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Finance and Growth

An Empirical Assessment of the Indian Economy

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Abstract

This study is an attempt towards an integration of financial development and its effect on the real sector via the transmission mechanism with special reference to developing and emerging market economies. It finds two cointegrating relations between the financial development, output growth and allocation of credit which makes sense from the standpoint of economic theory. The paper also addresses the issue of causality between finance and growth for the aggregate and broad sectors of the economy. The relations, however, are not similar across the broad sectors of the economy and thus have separate policy implications for different sectors.

Keywords: financial institutions, financial development, transmission mechanism, credit, cointegration

JEL classification: C3, E5, G2

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1 Introduction

In recent times a large body of literature has emerged that asserts the role of financial intermediation in the macroeconomic models.[1] The significance of financial institutions, mainly those of banks, lies in the following activities: (i) banks accept deposits of household savings and lend to a large number of agents, (ii) banks hold liquid reserves against predictable withdrawal demand, (iii) banks issue liabilities that are more liquid than their primary assets, (iv) banks reduce the need for self-financing of investment. The implication of the above is that holding savings in bank deposits is safe in respect of returns compared to equities or direct lending to firms that have uncertain returns. The risk-averse agents would hold more of their savings in bank deposits than in equities or direct lending. The funds from deposit mobilization are lent to entrepreneurs to finance investment projects. Asymmetric information about the investment projects require ex ante evaluation and ex post monitoring which in turn require skill, as well as cost. An individual investor usually does not have the necessary skill and the cost is also prohibitive, while banks can do the job efficiently.[2] In the process, banks can exploit the *law of large numbers* to forecast the number of unsuccessful projects and as a result, the expected returns of the loans advanced. The savers can be assured of a safe return. In short, the bank is the institution through which savings are channelized into investment in the absence of a perfect insurance market for loans. Thus the process is conducive to growth in the real economy. Levine (2004) gives an excellent survey of this literature.

On the other hand, a large number of noted economists[3] hold diametrically just the opposite view. For example, Robinson (1952) argued that the development of financial markets and institutions simply follows growth in the real sector. Lucas (1988) stated that the role of financial markets is overstressed in the growth process. There is a third view[4] that sees the role of finance in growth as a *negative* one. The proponents of this view argue that the development of financial systems hinders growth by reducing the availability of loans to domestic firms. This happens because, as financial development in the formal sector takes place, borrowers shift from the informal to the formal sector for loans. As a result the total supply of credit shrinks, which affects the growth process in the negative direction.

There are three running hypotheses in the literature on finance and growth, of which the first one dominates the literature. The empirical evidence generally supports the first hypothesis though researchers have often found a bi-directional causality. The general strategy in the empirical literature on finance and growth has been to test the hypothesis of association between the level of financial development and the growth rate of GDP or GNP. The econometric tests are employed for cross-section, time

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1 See for example, Bencivenga and Smith (1991), de Mezza and Webb (1992), Gertler (1988), Greenwood and Jovanovic (1990), Bernanke and Gertler (1987), King and Levine (1993a, 1993b), Demirgüç-Kunt and Levine (2001) and many others.

2 See Williamson (1987) for a detailed discussion on this issue.

3 See Robinson (1952), Kuznets (1955), Lucas (1988) who among others are known to hold this view.

4 See Van Wijnbergen (1983), Buffie (1984).

series and panel data. What is relatively under researched is the exact transmission mechanism of how the financial system actually translates into higher growth in the real sector. The growth regression strategy in the tradition of cross-section studies has been severely criticized by Quah (1993), Caselli et al. (1996), Neusser and Kugler (1998) for several reasons, particularly, because it assumes the same coefficients for all the countries and also because causality tests cannot be conducted for the cross-section studies. The dynamic panel models are also not free from the first problem. Hence later studies such as Arestis and Demetriades (1997), Neusser and Kugler (1998), Luintel and Khan (1999) have favoured time series methods. These studies employ time series regressions for different countries.

The majority of the studies concentrate on a very high level of aggregation for the relevant variables, such as growth of GDP or GNP. Most developing countries are, however, characterized by a very dominant agricultural sector[5] and a modern industrial sector along with an informal sector in the urban or semi-urban areas. The present study addresses two of these issues in an econometric model for India. The econometric approach adopted is a multivariate time series for the aggregate economy and for the major sectors within the real part of the economy. The most important contribution of the present study is that instead of only concentrating on financial development and growth, it also considers how the transmission mechanism from financial sector to real sector operates. So the focus is on financial development and transmission mechanism on the one hand and transmission mechanism and income growth on the other.

The plan of the paper is the following: in Section 2 we discuss theoretical issues and the econometric methodology. Section 3 is devoted to the empirical results and Section 4 draws the conclusion.

2 Financial development and transmission mechanism

In the development economics literature credit from banks and other financial institutions is treated, at least in the organized part of the economy, as the main source of finance for economic activities.[6] Though many developing countries, including India, have a long history of an established stock market, these were seldom a major source of finance in the past. The general argument was that various informational problems which are more pronounced in these countries were not conducive to the development of the capital markets as the source of finance. Thus it was advocated that banks and other financial institutions were the appropriate financial institutions for these economies. In the absence of private sector participation, public sector banks and other non-banking financial institutions (henceforth NBFI) were either established or those in the private sector were nationalized. In this way governments gained control over the financial resources.

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5 For example the share of agriculture in the GDP is 26 to 28 per cent in India and a sizable 65 to 68 per cent depending on agriculture of livelihood. In many African countries over 90 per cent of the GDP is contributed by agriculture.

6 See Blinder (1987), Blinder and Stiglitz (1983), Rakshit (1987), (1999), Taylor (1983), (1993).

Government intervention took the form of administered interest rates—both deposit and lending—and directed credit programmes. These policies have led to what McKinnon (1973) and Shaw (1973) described as *financial repression*. Nevertheless, there was a tremendous growth in branch expansions in India, the number of bank offices has increased from 8,584 in 1969[7] to 66,535 in 2003–04. At the same time the per capita deposit has increased from Rs 135 in December 1972 to Rs 12,554 in 2003–04 and per capita credit from Rs 97 to Rs 7,143. Priority sector credit that constitutes mainly of agriculture and small scale industry has increased from 23 per cent of total bank credit in December 1972 to 37.6 per cent in 2003–04. During the same period deposit per bank office has increased from Rs 0.56 *crore* to Rs 19.72 *crore*.

Following the British tradition Indian banks generally provided short-term loans. Specialized financial institutions were established to provide long-term finance to different sectors of the economy. For example, the Industrial Development Bank of India (IDBI), the Industrial Credit and Investment Corporation of India (ICICI) and state financial corporations, etc. were set up to provide finance for the industrial sector while the National Bank for Agriculture and Rural Development (NABARD) was set up to serve the agricultural sector. In addition the Export Import Bank (Exim Bank) was established to help export finance. The majority of these were in the public sector or there were various controls on the private sector units. India is thus a typical example of how financial systems emerged in many developing countries by government intervention. The question is, does the emergence of such a financial system help the growth process—both at the aggregate level as well as in different sectors of the economy? If so, through which channels? We examine these issues in the Indian context.

In a regime of administered interest rate in the loan market an excess demand often emerged as the real interest rate was generally set at a very low level. With the onset of financial liberalization, in the early 1990s in India (and in the 1970s in Latin America) the regime of administered interest rates was over, but that did not imply a regime of market clearing interest rates. When the banks cannot distinguish between riskier and safer loans a priori they would prefer to charge a lower interest rate that would not encourage risky investors to ask for bank loans. This may often lead to an excess demand in the loan market and consequent rationing of credit.[8] Thus the transmission mechanism between real and financial sector no more operates through the interest rate but via the allocation of credit. In this respect a distinction has to be made between short-term and long-term uses of credit.

It has been argued that there are two main uses of credit: short-term requirement for financing working capital and long-term requirement for financing investment in fixed capital.[9] These two uses of credit have different effects on the real sectors of the economy. While credit for working capital affects the supply of goods, credit for fixed

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7 In India the first phase of bank nationalization took place in 1969.

8 See Stiglitz and Weiss (1981).

9 See particularly Rakshit (1987) on this issue. Also McKinnon (1973) and Shaw (1973) discussed these issues in detail.

capital augments the demand side in the short run and enhances the capital stock in the long run. Working capital loans are short-term in nature and affect the production in the real sector while long-term loans are used to finance investment and thus affect productivity through accumulation of capital.

The existing econometric literature on finance and growth does not adequately consider the transmission mechanism in the econometric models and only relates the degree of financial intermediation with income growth. We will consider an econometric model that will relate the degree of financial intermediation and the flow of credit for short-term and long-term requirement on the one hand and the relation between output and the two uses of credit on the other. These can be formalized in the following two sets of equations.

$$FD = f\,(LT, SL) \tag{1}$$

$$Y = g\,(LT, SL) \tag{2}$$

where FD = degree of financial intermediation (also called financial depth), LT = change in the long-term loan, SL = level of short-term loan and Y = output or income. Equations (1) and (2) are used both for the aggregate level as well as for different sectors of the economy. From the above theoretical discussion it follows that FD should be positively related with LT and SL and Y should be positively related with LT and SL.

The specified econometric model is a multivariate VAR with four sets of variables namely FD, LT, SL and Y. Our study relates to three sets of VARs—for the aggregate economy, for agriculture and for manufacturing. The general practice in the finance and growth literature is to work in terms of *growth rates*. We worked with *levels*, because the transmission mechanism outlined above actually operates in levels and not in growth rates. Thus we derived the long run statistical relationship between these four variables. The corresponding vector error correction model (VECM) of the set of cointegrated variables gives the short run dynamics of the model.

We used the *Hand Book of Statistics on Indian Economy* and *Banking Statistics: Basic Statistical Returns*, published by the Reserve Bank of India, for banking sector data. The *Hand Book of Statistics on Indian Economy* provides data on short-term and long-term loans separately for agriculture. They include loans of both types from all sources including co-operative and regional rural banks. Data on short-term loans by banks to the manufacturing sector, available in *Banking Statistics: Basic Statistical Returns*, were used to measure short-term loans. For all practical purposes bank loan can be treated as the institutional source of working capital finance in India for the registered manufacturing sector. It may be noted that data provided by the *Banking Statistics* were published in December and June of each year during 1972–89. Thereafter, they were published in March. To make the banking sector's data comparable with the real sector we interpolated them by a simple linear method between last year's December and current year's June data to arrive at current year's March data. Total term-loans by banks are deducted from total bank loans to the manufacturing sector to arrive at total short-term bank loans to the manufacturing sector. Total disbursements from all financial institutions and change in long-term bank loans to the manufacturing sector are added to get the change in long-term finance to the manufacturing sector. Data on all financial institutions are provided by the IDBI in its publication 'Report on Development Banking in India', reproduced in the *Hand Book of Statistics on Indian Economy.*

For the aggregate economy total short-term bank loans for trading, construction and electricity generation and distribution plus total short-term loan to agriculture from other sources were deducted from total short-term bank loans to arrive at total short-term loans. These loans were deducted as they are not directly connected with production and a large part of them are meant for food credit (e.g. trading) determined by government regulation or because their production structure is different from agriculture or manufacturing. For change in long-term loans we employed total disbursements from all financial institutions plus change in long-term bank loans for manufacturing plus change in long-term loans for agriculture. Our data source for the real sector are the *National Accounts Statistics* published by the Central Statistical Organization. It provides both aggregate as well as sectoral data on GDP, gross capital formation and so on.

The degree of financial intermediation or financial depth (FD) is measured by the ratio of bank deposits to nominal GDP lagged one period. This is a natural measure for FD and widely used in the literature. For the agricultural sector FD is measured by the ratio of deposits in rural and semi-urban areas to one period lagged nominal GDP of agriculture. For the manufacturing sector it is measured by the ratio of deposits in urban and metropolitan areas to one period lagged nominal GDP in the manufacturing. The output Y is in per capita terms. For the aggregate economy Y is per capital GDP and for agriculture (manufacturing) it is GDP from agriculture (manufacturing) per capita. In the latter cases the interpretation is per capita agricultural (manufacturing) output. Change in long-term loans, LT, is normalized by current nominal gross capital formation. Thus our LT is change in long-term loans as the proportion of nominal value of investment. Short-term loan is normalized by current nominal value of GDP. We also worked with the variables in logarithms, but that did not give better results.

Our analysis is conducted with annual data. Regarding the period of analysis it may be noted that depending upon the availability of data the period of analysis for agriculture and the aggregate economy is 1972–73 to 2001–02 and for manufacturing it is 1973–74 to 2002–03.[10]

3 Empirical results

Table 1 gives the descriptive statistics for the four variables for each sector. As is evident from the table mean FD is less than one third for agriculture and for the

[10] Considering the fact that it involves cointegration analysis the period may not appear to be satisfactory. However, two things should be kept in mind. First, it is a demonstration of the econometric model that incorporates the transmission mechanism in the finance–growth literature. Second, for the Indian economy there is unsatisfactory coverage of credit data for the years before 1970 at the disaggregate level.

aggregate economy than for manufacturing.[11] The same pattern is observed for the two types of credit variables for the two sectors. This is also true for the other measures of descriptive statistics.

Table 1 Descriptive statistics—sectoral and aggregate

Var.	Sector	Mean	SD	Median	Max	Min
Depth	Agriculture	0.4203	0.1793	0.4680	0.7992	0.1283
	Manufacture	1.4352	0.4198	1.4531	2.4385	0.7557
	Aggregate	0.3947	0.1100	0.4324	0.5903	0.1950
Income	Agriculture	2559.47	220.23	2518.45	2937.96	2125.11
	Manufacture	1307.90	491.29	1208.24	2268.41	722.59
	Aggregate	7757.56	2139.12	7010.53	12227.05	5261.31
Δ term loan	Agriculture	0.1555	0.0737	0.1344	0.3350	0.0363
	Manufacture	0.3202	0.1505	0.2937	0.7060	0.1056
	Aggregate	0.1281	0.0501	0.1281	0.2310	0.0577
Short-term loan	Agriculture	0.0581	0.0103	0.0589	0.0729	0.0342
	Manufacture	0.4813	0.0522	0.4784	0.5811	0.3898
	Aggregate	0.1458	0.0203	0.1463	0.1893	0.1055

Notes: Data for agriculture and aggregate economy is for the period 1972–73 to 2000–01, while for manufacturing it is 1973–74 to 2002–03.

In order to find out the long run statistical relationship among the four variables FD, Y, LT and SL we first start with unit root tests à la Dickey and Fuller (1981) and Phillips and Perron (1988). The relevant test statistics for all the series and their logarithms do not reject the null hypothesis of the unit root in general. The test results are given in Tables 1.1, 2.1 and 3.1. As is evident from Table 1.1 the null hypothesis of unit root is not rejected for FD for agriculture both by Dickey Fuller (DF) or Augmented Dickey Fuller (ADF) as well as Phillips-Perron tests in levels. However, the null of unit root is not rejected at first difference by DF/ADF tests, while it is rejected in second difference. But the Phillips-Perron test rejects the null at first difference. Thus we a have a problem of choosing the order of integration. We accept the result of the unit root test on the basis of the Phillips-Perron test. Again, the Phillips-Perron test for Y and LT shows that the null of the unit root is rejected at levels. But as DF/ADF shows the null is not rejected at levels, we take the result of the unit root test on the basis of DF/ADF to remain on the safe side. No such problem arises for the manufacturing sector or the aggregate economy. In both the cases the null of unit root cannot be rejected at 95 per cent with the variables in levels by both DF/ADF and the Phillips-Perron test criteria. But the null of unit root is rejected in the first difference of the variables.

[11] The value of some of the descriptive statistics for the aggregate economy is sometimes even lower than that for agriculture. This is because of the fact that aggregate economy includes some other sectors that are not exhausted by the union of agriculture and manufacturing.

The presence of unit root in all the four series prompts us to test for cointegration among the four variables in all the three cases. The test of cointegration is conducted by the ML method of Johansen (Johansen 1991; Johansen and Juselius 1992). The results are given in Tables 1.2, 2.2 and 3.2. For manufacturing and the aggregate economy the null of two cointegrating vectors are accepted both by trace as well as maximum eigenvalue tests. For agriculture though, the null of two cointegrating vectors are accepted by the trace test, the maximum eigenvalue test cannot reject the null of the presence of three cointegrating vectors. However, as the trace test is more robust than the maximum eigenvalue test we accept the result of the trace test.

The cointegrating vector is not unique in either case, thus we have to impose some restrictions on the variables. The a priori restriction that we impose is that a long run relationship exists between FD, LT and SL and a long run relationship exists between Y, LT and SL. Thus we posit a long run relationship between financial development and flow of credit for the two uses. This is how financial development leads to credit flow to different uses and for different sectors and another long run relation between Y, LT and SL. Thus unlike in the finance and growth literature we assume that financial development does not directly affect income, but it directly affects credit flows and then via credit flows the production side. In this way we incorporate the transmission mechanism in the finance–growth relationship. Thus the coefficient of Y in equation (1) is restricted to zero and the coefficient of FD in equation (2) is restricted to zero in the cointegrating relations. These two restrictions are Johansen's exactly identified restrictions. In order to test significance of one or more coefficients in the cointegrating framework we test over identifying restriction. As a matter of fact this was done for the manufacturing and the aggregate economy.

As is revealed by Tables 1.2c, 2.2c and 3.2c FD is positively associated[12] with outstanding short-term loans and negatively associated with the change in long-term loans in agriculture, positively associated with both loans in manufacturing while positively associated with change in long-term loans for the aggregate economy. The association between FD and short-term loans though positive is non-significant for the aggregate economy. The positive association of FD and the credit variables makes perfect sense. But a negative association with change in long-term loans for agriculture calls for an explanation. Plotting FD and change in long-term loan in agriculture shows that over time FD has increased in rural and semi-urban areas while change in long-term loans has decreased. Splitting the dataset into two sub-periods, namely from 1972–73 to 1985–86 and 1986–87 to 2001–02 shows that there is a significant change in the average values of FD, LT and SL (0.2592, 0.1785, 0.055 and 0.561, 0.1353, 0.061 respectively) across the periods. For manufacturing the association between FD and the credit variables are expected and significant.

The second cointegrating vector shows the long run statistical relation between Y, LT and SL. It is evident from the tables that Y is positively related to SL and negatively with LT at the 5 per cent level of significance for agriculture. The negative association between FD and LT is robust as given by the t-value and we also tested an

[12] The cointegrating vectors as reported in Tables 1.2c, 2.2c and 3.2c and also 2.3d and 3.3d. Actually take FD to the left and SL and LT on the right, thus a negative value for the coefficient of LT or SL implies a positive association between FD and LT or SL and vice versa.

over identifying restriction with a zero restriction for the coefficient of LT which is rejected (not reported in the table). So it calls for interpretation. The simplest explanation that can be advanced is that LT has both a supply side effect on output by adding to capital stock of this sector and it also has a demand effect on the agricultural sector. In the market equilibrium equation for the agricultural sector these two effects operate in opposite directions. The cointegrating relation being a reduced form relation, the coefficient of LT exhibits the net effect which is negative in this case (i.e. the demand effect dominates). For manufacturing the relation between Y and LT is positive and significant at the 5 per cent level, but is non-significant between Y and SL. Thus we re-estimated the model with an additional over identifying restriction that the coefficient of SL for equation (2) is zero. The χ^2 value for one degree of freedom is not rejected. Thus for the manufacturing sector the second cointegrating vector shows that SL has no effect on output. For the aggregate economy the relation between Y and SL is positive and significant at a 5 per cent level while the relation between Y and LT is non-significant at a 5 per cent level. The corresponding over identifying test confirms this.

It has been shown by Engle and Granger (1982) that every cointegrating relation has an ECM which gives us the adjustment of the system (described by the two equations for each sector in our model). We have also estimated the ECM for all the cases and they are reported in Tables 1.3, 2.3 and 3.3. The t-values of the coefficients in these tables show their role in the adjustment mechanism as and when disequilibrium occurs. It is revealed by Table 1.3 that any deviation of FD for the agricultural sector from long run equilibrium is taken care of by itself in the next period. The adjustment does not take place in the long run equilibrium. But any disequilibrium in the output equation for agriculture is corrected both by adjustment in the first cointegrating relation (with positive sign) and the second cointegrating relation (with negative sign). There is no adjustment in the VECM for term loan while for short-term loan output adjusts in the next period with a negative sign though the coefficient of adjustment is very low.

In the case of the manufacturing sector the disequilibrium in long run path of FD is taken care of by adjustment through the second cointegrating equation with a positive sign and through adjustment in output with a one period lag, but with a negative sign. For the output equation adjustment operates via the first cointegrating equation and lagged output (with positive sign) and short-term loan (with negative sign). Thus causality runs from output to FD and not vice versa for manufacturing. For the change in term loans equation causality operates through output and short-term loans.

For the aggregate economy adjustments take place only through LT and SL via both cointegrating vectors. No significant causality can be found to exist between FD and output or vice versa. For this sector LT takes the burden of adjustment for any disequilibrium in FD and Y. The above results show that FD is exogenous for all the sectors. However, for manufacturing there is a causal relation from output to FD though no such relation exists either for agriculture or the aggregate economy.

Tables 1.4, 2.4 and 3.4 report estimated long run matrix of coefficients by Johansen's estimation method. Tables 1.5, 2.5 and 3.5 report the variance decomposition analysis for agriculture, manufacturing and the aggregate economy respectively. It shows the generalized variance decomposition to one standard error shock in each of the four variables after 5 years and 10 years. It is revealed by the three tables that variance to own shock is higher for all the variables compared to that for shock to any other variable. For agriculture, however FD has a higher variance due to Y for agriculture. This points to a possible endogenity of FD to Y in agriculture though the corresponding VECM does not establish any such result.

Table 1.1 Unit root test for agriculture

	DF/ADF test			Phillips-Perron test		
Variable	Calculated value	Critical value (at 5%)	Nature of test eq.	Calculated value	Critical value (at 5%)	Nature of test eq.
Depth	-1.877*	-3.587	Int, T, L=0	-1.753	-3.573	
Output	-2.911	-3.573	Int, T, L=0	-5.047**	-3.567	Int, L
Term loan	-1.345	-2.967	Int, L=1	-4.143**	-2.963	Int
Short-term loan	-2.001	-2.971	Int, L=1	-1.635	-2.697	

Source: Authors' calculation.

Notes: * = Null of unit root is not rejected at a 5 per cent level in first difference. ** = Null of unit root is rejected at per cent for variables in levels. Int = Intercept, T = time trend, L = no. of lags for the first difference of the variables in the test eq.

Table 1.2 Cointegration test for agriculture—restricted intercept and no trend in VAR (Order of VAR = 2)

Table 1.2(a) Maximum eigenvalue test

Null hypothesis	Alternative hypothesis	Calculated statistic	Critical value (at 5%)
r = 0	r = 1	18.51	28.27
r <= 1	r = 2	18.38	22.04
r <= 2	r = 3	13.57	15.87
r <= 3	r = 4	5.14	9.16

Source: Authors' calculation.

Table 1.2(b) Trace test

Null hypothesis	Alternative hypothesis	Calculated statistic	Critical value (at 5%)
r = 0	r >= 1	55.59	53.48
r <= 1	r >= 2	37.09	34.87
r <= 2	r >= 3	18.71	20.18
r <= 3	r = 4	5.14	9.16

Source: Authors' calculation.

Note: r = number of cointegrating vector.

Table 1.2(c) Cointegrating vectors—exactly identified restrictions

$(Depth)_t$	$(Output)_t$	$(Term\ loan)_t$	$(Short\text{-}term\ loan)_t$	Intercept
1	0	3.306	-27.53	0.658
		(0.985)	(9.24)	(0.33)
0	1	277.54	-172.50	-1634.4
		(5.58)	(-14.27)	(505.4)

Source: Authors' calculations.

Notes: r = no. of cointegrating vectors = 2; Eigenvalues: (0.48361, 0.48129, 0.38417, 0.16754, 0.00); Standard errors are given in the parentheses.

Table 1.3 Vector error correction model for agriculture

	Dependent variable			
Explanatory variable	$\Delta(Depth)_t$	$\Delta\ (Output)_t$	$\Delta\ (Term\ loan)_t$	$\Delta\ (Short\text{-}term\ loan)_t$
ec_{t-1} [a]	0.0252 (0.19)	1959.6 (3.95)	-0.141 (-0.46)	0.002 (0.13)
ec_{t-1} [b]	0.000019 (0.225)	-1.414 (-4.353)	0.00002 (0.101)	0.00007 (0.65)
$\Delta\ (Depth)_{t-1}$	0.846 (3.00)	-1503.5 (-1.421)	0.053 (0.081)	0.009 (0.24)
$\Delta\ (Output)_{t-1}$	-0.000083 (-1.44)	0.267 (1.23)	0.00002 (0.119)	-0.00002 (-2.13)
$\Delta\ (Term\ loan)_{t-1}$	0.034 (0.337)	309.20 (0.818)	-0.396 (-1.69)	-0.008 (-0.60)
$\Delta\ (Short\text{-}term\ loan)_{t-1}$	-2.04 (1.25)	7192.5 (1.172)	-2.02 (0.532)	0.277 (1.24)
R^2	0.199	0.642	0.458	0.485

Source: Authors' calculation.

Notes: t-statistics are given in the parentheses. [a, b] are error correction terms corresponding to the cointegrating vector given respectively in the first and second row of Table 1.2(c).

Table 1.4 Estimated long run matrix in Johansen's estimation for agriculture

	Depth	Income	Long-term loan	Short-term loan	INTERCEPT
Depth	0.0252	0.000019	0.1711	-1.266	-0.015
Income	1959.6	-1.414	77.89	-12221.8	3599.6
Long-term loan	-0.1406	0.00002	-0.373	3.271	-0.1257
Short-term loan	0.0023	0.000008	0.0424	-0.291	-0.011

Source: Authors' calculation.

Table 1.5 Generalized error variance decomposition for agriculture (%)

Shock to	Horizon	Depth	Income	Long-term loan	Short-term loan
Depth	After 5 years	90.66	0.54	10.56	27.26
	After 10 years	89.57	0.19	7.54	22.53
Income	After 5 years	42.19	32.80	5.65	6.76
	After 10 years	62.57	11.61	2.18	5.34
Long-term loan	After 5 years	7.36	4.94	94.59	46.84
	After 10 years	4.40	4.65	88.93	44.00
Short-term loan	After 5 years	29.50	7.27	78.40	72.60
	After 10 years	32.32	5.63	81.54	70.03

Source: Authors' calculation.

Table 2.1 Unit root test for manufacturing

	DF/ADF test			Phillips-Perron test		
Variable	Calculated value	Critical value (at 5%)	Nature of test eq.	Calculated value	Critical value (at 5%)	Nature of test eq.
Depth	-1.902	-3.573	T, L=1	-1.420	-3.567	
Output	2.733	-1.953	L=0	-1.534	-3.567	T
Term loan	-3.419	-3.573	Int, T, L=1	-2.265	-3.567	
Short-term loan	-2.215	-2.967	Int, L=0	-1.721	-2.963	

Source: Authors' calculation.

Notes: Int = Intercept, T = time trend, L = no. of lags for the first difference of the variables in the test eq.

Table 2.2 Cointegration test for manufacturing—no intercept or trend in VAR (Order of VAR = 3)

Table 2.2(a) Maximum eigenvalue test

Null Hypothesis	Alternative Hypothesis	Calculated Statistic	Critical Value (at 5%)
r = 0	r = 1	30.30	23.93
r <= 1	r = 2	18.88	17.68
r <= 2	r = 3	5.88	11.03
r <= 3	r = 4	0.00029	4.16

Source: Authors' calculations.

Table 2.2(b) Trace test

Null Hypothesis	Alternative Hypothesis	Calculated Statistic	Critical Value (at 5%)
r = 0	r >= 1	55.05	39.81
r <= 1	r >= 2	24.75	24.05
r <= 2	r >= 3	5.88	12.36
r <= 3	r=4	0.00029	4.16

Source: Authors' calculations.

Table 2.2(c) Cointegrating vectors—exactly identified restrictions

$(\text{Depth})_t$	$(\text{Output})_t$	$(\text{Term loan})_t$	$(\text{Short-term loan})_t$
1	0	-3.2875	-1.754
		(1.415)	(0.464)
0	1	-2268.5	-186.07
		(851.81)	(280.55)

Source: Authors' calculations.

Table 2.2(d) Cointegrating vectors—over identified restrictions

$(\text{Depth})_t$	$(\text{Output})_t$	$(\text{Term loan})_t$	$(\text{Short-term loan})_t$
1	0	-3.666	-2.042
		(2.246)	(0.331)
0	1	-2029.7	0
		(1300.5)	

Source: Authors' calculations.

Notes: r = no. of cointegrating vectors = 2; Eigenvalues: (0.6744, 0.503, 0.1956, 0.000011); Standard errors are given in the parentheses; Likelihood ratio test of over identifying restriction $\chi^2(1) = 0.254$ [0.615].

Table 2.3 Vector error correction model for manufacturing

Explanatory variable	Dependent variable: Δ $(\text{Depth})_t$	Δ $(\text{Output})_t$	Δ $(\text{Term loan})_t$	Δ $(\text{Short-term loan})_t$
ec_{t-1} [a]	0.0073	-116.49	0.190	0.05
	(0.098)	(-2.28)	(2.73)	(1.68)
ec_{t-1} [b]	0.00022	-0.097	0.0003	0.00008
	(1.97)	(-1.26)	(3.16)	(1.69)
Δ $(\text{Depth})_{t-1}$	-0.0412	130.60	0.136	-0.039
	(-0.163)	(0.752)	(0.574)	(-0.38)
Δ $(\text{Depth})_{t-2}$	0.244	-70.72	0.144	0.005
	(1.163)	(-0.492)	(0.734)	(0.06)
Δ $(\text{Output})_{t-1}$	-0.0013	0.535	-0.0007	-0.0002
	(-3.97)	(2.39)	(-2.14)	(-1.14)
Δ $(\text{Output})_{t-2}$	-0.00032	-0.071	-0.0005	-0.000002
	(-0.71)	(-0.229)	(-1.07)	(-0.012)
Δ $(\text{Term loan})_{t-1}$	0.416	-310.32	-0.079	0.135
	(1.00)	(-1.09)	(-0.203)	(0.809)
Δ $(\text{Term loan})_{t-2}$	0.033	18.97	-0.013	0.067
	(0.114)	(0.095)	(-0.049)	(0.579)
Δ $(\text{Short-term loan})_{t-1}$	-0.692	151.82	0.094	-0.054
	(-1.165)	(0.373)	(1.7)	(-0.227)
Δ $(\text{Short-term loan})_{t-2}$	-0.6003	-1024.3	1.359	0.149
	(-0.995)	(-2.48)	(2.41)	(0.617)
R^2	0.643	0.549	0.742	0.345

Source: Authors' calculation.

Notes: t-statistics are given in the parentheses; [a, b] are error correction terms corresponding to the cointegrating vector given respectively in the first and second row of Table 2.2(c).

Table 2.4 Estimated long run matrix in Johansen's estimation for manufacturing

	Depth	Income	Long-term loan	Short-term loan	INTERCEPT
Depth	-0.0413	0.00024	-0.410	0.028	-0.0413
Income	-131.76	-0.093	643.32	248.39	-131.76
Long-term loan	0.180	0.00034	-1.355	-0.379	0.180
Short-term loan	0.0531	0.000074	-0.343	-0.107	0.0531

Source: Authors' calculation.

Table 2.5 Generalized error variance decomposition for manufacturing (%)

Shock to	Horizon	Depth	Income	Long-term loan	Short-term loan
Depth	After 5 years	60.57	33.53	1.89	18.95
	After 10 years	64.41	29.19	1.81	20.64
Income	After 5 years	2.17	80.14	12.23	6.37
	After 10 years	5.62	82.51	7.19	9.47
Long-term loan	After 5 years	12.36	11.36	61.60	24.73
	After 10 years	12.86	12.04	61.77	24.53
Short-term loan	After 5 years	2.17	18.55	44.66	83.01
	After 10 years	2.65	18.63	43.01	85.72

Source: Authors' calculation.

Table 3.1 Unit root test for aggregate economy

	DF/ADF test			Phillips-Perron test		
Variable	Calculated value	Critical value (at 5%)	Nature of test eq.	Calculated value	Critical value (at 5%)	Nature of test eq.
Depth	-2.028	-3.5796	Int, T, L=1	-1.765	-3.573	Int
Output	4.820	-1.954	L=0	7.622	-1.953	
Term loan	-2.422	-3.5796	Int, T, L=0	-1.861	-2.967	Int
Short-term loan	-2.516	-3.573	Int, T, L=0	-2.527	-3.573	Int, T

Source: Authors' calculation.

Notes: Int = Intercept, T = time trend, L = no. of lags for the first difference of the variables in the test eq.

Table 3.2 Cointegration test for aggregate economy—no intercept or trend in VAR (Order of VAR = 1)

Table 3.2(a) Maximum eigenvalue test

Null Hypothesis	Alternative Hypothesis	Calculated Statistic	Critical Value (at 5%)
r = 0	r = 1	44.50	23.92
r <= 1	r = 2	14.52	17.68
r <= 2	r = 3	8.55	11.03
r <= 3	r = 4	1.128	4.16

Source: Authors' calculation.

Table 3.2(b) Trace test

Null Hypothesis	Alternative Hypothesis	Calculated Statistic	Critical Value (at 5%)
r = 0	r >= 1	68.70	39.81
r <= 1	r >= 2	24.20	24.05
r <= 2	r >= 3	9.68	12.36
r <= 3	r = 4	1.13	4.16

Source: Authors' calculation.

Table 3.2(c) Cointegrating vectors—exactly identified restrictions

$(\text{Depth})_t$	$(\text{Output})_t$	$(\text{Term loan})_t$	$(\text{Short-term loan})_t$
1	0	-4.868	-0.476
		(3.91)	(1.682)
0	1	-14982.6	-17529.2
		(32807.8)	(13863.8)

Source: Authors' calculation.

Table 3.2(d) Cointegrating vectors—over identified restrictions

$(\text{Depth})_t$	$(\text{Output})_t$	$(\text{Term loan})_t$	$(\text{Short-term loan})_t$
1	0	-6.47	0.00
		(3.39)	
0	1	0.00	-21723.8
			(10775.4)

Source: Authors' calculations.

Notes: r = no. of cointegrating vectors = 2; Eigenvalues: (0.7941, 0.58111, 0.24932, 0.000); Standard errors are given in the parentheses; Likelihood ratio test of over identifying restriction $\chi2(2)$ =0.1109 [0.946].

Table 3.3 Vector error correction model for aggregate economy

	Dependent variable			
Explanatory variable	$\Delta\ (\text{Depth})_t$	$\Delta\ (\text{Output})_t$	$\Delta\ (\text{Term loan})_t$	$\Delta\ (\text{Short-term loan})_t$
	-0.0115	-347.17	0.101	0.025
ec_{t-1} [a]	(-0.402)	(-1.04)	(3.48)	(1.572)
	0.0000016	0.0223	0.00001	0.000003
ec_{t-1} [b]	(0.57)	(0.673)	(3.84)	(1.96)
$\Delta\ (\text{Depth})_{t-1}$	-	-	-	-
$\Delta\ (\text{Output})_{t-1}$	-	-	-	-
$\Delta\ (\text{Term loan})_{t-1}$	-	-	-	-
$\Delta\ (\text{Short-term loan})_{t-1}$	-	-	-	-
R^2	0.001	0.276	0.325	0.111

Source: Authors' calculation.

Notes: t-statistics are given in the parentheses; [a, b] are error correction terms corresponding to the cointegrating vector given respectively in the first and second row of Table 3.2(c).

Table 3.4 Estimated long run matrix in Johansen estimation for aggregate economy

	Depth	Income	Long-term loan	Short-term loan	INTERCEPT
Depth	-0.0226	0.000002	0.083	-0.021	-0.0226
Income	530.56	0.0286	2154.6	-248.60	530.56
Long-term loan	0.099	0.00001	-0.649	-0.241	0.099
Short-term loan	0.0234	0.000003	-0.160	-0.066	0.0234

Source: Authors' calculation.

Table 3.5 Generalized error variance decomposition for aggregate economy (%)

Shock to	Horizon	Depth	Income	Long-term loan	Short-term loan
Depth	After 5 years	97.6	2.70	16.0	6.61
	After 10 years	91.5	1.43	19.17	11.79
Income	After 5 years	2.40	91.93	1.20	1.61
	After 10 years	1.40	83.46	2.31	6.43
Long-term loan	After 5 years	15.65	6.69	75.95	15.36
	After 10 years	16.05	11.13	56.21	27.08
Short-term loan	After 5 years	5.61	2.73	16.33	88.27
	After 10 years	6.10	4.62	18.24	85.74

Source: Authors' calculation.

4 Conclusion

The paper specifies the relationships between financial development and the allocation of credit on the one hand and the transmission mechanism between real and financial sectors and the allocation of credit on the other in India. It tries to identify the missing link between financial development and output.

The research question of the paper is addressed in a multivariate time series model for the aggregate economy as well as the broad sectors. The presence of non-stationary variables leads to the testing for cointegrating relations. There are two cointegrating relations of which one is specified as the long run relationship between financial development and allocation of credit between different uses and the other as the long run relation between growth of output and two uses of credit—short-term and long-term. The latter represents the transmission mechanism in an imperfect credit market. However, the nature of these cointegrating relationships differ across sectors.

FD has a positive association with short-term loan while the nature of association with long-term loan is negative for agriculture. As the latter result is counter intuitive we explored it further and found that the observation is driven by a significant change in the relevant variables in the second part of the sample period, namely 1985–86 to 2001–02. This is the period when financial reforms began. The relation between FD and the two uses of credit for the manufacturing sector is positive. But there is no significant relation between FD and short-term loans in the aggregate data though the relation with long-term loan is positive. The second cointegrating relation shows that output of agriculture has a positive relation with short-term loans and a negative relation with long-term loans. The latter finding is interpreted as the net effect of a reduced form relation. In the case of the manufacturing sector short-term loan has no effect on output. On the whole for the aggregate economy there is no relation between output and long-term loans though the relation with short-term loan is positive and significant.

We also estimated the VECMs for all the three cases which represent the short run dynamics. The relevant estimates show that there are differences across sectors in respect of the adjustment mechanism when the system deviates from its long run equilibrium. The error correction mechanism for agriculture mainly operates through adjustment in output for agriculture. Similar results are also observed for the manufacturing sector. It is also observed that the causality runs from output to FD for the manufacturing sector. For the aggregate economy no significant causal relation can be established between FD and output. The variance decomposition analysis, however shows that a shock to output affects financial development quite significantly in the agricultural sector.

Our results indicate that the nature of relation between FD and allocation of credit or between output and allocation of credit are different across the sectors of the economy. It is also true about causal relation between the variables. So a general credit policy will not give same results across the sectors of the economy. This calls for the deployment of carefully nuanced policy for the development of financial institutions in India, and perhaps developing countries in general. The development of financial institutions backed by the government was very pronounced in India in the 1970s and 1980s and was reflected in the rate of expansions of bank branches. It had led to different types of effects on the growth of different sectors of the real economy. A single policy for the whole economy may backfire as it can generate differential impact on different sectors of the economy.

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