Re-Visiting Financial Development and Economic Growth Nexus: The Role of Capitalization in Bangladesh

Shahbaz, Muhammad and Rehman, Ijaz ur and Ahmed Taneem, Muzaffar

COMSATS Institute of Information Technology, Lahore, Pakistan, University of Malaya, Kuala Lumpur, Malaysia, University of Western Sydney, Australia

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Muhammad Shahbaz
Department of Management Sciences,
COMSATS Institute of Information Technology,
Defense Road, Off Raiwind Road, Lahore, Pakistan
Email: shahbazmohd@live.com
Phone: +92-334-3664-657

Ijaz Ur Rehman
Department of Finance and Banking
Faculty of Business and Accountancy
University of Malaya, Kuala Lumpur, Malaysia
Email: ejaaz.1983@gmail.com
Phone: +603 (0) 146179742

Ahmed Taneem Muzaffar
School of Business
University of Western Sydney
Locked Bag 1797, Penrith, NSW 2751, Australia
Email: taneemm@yahoo.com

Abstract: This paper revisits the relationship between financial development and economic growth in Bangladesh by incorporating trade openness in production function using quarter frequency data over the period of 1976-2012. We applied combined Bayer-Hanck cointegration to examine cointegration amongst variables in the presence of structural breaks. The results show that financial development facilitates economic growth but capitalization impedes it. In addition, trade openness stimulates economic growth. Labour is also positively linked with economic growth. The causality analysis reveals the feedback effect between financial development and economic growth. Trade and labour Granger cause economic growth. This paper provides new insights for policy making authorities to use financial development and trade openness as tool to sustain economic growth in long run. This paper also suggests policy makers to utilise capitalization in proper way to sustain economic growth for long run.

Keywords: Financial development, trade openness, Bangladesh
JEL Classification: E1, E44

Introduction

Theoretical and empirical research in recent years suggests that financial development plays an important role in economic development. According to Stiglitz (1994, p. 23) "Financial markets essentially involve the allocation of resources. They can be thought of as the 'brain' of the entire economic system, the central locus of decision making; if they fail, not only will the sector's profits be lower than would otherwise have been, but the performance of the entire economic system may be impaired". Despite its importance, research in this topic in the context of Bangladesh, a developing country in South Asia, is relatively scant. In a recent study, *Hye, QMA and Islam, F. (2013), Does financial development hamper economic growth: empirical evidence from Bangladesh? Journal of Business Economics and Management, 14(3), 558-582*, have investigated the relationship between financial development and economic growth in Bangladesh using time series data over the period of 1975-2009. They applied the traditional unit root test to examine the integrating properties of the variables. The ARDL bounds testing approach to cointegration is also applied to test whether cointegration between variables exists. They found that the variables are cointegrated in the long run. Empirical evidence of their study also reveals that financial development impedes economic growth. In addition, capital and labour facilitate economic growth but real interest rate declines it. These empirical findings reported by Hye and Islam (2013), however, seem to be biased because of methodological problems. For instance, log-linear specification of the empirical model suffers from the problem of misspecification since the authors have used real interest rate in log form analysis[1]. The problem arises since real interest is already in growth rate. Moreover, the empirical model has problem of multi-colinearity. This is because the authors have used both real interest rate and capital as independent variables at the same time in the model. Theoretically, capital is a function of interest rate (McKinnon, 1973; Shaw, 1973)[2]. Interest rate affects private investment through the allocation of domestic credit to private sector. The negative relationship between interest rate and money demand is usually based on the short-term liquidity effect. Additionally, money demand is a decreasing function of interest rate because of opportunity cost of cash holding. Therefore, increase in money supply must propel a decline in interest rate to keep the money market in equilibrium (Alatiqi and Fazel, 2008). In a situation where real interest rate is negative or very low, a surge in real deposit rate tends to encourage private savings-substitution effect dominates income effect as well as investment in physical capital to bank deposit. On other hand, at higher interest rate, economic agent would desire to deposit the funds that yield higher return than investment in capital. Hence, investment at high interest rate tends to have negative relationship with bank rate (McKinnon, 1973). This implies that interest rate affects money supply, allocation of domestic credit as well as capital formation in an economy.

On the empirical side, Hye and Islam, (2013) also ignored the role of structural breaks common in time series data of financial and economic variables. The government of Bangladesh started to implement financial liberalizations (reforms) in the 1980s to improve the performance of financial sector by mobilizing savings and allocating financial resources to

[1]The authors have used real interest rate in log form which is already in growth rate. Technically, it is inappropriate to take log of growth rates and it creates the problem of misspecification of empirical model.

[2] McKinnon (1973) and Shaw (1973) argued that interest rate is inversely linked with capital formation in developing economies.

productive ventures. These financial reforms not only affected financial variables but also economic variables such as economic growth, capitalization, private investment, and exports (Murshed and Robin, 2012). Therefore, the implications of the structural breaks, due to the financial reform, on unit root tests and on examination of integrating properties of the variables are critical. In the presence of structural breaks, the application of the ARDL bounds testing approach becomes useless. This method of cointegration does not seem to accommodate information about structural breaks and provides spurious results. It is recommended by Arize et al. (2000) to apply structural break cointegration approach to examine cointegration between the variables. Our objective is to overcome the above empirical problems and revisit the relationship between financial development and economic growth in case of Bangladesh.

The finance-growth nexus has been well documented in the economic literature and there is enormous debate over the direction of causality. This debate further intensifies following recent financial crisis given the significance of financial sector reforms and economic consequences of financial liberalization. The financial crisis of 2007-2008 triggers the need to reinvestigate the finance and growth nexus and improves the regulations of financial institutions to provide a safeguard for the unforeseen crisis. Plenty of research in this area has been done and contradictory results have been obtained. Therefore, it has become a controversial issue in existing financial economics literature. Following pioneering work on Schumpeter (1911), who suggested that well functioning financial market, is stimulus of technological innovation and thus technological innovation increase economic growth. Various researchers have extended the investigations of finance-growth using different framework and methodologies (e.g. Levine, 2005; Levine, 1997; Greenwood and Smith, 1997; King and Levine, 1993a; Roubini and Sala-i-Martin, 1992; Bencivenga and Smith, 1991; Greenwood and Jovanovich, 1990).

Previous attempts to answer this questions yield four different strands in economics literature namely supply-side hypothesis, demand-side hypothesis, feedback hypothesis and neutrality hypothesis. The original view about financial development and economic growth relationship suggests that developed financial markets stimulate growth by promoting savings to efficient investment projects (see, Goldsmith, 1969; Gurley and Shaw, 1955) while repressed financial system resultantly have an adverse affect on economic growth. Financial repression happens as result of frequent intervention in financial markets by authorities. Such frequent inference includes changes in bank reserve requirements, interest rate ceiling and credit supply to only preferred sector of an economy. The endogenous growth literature (see for example, Levine, 2005; Levine, 1997; Greenwood and Smith, 1997; King and Levine, 1993a; Roubini and Sala-i-Martin, 1992; Bencivenga and Smith, 1991; Greenwood and Jovanovich, 1990) underscore the positive impact of financial system on economic growth. Their proposition highlights that financial system plays its role in allocating resource to efficient investment projects, minimizing information problems, transaction and monitoring cost, saving mobilization and diversifying associated risk. Resultantly, more speedy accumulation of physical capital, efficient allocation of resources and rapid technological progress will yield economic growth.

Given that direction of causality has important implications for policy stance, research suggests that the direction of causality depends on degree of financial development. According to this proposition, financial development causes economic growth during its first phases of development. This effect, however, steadily reduces with development process until the development process in reversed (Rachdi and Mbarek, 2011). In their model, Greenwood and Smith (1998) show financial markets develop after a period of economic development and consequently promoting real growth. There have been various econometric approaches to investigate the relationship between financial development and economic growth. Majority of past researches that have investigated the finance-growth relationship were based on cross-sectional data and used relative less robust techniques such as standard OLS (Ordinary Least Square). Such studies results confirm positive impact of financial development and economic growth (Levine and Zervos, 1998; King and Levine, 1993a, b; Goldsmith, 1969). Conversely, few researcher (e.g. Barro, 1991; Khan and Senhadji, 2003; Chuah and Thai, 2004) argue that conclusions based on cross-sectional data and their subsequent analysis have several econometric issues and thus unreliable. For instance, the results derived from estimation of cross-section data are sensitive to sample of chosen countries in a sense that it is unsuitable to illustrate policy suggestions from results got from cross-country studies that consider different economies homogenously. Since the properties of different nations differ from each other's based on the traits of their economic and political system, level of financial development, various institutional arrangements and the role of financial institutions in capital market. The heterogeneity issue hold true for developing and emerging countries when compared with developed countries. Moreover, cross-sectional studies lack taking advantages of time-varying aspects in the cross-sectional data. Khan and Senhadji, (2003) noted that problem of causality cannot be properly handled in cross-countries studies. In view of time series approach, the implications of structural breaks stemming in the variables are also important. Esso (2010) highlighted that it is now suitable in time series analysis to accommodate structural breaks to examine whether chosen model unfolding the data under consideration are subject to structural breaks. The power of cointegration test reduces piercingly when relationships in the framework are subject to structural changes. Structural shifts in particular influence long run properties when model(s) drift time series, hence accounting for structural breaks have significant implications in integrated multivariate analysis (Kasman et al. 2008; Andrade et al. 2005). Given the inappropriateness of time series studies in finance-growth nexus, subsequent problems associated with time series data and the notion that pattern of causality differ significantly across countries, countries specific studies have taken lead in this respect.

The present study contributes to the existing literature in five ways: (i), we use longer time series data over the period of 1976Q1-2012Q4. (ii), we have extended Cobb-Douglas production function by incorporating trade openness as a potential determinant of both financial development and economic growth. (iii), we have used unit root test accommodating single unknown structural breaks stemming in the series. (iv), we have applied the ARDL bounds testing to examine cointegration between the variables in the presence of structural breaks and (v), the robustness of cointegration is tested by applying Bayer and Hanck, (2013) cointegration approach. Our findings, unlike Hye and Islam (2013), indicate that financial development stimulates economic growth but capitalization declines it. In addition, we find that trade openness and labour contribute to economic growth.

II. Literature Review

In broad sense, financial development refers to transformation of savings into productive investment areas by all the financial institutions. In narrow sense, however, financial development refers to efficient operation by financial intermediaries to transfer the funds' flow from savers to investors. This implies that financial development is not just a growth in stock markets, financial intermediaries, tools or instruments but also speed, accuracy and efficiency in fund transferring (Hye and Dolgopolova, 2011). Aziz and Duenwald (2002) stated that financial development could influence economic growth through three main mechanisms. First, it increases the fraction of saving, which could be channelled to investment through financial development. Second, it boosts the marginal productivity of the capital through collecting information to assess the alternative investment projects. Finally, financial development also helps in increasing the percentage of private savings. Several research studies have documented positive relationship between positive relationship financial development and economic growth (Shahbaz, 2012; Khan and Qayyum, 2006; Khan et al. 2005; Chistopoulos and Tsionas, 2004; Levine et al. 2000; Rousseau and Wachtel, 1998; Neusser and Kugler, 1998; King and Levine, 1993b). Conversely, some studies view that financial development is propelled by economic growth (Levine et al. 2000; Khan and Senhadji, 2000; Jung, 1986; Robinson, 1952). On other hand, few researches document the bidirectional relationship between financial development and economic growth (Luintel and Khan, 1999; Demetriades and Hussein, 1996). Further, some studies consider that this nexus is overstressed and finance does not matter in economic growth (Lucas, 1988).

In cross-sectional settings, using sampling of 98 countries, Gregorio and Guidotti (1995) document significantly positive relationship between banking sector development and economic growth. They further highlight differences in some group of countries and across time by documenting that the impact of financial development on economic is relatively weak in high-income countries than that of low-income countries. On contrary, Levine (1993a), Deidda and Fattouh (2002) find overall positive influence of financial development on economic growth. By using same data set and threshold model, they report that this relationship holds significant only for high per capita income countries and insignificant for low-income per capita countries. As discussed earlier that cross-sectional specification might to be subject to simultaneity bias and other specification issues associated with it, economic growth might influence financial development as well. Resultantly, several studies used instrumental variables to gauge financial development. Levine et al. (2000), Levine (1999); La Porta et al. (1997) and La Porta et al. (1998) utilized legal environment and regulatory indicators to comb exogenous factor of banking sector development. They document the positive relationship between financial development and economic growth and argue that better regulatory and legal environment can promote well functioning of financial institutions. In a similar vein, Levine (1998) suggests total factor productivity and capital accumulation propel the effect of banking sector development on economic growth. Using same approach, Beck et al. (2000) document relative less robust impact on capital accumulation. Using total productivity improvement approach, Beck and Levine (2004) examine the impact of stock market development and financial intermediaries on economic growth. They document positive impact of both stock market development and financial intermediaries on economic growth. Replicating the analysis of Beck et al. (2000) by grouping the countries according to

degree of financial development, Rioja and Valev (2004a) reported that banking sector development has positive impact on economic growth. They further noted that this impact remain significant until it reaches to some threshold.

Using VAR settings, Rousseau and Wachtel (2000) examine the linkages between banks, stock market and economic growth. They report Granger causality running from stock market and banks toward economic growth. They do not find any indication of the reverse causation running from economic growth to stock market and banks. Using pooled data from 94 countries, Calderon and Liu (2003) examine the direction of causality between financial development and economic growth. They noted three different findings. First, financial development propels economic growth. Second, financial intermediaries contribution is relatively stronger in developing nations. Finally, their causality analysis revealed the bidirectional causality between financial development and economic growth when sample is split between developing and developed countries. Meanwhile, time series approach to investigate the causal relationship between financial development and economic growth is also developed to counter the country specific estimation dilemma. Using 16 countries sample, Demetriades and Hussein (1996) examined cointegration between banking and economic growth. They used growth rate of financial intermediaries instead of liquid liabilities as a measures of banking sector development. Their analysis supported less to supply leading hypothesis in a sample of 16 nations but found bidirectional causality between banking sector development and economic growth. In most case, direction of causality is running from economic growth to financial development. Moreover, they exposed that results of this nexus are very country specific. In similar vein, using multivariate VAR system and adding real interest and per capita stock to the bivariate VAR system, Luintel and Khan (1999) confirmed the bidirectional causality between financial development and economic growth. In contrast, Xu (2000) finding indicates the impact of financial development on economic growth in 41 countries. Arestis et al. (2001) investigate cointegration between banks development, stock market and economic growth and provide an evidence of long run positive impact of bank and stock market on economic growth. Using panel cointegration in 10 countries, Christopoulos and Tsionas (2004) report single cointegrating vector and confirm long run relationship between financial development and economic growth. In similar vein, Apergis et al. (2007) use panel cointegration estimation to a single hypothesized vector unlike Christopoulos and Tsionas (2004), which let several vectors of cointegration using Johansen approach and concluded that there is bidirectional relationship between financial intermediaries' development and economic growth.

In a time series framework, Arestis et al. (2001) examined the relationship between financial development and economic growth in developed countries using quarter frequency data. Their results confirm the impact of stock market and banking sector development on economic growth. In case of Greece, Hondroyiannis et al. (2005) examined the relationship between financial development and economic growth over the period of 1986-1999 and confirmed the presence of long run positive association between the variables. Similarly, in case of Belgium, Nieuwerburgh et al. (2006) investigated the relationship between financial development and economic growth and suggested the long run positive impact of both bank and stock market on economic growth. In case of Egypt, Bolbol et al. (2005) reported the positive impact of

stock market development on total factor productivity and negative impact of banks development on total factor productivity. In case of 10 MENA countries, Ben et al. (2007) document negative relationship between economic growth and banks development after controlling for stock market capitalization. In case of Malaysia, using six equation models, Ang (2008) investigates the relationship between financial development and economic growth to provide mechanism connecting these two important variables. Ang (2008) finding reveals that financial development causes economic growth through encouraging both private saving and private investment. Repressive financial policies, such as high reserve requirements, direct credit program and controlling interest rate positively contributes to financial development whereas, other government interventions such as public investment programs and resource allocation via operation broad-based employee provident fund seems to have negative impact on economic development.

In single country case studies, for example, Chang (2002) uses quarterly data over the period of 1987-1999 to examine the relationship between financial development and economic growth in Mainland China. He applies the VECM Granger causality approach and finds the neutral effect between both variables. Shan and Jianhong (2006) explored the relationship between financial development and economic growth using Chinese data over the period of 1978-2001. They have applied innovative accounting approach and found that financial development has contributed to economic growth and in result, economic growth also enhances the demand for financial services and increases financial development i.e. feedback effect. Hye and Dolgopolova, (2011) apply the Johansen-Juselius cointegration approach to probe the relationship between financial development and economic growth using neo-classical production function in case of China. They find the existence of long run relationship between the variables. Their analysis reveals that financial development adds in economic growth. Chakranorty, (2010) investigates the finance-growth nexus in India using different indicators of financial development by extending Mankiw et al. (1992) growth model. She reports that stock market capitalization (financial development indicator) adds in economic growth but Real wealth, debt burden, real effective exchange rate and the rate of growth of labour decline it. Using rolling regression, Hye (2011) investigates the relationship between financial development and economic growth in case of India over the period of 1973-2008. He noted that financial development impedes economic growth. Perera and Paudel, (2009) investigate the causality between financial development and economic growth in case of Sri Lanka using data over the period of 1955-2005. They have applied the VECM Granger causality approach and found that financial development contributes economic growth i.e. supply-side hypothesis and economic growth enhances financial development i.e. demand-side hypothesis. Regmi, (2012) uses stock market capitalization as an indicator of financial development to examine its impact on economic growth in case of Nepal. The Johansen and Juselius, (1990) is applied to examine long run relationship and direction of causal relationship between the variables is investigated by applying the VECM Granger causality. He finds the presence of cointegration between the variable over the period of 1994-2011 and financial development contributes to economic growth.

Khan et al. (2005) probe the relationship between financial development and economic growth by applying the ARDL bounds testing approach to cointegration in case of Pakistan. They report that variables are cointegrated for long run relationship. Their analysis indicates that financial development and financial liberalization enhance economic growth via promoting investment activities. Later on Shahbaz et al. (2008) and Shahbaz, (2009) confirm that financial development stimulates economic growth in Pakistan. Jalil and Feridun, (2011) generate an index of financial development to revisit the finance-growth nexus in Pakistan. They note that financial development, capitalization and trade openness increase economic growth but real interest rate declines it. Shahbaz, (2012) uses Cob-Douglas production function and notes that financial development and trade openness are contributing factors to economic growth in Pakistan. Rahman, (2004) investigates the association between financial development and economic growth in case of Bangladesh over the period of 1976-2005. He applies the structural VAR (SVAR) approach and reported that financial development supports investment which increases economic growth. This confirms the validity of supply-side hypothesis in Bangladesh. Alauddin and Anthon, (2012) use district level data to examine the role of financial development in determining economic growth in case of Bangladesh. They report that financial development does not have conclusive role to promote economic growth due to allocation of financial resources to inefficient investment projects. But Hye and Islam, (2013) report that financial development and real interest rate impede economic growth but labour and capital add in it.

While there is growing interest in examining the relationship between financial development and economic growth at country specific level, several research studies have extend this conversation from bivariate framework to multivariate framework accommodating other potential variable(s) to examine the mechanism that link both these variables. Most notably, financial liberalization in the context of trade openness is being allowed in a multivariate framework to investigate whether trade openness hurts or spurs this relationship. The relationship between financial reforms, trade liberalization and economic growth is acutely covered in economic literature. Sufficient amount of literature support the view that there is positive link between trade openness, financial development and economic growth. Nations having more open trade and financial policies are likely to grow faster as compared to those who have repressed financial and trade policies (Shaw, 1973; Mckinnon, 1973; Levine, 1997; Fry, 1995, 1997; Jin, 2000). The main objective of both trade and financial liberalization policies is to promote productivity by minimizing inefficiencies in investment. With the growing interest in empirical investigation of relationship between trade openness and growth among academicians and policymakers, the findings fail to pin point the exact relationship between trade openness and financial development and their impact on economic growth. This study is humble effort to fill the gap in case of Bangladesh.

III. Model Construction and Data Collection

The correct specification of empirical model is an important assumption of Classical Linear Regression Model (CLRM) and well-debated research problem in applied economics (Kmenta, 1986; Lin et al. 2012). The specification problem may be either due to incorrect functional form of the model or inclusion of irrelevant variable(s). The exclusion of potential variable(s) also plays its role to create misspecification problem (Light, 2010). These types of

empirical models provide inefficient and spurious results, which cannot provide guidance to policy makers in designing compressive economic policy (Shahbaz, 2012). Similarly, Cameron (1994) and Ehrlich (1996) suggested of using the log-linear specification while investigating the relationship between the variables. The log-linear speciation provides efficient and consistent empirical results (Shahbaz, 2010). It is also argued by Lütkepohl (1982) that omission of irrelevant variable provides potentially inappropriate and biased empirical findings. The bivarite system provides no causal relationship between two variables due to overlooking of other relevant variables but we have causality between the variables once other potential variables are incorporated in the empirical model. Further Bartleet and Rukmani, (2010) suggested to incorporate other potential variables to avoid misspecification and spurious problem. Chang, (2002) exposed that unit root and cointegration tests provide robust empirical findings if longer time series data is available. Existing applied economics literature also provides numerous studies where short time series data is also used (see for more details; Chang, 2002).

The relationship between financial development and economic growth is well debated research area both for researchers and academicians. The nature of relationship between financial development and economic growth is an open question. There is ambiguity in findings due to various definitions of financial development indicators and misspecification of empirical models. The existing empirical studies on finance-growth nexus reveals finance-led growth i.e. supply side hypothesis or growth-led finance i.e. demand side hypothesis or neutral hypothesis assuming financial development and economic growth do not affect each other or feedback hypothesis assuming financial development affects economic growth and in resulting, economic growth contributes to financial development following different empirical growth models. Following Mankiw et al. (1992), we use Cobb-Douglas production function assuming marginal contribution of capital and labour in production, production function in period *t*is given below:

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

Where Y is domestic output, A is technological progress, K is capital stock and labour is L. We extend the Cobb-Douglas production function by assuming that technology can be determined by level of financial development and international trade[3]. 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 structure of trade flows, is determined by relative level of financial intermediation[4]. 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

[3] We hold the impact of human capital on economic growth constant.
[4] Goldsmith, (1969); King and Levine, (1993a)

developed countries exploit innovations by developed countries i.e. learning by doing effects[5]. This leads us to model the empirical equation as follows:

$$A(t) = \phi.TR(t)^{\alpha} FD(t)^{\delta} \quad (2)$$

where ϕ is time-invariant constant, *TR* is indicator of trade openness and *FD* is financial development[16]. Substituting equation-2 from equation-1:

$$Y(t) = \phi.TR(t)^{\delta_1} FD(t)^{\delta_2} K(t)^{\beta} L(t)^{1-\beta} \quad (3)$$

We have divided equation-3 from both sides on population to transform variables in model into per capita term. After that, log-linear specification is followed due to its superior merits compared to simple linear specification (Shahbaz, 2012). The log-linear specification provides consistent and efficient empirical evidence. The empirical equation is modelled as follows:

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

Where, $\varphi_1 = \log \phi$ is constant term, $\ln Y_t$ is log of real GDP per capita, $\ln FD_t$ is real domestic credit to private sector per capita, $\ln TR_t$ is log of real trade openness per capita, $\ln K_t$ is real capital stock per capita, $\ln L_t$ is labour force per capita and u_i is error term assumed to be constant.

The data of real GDP, real domestic credit to private sector, real trade (exports + imports), real capital and labour force has obtained from world development indicators (CD-ROM, 2013). We have used population series to transform all the series into per capita. The study covers the period of 1976-2012. We have converted all the annual series into quarterly data to avoid the problem of degree of freedom for the sake of efficient empirical results. We have used quadratic match sum method to transform all the variables into quarter frequency following Romero, (2005) and, McDermott and McMenamin, (2008).

IV. Methodological Framework

IV.I Zivot-Andrews Unit Root Test

There are many unit root tests available to test the integrating properties of the variables. These unit root tests are such as ADF (Dicky and Fuller, 1981)**;** PP (Philip and Perron, 1988); DF-GLS (Elliot et al. 1996) and Ng-Perron (Ng and Perron, 2001). These tests provide biased and spurious results due to not having information about structural break points occurred in the series. Zivot-Andrews (1992) developed three models to test the stationarity properties of the variables in the presence of a structural break point in the series: (i) this model allows a one-time change in variables at level form, (ii) this model permits a one-time change in the slope of the trend component i.e. function and (iii) model has one-time change both in

[5] Without trade openness, we cannot capture the impact of financial development on economic growth.

intercept and trend functions of the variables to be used for empirical propose. Zivot-Andrews (1992) followed three models to check the hypothesis of one-time structural break in the series as follows:

$$\Delta x_t = a + ax_{t-1} + bt + cDU_t + \sum_{j=1}^{k} d_j \Delta x_{t-j} + \mu_t \qquad (5)$$

$$\Delta x_t = b + bx_{t-1} + ct + bDT_t + \sum_{j=1}^{k} d_j \Delta x_{t-j} + \mu_t \qquad (6)$$

$$\Delta x_t = c + cx_{t-1} + ct + dDU_t + dDT_t + \sum_{j=1}^{k} d_j \Delta x_{t-j} + \mu_t \qquad (7)$$

where the dummy variable DU_t is indicated by showing mean shift occurred at each point with time break while trend shift variables is show by DT_t [6]. So,

$$DU_t = \begin{cases} 1 \ldots if \quad t > TB \\ 0 \ldots if \quad t < TB \end{cases} \text{ and } DU_t = \begin{cases} t - TB \ldots if \ t > TB \\ 0 \ldots if \ t < TB \end{cases}$$

The null hypothesis of unit roots break date is $c = 0$ which indicates that the series is not stationary with a drift not having information about structural break point while $c < 0$ hypothesis implies that the variable is found to be trend-stationary with one unknown time break. Zivot-Andrews unit root test fixes all points as potential for possible time break and does estimation through regression for all possible break points successively. Then, this unit root test selects that time break which decreases one-sided t-statistic to test $\hat{c}(= c - 1) = 1$. Zivot-Andrews intimate that in the presence of end points, asymptotic distribution of the statistics is diverged to infinity point. It is necessary to choose a region where the end points of sample period are excluded. Further, Zivot-Andrews suggested the trimming regions i.e. (0.15T, 0.85T) are followed.

IV.II Bayer and Hanck Cointegration Test

We have applied advanced cointegration test to examine long run relationship between the variables developed by Bayer and Hanck, (2013). Initially; Engle and Granger, (1987); Engle and Yoo, (1991); Philips and Hansen, (1990); Stock and Watson (1993) and Johansen and Juselius, (1990) have been use by various researchers to examine cointegration between the variables. These single-equation based cointegration techniques may provide spurious results. These approaches require that all the variables should be integrated at unique order of integration. This deficiency is covered by Pesaran et al. (2001) who developed an autoregressive distributive lag model (ARDL) to scrutinize the long run relationship between the series. This cointegration approach is applicable if series are integrated at I(1) or I(0) or I(1)/I(0). The major problem with the ARDL bounds testing is that this approach provides efficient and reliable results once single equation cointegration relation exists between the

[6]The model-4 is used for empirical analysis

variables otherwise it misleads the results. This approach is unable to provide any empirical results if none of the variables is integrated at I(2).

This implies that all these cointegration approaches have different theoretical backgrounds and produce conflicting results. In such circumstances, it is difficult to obtain uniform results because one cointegration test rejects the null hypothesis but other accepts it. We can observe, Engle-Granger, (1987) residual based test, Johansen (1995) system based test and, Boswijik, (1994) and Banerjee et al. (1998) also suggested lagged error correction based approaches to cointegration. It is pointed by Pesavento (2004) that the power of ranking cointegration approaches is sensitive with the value of nuisance estimators. To overcome this issue, Bayer and Hanck, (2013) developed a new 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 provide robust and efficient results compared to individual t-test or system based test. So, Bayer and Hanck, (2013) followed Fisher, (1932) formula to combine the statistical significance level i.e. p-values of single cointegration test and formula is given below:

$$EG-JOH=-2[\ln(P_{EG})+\ln(P_{JOH})] \tag{8}$$

$$EG-JOH-BO-BDM=-2[\ln(P_{EG})+\ln(P_{JOH})+\ln(P_{BO})+\ln(P_{BDM})] \tag{9}$$

The probability values of different individual cointegration tests such as Engle-Granger, (1987); Johansen, (1995); Boswijik, (1994) and, Banerjee, Dolado and Mestre, (1998) are shown by P_{EG}, P_{JOH}, P_{BO} and P_{BDM} respectively. To take decision whether cointegration exists or not between the variables, we follow Fisher statistic. We may conclude in favour of cointegration by rejecting null hypothesis of no cointegration once critical values generated by Bayer and Hanck are less than calculated Fisher statistics and vice versa.

IV.III VECM Granger Causality

It is argued by Granger, (1969) that we should investigate the direction of causal relationship between the variables, once long run relationship is found. The next is to test direction of causality between the variables, following error correction representation is given below[7]:

$$(1-L)\begin{bmatrix}\ln Y_t\\ \ln FD_t\\ \ln TR_t\\ \ln K_t\\ \ln L_t\end{bmatrix}=\begin{bmatrix}a_1\\ a_2\\ a_3\\ a_4\\ a_5\end{bmatrix}+\sum_{i=1}^{p}(1-L)\begin{bmatrix}b_{11i}b_{12i}b_{13i}b_{14i}b_{15i}\\ b_{21i}b_{22i}b_{23i}b_{24i}b_{25i}\\ b_{31i}b_{32i}b_{33i}b_{34i}b_{35i}\\ b_{41i}b_{42i}b_{43i}b_{44i}b_{45i}\\ b_{51i}b_{52i}b_{53i}b_{54i}b_{55i}\end{bmatrix}\times\begin{bmatrix}\ln Y_{t-1}\\ \ln FD_{t-1}\\ \ln TR_{t-1}\\ \ln K_{t-1}\\ \ln L_{t-1}\end{bmatrix}+\begin{bmatrix}\alpha\\ \beta\\ \delta\\ \phi\\ \varphi\end{bmatrix}ECT_{t-1}+\begin{bmatrix}\varepsilon_{1t}\\ \varepsilon_{2t}\\ \varepsilon_{3t}\\ \varepsilon_{4t}\\ \varepsilon_{5t}\end{bmatrix} \tag{10}$$

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

Where difference operator is indicated by $(1-L)$ andECT_{t-1} is lagged residual term generated from long run relationship while $\varepsilon_{1t}, \varepsilon_{2t}, \varepsilon_{3t}, \varepsilon_{4t}$, and ε_{5t} are error terms assumed to be normally distributed with mean zero and finite covariance matrix. The long run causality is indicated by the significance of t-statistic connecting to the coefficient of the error correction term (ECT_{t-1}) and statistical significance of F-statistic in first differences of the variables shows the evidence of short run causality between variables of interest. For instance, $b_{12,i} \neq 0 \forall_i$ shows that economic growth Granger causes financial development and causality is running from financial development to economic growth indicated by $b_{21,i} \neq 0 \forall_i$.

V. Results and their Discussion

Primarily, we have applied traditional unit tests such as ADF and PP to test the integrating order of the variables. The results are reported in Table-1. We find that all the variables have unit root problem at level with intercept and trend. After first difference, all the variables are found to be stationary at I(1)[8]. This shows that all the series are integrated at I(1). The problem with these unit root tests is that these tests have low predicting power and mislead the results once series has structural breaks. This issue is solved by applying ZA unit root test that accommodates the information about single unknown structural break point stemming in the variables. The results are reported in Table-2. We find that all the variables are non-stationary at level in presence of structural breaks. These structural breaks are in series of economic growth, financial development, capital, labour and trade openness in 1990Q1, 1996Q2, 2007Q4, 1987Q2 and 2006Q4. The Bangladesh economy adopted numerous economic reforms to promote economic activities in the country. For example, Bangladesh adopted crisis-driven reforms in 1990s to save the economy as well as bank reforms committee was made to peruse the financial reforms to improve the performance of financial sector which was also the continuity of financial sector reforms program started in early 1990s. The Bangladesh government continued financial reforms, which affected economic growth via capitalization in 2007. Similarly, labour force reforms were also implemented by Bangladesh government to encourage the female participation manufacturing sector in 1987 which affected manufacturing contribution to GDP (Abdullah, 1998). In this regard, Bangladesh labour act 2006 was also approved by government in 2006 to stimulate export oriented policies for enhancing trade share in international market. After first differencing, all the variables are integrated at *I(1)*. This shows that unique order of integration is found for all the variables.

Table-1: Zivot-Andrews Unit Root Test

Variable	**At Level**		**At 1st Difference**	
	T-statistic	Time Break	T-statistic	Time Break
ln Y_t	-2.941(3)	1990Q1	-8.340(3)*	1982Q2
ln FD_t	-3.862 (2)	1996Q2	-6.317 (3)*	1990Q4
ln K_t	-2.327 (2)	2007Q4	-5.882 (3)*	2005Q2
ln L_t	-2.258 (3)	1987Q2	-5.346 (3)*	1991Q2

[8]Results are available upon request from authors.

$\ln TR_t$	-3.225 (1)	2006Q4	-10.455 (3)*	2006Q4
Note: * and *** represent significant at 1 and 10 per cent level of significance. Lag order is shown in parenthesis.				

This leads us to apply cointegration approach to examine long run relationship among the variables. We have chosen to employ the ARDL bounds testing approach to cointegration developed by Pesaran et al. (2001). Before proceed for cointegration, we have to choose appropriate lag length. The inappropriate selection of lag length selection provides biased results which would be not helpful in designing economic policies. In doing so, we choose Akaike information criteria (AIC) to select lag length. The AIC criterion provides efficient results and has superior properties compared to Schwartz Bayesian criteria (SBC). The results are reported in Table-2. We find that lag 6 is appropriate in our sample size.

Table-2: VAR Lag Order Selection Criteria

VAR Lag Order Selection Criteria						
Lag	LogL	LR	FPE	AIC	SC	HQ
0	1185.813	NA	3.68e-15	-19.0453	-18.9316	-18.999
1	2777.336	3029.028	3.92e-26	-44.31187	-43.6295	-44.0347
2	3251.388	863.9985	2.81e-29	-51.5546	-50.3037*	-51.0464
3	3261.132	16.9724	3.61e-29	-51.3085	-49.4890	-50.5694
4	3267.401	10.4147	4.93e-29	-51.0064	-48.6183	-50.0363
5	3335.405	107.4905	2.50e-29	-51.7000	-48.7433	-50.4989
6	3442.738	160.9992*	6.78e-30*	-53.0280*	-49.5026	-51.5959*
7	3454.430	16.595	8.68e-30	-52.8139	-48.7194	-51.1503
8	3461.815	9.8859	1.20e-29	-52.5292	-47.8667	-50.6352
* 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						

Table-3: ARDL Cointegration Analysais

Variable	$\ln Y_t$	$\ln FD_t$	$\ln K_t$	$\ln L_t$	$\ln TR_t$
F-statistics	9.869*	4.797**	4.678**	0.966	12.096*
Structural Break	1990Q1	1996Q2	2007Q4	1987Q2	2006Q4
Critical values#	1 % level	5 % level	10 % level		
Lower bounds	3.60	2.69	2.53		
Upper bounds	4.90	3.83	3.59		
Diagnostic Test					
R^2	0.8486	0.7179	0.8110	0.9998	0.6994
$Adj-R^2$	0.7888	0.5789	0.7166	0.9997	0.5509
F-statistic	12.300*	5.1586*	8.5869*	12.0908*	4.7712*

Note: *, ** and *** show significant at 1%, 5% and 10% level respectively. # Critical values bounds are from Pesaran et al. (2001) with unrestricted intercept and unrestricted trend.

Table-4: The Results of Bayer and Hanck Cointegration Analysis

Estimated Models	EG-JOH	EG-JOH-BO-BDM	Cointegration
$Y_t = f(FD_t, K_t, L_t, TR_t)$	12.046	21.051	Yes
$FD_t = f(Y_t, K_t, L_t, TR_t)$	17.491	35.788	Yes
$K_t = f(Y_t, FD_t, L_t, TR_t)$	13.286	25.319	Yes
$L_t = f(Y_t, FD_t, K_t, TR_t)$	9.542	13.525	No
$TR_t = f(Y_t, FD_t, K_t, L_t)$	4.501	12.545	No
Note: ** represents significant at 5 per cent level. Critical values at 5% level are 10.576 (EG-JOH) and 20.143 (EG-JOH-BO-BDM) respectively.			

The results of the ARDL bounds testing are shown in Table-3. We find that our calculated F-statistics is greater than upper critical bounds at 1 percent and 5 percent levels of significance restively, once treat economic growth, financial development and capital as forcing variables[9]. This shows that we have three cointegrating vectors confirming the presence of long run relationship between the variables over the period of 1976Q1-2012Q4 in the presence of structural breaks[10]. The robustness of the ARDL bounds testing findings is tested by applying Bayer and Hanck, (2013) cointegration approach. The results of combined cointegration tests i.e. EG-JOH and EG-JOH-BO-BDM reported in Table-4 reveal that the Fisher statistics for EG-JOH and EG-JOH-BO-BDM tests exceed the critical values at 1 percent level of significance once we treated economic growth, financial development and capital as dependent variables. It seems to reject the hypothesis of no cointegration between the variables. This shows that there are three cointegration vectors. This validates the presence of long run relationship between the variables. We find that Bayer and Hanck (2013) cointegration approach findings are robust and consistent with the ARDL bounds testing estimates.

Table-5: Long Run Analysis

Dependent Variable = $\ln Y_t$				
Variables	Coefficient	Std. Error	T-Statistic	Prob.
Constant	1.8077*	0.0196	92.010	0.0000
$\ln FD_t$	0.0694*	0.0166	4.1653	0.0001
$\ln K_t$	-0.2957*	0.0419	-7.0418	0.0000
$\ln L_t$	0.0528*	0.0040	13.1389	0.0000
$\ln TR_t$	0.0354***	0.0195	1.81664	0.0716

[9]If our calculated F-statistics falls between upper and lower critical then we favour for inconclusive decision. We favour cointegration if upper critical bound is less than our calculated F-statistic and vice versa.

[10]These structural breaks points are based on ZA unit root test.

DUM_t	-0.0197*	0.0016	-11.8972	0.0000
R^2	0.9859			
Adj. R^2	0.9757			
F-Statistic	24.1100*			
Diagnostic Checks				
Test	F-statistic	Prob.		
$\chi^2 NORMAL$	0.1271	0.1732		
$\chi^2 ARCH$	0.2545	0.3823		
$\chi^2 REMSAY$	0.2463	0.6721		
Note: *, ** and *** show significance at 1%, 5% and 10% levels respectively.				

The long run analysis is reported in Table-5 after finding the cointegration between the variables. We find that financial development adds in economic growth at 1 percent level of significance. All else is same, a 1 percent increase in real domestic credit to private sector enhances domestic production and hence economic growth by 0.0694 percent. This finding is contradictory with Hye and Islam, (2013) who reported that financial development impedes economic growth but consistent with Rahman (2004) and later on Beck and Rahman (2006). The impact of capital is negative and it is statistically significant at 1 percent level. It is argued by Rodrik, (2013) that in developing economies, physical capitalization is low than required level of economic activity and due lack of skilled human capital, developing economies could not reap the fruits of capitalization. In case of Bangladesh, mostly capital loans are issued under the pressure of political influence to white elephants (public enterprises) whose production is declining day by day which in resulting impedes economic growth. Keeping other things constant, a 1 percent increase real capital use decreases economic growth by 0.2957 percent. The relationship between labour and economic growth is positive and statistically significant at 1 percent level of significant. A 1 percent increase in labour will enhance domestic production and hence economic growth by 0.0528 percent, all else is same. This supports the findings by Shahbaz, (2012) in case of Pakistan. The effect of trade openness on economic growth is positive and it is statistically significant at 10 percent level of significance. It is noted that 0.354 percent increase in economic growth is linked with 1 percent increase in trade openness if other things remain same. This finding is consistent with Shahbaz, (2012) in case of Pakistan. The dummy for crisis-driven reforms affects economic growth negatively at 1 percent level of significance.

Table-6: Short Run Analysis

Dependent Variable = $\Delta \ln Y_t$				
Variables	Coefficient	Std. Error	T-Statistic	Prob.
Constant	-0.0009*	0.0002	-3.2553	0.0015
$\Delta \ln FD_t$	0.0464*	0.0129	3.5720	0.0005
$\Delta \ln K_t$	0.0600	0.0498	1.2056	0.2302
$\Delta \ln L_t$	0.0791*	0.0047	16.6057	0.0000

$\Delta \ln TR_t$	-0.0181***	0.0106	-1.7121	0.0893
ΔDUM_t	0.0009**	0.0004	1.9647	0.0517
ECM_{t-1}	-0.0456*	0.0107	-4.238999	0.0000
R^2	0.5076			
Adj. R^2	0.4879			
F-Statistic	25.7744*			
Diagnostic Checks				
Test	F-statistic	Prob.		
$\chi^2 NORMAL$	0.6236	0.2732		
$\chi^2 ARCH$	0.3029	0.3933		
$\chi^2 REMSAY$	0.0205	0.8862		
Note: * and *** show significance at 1% and 10% levels respectively.				

The short run results are reported in Table-6. We find that financial development adds in economic growth and it is statistically significant at 1 percent level. Capital increases economic growth but it is statistically insignificant. The impact of labour on economic growth is positive and significant at 1 percent level. Trade openness impedes economic growth at 1 percent level of significance. The dummy for crisis-driven reforms has positive but minor impact on economic growth and it is statistically significant at 10 percent level of significance. The negative sign of ECM_{t-1} indicates the speed of adjustment from short run towards long run equilibrium path. We find that short run deviations are corrected by 4.56% in each quarter for economic growth function in case of Bangladesh. It would take more than 5 years to reach long run equilibrium path. The statistical significance of lagged error term ECM_{t-1} with negative sign is further proof of established long run relationship between the variables. The short run model passes all diagnostic tests. We find that there is no evidence of non-normality of error term and same is true for autoregressive conditional heteroskedisticity. The functional form of short run model is well designed.

Table-7: The VECM Granger Causality Analysis

Variables	Direction of Granger Causality					
	Short Run					Long Run
	$\ln Y_t$	$\ln FD_t$	$\ln K_t$	$\ln L_t$	$\ln TR_t$	ECT_{t-1}
$\ln Y_t$	....	8.9937* [0.0002]	0.8307 [0.4342]	2.6889*** [0.0720]	0.5620 [0.5715]	-0.0570* [-4.6030]
$\ln FD_t$	9.6670* [0.0001]	....	0.2755 [0.9597]	0.6017 [0.5495]	0.0055 [0.9945]	-0.0388*** [-1.9111]
$\ln K_t$	2.0949 [0.1276]	0.2449 [0.7831]	....	0.3419 [0.7111]	3.5013** [0.0330]	-0.0273*** [-1.7894]
$\ln L_t$	5.4013* [0.0057]	1.3175 [0.2716]	0.8598 [0.4258]	....	0.4265 [0.6537]	....
$\ln TR_t$	1.4009 [0.3229]	0.2480 [0.7807]	4.3212** [0.0154]	2.6806*** [0.0726]	....	....
Note: *, ** and *** represent significance at 1%, 5% and 10% levels respectively.						

The results of the VECM Granger causality are reported in Table-7. In long run, we find that financial development Granger causes economic growth and economic growth Granger causes financial development i.e. feedback effect. The bidirectional causality is found between financial development and capital and same is true for capital and economic growth. The unidirectional causality is found running from trade openness and labour to economic growth. Financial development is Granger cause of trade openness and labour. Trade openness Granger causes capital and capital is Granger cause of labour. In short run, the feedback effect exists between financial development and economic growth. Labour Granger causes economic growth and in resulting economic growth Granger causes labour. The relationship between capital and trade openness is bidirectional. Labour Granger causes trade openness.

VI. Conclusion and Policy Implications

This paper revisits the relationship between financial development and economic growth by extending Cobb-Douglas production function incorporating trade openness as additional determinant of financial development and economic growth in case of Bangladesh. The study covers the period of 1976QI-2012VI. We have applied structural break unit root test to examine integrating properties of the variables. The ARDL bounds testing approach to cointegration is used to investigate cointegration among the variables in the presence of structural breaks. The robustness of cointegration results is tested by Bayer and Hanck cointegration approach. The direction of casual relationship among the variables is tested by applying the VECM Granger causality test.

Our findings confirm the presence of cointegration among the variables in the presence of structural breaks present in the series. Additionally, financial development increases economic growth. This is consistent with the widely held view that financial development provides an important potential mechanism for long run economic growth. The results also show that the relationship between capital and economic growth is negative. This is also consistent with the explanation from the existing literature that developing countries fail to reap the benefits of capitalization due to lack of skilled labour force. In the case of other control variables, trade openness and labour positively affect economic growth. The causality analysis reveals the feedback effect between financial development and economic growth. The causality between capital and economic growth is bidirectional and same inference can be drawn for capital and financial development. Both trade openness and labour Granger causes economic growth.

The findings of this study strongly support policies to encourage financial development of the financial sector in Bangladesh thus help stimulating economic growth. The policies and reforms starting from the mid-1980s mainly to bring about structural changes in the economy through liberalizing financial sector, thus promoting financial development, and creating a more open economy have positive impact on economic growth. A more market-responsive and democratic policy regimes since the early 1990s are also responsible for facilitating financial development and a higher trend in economic growth in the country. In terms of policy implication, the conduct of monetary policy using interest rate becomes important for financial development. Monetary policy should avoid financial repression by setting a ceiling

on interest rate. The country in the past resorted to financial repression aiming to provide funds for investment at a low cost of borrowing. Financial repression, however, may lead to mal-investment. Interest rate determined by market forces will facilitate financial development and allow efficient allocation of funds for productive investment. This view is also supported by the International Monetary Fund, which in 2010 advocated to uplift the interest rate ceiling to promote more financial development. The empirical evidence on trade openness also has an important implication and suggests that through liberalization process the country can generate economic growth. Bangladesh has introduced lower tariffs and uplifted non-tariff barriers as part of the reforms in recent decades helping it to integrate more with the international markets. Trade openness would help facilitate financial development in the country further since it would allow its domestic firms to have greater access to foreign funds from the international markets.

The finding of positive impact of labour on economic growth is encouraging in a densely populated country like Bangladesh. The country has made significant progress in terms of reducing population growth since its independence and thus is witnessing a demographic change. The size of the working population has increased due to the high population growth in the earlier decades. The positive impact of labour force on economic growth can also be explained by rising labour productivity due to capital deepening. However, result on the effect of capital on economic growth requires attention by the policy makers. Policies should aim at improving education and training to turn the working age population into a skilled labour force to utilize the benefits of capitalization.

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