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Abstract

The study investigates the effects of activities of financial institutions (FIs). In particular, an econometric study has been undertaken to examine the 'supply-leading' and 'demand-following' characteristics of FI activities. The investigation is conducted by employing time series data using certain macro variables over the period 1962-63 to 1996-97. Our analysis shows the existence of a strong supply-leading (SL) relationship from real disbursements to real investments. The SL relation is further confirmed through the Sims causality tests. The demand-following (DF) relationship from real investments to real disbursements finds weak confirmation via the Sims causality test. Evidence therefore supports the presence of a strong SL link in the Indian context.

JEL classification G 21, G 28

Key words Supply-leading, Demand following, Causality, Financial Institutions; India

I. Introduction

In recent years, a considerable amount of interest has been generated in the financial restructuring process of less developed economies (LDE). Most LDEs are experimenting with policy programmes to restructure their financial sector. The interest in such exercise stems from two strands of literature. The first of these relate to the financial liberalisation line of thinking, which can be traced to the seminal contributions by McKinnon (1973) and Shaw (1973). This literature emphasises the importance of financial liberalisation in LDEs as part of policy adjustment programmes (see, for instance, Fry 1995). The second line of thinking relates to the monetarist-structuralist dichotomy and underscores the point as to whether economic growth can be achieved via monetary influences, engendered by free financial markets, as opposed to government intervention in the real sector, characterised by economic planning (Taylor 1990). In general, financial restructuring experiments are underpinned by the argument that financial development usually induces economic growth.

However, as Jung (1986) has shown, the causal relationship between financial reforms and economic growth is not empirically resolved in the context of two fundamental hypotheses stipulated in a seminal paper by Patrick (1966). These are the *demand-following* and *supply-leading* relationships. The former postulates a causal relationship from real to financial growth: as the real sector develops, increased demand for financial services induces growth in the latter. The supply leading relation, on the other hand, posits a causal relationship from financial to real growth: deliberate creation of financial institutions and markets increases supply of financial services; this catalyses growth in the real sector.

II. The Theoretical Backdrop

The issue of financial restructuring and economic growth can be placed in the context of developments in economic theory. Given the experience with financial repression in most LDEs, the problem was formalised in the context of McKinnon-Shaw hypothesis. McKinnon (1973) advocated the complementarity between money and physical capital in the process of economic growth. Therefore, following McKinnon's complementarity hypothesis, one can postulate the money demand function as follows:

$$\frac{M}{P} = f(Y,\ I/Y,\ R) \qquad f_i > 0\ ,\ \forall\ i$$

where M/P is the real (broad) money stock; Y is real output; I is gross investment; and R is the real deposit rate. The argument is that financial liberalisation (a rise in R) is necessary, much as an increase in I/Y is important, for financial development and thereby economic growth. As investment rises, the demand for money to supplement physical capital also increases; hence $f_2>0$.[2]

Following the recent theoretical advances, the relationship between financial development and growth can be couched in terms of the endogenous growth literature. This strand of thinking however yields two competing predictions so much so that one is still confronted with the 'supply-leading' and 'demand-following' dichotomy.

In the first set of models, output (Y) is assumed to be a linear function of the capital stock (K) as given by equation (1):

$$Y_t = AK_t \qquad \textbf{(1)}$$

The production function can be seen as a reduced form resulting from one of two underlying framework. One is a competitive economy with external economies (Roemer, 1989) wherein, firms face a technology with constant returns, but productivity is an increasing function of the aggregate capital stock K_t. For example, assume an economy with N identical firms, each producing output $y_t = Bk_t^{\beta}$ with its capital stock k_t. Suppose B is regarded as a parameter by individual firms, but actually responds to the actual capital stock according to $B = Ak_t^{1-\beta}$. Then aggregate output, $Y_t=Ny_t$ is given by (1) above. Alternately, the AK model can be derived assuming K to be the composite of physical (J) and human (H) capital; $K=J_k+H_k$ (Lucas, 1988). Under certain other mild restrictions, it can be shown that the steady-state growth (g) is given by

$$g = A\varphi s - \delta, \quad s = S/Y \qquad \textbf{(2)}$$

Here δ denotes the depreciation rate and s is the rate of savings.

Equation (2) implies that financial development affects growth. In particular, financial development can raise φ, the proportion of savings funnelled to growth; or it may increase the social productivity of capital (A); alternately it may influence the savings rate (s).

The second set of models (Wang and Yip, 1992) is embedded in terms of an infinite-horizon, representative-agent, perfect-foresight specification. The representative household is assumed to

maximise an instantaneous utility function subject to a flow budget constraint. Under certain parametric configurations, it can be shown that the growth rates of real macroeconomic aggregates are independent of the rate of money growth: in other words, financial growth does not induce real growth[3].

The developments in economic theory therefore suggest that the causal relationship between financial development and economic growth remains unresolved. It is intended in this paper to draw on the recent developments in econometrics to set up a framework for testing this problem in the light of financial restructuring experiments in India. We employ the bivariate autoregressive framework (BVAR) model that encapsulates the main predictions of the theories enunciated at the beginning of this paper.

III. The Empirical Framework

The empirical study is couched in terms of a bivariate vector autoregressive (BVAR) framework. The study applies the BVAR framework in the spirit of the original model by Granger (1969). To apply the basic idea of Granger causality, assume that we have two variables: a proxy for financial development (X) and another for economic growth (Y). Granger's test assumes that the information relevant to the prediction of X and Y is contained in time-series data on these variables. The test therefore involves estimating the following distributed lag regression equations:

$$Y_i = \sum_{i=1}^{n} a_i X_{t-i} + \sum_{j=1}^{n} b_j Y_{t-j} + U_{1t} \qquad \textbf{(3)}$$

$$X_i = \sum_{i=1}^{n} c_i Y_{t-i} + \sum_{j=1}^{n} d_j X_{t-j} + U_{2t} \qquad \textbf{(4)}$$

where U_{1t} and U_{2t} are serially uncorrelated with zero mean and finite covariance matrix. The first (resp., second) equation assumes that current Y (resp., current X) is related to its own past values as well as those of X (resp., Y).

Let $\tilde{X}$ and $\tilde{Y}$ be all relevant past values of X and Y, and let $\sigma^2(Y_t|Z)$ be the minimum error of variance of prediction of Y_t given an information set Z, where Z can be $(\tilde{Y}+\tilde{R})$ or $\tilde{Y}$ or $\tilde{R}$ alone; and likewise $\sigma^2(X_t|Z)$. In addition, let $B=\{X,Y\}$ where X and Y are a pair of linear, covariance

stationary time-series. There are four possible directions of causality, as discussed in what follows.

(i) The existence of unidirectional causality from X to Y. It is predicted that X causes Y if $H_0: a_j = 0$ and $H_0: c_j = 0$ are rejected. Thus $\sigma^2\left(Y_t|\tilde{B}\right) < \sigma^2\left(Y_t|\tilde{B} - \tilde{X}\right)$, or taking account of past values of X leads to improved predictions for Y.

(ii) The existence of unidirectional causality from Y to X. It is predicted that Y causes X if $H_0: a_j = 0$ and $H_0: c_j = 0$ are rejected. Thus, $\sigma^2\left(X_t|\tilde{B}\right) < \sigma^2\left(X_t|\tilde{B} - \tilde{Y}\right)$, or taking account of past values of X leads to improved predictions for Y.

(iii) The existence of bilateral causality between X and Y. In this case, all the estimated coefficients in both equations are statistically different from zero; or, $\sigma^2\left(Y_t|\tilde{B}\right) < \sigma^2\left(Y_t|\tilde{B} - \tilde{X}\right)$ AND $\sigma^2\left(X_t|\tilde{B}\right) < \sigma^2\left(X_t|\tilde{B} - \tilde{Y}\right)$

(iv) The variables X and Y are independent. In this case, neither variable causes the other, so that $\sigma^2\left(Y_t|\tilde{B}\right) = \sigma^2\left(Y_t|\tilde{B} - \tilde{X}\right)$ AND $\sigma^2\left(X_t|\tilde{B}\right) = \sigma^2\left(X_t|\tilde{B} - \tilde{Y}\right)$

IV. The Data Set and Variables

Sanctions and disbursement data of the FIs have been taken from the Report of Development Banking in India (various years) The aggregate sanctions and disbursements figures are adjusted for inter-institutional flows. Data on Real Gross Domestic Product (at 1980-81 prices), Gross Fixed Capital Formation (GFCF) and Wholesale Price Index (WPI) have been taken from the Economic Survey, Govt. of India (various issues).

V. Causation of Financial Intermediation and Economic Development

It is now a well accepted fact that FIs play a significant role in promoting economic development (Bhatt, 1993). But it is equally important to ascertain whether FI activities are *demand following* or *supply leading* or both. In other words does financial development follow economic development or *vice versa*[4].

In order to examine this relationship, we have used Granger's (1969) methodology on the following set of equations as given by (5) through (10) below.

To exemplify, the Granger test of causality for (5) states that if inclusion of lagged values of ΔDBC does not improve the forecast of ΔY than the one made on the basis of its own lagged

values alone [equation (5b)], then (change in) real GDP is *independent* of (change in) real disbursements. For this, we run regressions (5a) and (5b) and conduct a F-test on the null hypothesis on the parameters α_2 and α_3 (i.e., lagged values of the independent variable) jointly equal to zero.

$$\Delta Y_t = \alpha_o + \alpha_1 \Delta Y_{t-1} + \alpha_2 \Delta DBC_t + \alpha_3 \Delta DBC_{t-1} + u_t \quad (5a)$$

$$\Delta Y_t = \alpha_o^{'} + \alpha_1^{'} \Delta Y_{t-1} + u_t^{'} \quad (5b)$$

$$\Delta DBC_t = \gamma_o + \gamma_1 \Delta DBC_{t-1} + \gamma_2 \Delta Y_t + \gamma_3 \Delta Y_{t-1} + \xi_t \quad (6a)$$

$$\Delta DBC_t = \gamma_o^{'} + \gamma_1^{'} \Delta DBC_{t-1} + \xi_t^{'} \quad (6b)$$

Likewise, for testing the relation between (DBC/Y) and I, we consider,

$$(DBC/Y)_t = \beta_o + \beta_1 (DBC/Y)_{t-1} + \beta_2 I_t + \beta_3 I_{t-1+} + v_t \quad (7a)$$

(7b)

$$(DBC/Y)_t = \beta_o^{'} + \beta_1^{'} (DBC/Y)_{t-1} + v_t^{'}$$

and

$$I_t = \omega_o + \omega_1 I_{t-1} + \omega_2 (DBC/Y)_t + \omega_3 (DBC/Y)_{t-1} + \psi_t \quad (8a)$$

$$I_t = \omega_o^{'} + \omega_1^{'} I_{t-1} + \psi_t^{'} \quad (8b)$$

Likewise, to test the relation between (ΔDBC/Y) and (I/Y), we consider the relations (9) and (10) according as:

$$(\Delta DBC/Y)_t = \theta_o + \theta_1 (\Delta DBC/Y)_{t-1} + \theta_2 (I/Y)_t + \theta_3 (I/Y)_{t-1} + \varphi_t \quad (9a)$$

$$(\Delta DBC/Y)_t = \theta_o^{'} + \theta_1^{'} (\Delta DBC/Y)_{t-1} + \varphi_t^{'} \quad (9b)$$

$$(I/Y)_t = \nu_o + \nu_1 (I/Y)_{t-1} + \nu_2 (DBC/Y)_t + \nu_3 (DBC/Y)_{t-1} + \rho_t \quad (10a)$$

$$(I/Y)_t = \nu_o^{'} + \nu_1^{'} (I/Y)_{t-1} + \rho_t^{'} \quad (10b)$$

Here DBC is the FIs real stock of credit to the private sector (as measured by real disbursements), Y stands for real GDP, $\dot{I}$ is the real gross fixed capital formation, and $\dot{I}/Y$ is the

investment output ratio. Here Δ refers to change in the variable under consideration ($\Delta X=X_t-X_{t-1}$). The coefficients are denoted by α, β etc., whereas zero subscripts stands for the intercepts. The ratio DBC/Y or the ratio of financial institutions stock of claims will thus imply the depth of FI activity.

The Sims test (Sims, 1972), on the other hand, posits that if causality runs from ΔY to ΔDBC (equation 11), then future values of ΔY should have coefficients *insignificantly* different from zero as a group. For this again, a F-test would need to be performed to test the null hypothesis that the coefficients for future values of the independent variable are *jointly* equal to zero.

The Sims test is given by the equations (11) to (13) according as:

$$\Delta DBC_t=\tau_o+\tau_1\Delta Y_{t-1}+\tau_2\Delta Y_t+\tau_3\Delta Y_{t+1}+\chi_t \quad (11a)$$

$$\Delta DBC_t=\tau_o^{'}+\tau_1^{'}\Delta Y_{t-1}+\tau_2^{'}\Delta Y_t+\chi_t^{'} \quad (11b)$$

$$\Delta I_t=\eta_o+\eta_1(DBC/Y)_{t-1}+\eta_2(DBC/Y)_t+\eta_3(DBC/Y)_{t+1}+w_t \quad (12a)$$

$$\Delta I_t=\eta_o^{'}+\eta_1^{'}(DBC/Y)_{t-1}+\eta_2^{'}(DBC/Y)_t+w_t^{'} \quad (12b)$$

$$(I/Y)_t=\varepsilon_o+\varepsilon_1(\Delta DBC/Y)_{t-1}+\varepsilon_2(\Delta DBC/Y)_t+\varepsilon_2(\Delta DBC/Y)_{t+1}+\zeta_t \quad (13a)$$

$$(I/Y)_t=\varepsilon_\varepsilon^{'}+\varepsilon_1^{'}(\Delta DBC/Y)_{t-1}+\varepsilon_2^{'}(\Delta DBC/Y)_{t+1}+\zeta_t^{'} \quad (13b)$$

The causality from ΔDBC to ΔY (or, for that matter, the other set of variables) can be tested by interchanging the variables in equation set (11) to (13).

Mention must be made here to the fact that we have attempted to determine two sets of causal relationships. The first set, equations (5) and (6) look into the relationship between (per capita) SDP and disbursements (proxied by the variable (DBC/Y). The intuition here is that higher disbursements will generate increased industrial activity, leading to higher economic growth (reflected in GDP). Here equation (5) can be thought of to be a supply leading relationship (higher disbursements inducing greater economic activity and therefore improved purchasing power, consequently resulting in higher growth rates) and equation (6) as the demand following one (higher growth will tend to attract more productive resources to the state and therefore, induce greater disbursements to follow).

The second set of causal relationships is captured in equations (7) through (10). Here, (8) and (10) reflect supply leading relationships, whereas equations (7) and (9) are the demand following ones. This set of equations, on the other hand, aims at identifying the reasons of financial development as measured by some broad macroeconomic aggregates.

A word is in order about the choice of variables. We have two measures of real economic activity - per capita real GDP and the (increase in) gross fixed capital formation (GFCF). The latter variable seems to be relevant in the present context as FI activity seeks to increase the stock of GFCF in the economy. The financial proxies for FI activity intermediation, (ΔDBC/Y) or the share of financial institutions credit flow to the private sector in the GDP and (I/Y) - the share of GFCF in the GDP are based on the view that that, if FI activity is demand determined, it is the GFCF - GDP ratio which will determine the flow of credit from the FIs.

So far as the interpretations of equations (5) through (10) are concerned, in equation (5), the level of real disbursements would be said to have a causal (presumably, positive) relationship on the extent of overall economic activity (as reflected in Y), if the estimates of are *jointly* different from zero, as indicated by the joint F-statistic value of these three coefficients. Otherwise, real disbursements would be said to have no causal effect on economic activity. In the same manner, real GDP would be said to be causally affecting real disbursements, if the coefficients are jointly different from zero, using the F -test as above.

Coming to equations (7) to (10), investment (resp., depth of FI activity) would be said to have a causal effect on the depth of FI activity (resp., investment) i.e., demand following relationship (resp. supply leading relationship), if the coefficients on these variables are jointly different from zero, using F- test. Similar interpretations can be adduced for the alternative system of equations in (9) and (10). To exemplify, in equation (9), if the estimates of are jointly different from zero, then the share of GFCF in real GDP (i.e. I/Y) would be interpreted as having a causal effect on the share of FIs credit flow to the private sector in GDP (i.e., ΔDBC/Y).

VI. Unit Root Tests and Evidence of Conitegration

To perform the Granger test, we first checked for stationarity of the series by using the standard augmented Dickey-Fuller (ADF) tests. The degree of augmentation is determined automatically. The results are not reported to save space.

VII. Results of Causality Tests

With these results at hand, we can test for Granger (and Sims) causality between the variables under study. For this, we use a simple F-test to test whether the lagged value of each X or Y variable help significantly to explain the power of the unrestricted regression. If they do, we will reject the null hypothesis and conclude X Granger-cause Y or vice versa. The F-test is given as:

$F=(N-K)\ [ESS_R-ESS_{UR}]/q[ESS_{UR}]\sim F(q, N-K)$

Where N is the number of observations, K is the number of estimated parameters in the unrestricted regression, q is the number of parameter restrictions. ESS_R and ESS_{UR} are the error sum of squares in the restricted and unrestricted regressions, respectively.

Table- I: Granger Causality Results

Causal Direction	**F-test**	**DF or SL**
$Y \Rightarrow DBC$	0.06	Independent
$DBC \Rightarrow Y$	0.25	Independent
$\left(\frac{DBC}{Y}\right) \Rightarrow \dot{I}$	28.74	SL
$\dot{I} \Rightarrow \left(\frac{DBC}{Y}\right)$	0.11	Independent
$\left(\frac{\Delta DBC}{Y}\right) \Rightarrow \frac{I}{Y}$	13.54	SL
$\frac{I}{Y} \Rightarrow \left(\frac{\Delta DBC}{Y}\right)$	0.64	Independent

Note Critical F(1, 32) at 1% =7.5; F(1, 34) at 1%=7.4
DF= demand-following; SL=supply-leading

Table- II: Sims Causality Results

Causal Direction	F-test	DF or SL
$Y \Rightarrow DBC$	35.90	SL
$DBC \Rightarrow Y$	0.04	Independent
$\left(\frac{DBC}{Y}\right) \Rightarrow \dot{I}$	5.55	SL
$\dot{I} \Rightarrow \left(\frac{DBC}{Y}\right)$	27.5	DF
$\left(\frac{\Delta DBC}{Y}\right) \Rightarrow \frac{I}{Y}$	32.02	SL
$\frac{I}{Y} \Rightarrow \left(\frac{\Delta DBC}{Y}\right)$	8.03	DF

Note F(1, 32) at 5%=4.15; F(1,32) at 5%=4.13

We ran the OLS regressions of equations (5) through (10) on the stationary series. Regarding equations (5) and (6) it was found that there did not exist any causality either from disbursements to real GDP or *vice versa*. So far as equations (7) through (10) are concerned, it is found that (i) the depth of FI activity (i.e., DBC/Y) (Granger) causes real investment (I); and, (ii) share of FIs credit flow to the private sector in GDP (i.e., ΔDBC/Y) (Granger) causes the share of GFCF in real GDP (i.e., I/Y). This is a very strong result, and lends credence to the fact that FI activities are essentially supply-leading and not demand-driven. The results are summarised in Tables I and II.

However, a word of caution is warranted. FI disbursements may affect the variables with a lag length much greater than the one considered in the study. Our data limitation precludes us from taking this into account. One may also mention here that the majority of the sample under consideration pertains to the pre-liberalisation period.

VIII. Conclusions

It has been argued that if national economic policies is to favour a supply-leading experiment in the form of a financial restructuring exercise, it is necessary that the policy makers be first able to isolate the relevant financial variables that could be operationalised as elements of economic policy. To this end, we have placed the main hypotheses on financial restructuring and economic growth within economic theory, and then explored certain surrogate variables for such revamping

experiments. Several studies for East Asia and the Pacific Basin have confirmed the catalytic role of financial restructuring in inducing economic growth (See, Murinde and Eng, 1994, Odedokun, 1996)[5],.our study confirms the positive role of such restructuring experiments in the case of India.

As has been widely noted, the period was marked by an industrial policy wherein assistance to industries / areas was more often than not, driven by non-economic factors than by the forces of the market. It may well have been possible that industrial location was determined by the fiat of the licensing authorities so much so that the FIs had little say in this regard. Such a relationship would naturally impair the working of the causality equations.

Due to data limitations, the analysis was conducted at the aggregate level. However, given the small period under study and the limited sample size, it would be wiser to undertake a broader study encompassing a larger number of variables at the disaggregated level before one can arrive at some firm conclusions. This remains part of the future research agenda.

ENDNOTES

The authors are Assistant General Manager and Assistant Manager, IDBI. The present paper is a part of the study titled "Financial Institutions and the Efficacy of Institutional Credit: An Empirical Analysis for India" presented at the Conference on Regional Disparities in India's Economic Development held at Jadavpur University, Calcutta in March 1997. The views expressed here are the authors' own and does not necessarily reflect those of the institutions to which they belong.

2. Shaw (1973) focused on debt intermediation in the process of economic growth. In our context, Shaw's view can be specified as follows

$$\frac{M}{P} = g(Y, Z, R) \quad g_i > 0, \quad \forall\, i$$

where, Z is the opportunity cost of holding money.

3. Money is introduced via a Hicks-neutral technological progress. To quote Wang and Yip ..." it is hard to imagine that money improves the efficiency biased to either one of the production factors as represented by the Harrod and Solow-neutral technological progress..." (pp. 362, fn 6)

4 Murinde and Eng (1994) conducted such an econometric exercise for Singapore covering the period 1979-1990. Overall, the dictum of the study supports the supply-leading hypothesis: financial development *unidirectionally* causes economic growth.

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