

FINANCIAL DEVELOPMENT AND INDUSTRIAL GROWTH IN INDIA: AN EMPIRICAL INVESTIGATION

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Abstract *The purpose of this paper is to examine the causal relationship between industrial growth and financial development during the post economic reforms in India (1991-2014). The long run relationship between financial development and industrial growth is tested by using ARDL (Auto Regressive Distributed Lag) model while causal relationship has been investigated with the help of Granger Causality Test. The empirical results of ARDL model found strong evidence in the long run between financial development and industrial growth and Granger Causality test indicate the bi-directional causality exists between industrial growth and financial development in India. The results of the present study support the significant role of financial development in the industrial growth. Easy licensing policy, credit availability, tax structure, skill centres and digitalization of market structure can enhanced the industrial growth in India.*

Keywords: *Financial Development, Industrial Growth, Economic Reforms*

INTRODUCTION

Financial development is a key factor of industrial growth in India. At present, the growth of financial sector in India is about 8.5 percent per year. The rise in the growth rate suggests for the growth of the industrial sector. The relationship between financial development and industrial growth is a serious matter for the growth of any country. The low level of investment and industrial concentration on some regions creates great relevance of financial development for the growth of industrial sector in India. Economic growth of any nation depends on the pillars of industrial development, so the pace of industrial development which is a debatable issue in this world at national and state level due to exploitations of natural resources. Financial development has emerged as a necessary condition for high economic development during the phases of development (Chang, 2002). It is a known fact that industrial credit plays a significant role to enhance the industrial output through credit availability. Industrial credit is a engine of industrial growth for any economy through intermediation of credit institutions. A healthy financial sector plays an important role in promoting growth by speeding up savings in to various channel of investment of any economy.

The main focus of the Indian socialist economy in the 1950s was widely emphasized on industrial growth and self reliant. For this some industrial credit institution were open for the growth of industrial sector. Before 1991 economic

reforms the industrial sector had not shows any significant improvement due to inefficiency of macro policy. The framework of liberalization of industrial sector was begun to start from 80s and major start were initiated from the reforms of 1991, which included de-licensing and deregulations of industries (Chandersekhar, 1988).

The year 1991, was a significant year for Indian economy when policy makers announced the economic reforms for growth of Indian economy. Enhancing the soundness and efficiency of the financial system, the main aim of financial sector reforms was to upgrade the allocative efficiency of resources, financial stability (Gopinath, 2007). Financial development generally measured by the level and availability of the credit along with size of stock market which are helpful in economic growth. But here this study analyse the only one approach of financial development (industrial sector outstanding loan i.e. level of credit), how affects the industrial performance in the long run as well as in the short run. Finding a strong cause for industrial development from financial growth is an important concern for policy makers, and a rationalisation for stability of the economy.

LITERATURE FRAMEWORK

Finance was ignored in the early theories of economic growth advocated by the classical economists as a factor explaining economic growth. Schumpeter (1934) focused on financial development as a key of economic growth. Since then, this

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has been a continue debatable issue for any country. There are lots of empirical studies that provided a positive significant link between financial development and economic growth (Deidda & Fattouh, 2002; Neusser & Kugler, 1998 and Qayyum (2006). In the same way easily availability of credit for boosting industrial production, financial development plays an important role in the growth process (Kletzer & Bardhan, 1987 and Rajan & Zingales, 1998). The taxation policy and structure also play a significant role in economic growth through the supply of financial growth. Aziz and Duenwald (2002) studied the different types of investment projects in China and identified the positive relationship between financial development and economic growth after the introduction of economic reforms 1978.

Calderon and Liu (2003) examined the data of 109 industrial countries and provide the evidence related to a positive relationship between financial development and economic growth. Lan et al. (2015) provided a strong positive relationship in the long run as well as in short run between domestic saving and economic growth (by using Johansen Cointegration approach and Error Correction Model) during the time period 2001-2015 in Taiwan.

Aghion et al. (2005) analyzed the role of technological capability after liberalization period for the interstate industries and provide strong supportive evidence regarding industrial performance through credit availability. Gupta et al., (2008) focused on how the interaction effect of state financial structure and industry characteristics influence industry growth. Ranjan and Zinglas (2008) empirically investigated the relationship among financial sector development, financial structure and industrial growth in India after economic reforms period. There was positive impact of financial sector development and industrial growth; where as negative impact was recorded by the financial structure and industrial growth.

The above surveyed existing literature lacks to investigate the impact of financial development on industrial growth in India. The literature investigate that countries with strong industrial base provide more economic growth. On the other hand growth of industrial sector improves the standard of living, employment opportunities and efficiency of the resources. This paper highlights the role of financial development in the industrial growth in India.

DATABASE AND METHODOLOGY

The present study covered the time period of 1991-2015 in India to test the effectiveness of financial development on industrial growth. Value of industrial output is used as a proxy of industrial growth, whereas outstanding credit of the industrial sector is used to measure the financial development. All the data used in the study has been taken

from Reserve Bank of India. The compound annual rate of growth (CAGR) has been calculated by using the Semi-log Model and applying the method of ordinary least squares (OLS) as explained below.

$$\text{Let } Y = ab^t = a (I+r)^t \dots\dots\dots(i)$$

$$\therefore \text{Log } Y = \log (ab^t) = \log a + t (\log b)$$

$$\text{Or } \log Y = A + B_t (\text{Here } A = \log a, B = \log b)$$

$$\text{Or } \log Y_t = A + B_t + U_t; (t = 1, 2, \dots\dots\dots n) \dots\dots(ii)$$

Where $Y_t = t_{th}$ observation on the variable Y for which rate of growth is to be calculated.

t = time variables taking n values n values 1, 2,n, and this study n takes 25

values from 1991 to 2015.

U_t = A random disturbance (or error) term at time t satisfying the usual assumption of OLS. r = rate of growth or compound annual rate of growth.

a and b are parameters of original model (i) and A and B are the parameters of transformed model (ii)

From (ii), a and b are calculated as follows.

$$\text{Log } a = A, a = \text{Antilog } A$$

$$\text{Log } b = B, b = \text{Antilog } B$$

$$\text{Since } (1+r) = b$$

Since rate of growth is calculated in % terms,

$$r = (b-1) \times 100 = (\text{Antilog } B-1) \times 100.$$

Moreover, to find the long run association between variables all the data has been transformed in natural logarithm. The relationship is expressed through the below specification:

$$IG=f(FD) \dots\dots \text{eqn (1)}$$

$$\Delta \text{Log}(IG)_t = \alpha_0 + \sum_{i=1}^p \alpha_1 \Delta \text{Log}(IG)_{t-i} + \sum_{i=0}^p \alpha_2 \Delta \text{Log}(FD)_{t-i} + \pi_1 \text{Log}(IG)_{t-1} + \pi_2 \text{Log}(FD)_{t-1} + \mu_t \dots\dots \text{eqn.2}$$

Where IG represent the industrial growth and FD shows the financial development. α_1, α_2 short run elasticity and π_1, π_2 shows long run elasticities

Moreover ARDL model is used to analyse the long run elasticities which are introduced initially by Pesaran and Shin (1999), further extended by Pesaran Shin, and Smith (2001). The main advantage of ARDL model is applicability of the model on the variable when they are I (0) or I (1). Pesaran et al. (2001) bound test procedure is used to test the presence of long run relationship among variables. In the bound tests procedure if the value of F is greater than the upper bounds, then we can say that there is co-integration among variables.

RESULTS AND DISCUSSIONS

Financial development includes the establishment and expansion of financial institutions. The development of the financial sector induced to economic growth via producer and consumer. The easily availability of loans induced producer for more investment that leads to industrial output. One the other way round expansions of industrial sector upgrade the profitability of the stock market which induced private investment through financial institutions. The results of this study provide the evidence to enhance financial system that helps economic growth through the channel of industrial growth in India. Moreover, more credit facilities will also introduce new technologies which

improve the industrial growth. Industrial production is a measure of output of industrial production from various activities (manufacturing, mining and utilities) in any economy. Moreover, these activities are highly sensitive to interest rate and availability of credit. Industrial production depends upon availability of credit, monetary policy and liberalisation regarding repayment of loans. Table 1 reveals the trends in outstanding loans and industrial production of the India during the time period 1990-91 to 2014-15. The absolute amount of outstanding loans was 1045.66 billion in 1990-91 and increased to 11521.95 billion with a CAGR of 10.27 percent per annum. However, industrial production increased to 68838.12 billion from 2705.65 billion during the time period 1990-91 to 2014-15.

Table 1: Trends in Outstanding Loans and Industrial Production in India (Rs. in Billion)

Year	Outstanding Loans	Industrial Production
1990-91	1045.66	2705.64
1991-92	1101.87	2991.96
1992-93	1612.87	3686.14
1993-94	1627.13	4257.44
1994-95	2063.71	5179.87
1995-96	2469.34	6705.14
1996-97	2596.09	7418.08
1997-98	3246.05	8363.36
1998-99	2282.10	7837.71
1999-00	2537.82	8979.38
2000-01	2579.54	9269.02
2001-02	2692.19	9624.57
2002-03	2633.92	11305.61
2003-04	2897.76	12874.01
2004-05	3346.34	16725.61
2005-06	3515.07	19083.55
2006-07	4285.89	24085.48
2007-08	4539.96	27757.09
2008-09	5364.19	32727.98
2009-10	6630.10	37330.36
2010-11	8256.38	46762.17
2011-12	9243.82	57036.69
2012-13	10722.47	60259.45
2013-14	12220.94	65552.51
2014-15	11521.95	68838.12
CAGR	10.27	14.43

Source: Computed from RBI.

The compound annual growth of industrial production was 14.43 percent. The CAGR of industrial production was much higher than outstanding loans during the studied period. Figure 1 depicts that there is close relationship between

industrial production and outstanding loans in India. Outstanding loans to industry recorded positive growth as shown in following figure.

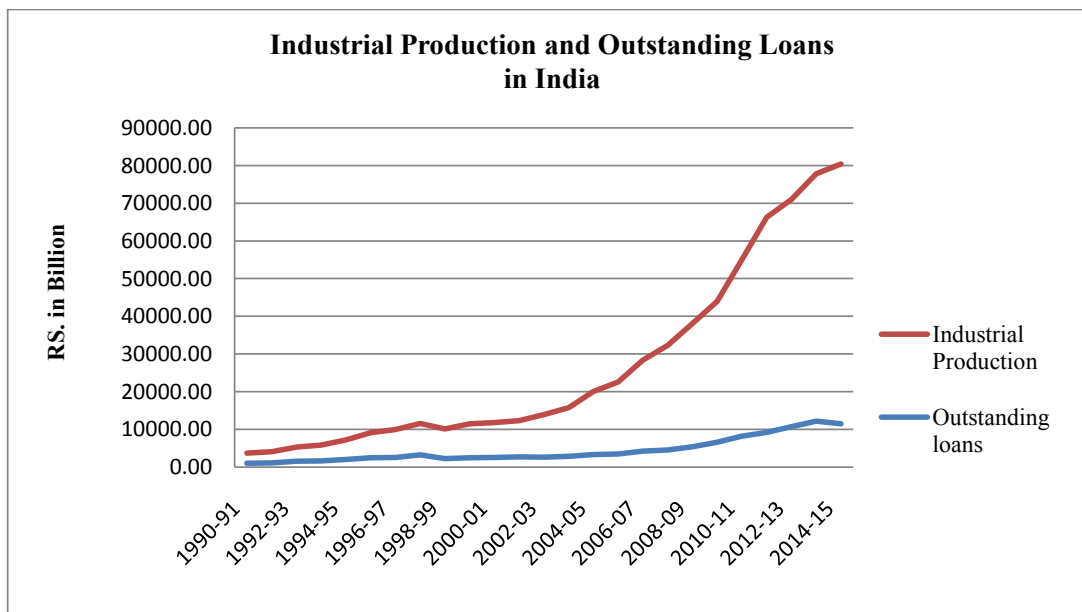


Fig. 1: Trends in Industrial Production and Outstanding Loans in India

Unit Root Test

Different tests are available to check the stationarity in the time series data. We have checked the stationarity of the data with help of three unit root test namely Augmented

Dickey–Fuller (ADF), Phillips-Perron (PP) and Dickey Fuller GLS test. The unit root test procedure confirmed that the data is non stationary at level but at first difference became stationary which is given in the table 2.

Table 2: Stationarity-Unit Root Test

	ADF		PP		DF-GLS	
	Level	First Difference	Level	First Difference	Level	First Difference
Log IG	0.4382	3.8328***	0.4372	3.9312***	0.4609	3.8009***
Log FD	0.5212	5.5935**	0.5078	5.5391***	0.3004	5.4883***

Source: Authors’ own calculations.

Note: 1. The truncation lag for the PP test is based on Newey and west (1987) bandwidth.

2. Critical values of Dickey-Fuller GLS test are based on Elliot et al. (1996, Table 1).

*, **, *** indicates level of significance at 10%, 5% and 1% respectively.

Lag Selection Criterion

To analysed the long run elstacities of the ARDL we have taken lag selection criterion which is given in the table 3.

The lag selection criterion according to the AIC, FPE and HQ founds the 4 lag are suitable to run the ARDL model in the long run.

Table 3: Lag Selection

Lag	LogL	LR	FPE	AIC	SC	HQ
0	20.50026	NA	0.000539	-1.85003	-1.75045	-1.83059
1	78.70637	98.95039*	2.40E-06	-7.27064	-6.97192*	-7.21232
2	79.88535	1.768474	3.23E-06	-6.98854	-6.49067	-6.89135
3	85.26256	6.990374	2.93E-06	-7126256	-6.42924	-6.99019
4	93.54518	9.110874	2.06E-06*	-7554518*	-6.65836	-7379578*
5	94.46857	0.831051	3.21E+06	-7.24686	-6.15155	-7033042

Note:

* indicates lag order selected by criterion, LR-sequential modified LR test statistic (each at 5% level), FPE- Final prediction error, AIC- Akaike information criterion, SC-Schwarz information criterion, HQ- Hannan-Quinn information criterion.

Long Run Elasticities of the Selected Model

The long run elasticities of the financial development with respect to industrial growth under the procedure of ARDL technique is reveals in table 4. The table 4 shows that the elasticity of financial development is 0.36 percent at lag 4, which indicates that 1 percent increase in financial development will enhance the industrial growth by 0.36

percent. All the variable are statistically significant at 1 percent level along with high R^2 value which is statistically very good for the estimated model.

There is no problem of serial correlation and heteroskedasticity in our model (confirmed by Breusch-Godfrey serial correlation LM test and Chi square value of Breusch-Pagan-Godfrey test).

Table 4: Long Run Elasticities: ARDL Model (1,1)

Variable	Coefficient	Std. Error	t-statistic	Prob
LogFD	0.3614	0.0993	3.6856	0.0015***
LogFD(-1)	-0.4487	0.103	-4.3566	0.003***
Log IG(-1)	1.0484	0.0678	15.4448	0.0000***
C	0.1339	0.0946	1.4164	0.1720

Source: Authors own calculations.

Note: *** indicates level of significance at 1%. Prob. = Probability, R -squared = 0.9968, Adjusted R -squared = 0.9963, S.E. of regression = 0.0252, Sum squared resid = 0.0127, F-statistic = 2120.186, Prob (F-statistic) = 0.00000, mean dependent var = 4.1767, Akaike info criterion = -4.3671, Durbin-Watson stat = 1.9957, Breusch-Godfrey Serial Correlation LM Test = 0.9505, Heteroskedasticity Test (Prob. chi-square value of Breusch-Pagan-Godfrey) = 0.7683.

The long run model can be expressed as follows:

$$IG_t = 0.1339 + 0.3614 FD_t$$

Table 5: Bounds Test Statistic

Test Statistic	Value	K
F-Statistic	13.9135	1
Critical Value Bounds		
Significance	I 0 Bound	I 1 Bound
10%	3.02	3.51
5%	3.62	4.16
2.50%	4.18	4.79
1%	4.94	5.58

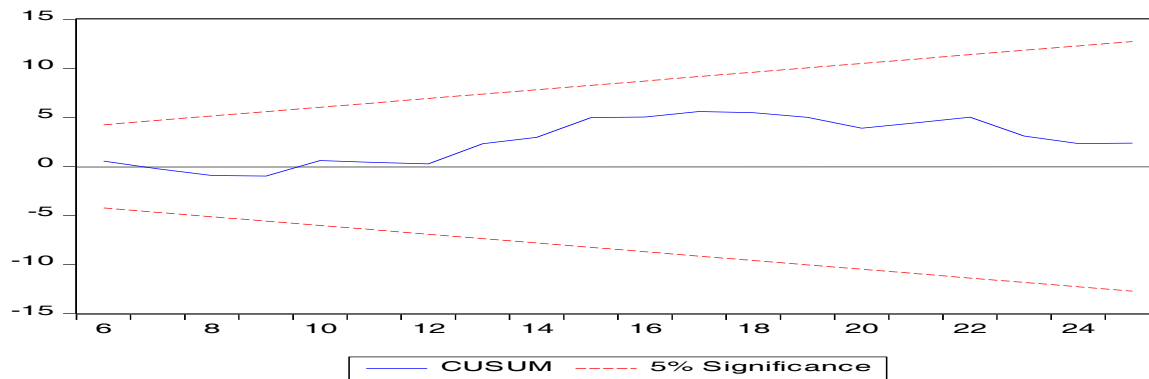
Source: Authors own calculation.

The computed F statistic (13.91) is greater than upper bound (4.16) at 5 percent level of significance by ARDL bound test verified the long-run relationship between industrial growth and financial development.

(cumulative sum) and CUSUM of Square test to check the coefficient stability of the model (in figure 2 and 3). The straight lines in the figures 2 and 3 shows the critical bounds at 5% level of significance which do not cross the critical value. It indicates the long run stability of the coefficients.

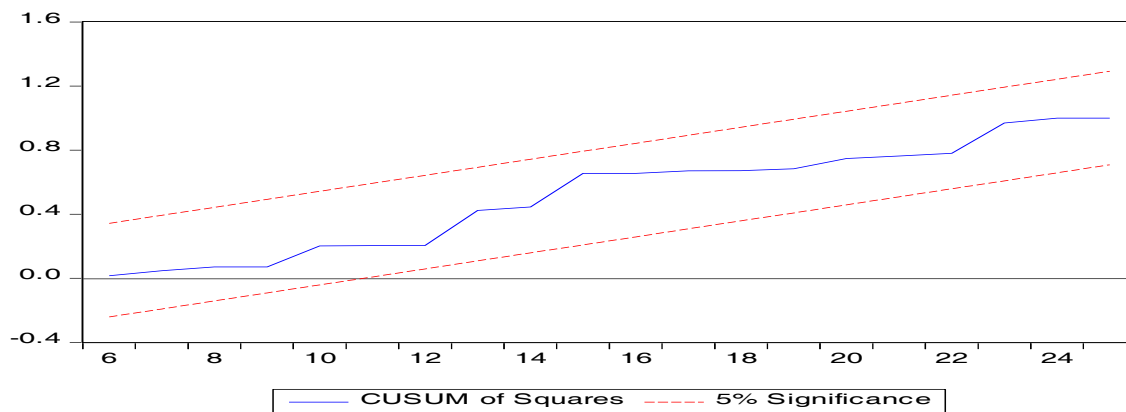
Coefficient Stability Test

Parameter or coefficient stability of the estimated model is crucial for different aspects. This study has used CUSUM



Source: Authors own calculation.

Fig. 2: CUSUM Test Results



Source: Authors own Calculation.

Fig. 3: CUSUM of Square Test Results

GRANGER CAUSALITY TEST

After investigated the long run elasticities and stability of the model, this study proceed the pair wise Granger Causality test to check the whether there is any causal relationship existed

or not. The results of the Granger Causality test (see in table 6) confirmed that there is strong evidence of bi-directional (two way) causality between industrial growth and financial development (at 5% level of significance) at lag 4 (chosen by AIC criterion) during the studied period in India.

Table 6: Pair Wise Granger Causality

Granger Causality Variable Pair	Lag Length	F-Statistics	p-value	Causality Direction
	(AIC criterion)			
LIG and LFD	4	4.7481	0.0158**	LIG↔LFD (Bi-directional)
LFD and LIG		5.0869	0.0124**	

Source: Authors own calculation.

Note: ** indicates level of significance at 5%.

CONCLUSION

The long run association between financial development and industrial growth (industrial output) has been find out with the help of ARDL bound test approach. The results of ARDL bound test suggested that there is existence of long run relationship between financial development and industrial growth in India during studied period. The values of elasticity in the long run are statistically significant. However, outstanding loan of the industrial sector has been increasing during study period, but the rate of growth could not exceeded growth in industrial output. The results of Granger causality confirm the evidence of bi-directional causality between financial development and industrial growth. Coefficient stability (CUSUM and CUSUM Square) test also justifies the long run stability of the model. Study suggested that rapid industrial development in India requires wide improvement in financial sector development along with upgrading facilities infrastructure, public transport, skill centres, tax structure and government policy. The government and policy makers should focus on the above parameters to develop the financial sector for stimulate the industrial growth in India.

REFERENCES

- Aghion, P., Burgess, R., Redding, S., & Zilibotti, F. (2005). Entry liberalization and inequality in industrial performance. *Journal of the European Economic Association*, 2(3), 291-302.
- Aziz, J., & Duenwald, C. (2002). Growth-financial intermediation nexus in China (No. 2002-2194). International Monetary Fund.
- Calderón, C., & Liu, L. (2003). The direction of causality between financial development and economic growth. *Journal of Development Economics*, 72(1), 321-334.
- Chandrasekhar, P. C. (1988). Aspects of growth and structural change in Indian industry. *Economic and Political Weekly*, 23(45-46-47).
- Chang, T. (2002). Financial development and economic growth in Mainland China: A note on testing demand-following or supply-leading hypothesis. *Applied Economics Letters*, 9(13), 869-873.
- Deidda, L., & Fattouh, B. (2002). Non-linearity between finance and growth. *Economics Letters*, 74(3), 339-345.
- Dickey, D. A., & Fuller, W. A. (1979). Distribution of estimators for autoregressive time series with a unit root. *Journal of the American Statistical Association*, 74(366a), 427-431.
- Gopinath, S. (2007). Special features of financial sector reforms in India. Inaugural Address delivered at the 18th Annual National Conference of Forex Association of India on April 6, 2007 at Bangkok.
- Kletzer, K., & Bardhan, P. (1987). Credit markets and patterns of international trade. *Journal of Development Economics*, 27(1), 57-70.
- Lan, Y. W., Lin, D., & Lin, L. (2015). Financial liberalization, economic growth and investment strategy: Lessons from Taiwan for new industrial Countries. *Journal of Business Theory and Practice*, 3(2), 188.4.
- Neusser, K., & Kugler, M. (1998). Manufacturing growth and financial development: Evidence from OECD countries. *Review of Economics and Statistics*, 80(4), 638-646.
- Pesaran, M. H., & Shin, Y. (1999). An autoregressive distributed lag modeling approach to co integration analysis. In S. Strom (ed.), *Econometrics and economic theory in the 20th century: The Ragnar Frisch Centennial Symposium* (Chapter 11). Cambridge University Press: Cambridge.
- Pesaran, M. H., Shin, Y., & Smith, R. J. (2001). Bounds testing approaches to the analysis of level relationships. *Journal of Applied Econometrics*, 16(3), 289-326.
- Qayyum, A. (2006). Money, inflation, and growth in Pakistan. *The Pakistan Development Review*, 203-212.
- Rajan, R. G., & Zingales, L. (1998). Which capitalism? Lessons from the east Asian crisis. *Journal of Applied Corporate Finance*, 11(3), 40-48.