ln Y_t$	−5.8319(1)	−1.6053	0.2752	15.4542
$\ln FD_t$	−6.3759(3)	−1.7236	0.2703	14.2827
$\ln K_t$	−3.1919(1)	−1.0325	0.3234	23.7695
$\ln TO_t$	−8.4799(2)	−2.0514	0.2419	10.7715
$\Delta \ln Y_t$	−21.6160(3)**	−3.2842	0.1519	4.2358
$\Delta \ln FD_t$	−26.5479(1)*	−3.6428	0.1372	3.4351
$\Delta \ln K_t$	−27.0016(4)*	−3.6732	0.1360	3.3812
$\Delta \ln TO_t$	−35.8041(5)*	−4.1699	0.1164	2.8777

Note * and ** show significance at 1 and 5 % levels respectively. () Indicates the legs

Table 3 Zivot-Andrews unit root test

Variable	At level		At 1st difference	
	T-statistic	Time break	T-statistic	Time break
Y_t	−3.427 (1)	1990	−6.071(0)**	1982
FD_t	−4.260 (0)	1992	−10.293(1)*	1992
K_t	−3.179 (3)	1999	−5.742(2)*	1985
TO_t	−3.546 (1)	1982	−5.710(0)*	2005

Note * and ** represent significant at 1 and 5 % level of significance. Lag order is shown in parenthesis

Table 4 Lag length selection

Lag	LogL	LR	FPE	AIC	SC	HQ
VAR lag order selection criteria						
0	98.75455	NA	9.12e−08	-4.859207	−4.688586	−4.797990
1	262.2841	285.1285[a]	4.75e−11	-12.42483	−11.57172[a]	−12.11874[a]
2	279.1774	25.98960	4.67e−11[a]	-12.47063	−10.93504	−11.91968
3	295.9737	22.39504	4.81e−11	−12.51147[a]	−10.29339	−11.71564

[a] Indicates lag order selected by the criterion
LR Sequential modified LR test statistic (each test at 5 % level), *FPE* Final prediction error, *AIC* Akaike information criterion, *SC* Schwarz information criterion, *HQ* Hannan-Quinn information criterion

that series of economic growth, financial development, capital and trade openness have a unit root problem at the level. The variables are found to be stationary at first difference. This indicates that the variables are integrated at I(1). The problem with Ng-Perron unit test is that it provides biased empirical evidence if series contains a structural break. The structural break arising in the series may be a cause of unit problem which is ignored by Ng-Perron unit test.

To overcome this issue, we have applied the Zivot-Andrews unit root test which accommodates the information about single unknown structural break in the series (Table 3). The results reported in Table 4 reveal that all the variables have a unit root problem at level in the presence of structural break in the series. After first differencing, we find that variables are found to be stationary. This implies that all the series are intergrated at I(1).

As the unit root test shows that all variables follow the $I(1)$, the combined cointegration tests are proceeded. Table 5 illustrates the combined cointegration tests including the EG–

Table 5 The results of Bayer and Hanck cointegration analysis

Estimated Models	EG–JOH	EG–JOH–BO–BDM	Cointegration
$Y_t = f(FD_t, K_t, TO_t)$	5.366	9.274	No
$FD_t = f(Y_t, K_t, TO_t)$	13.521	24.688	Yes
$K_t = f(Y_t, FD_t, TO_t)$	8.385**	17.878**	Yes
$TO_t = f(Y_t, FD_t, K_t)$	19.098*	29.546**	Yes
Significance level	Critical values	Critical values	
1 % level	16.259	31.169	
5 % level	10.637	20.486	
10 % level	8.363	16.097	

Note * and ** represent significant at 1 % and 5 % levels respectively. Critical values at 5 % level are 10.576 (EG–JOH) and 20.143 (EG–JOH–BO–BDM) respectively

JOH, and EG–JOH–BO–BDM tests. The result reveals that Fisher-statistics for EG–JOH and EG–JOH–BO–BDM tests, for the case of FD_t, K_t, TO_t are greater than 5 % critical values indicating that both EG–JOH and EG–JOH–BO–BDM tests statistically reject the null hypothesis of no cointegration between variables. However, the result of combined cointegration tests for the case of Y_t fails to reject the null hypothesis of no cointegration. Our finding shows that there is a cointegration between FD_t, K_t, TO_t and their determinants, but not for the case of Y_t. This implies that the long run relationship exists between financial development, capital, trade openness and economic growth over the period of 1970–2011.

The long run as well as short run results are discussed in Table 6. We find that in long run financial development adds in economic growth at 5 % level of significance. All else is same, a 1 % increase in financial development boosts economic growth by 0.3170 %. The relationship between capital and economic growth is positive and it is statistically significant at the 1 % level of significance. A 1 % increase in capital is positively linked with economic growth by 0.2827 % by keeping other things constant. Trade openness impedes economic growth. This relationship is statistically significant at the 10 % level of significance. We find that a 0.0624 % economic growth is impeded by 1 % increase in economic growth if other things remain same. The high value of R^2 indicates that economic growth is explained more than 80 % by financial development, capital and trade openness.

In the short run, we find that financial development is negatively related to economic growth but it is statistically insignificant. The relationship between capital and economic growth is positive and it is statistically significant at the 1 % level of significance. Trade openness adds in economic growth at 1 % level of significance. Table 6 shows the estimate of lagged error term i.e. ECM_{t-1} which is statistically significant at 5 % having negative sign. This indicates the speed of adjustment from short run towards long-run equilibrium path. Bannerjee et al. (1998) suggested that "significance of the lagged error term further validates the established long-run relationship between the variables". We find that coefficient of ECM_{t-1} is -0.1662 significant at the 5 % level of significance. It means that a 16.62% of disequilibrium from the previous year's shock seems to converge back to long-run equilibrium of economic growth in the current period. It will take almost 6 years to reach the long run equilibrium path of growth function in case of South Africa.

We have also applied the VECM Granger causality approach to examine the cause and effect of each variable. It is argued by Granger (1969) that if variables have unique level of integration then we should apply the VECM Granger causality test to detect the direc-

Table 6 Long run and short run analysis

Dependent variable: ln Y_t				
Variables	Coefficient	T-statistics	Coefficient	T-statistics
Long run analysis				
Constant	8.2247*	0.2270	36.2255	0.0000
ln FD_t	0.3170**	0.1508	2.1020	0.0422
ln K_t	0.2827*	0.0202	13.9307	0.0000
ln TO_t	−0.0624***	0.0347	−1.7970	0.0803
R^2	0.8660			
Adj. R^2	0.8550			
F-statistic	81.9127*			
Short run analysis				
Constant	0.0024	0.0023	1.0219	0.3136
ln FD_t	−0.0156	0.0186	−0.8411	0.4058
ln K_t	0.1918*	0.0380	5.0349	0.0000
ln TO	0.1356*	0.0284	4.7663	0.0000
ECM_{t-1}	−0.1662**	0.0802	−2.0727	0.0454
R^2	0.7227			
dj. R^2	0.6919			
F-statistic	23.4664*			

Note *, ** and *** show significance at 1 %, 5 % and 10 % levels respectively

Table 7 The VECM Granger Causality Analysis

Variables	Direction of Granger Causality				
	Short Run				Long Run
	$\Delta \ln Y_t$	$\Delta \ln FD_t$	$\Delta \ln K_t$	$\Delta \ln TO_t$	ECT_{t-1}
$\Delta \ln Y_{t-1}$	….	1.2500	3.2698**	20.2212*	
		[0.2497]	[0.0506]	[0.0000]	
$\Delta \ln FD_{t-1}$	1.5196	….	0.0738	3.5626**	−0.2815***
	[0.2357]		[0.9092]	[0.0404]	[−1.7758]
$\Delta \ln K_{t-1}$	14.9383*	1.5323	….	1.5238	−0.2143**
	[0.0000]	[0.2323]		[0.2338]	[−2.5209]
$\Delta \ln TO_{t-1}$	12.5533*	1.9897	4.7720**	….	−0.2663**
	[0.0001]	[0.1557]	[0.0162]		[−2.6835]

Note *, ** and *** represent significance at 1 %, 5 % and 10 % levels respectively

tion of the causal relationship between the variables. If there is confirmed cointegration between the variables then there must be a causality at least from one direction. Long run causality analysis reveals that financial development Granger causes economic growth and validates the supply-side hypothesis in South Africa. This finding is contradictory with Odhiambo (2010) who reported the demand-side hypothesis i.e. economic growth Granger causes financial development. The bidirectional causality is found between financial development and capitalization. The relationship between financial development and economic growth is

bidirectional. Capital Granger causes trade openness and resultantly trade openness Granger causes capital. Economic growth is Granger cause of trade openness and capital (Table 7).

In short run analysis, we find that the feedback effect exists between capital and economic growth. Trade openness Granger causes economic growth and resultantly, economic growth Granger causes trade openness. The neutral effect is found between financial development and economic growth. Capital Granger causes trade openness.

6 Concluding remarks and recommendations

This paper revisits the relationship between financial development and economic growth by incorporating trade openness in the case of South Africa over the period of 1971–2011. We have applied structural break unit root test in order to examine the stationarity properties of the variables. The presence of cointegration between the variables is investigated by applying the combined cointegration approach. Our empirical evidence confirms the presence of cointegration between financial development, trade openness, capital and economic growth in South Africa.

Furthermore, financial development facilitates economic growth. Capital adds in economic growth. Trade openness impedes economic growth. The unidirectional causality is found running from economic growth to financial development. Financial development Granger causes trade openness and in the resulting, trade openness Granger causes financial development. The feedback effect exists between capital and financial development and the same is true for trade openness and capital. Trade openness and capita Granger cause economic growth.

The findings of this study strongly support policies to encourage financial development of the financial sector in South Africa thus help stimulating economic growth. This means that policy makers should adopt policies that reinforce financial development in a country through fiscal or monetary interventions. In monetary intervention context, polices of easing credit constraint should be allowed. This would allow reducing the capital cost and thus efficient allocation of financial resources. Such policies should be anchored provided that stable macroeconomic environment in South Africa is sustained.

The adverse effect of trade openness on economic growth is justified by the South Africa trade regimes, which have been, varies since last three decades. After the adoption of import substitution industrialization policy, South Africa trade policy has enthralled on accomplishing larger openness through export stimulus during 1970s and 1980s and later through more rigorous efforts towards trade liberalization. Despites these efforts, soaring and uneven tariffs and a multifarious system of quantitative restrictions were, however observed in South Africa during 1990s. Even though, 1990s was a period of remarkable trade liberalization, earlier years of 1990s observed rise in protection and average nominal tariff rate mount to approximately 20 % by 1993 and tariff rate was uneven across the different commodities.[4] In retrospect, one important policy implications are that South Africa trade policy should be strongly incorporated into the process of growth stimulus initiatives. Such measures should also address encouraging financial sector development (reducing capital constraints), entice foreign direct investment as well as increasing the size of investment ratio in real sector of the economy.

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[4] For more details, See Xinshen et al. (2006).

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