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Does Financial Development Influence Economic Growth in India?

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Abstract. *In earlier times economic growth is commonly discussed in terms of real GDP per capita, industrial output, capital, labor force, educational growth, savings, investments, inflation and trade openness of the country. Including all the factors, financial development plays a crucial role for country's economic growth. It is a multidimensional concept and constitutes a potentially important mechanism for long run economic growth. The study makes use of the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) methods for unit root test and the variables were found to be stationary, though not in their level form but in their first difference. Autoregressive Distributed Lag (ARDL) bound testing approach to co-integration techniques and Error Correction Model (ECM) is used for long run and short run causality in Indian time series data covering the period from 1980 to 2011. The paper finds a co-integration relationship between financial sector development and economic growth. It concludes that financial development can be interpreted as one of the long run determinants of economic growth, not vice-versa.*

Keywords: Financial development; Economic growth; PCA; ARDL; ECM; India.

JEL Classification: E44; G2; O1; O4; O11.

1. Introduction

There exist a plethora of studies on the link between financial development and economic growth. In recent years this relationship has become an issue of extensive analysis. The question is whether financial development precedes or simply follows economic growth. In general the development of financial sector is expected to have a positive impact on economic growth. Voluminous studies has documented a positive relationship between financial development and economic growth (see, for example, Schumpeter (1911), Goldsmith (1969), McKinnon (1973), Gleb (1989), King and Levine (1993), Fry (1997), Chakraborty (2010), Al-Jarrah et al. (2012) Bojanic (2012), Hussain and Chakraborty (2012), Masoud and Hardaker (2012), Grounder (2012), Adu et al. (2013), Sahoo (2013), Lopes and Jesus (2015)) that attempts to identify the financial development as the main drivers of economic growth across the globe. Financial sector in earlier times were considered to play only a minor role in the process of economic growth. But with the development of sophisticated financial system in every nation across the globe, modern economists conclude that the development of the financial sector of an economy can be interpreted as an important aid towards the economic growth and may be a necessity (Lenka, 2015). Since the beginning of the 1990s, the Indian economy has been undergoing economic reforms which include financial sector reforms among others. It mainly entails reforms of the banking system and capital market. With deregulation of the interest rate, Indian banking system has become more market oriented since 1991.

Earlier empirical studies, individual and broad cross country comparison, even firm level as well as industry level analysis, suggested that there is a significant positive association between financial development and economic growth except a few other studies. However, these findings do not establish a harmony about the direction of causality between financial development and economic growth. And several studies are used in different types of financial proxy variable for measurement of financial depth, which is not an efficient measure to capture complete financial depth in the country. In the backdrop of above, this study investigate the causal relationship between financial development and economic growth in both short run and long run individually. The present study investigates linear and uncorrelated causality relationship using alternative measures i.e. PCA (Principal Component Analysis) of financial development (Lenka, 2015) and economic growth in India. This study investigated that the financial development can be interpreted as one of the long run determinants of economic growth, not vice-versa. The rest of the paper proceeds as follows. Sections 2 briefly discuss the existing literature. Section 3 describes methodology framework of this paper. Section 4 explains the main results. Section 5 presents concluding remarks and policy implications.

2. A brief review of existing literature

Ample of literature, both theoretical and empirical, has come up on the issue of financial development and economic growth over the years. The theoretical contributions have highlighted the different services provided by the financial sector that can affect output and growth (Dimond, 1984; Bencivenga and Smith, 1991; Saint-Paul, 1992). The relationship between financial development and economic growth can be traced back to the work of Schumpeter (1911, 1939). The study emphasized that financial intermediaries play an important role in promoting economic growth by redirecting funds towards innovative projects. Dybvig (1983) and Bencievenga and Smith (1991) stressed the role of financial intermediaries in managing liquidity. Financial intermediaries reduce the volume of low return investment due to premature liquidation and redirect funds into longer term, high-yield projects, leading to faster growth. Therefore, economic growth is directly affected by the increase in the quality of aggregate investment by enhancing profitable opportunities, accomplished partly through the informational role of intermediation. The work of King and Levine (ibid.) could be one of the earliest works where they found a statistically significant positive relationship between the measures of financial development and growth by analyzing 77 countries for the period 1960-1989. Following work by King and Levine (ibid.), many studies offered econometric evidence, which supports the view that financial development is a potent predictor of future economic growth. Many studies (see Goldsmith, 1969, McKinnon, 1973, Jalil and Feridun, 2011), Hussain and Chakraborty (2012)) also supported the view that the casual relationship runs from financial development to economic growth. Chakraborty (2010) examined that the impact of developments in the financial sector on economic growth in India in the post-reform period. The model suggested by Mankiw et al. (1992) was used to establish a relationship between financial development and economic growth. Using quarterly data for the period 1993 to 2005 for India, the model used co-integration and vector error correction method. The findings lend no support to the theoretical prediction that the stock market development would play an important role in enhancing economic growth in India. On the contrary, reform measures on the market rate of interest that were introduced in the Indian banking system appeared to have promoted economic growth significantly. Akinlo and Egbetunde (2010) examined the long run and casual relationship between financial development and economic growth for ten countries in sub-Saharan Africa (Central African Republic, Chad, Congo Republic, Gabon, Kenya, Nigeria, Sierra Leone, South Africa, Swaziland and Zambia) for the period 1980-2005. The result showed that there was a long run relationship between financial development and economic growth in the selected countries in sub-Saharan Africa. Further, it showed that financial development Granger caused economic growth in Central African Republic, Congo Republic, Gabon and Nigeria while economic growth Granger caused financial development in Zambia. Inoubli (2011) examined how financial development impacted growth in the MENA (Egypt, Jordan, Moroco, Tunisia and Turkey) region during 1981 to 2008. Bojanic (2012) focused on the relationship between economic growth, financial development and trade openness in Bolivia. The study covers annual time series data for Bolivia during the 1940-2010. The results showed that there was a long run equilibrium relationship between economic growth, financial development and trade openness indicators and unidirectional relationship from financial development and trade openness indicators to economic growth. The study by Masoud and Hardaker (2012) covered financial development and economic growth for 42 emerging markets over 12 years using endogenous growth model. The results suggested that stock market development has a significant effect on economic growth. Gounder (2012) examined whether financial development promotes economic growth in Fiji over the period 1970 to 2005. Co-integration and error correction models were applied to test the long run equilibrium and short run relationship among the key variables relevant for this study. Here for co-integration test results supported the existence of a long run relationship. And, the short term dynamic behavior of the relationship between financial development and growth showed that financial development had made a modest contribution to output. The study by Sahoo (2013), empirically evaluated the role of financial structures in the economic development of India. The study used data for the period 1982-83 through 2011-12. Since data on stock market capitalization was not available prior to 1982-83. The found one-way Granger causality from bank-based financial depth to economic development supporting the premise that growth is more of supply-driven. However, there was no evidence of causality between market capitalization and economic development. A detailed analysis based on co- integration method revealed that both the bank based and market based indicators of financial depth had positive impact on economic development in India. Various empirical studies (Diamond and Dybvig 1983; Schumpeter 1991; Smith 1991) suggest that both financial institution and financial market play an important role in promoting economic growth. There is a positive and bidirectional long run relationship between financial development and economic growth. The study by Nain and Kamaiah (2014) suggested that there is no causal relationship between financial development and economic growth is one of nonlinear and limitation of Granger test. The above exiting literature concludes that earlier researchers used different financial proxies (like Broader money (M2) to nominal GDP, private sector credit to GDP, liquid liabilities of the financial sector to GDP, commercial bank assets to total banking sector assets, and stock market capitalization to GDP) for measuring financial depth . This paper uses a single financial development index computed by (Lenka, 2015) based on various financial indicators from financial institutions and financial markets.

3. Model Specification, Data and Methodology

3.1. Model specification and data

The link between financial development and economic growth rate is verified using an aggregate Cobb-Douglas production function. Although the focus of the paper is on the lead-lag relationship between a measure of financial development and economic growth, these variables interact with other conditioning variables of capital (K) and Labor (L). Following Rao (2010), the basic Solow (1965) model and its extension by Mankiw, Romer and Weil (1992), MRW hereafter, is used. The MRW Cobb-Douglas production function is provided below:

$$Y = K^{\alpha} H^{\beta} (AL)^{1-\alpha-\beta} \quad (1)$$

Where K is physical capital, H is human capital, L is labor supply and A is an index of technical efficiency. An assumption of MRW is that investment rates in physical and human capital are constant, and that both types of capital depreciate at a common rate. MRW also assume that technical efficiency grows at the same exogenous rate across countries and the labor force grows at differing rates. This is obviously just the Solow model augmented with human capital and the assumption that countries share the same rate of efficiency growth. In implementing the MRW model empirically for this purpose with time series data requires modification. Firstly, the dependent variable is the rate of growth of output. Secondly, we assume that there are constant returns and technology is Hicks neutral. Finally, the variable of financial development is introduced in to the model as a shift variable in to production function.

Following MRW the long run equilibrium production function is specified as follows:

$$Y = f(K, L, FD) \quad (2)$$

Where Y is the growth rate of real GDP; K, L and FD represents capital, Labor and measure of financial development respectively. Other than labor and capital there is many other control variables (inflation, Govt. expenditure, Trade openness etc.) which also influenced GDP of the country. As we know, new economic policy was introduced in India in the year 1991 and financial markets actively participated after 1991. So this study captures the economic reforms by using a Dummy variable (D) in this model. Considering the influence of control variables in the model, the final model in the log liner form (with an error term, μ_t) may be written in the following way:

$$LnY_t = \beta_0 + \beta_1 LnFD_t + \beta_2 \ LnX_t^* + \alpha_1 D_t + \mu_t \quad (3)$$

Here Y_t is Growth (measured by log $GDPPC_t$-$GDPPC_{t-1}$ and GDPPC- real GDP per capita). FD is an index used as a proxy for financial depth. X_t^* denotes a vector of control variables of L – agricultural Labor used as a proxy for labor force; C– gross capital formation used as a proxy for capital; GOV– government expenditure; INF– inflation; TR– trade openness (Export plus Imports as a percentage of GDP); D_t used as dummy variable to capture structural break in the financial reform period (1991). And μ_t is an error term. All variables are in natural logarithm except D_t.

The first is to test the existence of unit roots followed by the test for co-integration technique. The present study used on the macro level time series data from 1980 to 2011 in the country of India. The time series data collected from Handbook of statistics on Indian economy (Reserve bank of India), the Reserve bank of India Bulletin (Various issues), International financial statistics (IMF, various issues), statistical Abstracts (various issues, Government of India) and Economic Survey (various issues, Government of India). All the variables are taken in their natural logarithms to reduce problems of heteroscedasticity as much as possible.

3.2. Methodology

The present article employs the ARDL model, introduced by Pesaran et al. (2001) as it can be applied irrespective of whether the underlying variables are I(0), I(1) or a combination of both (Pesaran and Pesaran, 1997). Besides, the ARDL model takes sufficient number of lags to capture the data generating process in general to specific modeling framework (Laurenceson and Chai, 2003). Also, the Error Correction Model (ECM) can be derived from ARDL through a simple linear transformation (Benerjee et al., 1993). ECM investigate short-run adjustments with long-run equilibrium without losing long-run information (Pesaran and Shin, 1999). Moreover, small sample properties of ARDL approach are more superior to that the Johansen and Juselius's co-integration technique (Pesaran and Shin, 1999). The ARDL approach to co-integration involves the estimation of the following model:

$$\Delta \ln Y_t = \beta_0 + \sum_{i=1}^{p} \psi_i \Delta \ln Y_{t-i} + \sum_{i=1}^{p} \phi_i \, \Delta \ln FD_{t-i} + \sum_{i=1}^{p} \varpi_i \Delta \ln X^*_{t-i} + \sum_{i=1}^{p} \gamma_i \, \Delta D + \theta_1 Y_{t-1} + \theta_2 FD_{t-1} + \quad (4)$$

$$+\theta_3 X^*_{t-1} + \theta_4 D_{t-1} + \mu_t$$

Where β_0 is drift component, the variables are as explained before and μ_t denotes the white noise.

The first procedure in the ARDL bound test approach is to test for a long-run relationship among variables using F-tests. The null hypothesis in the above equation is $H_0:\theta_1=\theta_2=\theta_3=\theta_4=0$, which implies the nonexistence of long-run relationship. On the other hand, the alternative hypothesis is $H_1:\theta_1\neq 0,\ \theta_2\neq 0,\ \theta_3\neq 0,\ \theta_4\neq 0$.The test which normalizes on Y is represented as F_y (Y/FD,X^*,D). The calculated F-statistics value is compared with two sets of critical values estimated by the Pesaran et al., (2001). One set assumes that all variables are I(0) and other I(1). If it is below the lower critical value, the null hypothesis of no co-integration cannot be rejected. If it falls inside the critical values, the test is inconclusive. In order to choose optimal lag length for each variable, the ARDL method estimates $(p+1)^k$ number of regressions, where p is the maximum number of lags and k is the number of variables in the equation. The lag automatically selected using Akaike Information Criteria (AIC) and Schwartz-Bayesian Criteria (SBC) in the software.

According to ARDL representation theorem, if the series are co-integrated, the dynamic or short run relationship involving the variables could be examined within ECM framework. This leads to the specification of ECM of the production function of the following form:

$$\Delta \ln Y_t = \beta_0 + \sum_{i=1}^{p} \psi_i \Delta \ln Y_{t-i} + \sum_{i=1}^{p} \phi_i \Delta \ln FD_{t-i} + \sum_{i=1}^{p} \varpi_i \Delta \ln X^*_{t-i} +$$

$$+ \sum_{i=1}^{p} \gamma_i \Delta D_{t-1} + \alpha ECT_{t-1} + \mu_t \quad (5)$$

Here, ECT refers to the Error Correct Term which indicates the speed of adjustment back to long run equilibrium after a long run shock.

4. Results

4.1. Result of Principal component analysis

The study uses principal component method to combine the eleventh selected measures of financial development in to single index. According to this procedure the j^{th} factor F_j can be expressed as:

$$F_j = W_{J1}X_1 + W_{J2}X_2 + W_{J3}X_3 + \ldots + W_{JP}X_P \quad (6)$$

Where:
F_j – estimate of j^{th} factor;
W_j – weight on factor score coefficient;
P – number of variables.

The Eigen values in Table 1 indicate that the first principal component explains more than 90% of the standardized variance. Hence, the first principal component is a more relevant measure of financial development, as it explains the variations of the dependent variable better that any other linear combination of explanatory variables. Therefore, only information related to the first principal component is considered to form a composite indicator. For each year in the analysis here, the factor score (see Table 2) are obtained by the corresponding factor score coefficients using equation 6. Thus a composite financial development indicator (FD index) is obtained.

Table 1. *PCA for Index (1980-2011)*

Principal component	Eigen values	Variance (%)	Cumulative (%)
1	9.938	90.350	90.350
2	0.460	4.178	94.528
3	0.266	2.415	96.942
4	0.186	1.687	98.629
5	0.099	0.902	99.531
6	0.033	0.304	99.836
7	0.011	0.096	99.931
8	0.005	0.045	99.976
9	0.002	0.020	99.996
10	0.000	0.003	99.999
11	0.000	0.001	100.000

Extraction method: principal component analysis.

Table 2. *Components score coefficient matrix (1980-2011)*

Variables	Components
PSC	0.093
BA	0.099
CBA	-0.092
LL	0.100
M2	0.100
FSD	0.099
CGSE	0.094
RI	0.094
TR	0.098
IFDI	0.092
GDS	0.091

Here, PSC–private sector credit, BA–bank assets, CSA–central bank assets, LL–liquidity liabilities, M2–broad money, FSD–financial system deposits, CGSE–credit to government and state owned enterprises, RI–remittance inflows, TR–total reserves, IFDI–inflows of FDI and GDS–gross domestic savings.

4.2. Result of Unit root test

The results of unit root test are presented in the table 3. The pre- requisite of time series analysis is to bring the stationary of each variables over the sample period. For this, the study used ADF (augmented Dickey-Fuller) and PP (Phillips Perron) unit root test to investigate stationarity of each time series data involved in this analysis. The ADF unit root test requires the estimation of the following regression:

$X_t = \alpha + \beta_t + \rho X_{t-1} + \mu_t$.

Where, α is the intercept, β is the co-efficient of lagged term, ρ is the number of lagged term chosen to ensure that μ is white noise. The optimal lag length is chosen by Akaike Information Criteria (AIC). Based upon this estimate, the hypothesis of test are:
H_0: $\rho = 1$, i.e. there is a unit root – the time series is non stationary.
H_0: $\rho < 1$, i.e. there is no unit root – the time series is stationary.

The results indicate that the variables considered in this paper, including the financial index (FD) created from principal component analysis are mixture of stationary I(0) and nonstationary I(1) variables. Variables such as the log of real GDP, log of Govt. expenditure and log of labor force appear to be stationary at the level without trend terms are included in the regressions. The remaining variables (log of financial index, log of trade openness, log of inflation and log of capital) are found to be stationary not in their level form but in their respective first difference (see Table 3).

Table 3. *Unit Root Test*

Variable	ADF (at intercept)		PP (at intercept)	
	I(0)	*I(1)*	*I(0)*	*I(1)*
LnY	-5.05984***		-5.072972***	
LnFD	0.880127	-3.792114***	0.271613	-3.871506***
LnTR	1.117999	-5.480283***	1.205070	-5.483247***
LnINF	-1.575875	-8.680298***	-2.261488	-8.246204***
LnGOV	-3.205135**		-2.230569	-3.765021***
LnL	-6.486508***		-4.179533***	
LnC	-0.284466	-8.258358***	-1.177418	-8.424805***

Note: (i) *** and ** indicates significant at 1% and 5% critical level. (ii) Optimal lags for ADF is determined based on AIC and PP test it is Newey-West bandwidth selection using Bartlett kernel. (iii) Probability values for ADF and PP test is as per MacKinnon one-sided p-values.

Finally, the result of ADF unit root test shows that the null hypothesis of presence of unit root is rejected; some at their level form and others are at their respective 1^{st} difference. To check the reliability of the unit root result found in the ADF test, we conducted Phillips-Perron (PP) test. All result are found to be same as before, other than Govt. expenditure. Here Govt. expenditure is found to be stationary in ADF but not in PP test. When the variables are stationary in their level form, there is no need to check their first difference. After confirming stationarity in all series, the study proceeds to conduct co-integration test to ascertain that the variables are co-integrated.

4.3. Result of co-integration (ARDL) test

The result of the co-integration test based on the ARDL bound test approach, presented in Table 4 shows the F-statistics (6.136) is higher than the upper critical values; there is a strong evidence of a long run relationship among the variables. However, as mentioned above, some other studies have documented either a directional relationship between financial development and economic growth (see Robinson (1952), Kuznets (1955), Demetriades and Hussein (1996)) or financial development is determined by economic growth (Ang, 2008). Therefore, following Ang (2009) and Ang (2010), the study set FD as a dependent variable to address the concern of endogeneity bias and then apply the co-integration test. But do not find co-integration when FD is used as the dependent variables (see table 4). The results suggest that financial development can be interpreted as one of the long run determinant of economic growth and not vice-versa.

Table 4. *Co-integration test*

ARDL bound test			
		F-statistics	1% critical bounds
Dependent variable: Y	6.136	3.72	5.06
Dependent variable: FD	2.634	3.72	5.06

Note: Source of critical bounds values, Pesaran et al. (2001).

Table 5. *Diagnostic Tests*

Diagnostic Tests		
Test Statistics	LM Version	F Version
A: Serial Correlation	CHSQ(1)= 0.1024 [0.749]	F(1,16)= 0.053015[0.821]
B: Functional Form	CHSQ(1)= 0.0338 [0.854]	F(1,16)= 0.017441[0.897]
C: Normality	CHSQ(2)= 1.3754[0.503]	Not applicable
D: Heteroscedasticity	CHSQ(1)= 0.01795[0.893]	F(1,29)= 0.016799 [0.898]

Note: A–Lagrange multiplier test of residual serial correlation, B–Ramsey's RESET test using the square of the fitted values, C–Based on a test of skewness and kurtosis of residuals, D–Based on the regression of squared residuals on squared fitted values.

Table 6. *Estimated Long run coefficients using the ARDL approach*

Dependent Variable: LNY				
Regressor	Coefficient	Standard Error	t-Statistic	t-Probability
C	2.7806	2.6279	1.0581	0.305
LNFD	0.50767**	0.22317	2.2748	0.032
LNL	0.00563	0.14157	-0.03979	0.969
LNC	1.2882**	0.56531	2.2788	0.036
LNTR	0.33044	0.54814	0.60285	0.555
LNINF	-0.42040***	0.12906	-3.2573	0.005
LNGOV	-0.53981	0.79712	-0.67720	0.507
D1	-0.04242	0.27911	-0.15197	0.881

Note: ***, ** denotes 1% and 5 % significance level.

Here AIC (Akaike Information Criterion) is used for selection of lag order one in this analysis. Before going to test long run and short run effect in ARDL model, I did the diagnostic test for knowing the presence of serial correlation, Heteroscedasticity and normality in the data. The diagnostic test shows all parenthesis value is highly insignificant; so there is no serial correlation and heteroscedasticity in this used data (see table 5). Table 6 defines FD, C and INF as statistically significant and value posses 0.50767, 1.2882 and -0.42040 respectively. Here FD implies that 1% increase in financial development will increase 0.50767 in real GDP per capita in the economy. Similarly, if capital increases by 1% it will lead to more than 1% increase in real GDP per capita. Again, as we expected inflation is negatively related with GDP per capita; here it shows that 1% increase in inflation will reduce 0.42040 % in real GDP per capita during sample period. Table 7 shows the short run dynamic of the estimated model. The short run result suggests that ΔFD is highly significant but coefficient is negative. It is in contrast with our expected result. This may be the cause of more variables included in the FD index or others. May be financial inputs negatively work in short run in the specified sample period. Here all other coefficient of variables is found to be negative; except labor, capital and Trade. The coefficient, ECM_{-1} representing the speed of adjustment process, is correct in sign and is statistically significant. Its coefficient suggests that nearly 2 % of the disequilibria in GDP growth of the previous year's shock adjust back to the long run equilibrium in the current year.

Table 7. *Estimated coefficients of the Short run Dynamic Error correction Model*

Dependent Variable: LNY				
Regressor	Coefficient	Standard Error	t-Statistic	t-Probability
ΔC	3.0929	2.8966	1.0677	0.297
ΔLNFD	-8.4831***	1.4228	-5.9621	0.000
ΔLNL	0.80380***	0.43492	-1.8481	0.078
ΔLNC	1.4329**	0.59078	2.4254	0.024
ΔLNTR	0.53401	0.73797	-.72361	0.477
ΔLNINF	-0.46762***	0.14228	-3.2865	0.003
ΔLNGOV	-2.0523*	1.0179	-2.0163	0.078
ΔD	-1.5256***	0.26278	-5.8057	0.000
ECM(-1)	-1.1123***	0.10301	-10.7983	0.000
R-squared 0.856		Akaike info criterion 5.5431		
Adjusted R-squared 0.823		Schwarz criterion -4.4948		
Durbin-Watson 2.066		F-statistic 46.5805		

Note: ***, ** and * denotes 1%, 5 % and 10% significance level respectively.

5. Conclusion and policy implication

The aim and objective of this paper is to investigate the long run growth effect of financial development and economic growth in India. The study used ADF and PP test to check the stationary among the variables. Because most of the financial variables are highly volatile by nature, if the study conduct direct regression in high volatility data the result may be spurious and unexpected. So the study conducted stationary test and found some variables are stationary in the level form, and others become stationary not in level form but in their 1st difference. Now all variables are combination of *I(0)* and *I(1)*. So we can't use Engel Granger as well as Johansen co-integration techniques in this situation. Thus the study adopted ARDL method to solve this problem. Here the study concludes that, the financial development is more helpful in long run growth and it can be interpreted as one of the long run determinants of economic growth, not vice-versa. Based on these research outcomes, the following policy implications can be drawn: the most important task for government of India is to introduce further financial sector reforms to improve the efficiency of domestic financial sector, which is essential for economic growth. For the time being, the analysis is confined with annual time series data. In future I will include available quarterly data with more new variables as well as will include more countries to identify the relationship between financial development and economic growth.

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