RESERVE BANK OF INDIA

OCCASIONAL PAPERS

VOL. 18 NO. 1 MARCH 1997

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(ii) Rs. 35 (for a single issue of the 1997 volume inclusive of postage).

Foreign : (i) $ 100 (for four issues of the 1997 volume inclusive of registered air mail charges).

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EDITOR'S NOTE

A special issue of the Reserve Bank of India Occasional Papers will be brought out on the occasion of the completion of fifty years of India's independence. The special issue will combine the regular issues of June 1997 and September 1997 and will be brought out in August 1997.

Editor

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Published by M.S. Mohanty for the Reserve Bank of India and printed by him at Karnatal Orion Press, 17-18, Prospect Chambers Annexe, Dr. D.N. Road, Fort, Mumbai - 400 001.

RESERVE BANK OF INDIA

OCCASIONAL PAPERS

VOL. 18 NOs. 2&3 Special Issue, June & September 1997

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Book Reviews

of prudential accounting norms. AB show that the performance of banks has also been constrained by external factors such as monetary policy and prudential regulations, and barriers to entry and exit. AB then proceed to give an analytical account of the financial sector reforms being undertaken since early 1992 to improve the working of banks in particular.

While economic activities in most developing economies are largely financed by bank funds, the investment requirements and the liquidity needs are often met by financial markets. B.M. Misra deals with the developments in one segment of financial markets, namely the capital market since the time of Independence. Since the mid-'eighties, capital market in India has been subjected to considerable widening and deepening. A number of specialised institutions too came up, besides the regulatory authority. Misra traces the developments in the primary and secondary markets separately, and discusses the major issues being faced by the Indian capital market, viz., the investor protection, the integration of stock exchanges, the product innovation and technology and the integration of capital market with other markets. The fact that equity market is developing along with private and public debt market gives confidence that financing avenues can be best utilised by businesses to minimize costs of activities, while financial intermediaries compete for quality assets.

Macro-economic balance is not merely internal balance. External balance is as important as domestic balance. Muneesh Kapur in a paper on balance of payments (BOP) points out the unsatisfactory past experiences of policies such as import substitution, and export promotion with quantity and tariff constraints. These policies hardly helped to improve the BOP. In fact, the import cover of foreign currency assets was limited for much of the period till the end-'eighties. Kapur argues that the 1991 BOP crisis was essentially a reflection of the growing macroeconomic imbalances of the 'eighties and of delayed adjustment. Kapur observes that the policy responses to the crisis drew not only from the 'elasticity approach' and 'absorption approach' but also from extensive structural reforms. Kapur also discusses the exchange rate and external reserve management issues in detail and brings out the importance of phasing of capital account liberalisation.

There are some aspects of external sector, namely the foreign trade and foreign investment, on which considerable attention has been bestowed in recent years. Sujan Hajra and David Sinate (HS) survey India's trade policy in the post-independence period and point out how export

pessimism and inward orientation have contributed to India's failure to improve her export performance, as much as relatively low rates of domestic growth. The constant pressure on BOP has had an effect on India's trade policies which turned to be highly regulatory till 1991. Efficiency rather than import substitution has since permeated the trade policy reforms. T. Gopinath reviews the evolution of foreign investment policy since Independence and examines the relationship between FDI inflows on the one hand, and factors such as GDP, inflation rate, foreign exchange reserves and a composite indicator that recognises the criticality of gross fiscal deficit and debt service ratio. The data for 1980-81 to 1994-95 show that FDI inflows are largely shaped by economic fundamentals. Policies to attract such inflows may not by themselves be sufficient for the purpose.

The lone contribution in the area of international economic relations by Kumudini Hajra deals with India's relations with the International Monetary Fund (IMF). The international policy issues that India took up at the IMF represent the developing country interests. But the monetary integrity of the Fund was not allowed to be compromised. The crucial point is that in a world of economic interdependence, economic cooperation among member States is essential for world economic growth and well-being.

No literature on Indian development can be complete without a discussion on issues related to economic justice. There are three papers on them in this special issue. S.K. Mohapatra traces the strategies adopted to attack poverty alleviation, discusses the definitional and measurement issues relating to poverty, provides trends in poverty estimations over time, recounts various programmes like the IRDP, NREP, JRY, PMRY etc., and asks a relevant question as to 'where have we gone wrong'? There are perhaps many possible answers, and as Mohaptra points out, several factors contributed to failure in directly addressing the poverty problem. The urban-orientation and the land-related programmes apart, the inadequate emphasis on human development with little focus on education and health was the most important explanation, in Mohapatra's view, of continued high poverty situation. He also cautions against price increases, especially of foodgrains, and advocates, in this context, the need for application of effective safety net measures.

K.G.K. Subba Rao, K.S. Ramachandra Rao, and A.K. Tripathi (RRT) provide an interesting view of declining indebtedness of rural households, as revealed by the decennial surveys between 1951 and 1981.

Reserve Bank of India Occasional Papers
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Credit Availability and Small Firms: A Probit Analysis of Panel Data

Renu Kohli*

That small firms are more likely to be rationed in credit markets is a well-established fact now, both in economic theory and empirical evidence. There are several reasons as to why access to external finance might be more difficult for this category of borrowers. This paper examines the role of size, age and collateral in allocation of credit to small firms by banks, using a panel of Indian corporate firms and finds that they are significant factors in credit allocation by commercial banks.

Introduction

Economic theory suggests that imperfect credit markets will imply differential access to external finance for different borrower groups. A growing body of literature on the subject also offers evidence that substantiates this viewpoint. In the presence of imperfect information, risk-averse lenders are likely to rely upon observable risk characteristics of potential borrowers to distinguish borrower types. When firm-specific features play a role in credit allocation by financial intermediaries, small firms are more likely to face restrictions in the availability of credit; more specifically, borrower characteristics such as size, age and the availability of collateral are likely to influence credit-allocation as lenders attempt to safeguard themselves against financing a risky borrower. It is the purpose of this paper to examine the role and importance of these risk characteristics in the allocation of credit by banks, using Indian panel data for econometric analysis.

This question has been addressed in the paper by exploiting variations in borrowing features of firms to study the influence of firm

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size, age and availability of collateral in explaining differences between borrower and non-borrower firms. A probit model fitted on the data confirms that these variables have a significant influence in determining the probability of a firm gaining access to bank finance in the Indian commercial bank credit market. A stratification along these lines between a relatively homogenous category of firms, i.e. small corporate firms, enables us to examine another associated issue, which is whether size within this group matters in access to bank credit. We find that indeed it does. The results have a number of interesting policy implications which are relevant in the Indian context where small firms have been targeted for the selective provision of bank credit.

The paper is organised into five sections: Section II evolves a theoretical framework to motivate the empirical work that follows later. Section III contains a discussion and preliminary examination of the data while Section IV deals with econometric testing of the hypothesis. Section V concludes.

Section II
Theoretical Framework

The modern theory of financial intermediation draws upon Akerlof's idea that the *lemons'* problem may distort economic behaviour between contracting agents.[1] The recognition of informational asymmetries has been extended to the theory of financial markets, notably by Stiglitz and Weiss (1981), who demonstrate that the existence of asymmetric information in debt finance can lead to credit-rationing as an equilibrium outcome. Two broad categories of information problems can be identified in financial markets when either the principal or the agent has an informational advantage: the first is *adverse selection*, where asymmetric information exists between them prior to contracting, such as when particular characteristics of borrowers are unknown to lenders; and second is *moral hazard* - where asymmetries arise after contracting, that is, the possibility that borrowers may be induced to undertake riskier projects, thereby increasing the riskiness of lenders' portfolios.[2]

The problem of adverse selection in financial markets leads to the screening function of intermediaries by which they assess which borrowers and projects are likely to yield them the highest return and accordingly sort out good borrowers from the bad.[3] The objective of the lender here is to minimise adverse selection through a sorting process based upon certain observable characteristics of potential borrowers. He thus evaluates the risk associated with each borrower and decides whether to make a loan or not. In the post-loan stage, he tries to devise the contract in a way so as to ensure maximum recovery of the loan if the borrower defaults. The focus of this paper is on the importance of these risk features in determining the allocation of capital by financial intermediaries, viz. banks.

In the literature associated with Stiglitz and Weiss (1981), the interest rate plays a central role: it is not only the price at which loans are offered, but also a screening device for banks. Borrowers here are observationally indistinguishable *ex ante* and the key unobservable factor is the riskiness of their projects. A rise in the interest rate in this model lowers average borrower quality as the safer projects (borrowers) are the first to drop out; 'bad' borrowers (i.e. those with riskier projects) reveal themselves by remaining in the market.[4] This analysis is further extended by Stiglitz and Weiss to demonstrate a similar effect of collateral conditions.

However, when the interest rate is not determined by market forces, but regulated by monetary authorities, its importance and availability as a sorting device is limited, or even non-existent. Its role in credit-rationing in the Indian credit market until recently was not pertinent as there were interest-rate ceilings on both deposit and loan rates and banks were not free to vary the interest rate either to adjust the supply of funds or to cover the degree of risk that the borrower may pose.[5] We therefore, argue that in the absence of the interest rate as a tool to sort good borrowers from the bad, Indian commercial banks will select borrowers with the least probability of default. The decision to lend therefore, is expected to be based upon the availability of collateral as that is what all banks can expect to recover if the borrower defaults.

For example, borrower's wealth is indicated by the collateral available to secure the loan. From the bank's point of view, this is an observable characteristic of the borrower; risk-averse lenders would consider lending credit to a potential borrower depending on the amount they are able to recover if there is default. Collateral is both a signal to the bank as well as security offered on the loan that it makes. It provides information about the degree of risk associated with each loan. The importance of collateral, or net worth in the allocation of credit in the presence of asymmetric information in the capital market has also been shown by Calomiris and Hubbard (1993) - external finance as a consequence is differentially available to entrepreneurs according to their net worth positions.

Apart from collateral, there are some other features that may play a role in credit allocation by banks. Stiglitz and Weiss's (1981) model also considers the allocation of credit to observationally distinguishable borrower groups, to each of whom the bank is willing to make loans at different optimal interest rates. Given the cost of loanable funds, the banks will lend to those groups for whom the gross return from the loans is highest and the equilibrium interest rates will be such as to equalise the rate of return from loans to each group. This can result in exclusion of some groups from the market altogether since there may be no interest rate at which the bank can lend to them if the cost of funds to the bank is above a critical level.[6,7]

An important implication of the Stiglitz and Weiss analysis is the differential access of distinguishable borrower groups to external finance. In a Modigliani-Miller world, with its assumption of perfect capital markets, all borrowers are able to access external finance at equal terms, the only relevant factor being the cost of capital. This need not necessarily hold in the presence of imperfect information. *Ceteris paribus*, small or new borrowers - perceived as high-risk groups - will face tighter credit constraints than large borrowers or those with a proven performance record. Lenders, in any case, tend to be more knowledgeable about mature firms, since they have had time to assess their performance and record. These firms may also have the advantage of a long-term relationship with the lender,

which reduces informational problems through established creditworthiness.[8]

The implication is that since "...the class of large firms consists primarily of mature firms..." and "...there may be an informational economy of scale in lending to large firms, to the extent that lenders may face fixed costs of gathering certain types of critical data about borrowers...financial constraints are likely to have more impact on the real decisions of individual borrowers and small firms than on large firms."[9] This hypothesis has been tested by Hoshi et al (1991) who classify Japanese firms according to the strength of their institutional relationships with banks and find that investment of firms without close banking ties was quite sensitive to liquidity, while it was not so for firms with close bank ties.[10]

These theoretical arguments suggest that size and age of the borrower are relevant factors in the allocation of credit. The importance of requirements of collateral, debt service and other 'non-price' covenants' can also be verified by a common observation of loan contracts. Initial empirical evidence on these dimensions is provided by Fazzari and Athey (1987) who analyse the hypothesis that internal finance and interest expenses, which are observable characteristics of a firm's creditworthiness, are likely to influence its access to credit and thus limit investment; their results were consistent with this hypothesis. Subsequently, Fazzari et al. (1988) find differences across borrowers (US firms) in the structure of loan contracts and in provisions regarding the use of internal finance.[11]

Another factor that might be significant in credit allocation in the Indian credit market is the presence of informal borrowings as a source of funds by the borrower. The hypothesis here is that lenders may view the level and past record of informal borrowings as an indicator of creditworthiness. The possibility of borrowings from informal sources influencing the lender's decision cannot be ruled out, given the findings of several research studies on the subject. For example, the Report of the Banking Commission (GOI, 1972) found in its survey of small-scale industrial units that non-institutional borrowings were high for those firms for which bank-bor-

rowings were also high. It is not known with certainty which way the causality runs though, as Timberg et al (1980: pp. 293), in a survey of urban informal credit markets, find that being a bank borrower facilitates borrowings of informal credit. This fact is usually known to the urban informal intermediary and forms part of borrower screening.

Finally, we cannot ignore demand-related factors such as sales, which indicate the business conditions that a firm faces. We therefore consider sales as a variable representing demand for the firm's products. Given these arguments, we assume that when loans are made with imperfect information on the part of the lender, then the possibility of the borrower getting a bank loan is a function of a set of factors - collateral available to secure the loan, age and size of the firm, informal credit and sales. Thus '*b*', defined as the state of success of an applicant firm or otherwise, is a function of

b=f (Size, Age, Collateral, Sales, Informal Credit) ... *(1)*

Having outlined the theoretical framework, in what follows, we discuss the specification, choice of variables and the estimation method in some detail.

The Specification: In general, at a theoretical level we have assumed success in obtaining a bank loan to be a function of borrower size, age, collateral, sales and informal credit. This sub-section discusses the variables chosen to represent these factors at an empirical level. There are many measures that can be regarded as indices for collateral. Collateral may take the form of current or fixed assets available for pledging, or variables like net worth and profits indicating the standing and debt-servicing capacity of the borrower. Fixed assets and inventories (current assets) are variables that can be used to capture the effects of collateral as they indicate what the bank would acquire if the borrower fails to repay the loan. Fixed assets specifically also act as a proxy variable for size of the firm that is an important factor in accessing external finance. Even though our focus here is exclusively on small firms, we have reason to believe that within this group too, size may

matter. For it is likely that banks may prefer to finance the bigger of the small-scale firms to minimise risk.[12]

Net worth indicates the financial health of the borrower. A strong balance-sheet is a positive signal to the lender about the quality of the loan; firms with weak balance-sheets are therefore more likely to be rationed out.[13] Similarly, profits or cash flow[14] are considered by the lender as they contain information about the internal financial position of the firm. A sound internal financial position not only enhances a firm's ability to invest but is also an indicator of its ability to service debt. Internal finance is thus important for firms that need to seek external funding for their operations in markets subject to credit-rationing; it provides a signal because even though lenders may have difficulty predicting the cash flow generated by a new project, the loan will be secure if the firm's existing cash can service the new debt.

The information about age has been incorporated in the model through a binary variable. In doing so we have taken a threshold level of five years; it was not possible to define it with lesser number of years as there were very few firms in the sample that had one or two years of existence. Thus the dummy takes on the value of zero for firms that are less than five years old and one for firms that are more than five years old at a point in time, which has been chosen as 1970, being in the middle of the period. We expect that longer the number of years in existence of a firm, higher would be their probability of gaining access to bank credit for the first time.

The hypothesised model thus takes the following linear form

$$b = f\left(Inv/A, NW/A, Cf/A, Sales/A, IC/A, GFA, Age\right) \qquad (2)$$

where b is the probability of a firm being either a bank-borrower or a bank non-borrower. *Inv*, *NW*, *Cf*, *Sales* and *IC* are past year's values of inventories, net worth, cash flow, sales and informal credit, taken as ratios to total assets. All these variables have been scaled by total assets to remove the size effect that they

would otherwise represent. *GFA* has been taken as past year's level of gross fixed assets of the firm to capture the effect of size. *Inv, NW, Cf, Sales, IC* and *GFA* are all assumed to have a positive impact on the lender's decision to make a loan.

Section III that follows describes the data set used, a preliminary examination of the data at the level of descriptive statistics presents some stylised facts that are taken up more formally in Section IV.

Section III
The Data and some Preliminary Observations

The data that we use here is firm-level, balance-sheet data between 1965-78, obtained from the company finance studies of the Reserve Bank of India. The firms are small manufacturing firms engaged in different industrial activities. It was not possible to extend the period later than 1978 for reasons of data availability. It is presumed however, that the results of the study would not be out of context for the present environment as the financing behaviour of small firms would not have changed significantly in the 1980s and the early 1990s. For estimation of the specified model, our sample consists exclusively of small public limited firms engaged in different manufacturing activities.[15] A sub-set of these firms have become bank borrowers at different points in time during the span of the data-period, while another sub-set have been bank borrowers throughout. This distinction between the two sets of firms has been exploited in the research to study the variation in their risk characteristics in determining the firms' probability of being a successful loan applicant firm.

To begin with, we had 219 firms in all with a total of 2001 observations (*N*T*); the length of the panel varied considerably for each firm, as such, our panel is an unbalanced one. Table 1 below relates bank borrowings to some characteristics of a firm such as size of the firm, collateral as well another source of external funds - informal credit, to look for evidence of association between the two sets of variables. Note that firms are classified into different ranges by percentage shares of bank finance in their total external borrowings, enabling us to examine any association between the credit worthiness of a firm for bank loans and other variables.[16]

Table 1: Bank Borrowings and Some Related Characteristics:

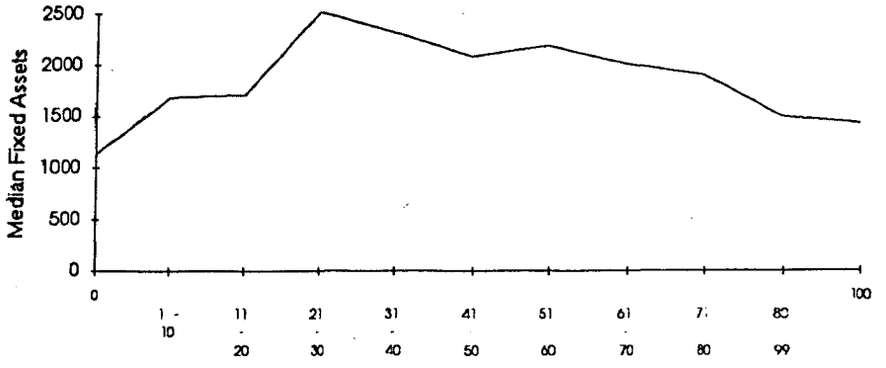
Sl. No.	*Bank borrowings (% share of total external borrowings)*	*Class distribution of firms (per cent)*	*Informal Credit (% share of total external borrowings)a*	*Median Fixed Assets (Levels)*	*Inventory/ total assets*	*Cash Flow/ total assets*	*Net worth/ total assets*
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*
1	0	19.9	10	1130	0.95	0.21	0.52
2	1 - 10	5.0	39	1676	0.54	0.03	0.29
3	11 - 20	6.3	54	1698	0.73	0.02	0.43
4	21 - 30	12.5	36	2499	0.76	0.02	0.13
5	31 - 40	14.4	29	2298	0.89	0.03	0.43
6	41 - 50	16.0	18	2058	0.93	0.06	0.70
7	51 - 60	11.1	16	2160	0.98	0.04	0.65
8	61 - 70	7.7	7	1980	1.00	0.13	0.84
9	71 - 80	3.7	4	1875	1.10	0.14	0.81
10	80 - 99	2.7	0	1471	1.53	0.25	1.10
11	100	0.6	0	1403	1.57	0.26	1.38

Note: [a] = *Excludes bank borrowings; Median Values in Cols. 3,4 & 5;*

The dispersion of firms in this classification is fairly spread out: about 20 percent of the firms have no access to bank credit and 0.6 percent of them are totally financed by the banks. The rest of the firms are distributed in between, with a majority of them (16 per cent), falling in the 41-50 per cent borrowing category. Thus a majority of the firms are either zero bank-loan borrowers or borrow upto fifty percent of their total external funds from the banks. 'Informal Credit'[17] has been taken as a share of total external borrowings with bank borrowings excluded to bring out the association if any, between the two variables. Column 4 of the table shows that as firms move up from no bank credit to obtaining upto 20 percent of external funds from banks, they also have higher shares of informal credit. Thereafter, the extent of informal credit in total external funds declines for firms in the higher range of bank borrowings classification, indicating a substitution rather than complementary relationship between the two variables. This is presumably because bank credit is cheaper and having once gained access to it, the firm's chances of full financing from banks improve.[18]

The association between the size and the extent of bank borrowings in the firms' external financing structure plotted in figure 1 roughly follow an inverted U pattern - the smallest of firms either do not borrow from banks at all or are totally reliant on bank borrowings. This observation substantiates the hypothesis that smaller the firm, the more difficult it is to access bank finance, but once they do, their reliance on it is considerable.

Fig. 1 - Size of the Firm and Bank Borrowings



Bank Credit (percentage share of total external borrowings)

The collateral variables, viz. inventories, cash flow and net worth, suggest a positive association with the extent of bank borrowings, when firms are borrowing from the banks. As firms ascend on a higher class of bank credit in their external finance, collateral goes up too.[19] The positive association between bank credit and collateral might be suggestive of an important role of collateral in obtaining bank finance though it could also indicate an improved performance in the post-debt stage.

Finally we attempted to see what association, if any, existed between the extent that a firm borrowed from the banks, as a share of total external debt, and its age. In Table 2, firms are lumped into average categories according to their age in the middle of the period (1970). It can be seen that a weak inverted-U association exists between age of the firm and the extent that it will rely on bank finance, which is also clear from the plotted values of the two series (Figure 2). Firms which are more than 25 years old and those which are less than 5 years old seem to rely much less on

bank borrowings, as a share of total external borrowings, than firms which are in the middle range of the age classification, that is, more than five years and less that 25 years old firms. The latter category of firms obtain about 75 percent of their external finance from the banks. There is not much difference however between firms in the age-group of 20-25 years and 10-15 years, who seem to finance approximately 75 percent of their external financing requirements from bank credit.

Table 2: Age of the Firm and Bank Finance:

Sl. No.	*Age of firm in middle of the period - 1970*	*Bk. Borrowings (% share of external borrowings.)*
1	*2*	*3*
1	More than 30 years	45
2	25-30 years	42
3	20-25 years	76
4	15-20 years	74
5	10-15 years	77
6	5-10 years	55
7	Less than 5 years	65

This association, in a way supports the idea of a dynamic process, where firms of an intermediate age are most bank-dependent. Further, the cross-section evidence in regard to age as well as size of the firm is very similar, indicating that within the small firms' group too, firms of intermediate size and age have the highest shares of bank finance.

Fig. 2 - Age of the Firm and Bank Credit

Transition and Borrower Firms: In the next stage, we retained only the borrower and the transition firms in order to look for differences between the two sample classes with respect to some performance and creditworthiness indicators.[20] For this purpose, we had 124 firms that were existing bank borrowers (with 1113 observations) and 47 firms (484 observations) that transited at various points into the bank credit market. Table 3 below presents some features of transiting firms in both phases - as outsiders

Table 3: Summary Features of Transition and Borrower Firms:

	Transition firms (%)		
	Pre-Borrowing	*Post-Borrowing*	*Borrower Firms (%)*
1	*2*	*3*	*4*
Investment/Gross Fixed Assets	0.14	1	2
Sales/Gross Fixed Assets	350	260	259
Cash Flow/Gross Fixed Assets	7	5	8.4
Profits/Gross Fixed Assets	3	1.3	3
Retentions/Total Funds	75	28	32
Inventories/Gross Fixed Assets	70	79	80
Current Assets/Gross Fixed Assets	264	313	214
Growth Rate of Sales	1.89	2.32	2.52
Standard Deviation of Real Sales Growth	1.51	1.51	1.59
Other Borrowing/Total External Debt	30	24	7
Trade Credit/Total External debt	68	34	36
Development finance/Total External Debt	0	0.03	2
Mean Fixed Assets (Rs. '000s)	1030	1250	2053
No. of Observations	182	302	1113

when not borrowing from the banks and thereafter as bank borrowers after transition, comparing them at the same time with the existing bank borrower firms. Focusing on transition features first, we find that investment, as ratio to total assets (Row 1) shows a rise on transition to bank credit; this ratio is however half that of the existing bank borrower firms.[21] Profits (Row 4) decline on the transition of firms into the bank borrowing phase. When taken as a

ratio to total funds, financing from internally generated funds falls steeply on transition to bank finance; moreover, the level of internal funds used for financing operations after transiting is broadly equal to that of the existing borrower firms. This suggests an association between the internal financial position of a firm and its access to bank credit. Collateral variables such as inventories do not show any significant change on transition though current assets as ratio to capital stock show a rise as the firms transit into the bank borrowing stage.

In the external financing structure of the three categories of firms, informal credit shows a slight decline from 30 to 24 per cent for firms transiting into the bank credit market. What is interesting here is the 30 per cent share of informal credit in the external debt of firms that are not borrowing at all and the modest 7 per cent associated with the existing borrower firms. This shows that existing borrower firms borrow much more from banks than do the transiting firms who are relatively new; this is also similar to the evidence from Table 1 above which revealed a higher proportion of financing through informal sources as firms started to borrow from banks. The financing pattern of the transition firms when not borrowing from banks indicates that approximately 72 percent of these firms were borrowing from informal sources, while 28 percent of the firms were totally internally financed - these firms did not borrow from any external source at all. After transition, all firms continued to borrow from this source as well as banks.

The preliminary examination of the data thus reveals some differences between borrowing and transiting firms, as also between the borrowing and non-borrowing phases of the transiting firms. We also find preliminary evidence suggestive of an association between the size and the age of a firm and the extent it can finance its operations through bank credit as a mode of external finance. These observations are taken up for a more rigorous econometric exercise in Section IV, though framed somewhat differently.

Section IV
Estimation of the Model

In Section II, the specified model defines the dependent variable 'b' to be the state of being a bank borrower or not. The issue of a firm's probability of being a bank borrower can be appropriately addressed within the framework of an outcome model, which falls into the class of binary choice models.[22] The dependent variable here is a qualitative response or outcome, such as a 'yes' or 'no' decision, representing a choice, which can be given a meaningful value with a zero/one coding. Here 'no' is equated with zero and 'yes' is equated with one, both of which are qualitative choices. The outcome can be seen as the probability that a firm will be a borrower or not, under the assumption that this outcome is a function of a set of factors. The regression model is constructed so as to link the decision or outcome to a set of factors. In our model, the relevant question is to decide whether the borrower firm is a successful applicant ($Y = 1$) or otherwise ($Y = 0$). The probability of a firm being a bank borrower is explained by a set of factors, a vector x, so that

$$\text{Prob} \quad (Y=1) = F(\beta' x) \qquad (3)$$
$$(Y=0) = 1 - F(\beta' x)$$

where the set of factors b reflect the impact of changes in x on the probability. A model that will produce predictions consistent with the general framework of probability models, squeezing the estimated probabilities inside the 0-1 interval is the probit model.[23]

Before estimating the probit model, the data was prepared for estimation. The time structure of the panel was collapsed to obtain cross-section values of the variables by averaging the different series for each firm in the following manner. The data on borrower firms was averaged throughout the time-period in order to incorporate all information contained in the data over time about firms having attributes that made them borrowing firms; for the transition firms, only the data prior to transition has been averaged while only one observation for each firm has been included from the post-transition stage. The intuition behind this method has been to capture all the information available in the data about borrowing and non-borrowing firms.

The probit regression was run using the *TSP* computer program and the results are reported in Table 4 below. The final estimation of the model has been done in semi-logarithmic form as the original hypothesis in ratio form did not perform very well in terms of accepted norms of goodness of fit and some coefficients (notably cash flow) had the wrong sign.[24] Table 4 gives the estimated coefficients and the slopes (derivatives) of the variables.

Table 4
Probit estimation for differences in state of borrowing:

Explanatory Variables (Dependent Variable= 0/1)	Coefficients	Slopes *(Marginal Effects)*
1	2	3
Constant	0.055 *(0.151)*	—
Age	0.187 *(1.64**)*	0.051
Inventories/Assets	0.326 *(2.50***)*	0.088
Gross fixed Assets	0.002 *(2.27***)*	0.00006
Cash Flow/Assets	0.484 *(2.54***)*	0.131
Sales/Assets	0.017 *(0.617)*	0.014
Informal Credit/Assets	0.006 *(0.220)*	0.001
Net worth/Assets	0.363 *(2.44***)*	0.098

No. of Observations	141	*Likelihood Ratio statistic*	25.908 ***
Log Likelihood function (restricted)	-80.8489	*Likelihood Ratio Index*	0.160
LogLikelihood function (unrestricted)	-67.8946	*% correct predictions*	75

*Note: Figures in parentheses are t-ratios; *, ** and *** indicate significance at 10, 5 and 1 percent levels respectively. The critical values of the t-distribution for n>100 are 1.96 and 2.32 respectively.*

We have reported two measures of goodness of fit. The first is the percentage of correct predictions made which is usually considered a naive predictor.[25] The percentage correct predictions made by the model are seventy five per cent which means that it predicts 105 of 141 observations correctly. The second measure reported is the likelihood ratio statistic calculated from the constrained and unconstrained log-likelihood functions. The likelihood ratio test is highly significant, based on a chi-squared value of 25.90, so the joint hypothesis that the coefficients on all the variables are zero is rejected. The likelihood ratio index, which is analogous to the R^2 in a conventional regression model, is only 0.160.

All the coefficients on the explanatory variables have signs in accordance with our *a priori* expectations. Further, all coefficients except sales/assets and informal credit/assets are statistically significant. The latter result suggests that demand factors, represented by sales/assets are not important in explaining differences across borrower/non-borrower states; further, the hypothesis that informal credit could be a favourable influence on the state of being a bank borrower is also rejected by the data.

The marginal effects of the explanatory variables are given by the partial derivatives of the expression for probability ($y = 1$) with respect to each of the explanatory variables, which are not equal. It is held that the marginal effects generally produce a reasonable approximation to the change in the probability that Y equals one at a point such as the regressor means. The derivatives computed at the means of the explanatory variables are given in Column 3 of the table. The coefficients on the quantitative variables are interpreted as the impact on Y per unit change in x, but the coefficient on age cannot be interpreted as the percentage impact on Y of change in the dummy variable from zero to one status.

Using the normal t test for significance of the coefficients, we see that the t-ratios on all coefficients except that on informal credit and sales are significant. Size of the firm, as proxied by the coefficient on gross fixed assets, has a positive and significant impact

on the probability of being a bank borrower indicating that even within the small firms' group, size exerts an important influence upon lender's decision to extend credit to first-time borrowers.[26] The magnitude of the size effect, given by the marginal effect of the coefficient on gross fixed assets is small though, probability values rise by 0.00006 in response to a unit change in the size of the firm.

This result confirms that size is an important constraint on the part of borrower firms, not only as opposed to large firms, but also within the more homogenous group of small firms.[27] It also compares well with the results of the Report of the Banking Commission, 1972, that found the average size of the units in the category of successful loan applicants to be above Rs 3 lacs (in terms of assets) which was much larger than the mean size of the rejected loan applicants (approximately Rs. 1 lac) and those that did not approach the banks at all (Rs. 95,000). This information brings out the inclination of the commercial banks in financing the larger of the small-scale units.

The coefficients on net worth/assets, cash flow/assets, and inventories/assets, representing the effect of collateral, are highly significant at less than one percent level. This suggests an extremely important influence of these variables, which essentially represent the effect of collateral on differences in borrower/non-borrower states of small firms. The magnitude of the impact, or the size of the coefficients on these variables is given in Col. 3 of the table - a unit change in net worth/assets, cash flow/assets and inventories/assets changes probabilities of bank borrower or non-borrower state by 0.098, 0.131 and 0.088 respectively. The large size of the coefficient on cash flow/assets indicates that this variable has a particularly important influence on probabilities.

In examining the effect of age upon the probability of a firm being a bank borrower or not, we are primarily examining the effect upon some kind of response - whether the firm will be one or not. This response, or a pattern of it, has been studied in the data with regard to some age threshold which in our specification is

five years. The regression results suggest that this categorisation has a significant influence on the probability of a firm being a bank borrower; if a firm is less than five years old then its probability of being a borrower firm is lower than what it would be if it were older. This result has an important policy implication.

Section V
Conclusion

This paper has focused upon factors such as size, age and collateral as determinants of access to bank credit by small firms. The issue was addressed from a lender's perspective in order to underpin the relative importance of these factors in allocation of credit by Indian commercial banks. An important result of the study was that the collateral effect, represented by net worth, cash flow and inventories was significant in influencing outcomes of borrower/non-borrower states across small firms. Size and age of the firm were again very important though sales were insignificant. This analysis substantiates existing theoretical views on the subject and also adds to the growing body of empirical literature that confirms the significance of these factors in the presence of imperfect information.

The paper attempted to reason out why small firms may be rationed out of organised credit markets. The findings of the paper have a number of policy implications in the Indian context. For instance, the finding that size is a relevant factor in credit-allocation even amongst the small firms deserves attention from the view point of reassessing the merits of the present comprehensive eligibility criteria under the sector-specific lending programme by public sector banks. In relative terms (as for example, small versus large industries) differences in size weighs with risk-averse financial intermediaries which might be affecting credit availability to small borrowers.

Another policy implication emerging from this research relates to the finding of age as a significant determinant of credit allocation. There is a distinction that can be made between the first-time and the existing borrower firms in the light of this evidence. An exam-

ple here is provided by the Japanese experience: the Japan Development Bank successfully used selective provision of credit to enable new firms to gain access to the bank credit market. Once these firms were well-established, selective funding was withdrawn and re-targeted towards newer firms, thus widening the size of the bank loan market by drawing new borrower firms into it.

The question however still remains whether it is possible to overcome these factors so that small and large firms and young and mature ones could access external finance on equal terms and conditions? Given the nature of finance and financial intermediation itself, clearly lenders safeguard themselves against possible default as far as possible. When size is linked to credit-rationing, it is difficult to arrive at a best policy option in this regard. A reasonable approach under the circumstances could be that such borrower-firms are supported through regulation of financial intermediaries if it were clear that the social gains to be had through special credit dispension arrangements outweighed losses due to regulation.[28]

Notes

1. Akerlof (1970) demonstrates how asymmetric information between buyers and sellers about product quality can cause inefficiencies in market functioning. These are usually referred to as 'principal-agent' problems in the literature.

2. Alternately, one can employ Arrow's (1985) terminology of 'hidden information' and 'hidden action' (Gravelle and Rees, 1992, 2nd ed.).

3. Similarly, the problem of moral hazard arises because some behaviour of the borrower cannot be covered by contract, as for example, the incentive to engage in a riskier project in the post-contract stage.

4. The interest rate will not rise beyond a point to equilibriate the market as further increases may lower the lenders' expected return if the adverse selection effect exceeds the direct revenue effect. Excess demand persists in the market where some borrowers are denied credit when the loan demand and supply curves do not intersect.

5. Interest rates on loans have been de-regulated only recently. Throughout the span of our data period, i.e. 1965-78, a regulated interest structure prevailed.

6. Another reason could be that the excluded group has a broader range of available projects - they can invest in all the projects available to [illegible] loans but can also invest in high-risk projects unavailable to

7. There is a welfare consequence of this result: Stiglitz-Weiss point out that this group might precisely be possessing projects, the returns to which could be higher than the group receiving loans. There is therefore no presumption that the market allocation is optimal. This allocative inefficiency in fact leads to an argument for intervention in favour of groups which are rationed out by banks.

8. The existence of a long-term relationship between banks and firms has received importance in another theoretical context by Mayer (1988) who attributes differences in financial systems across countries to the mechanism of commitment between entrepreneurs and financiers. The argument is that firms need stable funding for investing, while banks want to share in their future profits when they extend a long-term loan, thus incurring a risk. The nature of this long-term relationship determines the availability of long-term finance to firms, and this availability explains the differences between financial systems.

9. Gertler (1988: pp. 574).

10. Extending the same work, Hoshi et al (1993) analysed the same firms over a different period when they had loosened their bank ties and moved to the capital market. They found that investment of firms that chose this financing option was much more sensitive to liquidity than that of firms that continued to borrow from banks, confirming the significance of long-term bank-firm relationships.

11. They also find that stronger balance-sheets, that is, greater net worth relative to physical assets, stimulate investment for young and growing firms while such considerations are not important for mature firms active in centralised debt and equity markets. Investment spending and financing are substantially more volatile in the former group.

12. The Report of the Banking Commission (1972) and the Nayak Committee Report (1992) both show the relatively greater flow of credit towards the larger small-scale units.

13. This argument applies mainly to first-time applicants. Where existing borrowers are concerned, it may not be surprising to come across instances of banks lending to financially distressed firms, as they attempt to bail out such firms with a view to a share in future profits.

14. Defined as retentions after taxation and dividends plus depreciation.

15. The industries (at the 3-digit level of classification) are Foodstuffs, Electrical Machinery, Miscellaneous Machinery, Engineering, Metal Products, Medical/Pharmaceuticals, Chemical Products, Miscellaneous Industries, Sugar and Cotton Textiles.

16. The dependent variable in the empirical model is taken to be the probability that the firm is a bank borrower. This somewhat restrict strict comparison of the observations made here with the empirical results.

17. In the data, the definition of this category of external funds is given under the heading 'non-institutional borrowings' as other borrowings; this variable represents borrowings from friends, relatives etc. Since in any case it is not a formal source of credit, our assumption about its informal nature is valid.

18. Elsewhere (Kohli, 1996) we have found evidence of a weak negative association between the two variables in the post-nationalisation period at the industry level. Both these evidence suggest that as the share of bank credit increases firms reduce their borrowings from the informal sources; the two variables are more often than not substitute modes of finance.

19. The table also reveals that firms that do not borrow from banks do not, by any means, have low levels of collateral. This implied two possibilities are: one, that firms that start borrowing from the banks do not need to have a good internal liquidity position or a healthy balance-sheet or that they are distress borrowers; alternately, that they are simply well-endowed initially and choose not to borrow from banks at all. A closer examination of the data revealed a sub-set of bank non-borrower firms that were well-endowed *ex ante*, this group probably chose not to borrow from banks.

20. All the collateral variables have been taken as ratios to total assets; retentions have also been taken as a ratio to total funds to bring out the extent of self-financing of firms. Finally, the financial variables have been taken as ratios to total external debt to see the extent of financing by each category.

21. This evidence is similar to that found in Kohli (1996) where new firms that entered the bank credit market showed a rise in their investment growth rates.

22. The general framework of these models is : Prob (event j occurs) = Prob ($Y = j$) = F [relevant effects: parameters].

23. This model specifies a continuous probability distribution like the normal distribution giving rise to Prob (Y=1) = $@\int \beta'x \varnothing(t)dt = \Phi(\beta'x)$ where the function $\Phi(.)$ is a commonly used notation for the standard normal distribution. The estimation of the probit model is based on maximum likelihood. See Greene (1993: pp. 635-37).

24. Several specifications were tried before choosing the preferred one; these results are available from the author on request. The data was also tested for heteroskedasticity - the likelihood ratio test statistic is 12. The critical χ^2 value at 5% level is 14.07, so the hypothesis that the disturbances in the specification are homoskedastic is accepted. The final estimation in semi-logarthimic form presumably removed whatever heteroskedasticity there was in the data..

25. The usual threshold value is 0.57, under the logic that we predict a 1 if the model says a 1 is more likely than a 0, though it is important not to place too much emphasis upon this measure of goodness of fit. As Greene (1993: pp. 652) points out, in the naive predictor Y = 1 if $P>0.5$ and 0 otherwise (where P is the proportion of ones in the sample), this rule will always predict 100 percent of the observations, which means that the naive model does not have zero fit.

26. It is also possible that small firms may find costs of borrowing prohibitive and therefore, choose not to borrow. Size of the firm, in that case is a demand rather than supply-side constraint.

27. It's extremely likely that the size effect would be larger were the sample to be more heterogeneous in nature. A Report of the Banking Commission, (GOI, 1972)

survey revealed that the maximum percentages of units who approached commercial banks and were successful in obtaining credit from them were in the corporate sector (69 per cent on the average in the case of public and private limited companies, the rest either having been rejected by the bank or not having approached at all, but the figure fell to an average of 36 per cent when the organisational form was a partnership or proprietorship).

28. Research elsewhere by the auther (Kolhi, 1996) suggests that there can be gains from generation of productive activity in such sectors.

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Reserve Bank of India Occasional Papers
Vol. 18, No. 1, March 1997

Fluctuation of Exchange Rate in India : An Application of a Markov Chain Model

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The paper specifies a simple two-state Markov chain model for the spot price of US Dollar in India. The paper shows that some common measures of mobility can be applied to such financial data. It calculates the long-run steady-state probabilities of the proposed Markov chain and projects it for the future. The out of sample performance of the model turns out to be satisfactory.

Introduction

With the advent of floating exchange rate regime in 1973, major swings in foreign exchange markets in recent years have become a frequent phenomenon. Models which have been used to analyze and predict exchange rate are of two types : (a) models which take extensive help of economic theory (Ranjan, 1995) and (b) statistical time series models (Hoque and Latif, 1993). Of these, models under the first category often specify a simultaneous equations framework. The practice of building up large structural models simultaneously, equation by equation, has been criticized by Sims (1980). These models often impose arbitrary exclusion restrictions for the purpose of identification. As an alternative, Sims has prescribed the use of time series models. Although over the years different types of sophisticated time series models like vector autoregressive moving average (VARMA) models, ARCH or GARCH models (Diebold and Nerlove, 1989) or neural network models (Kuan and Liu, 1995) have been proposed, accurate prediction of exchange rate has remained a difficult task (Gerlow and Irwin, 1991; Edison, 1991; Satchell and Timmerman, 1995).

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* The author is Research Officer in the Department of Statistical Analysis and Computer Services of the Bank. He is indebted to R.B. Barman, Balwant Singh and A.K. Srimany for the guidance in preparation of the paper. Comments and suggestions of Ashok Nag, G.P. Samanta and an anonymous referee substantially improved the exposition. The views expressed in this paper are those of the author's own and not of the institution to which he belongs.

Prediction of exchange rate is difficult because in the market for foreign exchange, new information is absorbed at a very fast pace and the market reacts and adjusts almost instantaneously. Since new information is supposed to be reflected in the current rate itself, in a given situation the current exchange rate is often believed to be the best predictor of the future rate. In fact, the results of Meese and Rogoff (1983) seem to suggest that exchange rate follows random walk. Since the time path of exchange rate is extremely sensitive to the initial condition, some researchers have attempted to show that its movements over time may generate chaotic pattern [Bajo-Rubio, Fernandez-Rodriguez and Sosvilla-Rivero, (1992); Rao, (1993)].

Since accurate prediction of exchange rate is difficult, a more pragmatic approach would be to know the speed of adjustment of exchange rate. Suppose, we fix a benchmark rate of fluctuation and call movements below this rate of fluctuation as 'normal fluctuation'. An important aspect of any stabilization policy would be to bring the series back to its normal zone of fluctuation from an abnormal state. Thus, period to period variation over the benchmark rate will be of concern and may need corrective measures from the central bank. In this context, it is extremely important to know the speed of adjustment of exchange rate.

The paper specifies and illustrates the use of a simple Markov chain model by which the speed of adjustment of exchange rate could be calculated. Markov chain models have been used widely in economics and other disciplines, especially for situations where a stochastic variable may move across a few possible states. Although their scope is somewhat limited, several measures for speed of convergence of stationary series may be obtained from these models. The paper uses one such popular measure and applies it to the Indian data. The paper, however, is illustrative in nature. The model specified has consciously been kept simple. In several places of the paper and especially in the concluding part, we have indicated several sources of generalizations and some possible ways to implement them. The plan of the paper is as follows : Section II specifies a simple Markov chain model. Section III considers an

empirical illustration with the data on foreign exchange. Finally, Section IV summarizes the main findings and indicates some possible generalizations.

Section II
A Simple Markov Chain Model

Let us define a set of random variables Y_t, $(t = 1, 2,...,T)$ based on the time series X_t, $(t = 1,2,...,T + 1)$ as follows

$$Y_t = 0 \qquad if \quad 1-K < \frac{X_{t+1}}{X_t} < 1+K \qquad (2.1)$$

$$= 1 \qquad otherwise$$

where K is the benchmark ratio of change. Here, $Y_t = 0$ denotes a normal movement and $Y_t = 1$ denotes an abnormal movement. Thus, idiosyncratic shocks are separated from normal shocks. Of course, there may not be consensus on the definition of a 'normal' shock and each definition would lead to a different measure for the speed of convergence. At best, one can try several such definitions and examine the robustness of the results.

Let us assume that Y_t follows a stationary Markov chain. This means any future movement of Y_t depends only on its 'current' state.[1] The chain has only two states,[2] viz., 0 and 1. Clearly, the state space of the chain Y_t is : $S = \{0,1\}$

The transition matrix is given by

$$P = \begin{pmatrix} p & 1-p \\ 1-q & q \end{pmatrix} \qquad (2.2)$$

where p and q are the transition probabilities from normal to normal and from abnormal to abnormal states, respectively. If $p+q \neq 2$, then the chain will have a unique steady state probability vector

$$\bar{\pi} = (\pi, 1-\pi) \qquad (2.3)$$

where π is the steady state probability of being in the normal state. Note that π may be obtained by solving the equation

$$p\pi + (1-q)(1-\pi) = \pi \tag{2.4}$$

With the above specification, one can associate the problem of fluctuation of the series with the literature on mobility indices. Mobility indices have been applied widely to measure fluctuations in income (Coondoo and Dutta, 1992) or employment (Bhattacharya, 1995). Mobility indices are summarized measures of fluctuation based on the transition matrix of a Markov chain. Different measures of mobility focus on different aspects of the chain like movement, predictability etc.

The close correspondence between mobility and speed of convergence towards steady state has been noted by Theil (1972) and Shorrocks (1978). To measure the speed of convergence of a chain, the literature on mobility focuses on the second highest eigenvalue modulus, $|\lambda_2|$, of the transition matrix. The eigenvalues of a matrix play a crucial role in determining the stability condition of any linear system involving that matrix. These eigenvalues may be real or may be complex. However, even if they are complex, they may be ordered according to their modulus. For a transition matrix with unique steady state, the 'highest' such eigenvalue modulus is always unity. However, the second highest eigenvalue modulus may take any value in the interval [0,1] and may be used to construct a measure for speed of convergence.

One such measure is

$$h = -\frac{\log 2}{\log|\lambda_2|} \tag{2.5}$$

The precise interpretation of h is the asymptotic half-life of convergence towards steady state,[3] i.e., it gives the average length of time that would reduce the distance between the 'current' probability vector and the steady state vector to half its present value. Calculation of this measure is easy from empirical observations. For the transition matrix P, λ_2 is given by

$$\lambda_2 = p + q - 1 \tag{2.6}$$

Section III
The Movements in Exchange Rate : An Illustrative Example

As an illustrative example, we consider the movement of the exchange rate of the Rupee vis-à-vis the US Dollar from 1 January 1993 to 29 November 1996, i.e., for 205 weeks. The data collected are weekly averages of the spot rate of the US Dollar. For the major part of this period, the Rupee remained stable. However, it also experienced wide volatility occasionally (Figure 3.1). During the first half of 1993, Rupee experienced some minor fluctuations vis-à-vis US Dollar. However, throughout the second half of 1993 and for almost the entire 1994-95, Rupee remained stable at 31.37. The Rupee was subject to temporary volatility in the market during March 1995 when it touched a low of 31.9700 per US Dollar. It however, recovered its stability quickly despite the Reserve Bank's negligible presence in the foreign exchange market (Reserve Bank of India, 1995, pp. 88).

From September 1995 onwards, the foreign exchange market in India experienced wide volatility. Between the two weeks ending 8 September and 15 September, the Rupee depreciated from 32.0680 to 33.0450 against the US Dollar. Such wide fluctuation in the market continued till February 1996. The value of the Rupee against the US Dollar fell to as low as 37.4030. However, the central bank intervention pushed the Rupee upward and by April 1996, it stabilized around 34.23.

In order to specify an appropriate benchmark rate, the period-to-period ratios of change in the exchange rate have been plotted (Figure 3.2). Determination of an appropriate benchmark rate in this context is difficult because the number of abnormal states is small and therefore, the estimates of the transition probabilities corresponding to the row of the abnormal state would tend to be less robust. We have considered five such rates starting from 0.2% to 1.0% and tried to identify the model which provides the best explanation to the data.

Figure 3.1 Movements in the Spot Price of US Dollar vis-a-vis that of Rupee, January 1993 to November 1996

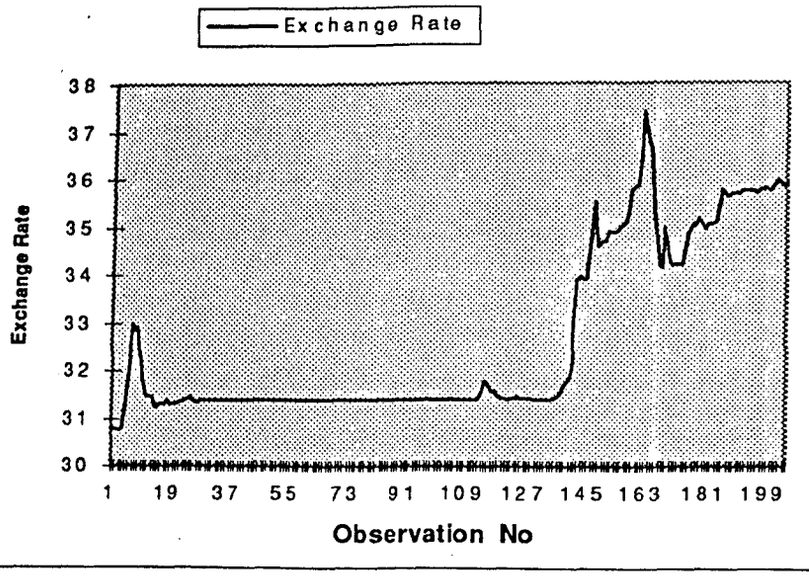


Figure 3.2 : Movement in the Ratio of Week-to-Week Change in Exchange Rate from Jan 1993 to Nov 1996

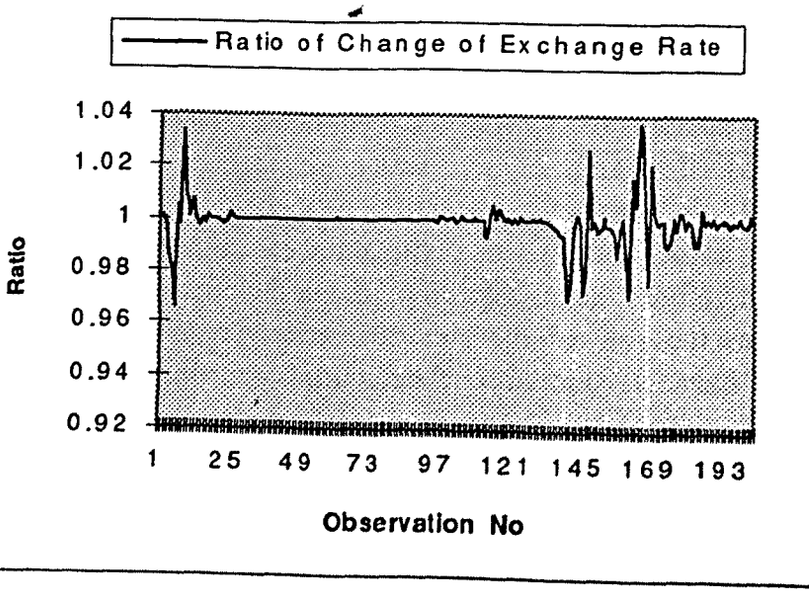


Table 3.1
Transition Probabilities, Steady State probabilities and Asymptotic Half-Life from the Simple Markov Chain Model

K	Transition Probabilities		Steady State Probabilities		Second Highest Eigenvalue	Half Life	Log Likelihood
	p	q	Obs	Est			
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
0.002	0.9008 (0.026)*	0.6750 (0.074)	0.7688	0.7661	0.5758	1.26	- 67.59
0.004	0.9231 (0.022)	0.6071 (0.092)	0.8382	0.8363	0.5302	1.09	- 57.54
0.006	0.9333 (0.020)	0.5238 (0.109)	0.8786	0.8772	0.4571	0.89	- 51.27
0.008	0.9477 (0.018)	0.5556 (0.117)	0.8960	0.8947	0.5033	1.01	- 43.76
0.010	0.9481 (0.018)	0.5294 (0.121)	0.9017	0.9006	0.4775	0.94	- 43.20

* The bracketed terms are estimated standard errors.

The transition probabilities have been estimated by the method of maximum likelihood and presented in Table 3.1. Estimates of p seem to be less sensitive to that of q on choice of K. Note that the transition probability p increases with K because of the increase in the number of 'normal' periods at the cost of 'abnormal' periods in the data. The increase in the number of 'normal' periods has also increased the reliability of the estimates. On the other hand, the estimates of q have become more and more unreliable because of fewer observations corresponding to that row of P. Estimated standard error of q has increased from 0.074 for K=0.002 to 0.121 for K=0.010. The split in proportional terms between the observations corresponding to normal and abnormal periods is somewhat different for K=0.008. This has affected the estimate of q for K=0.008, which otherwise decreases with K.

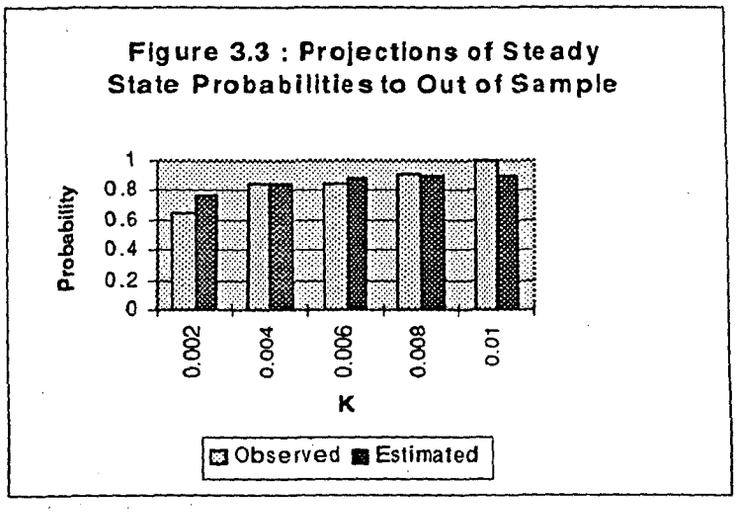
Table 3.1 also presents the steady state probabilities. The steady state probability of a state reflects the long-run proportion of time the chain will be in that particular state. The observed proportions have been calculated directly from the data while the estimated proportions have been calculated using the estimates of p and q and equation (2.4).

The steady-state probabilities may be used for projections of future movements of the chain. Unlike time series models, the specified model cannot provide a point forecast for the level of exchange rate. However, using the estimated steady-state probabilities, it could predict with reasonable accuracy the number of shocks that are likely to emerge over a long period. In the absence of accurate forecasts, this information still plays an important role. The length of the period for which such projections will be based would depend upon the speed of convergence of the Markov chain to its steady state.

Shorrock's measure of mobility, in this context, plays an important role. The interpretation of his asymptotic half-life measure is as follows : suppose the information on current probability is known. Let the distance between 'current' probability vector and the steady state vector be γ, the distance being measured using linear metric. Let us consider the benchmark rate 0.002. Then, on an average, the same distance will be $\frac{1}{2}\gamma$ after 1.26 week, $\frac{1}{4}\gamma$ after 2.52 weeks and in general, after $(\frac{1}{2})^n\gamma$ $1.26 \times n$ weeks. The maximum value of γ is 2.0. The distance between the two probabilities, therefore, becomes less than 0.001 for n=11. Thus, for all K, convergence to steady state is expected to take place within fifteen weeks.

For estimation, however, we have used data up to April, 1996, i.e., 174 observations. The rest of the data have been used to judge the performance of the model outside the sample range. The estimated steady-state probabilities from the model have been compared with the observed out of sample steady-state probabilities in Figure 3.3. Although we observe some discrepancies, the over-all performance of the model outside the sample range turns out to be

satisfactory. For K=0.004 and K=0.008, the steady state probabilities have been very close and for K=0.006, moderate. The projections for K=0.002 and K=0.010 are, however, not close — the gaps being 0.1236 and 0.0983, respectively. Given that these are estimates and not actual probabilities, the large gap does not invalidate the model. Our hypothesis is : more general models shall lead to projections of better quality. In Section IV, we indicate some possible general specifications.



Section IV
Conclusion

The paper specified a simple two-state Markov chain model for the spot price of the US Dollar in India. It showed that some common measures of mobility could be applied to such financial data. The strength of the Markov chain model lies in its projections of the long-run steady state probabilities for the future. Contrary to the more popular time series model, it focuses on the long-run behavior through the estimated steady-state probabilities. This may turn out to be a significant gain vis-à-vis the standard time series

models. The out of sample performances of the Markov chain model turned out to be reasonably satisfactory.

The framework considered in this model has been consciously kept simple. Several types of theoretical generalizations and some more applications are possible. For example, we could increase the number of states by distinguishing abnormal depreciation and abnormal appreciation. For more general models, one could go beyond the first-order Markov chain and specify a Markov chain of second order. One could also specify the transition probabilities as functions of some explanatory variables like the balance of payments position, the foreign exchange reserve, the RBI purchase and sale of foreign exchange, the call money rate etc. On the applied side, similar types of exercises could be done for the forward market and the hypothesis that adjustments in the forward market take place at a faster pace could also be examined. The general models involving a second-order Markov chain *or* a first-order Markov chain with non-homogeneous transition probabilities are hypothesized as useful solutions.

Notes

1. Given the fact that information is absorbed at a very fast pace in the foreign exchange market, the assumption of Markov chain may not be a bad assumption. Note that even this assumption can be generalized. However, such a generalization will impose some restrictions on the elements of the corresponding transition matrix.

2. Note that for this simple case, we have not made a distinction between changes due to depreciation and that due to appreciation. Such an assumption can be very easily relaxed by considering L number of classes based on the value of X_{t+1} / X_t. The state space will then consist of L elements. If L is large, such an analysis, however, will need a huge amount of data.

3. For proof, see Shorrocks (1978).

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Reserve Bank of India Occasional Papers
Vol. 18, No. 1, March 1997

Scale Economies in Banking — Indian Experience in Deregulated Era

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The ongoing financial sector reform has intensified competition in the Indian banking industry. In such a milieu, the banking industry has to sustain itself by reaching new heights of efficiency. One way to improve the efficiency is to exploit the scale economies of production. This paper examines the scale economy aspect of banking using accounting data of a wide cross section of Indian banks for the year 1994-95. Using 'intermediation' approach to define banks' output, the study uses two measures of the scale economy *viz.*, Ray Scale Economy (under constant output-mix) and Expansion Path Scale Economy (under changing output-mix). Under each measure, the effect of output expansion from the existing branches as also through opening of new branches are studied. Ray Scale Economy measures show that under constant output-mix, most of the banks in India will have cost efficiency gains if they expand their business at the existing branches. However, if new branches are opened to handle the increased business, only the small and medium sized private sector banks will gain in cost efficiency. The study points to the possibility of some merger/regrouping among the small sized banks in order to reap the maximum benefit of scale economies.

Introduction

Till the 'seventies, bankers all over the world operated in beneficially regulated markets and as cartels, restricting competition. Since then, several developments such as the deregulation of the banking sector, the improvement in the banking technology and the growth of non-bank financial intermediaries like mutual funds have taken place, changing the financial environment drastically. The banking industry has come to be characterised with intense competition, declining margins on traditional banking business, increased cost pressures and greater risk. As a fall out, instances of bank failures and mergers have

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increased. While banks have ventured into new lines of business, increased competition has brought in its wake increased reliance on cost minimisation and improvement in efficiency.

The Indian banking scenario too has undergone a change in the recent past. The financial sector liberalisation attempted since 1991, has allowed more operational flexibility and functional autonomy to banks than hitherto with a view to enhancing their efficiency, productivity and profitability. The broad direction of the policy reform has been towards rationalisation of the administered interest rate structure followed by deregulation of most of the deposit and lending rates, reduction in the governmental pre-emption of banks' funds in the form of CRR and SLR and relative freedom in branch licensing. Simultaneously, the supervisory mechanism has been strengthened and prudential norms relating to capital adequacy, income recognition, asset classification and provisioning have been put in place. Operational flexibility has infused a great deal of competition among the Indian banks which has been further heightened by introduction of new players in the market. New domestic banks have been allowed entry in the private sector and foreign banks have been permitted to open offices in India, subject to fulfilment of specified eligibility criteria. Establishment of mutual funds both in the public and private sector as also the growing influence of non-bank financial companies have increased the competition from outside the banking system. In such a milieu, the banking industry has to sustain itself by reaching new heights of efficiency.

Several types of efficiencies are associated with a production process. One such is the scale efficiency which relates the firm size to its production/cost curve. At present there exists a wide variation in the size of the banks operating in India. Thus a question arises: will all the banks of varying sizes be equally efficient under the competitive environment ? The paper makes an attempt to study the scale economy aspect of banks in India following the cost function approach and using accounting data for the year 1994-95 of all scheduled commercial banks (excluding the Regional Rural banks). The remaining part of the paper is organised as follows: Section II presents a few stylized facts of Indian banking industry. Section III reviews a number of studies on scale and scope econo-

mies in banking, mostly covering the experience of the U.S.A. and raises some conceptual issues. Section IV outlines the methodology of the present study while Section V presents the econometric evidence on scale economies. Section VI provides the broad conclusions and policy issues emanating from the study.

SECTION II

Indian Banking System : a Size-wise Profile

As at the end of March 1995, Indian banking system comprised 27 Public sector banks, 29 Private sector banks (including 6 newly opened banks), 27 foreign banks (including 4 banks which opened their maiden branch in India during 1993-94/1994-95), 2 non-scheduled banks and 196 Regional Rural Banks besides the Co-operative banks. Our analysis was restricted to the Scheduled Commercial banks (excluding the Regional Rural Banks) for similarity of their operations and their predominant position in the banking industry. Further, the newly opened 6 Indian Private sector banks and 4 foreign banks were also excluded for lack of sufficient data. Thus, the study was based on the operation of 73 commercial banks during the year 1994-95. The data for the study were collected from the published Balance Sheets and Profit & Loss Accounts of these banks.

The inter-se size difference of the Indian banking system, based on the sample banks, can be gauged from the following Table.

Table 1
Variability in the Basic Parameters of the Indian Banks — As of March 1995

(Amount in Rs. crore)

	Deposits	Total Assets or Liabilities	Investments	Advances	Number of Employees	Number of Branches
Average	5526	6944	2355	2835	13187	677
Minimum	23	27	5	4	31	1
Maximum	85122	121814	41673	48530	232086	8878

The 73 banks included in the study can be grouped into the following classes based on their size of deposits.

Table 2
Distribution of Banks in India according to Deposit Size

Deposit Size (Rs. crore)	Number of Banks	Broad Constituents
1. Upto 500	19	Small Private Sector banks
2. 501 — 2000	17	Medium Private Sector banks
3. 2001 — 4000	10	Large Private Sector banks + Small Public Sector banks
4. 4001 — 7000	14	Medium Public Sector banks
5. More than 7000	13	Large Public Sector banks

These size classes have been used for further analysis in the study. Variations in some of the operational parameters of the banks in each of the above size classes are brought out in the following Table.

Table 3
Deposit Size-wise Variation in the Operational Parameters of Banks in India

Parameter/Size-class (Rs. crore)	1 Upto 500	2 501-2000	3 2001-4000	4 4001-7000	5 More than 7000
1. Liability Mix					
Deposits	0.74	0.82	0.80	0.81	0.79
Borrowings	0.12	0.08	0.06	0.05	0.05
2. Deposit Mix					
Current Deposits	0.15	0.15	0.17	0.16	0.18
Savings Deposits	0.16	0.14	0.17	0.21	0.24
Term Deposits	0.69	0.71	0.66	0.63	0.58
3. Asset Mix					
Advances	0.48	0.48	0.44	0.39	0.40
Investments	0.30	0.30	0.32	0.34	0.34
4. Credit Mix					
Cash Credit etc.	0.63	0.58	0.66	0.59	0.62
Term Loan	0.18	0.24	0.21	0.28	0.25
Bills Discounted etc.	0.20	0.18	0.13	0.13	0.14
5. Interest Income in Total Income	0.89	0.85	0.84	0.86	0.88
6. Interest Expense in Total Expense	0.58	0.60	0.55	0.59	0.60
7. Operating Expense in Total Expense	0.22	0.24	0.29	0.29	0.30
8. Average Cost per unit of Asset (in Rs.)	0.0805	0.0752	0.0772	0.0771	0.08

The following broad trends are discernible from the above Table:

(i) The share of borrowings was relatively high in the two smallest size classes.

(ii) The share of term deposits was higher in the smaller banks than the larger ones.

(iii) The share of investments in the total assets was higher for large sized banks than for the small sized banks

(iv) Credit-mix of the smaller banks was more concentrated in favour of short-term loans (*i.e.* cash credit, bills etc.).

(v) Operating expense as a share of total expense was found to be high for the large sized banks.

(vi) The average cost per unit of asset was U-shaped and reached the minimum in the second size-class *i.e.,* for banks with deposits between Rs.501-2000 crore.

SECTION III

Scale Economies in Banking : Some Conceptual Issues and a Select Resume

A number of studies have been conducted to measure scale and scope economies in banking/financial institutions largely based on the experiences of U.S.A. The broad approach followed in these studies has been to specify a suitable production/cost function[1] for banking activity, estimate parameters of the cost function using accounting data of sample banks/financial institutions and finally arrive at measures of scale and/or scope economies at the sample mean and/or for different output ranges. However, these studies differed in their approaches in defining banks' output, selecting the functional form of the production/cost function, the range of bank sizes included in the sample and the measures of scale and scope economies used.

What Do the Banks Produce?

A fundamental issue in studying the production economies of a banking firm is : what constitutes a bank's output? While there is a wide consensus on the multi-product nature of a bank, views differ on the conceptual issue of the appropriate definition of outputs and inputs in the banking industry and consequently the banking costs. The two most commonly used approaches are the 'intermediation approach' and the 'production approach'. Under the intermediation approach, financial institutions are viewed as intermediaries which transform and transfer financial resources from units in surplus to units in deficit. In this approach, deposits are treated as input alongwith capital and labour and earning assets are taken as measures of output. Also, consistent with this approach, costs are defined to include both interest expenses and other operating expenses.

The production approach, on the other hand, views financial institutions as producers of services associated with individual loan and deposit accounts using capital and labour. Under this approach, it follows that number of accounts of each type form the appropriate definitions of output. Interest expenses are excluded in measuring the cost.

Murray and White (1983), H.Y. Kim (1986), Noulas,Ray and Miller (1990), Glass and Mckillop (1992) among others adopted intermediation approach to define banks' output while Gilligan and Smirlock (1984), Gilligan, Smirlock and Marshall (1984) based their analysis on production approach. Benston, Hanweck and Humphrey (1982) also adopted production approach but they combined number of deposit and loan accounts in several ways to obtain composite indices of bank output. Berger, Hanweck and Humphrey (1987) measured bank output and costs using both production and intermediation approach and observed that the scale economy measures are qualitatively comparable under both the methods. Berger and Humphrey (1991) followed a variation of intermediation approach where costs included both operating and interest expenses and output was measured on the basis of 'value added' approach.

Banking functions which are associated with a substantial labour or physical capital expenditure were identified as the major outputs. As consensus on what should constitute an output measure of a bank has eluded economists, it would be ideal to define banks' output adopting both 'intermediation' and 'production' approaches and test the sensitivity of the scale economy measures.

Form of the Cost Function for the Banking Industry

A number of studies prior to the 1980s, assumed production function of the Cobb-Douglas or CES type, which were not capable of generating a U-shaped average cost curve, implying that returns to scale would remain constant across all output levels. Consequently, an optimum size of a bank could not be determined. In order to correct this shortcoming, most of the studies since 1980s have selected Translog (TL) function to represent banks' cost structure which allows multiple outputs to enter as separate variables and can generate U-shaped average cost curve. Thus scale economies can vary according to the size of the bank. However, one important limitation of the TL function is its inability to admit zero output which is required for estimation of scope economy and/or product specific scale economy. This led to the use of more flexible cost functions in recent studies. Glass & Mckillop (1992) used a hybrid TL function while Hunter, Timme and Yang (1990) used minflex Laurent approximation to estimate the scale and scope economy. McAllister & McManus (1992) observed that TL cost function may behave poorly if the global behaviour of the approximated function differs from its local behaviour and used nonparametric techniques which are designed to estimate a function uniformly well over some region.

Choice of the Sample

Previous studies on scale economies in banking can be grouped in two classes based on the choice of sample banks included in the study. Most of the studies included a cross section of banks of all sizes and typically found scale economies among small banks — usually banks with less than $100 million in total assets — and

scale diseconomies among larger banks. Some authors, however, restricted their study only to large banks (above $1 billion in total assets) and found evidence of scale economies for relatively large banks ($2 billion to $10 billion of total assets). McAllister and McManus (1992) demonstrated that such results could be due to trying to fit a single TL function over a population of banks that varied widely in terms of size and output mix which systematically misrepresented costs for certain types of banks leading to specification bias.

Measures of Scale Economies

Conventionally, scale economies are measured through elasticity of cost with respect to output keeping product mix unchanged. Further, as the number of branches enter as an independent variable in most of the cost function specifications, in this measure, this variable is also assumed to remain constant as output expansion takes place.[2] Arguing that banks expand primarily by opening new offices (which attract new accounts) rather than by adding accounts to existing offices, Benston, Hanweck and Humphrey (1982) defined an augmented scale economy measure which takes into account both the sources of banks' output expansion.[3] Noulas, Ray and Miller (1990) measured the 'plant' level scale economy through inclusion of branch variable in the cost function and 'firm' level scale economy by excluding the same from the cost equation. Berger *et al.* (1987) developed a new measure of scale economy called Expansion Path Scale Economy (EPSCE) which captures the impact of changing scale and product mix simultaneously by choosing the mean output levels of representative banks in successive size classes as expansion path.

The studies discussed so far assumed that all sample banks are technically efficient and the observed cost represents the frontier. Berger & Humphrey (1991) observed that economies or diseconomies found in such studies were relatively small despite the fact that bank costs revealed a striking degree of dispersion. The authors estimated a 'thick frontier' cost function and showed that inefficiency residuals completely dominated scale and product mix

effects. Review of other studies which fitted frontier cost/production function and estimated scale efficiency therefrom, has not been attempted in this paper.

Scale Economies of Banking in India

Most of the studies referred to above are based on data from U.S. banking industry. Literature on scale and/or scope economies of Indian banks are very few. Rangarajan & Mamipally (1972) studied economies of scale in Indian banking by regressing total operating costs of banks on size of deposit and other control variables like deposit-mix, number and spread of branches etc. and derived the shape of marginal and average cost curves. Using the data for the period 1967-69, this study found that the marginal cost curve reached its minimum at the deposit size of Rs. 300 crore which was taken as the least-cost size of the banks. The authors acknowledged major shortcoming of the study as its exclusive reliance on deposits as indicator of banks' output. Ray & Sanyal (1995) conducted an econometric investigation of scale efficiency in Indian commercial banking based on the data for the year 1989-90. They fitted a TL function as also a hybrid TL function and minflex Laurent's approximation to cost data in the single equation framework as well as in the framework of a system of equations (which included cost share equations). The study concluded that substantial scale economies exist among the sample banks and it would be more cost effective to expand output at existing branches than to expand output through opening of new branches. The study was, however, based on a sample of only 16 nationalised banks which constrained the authors to make several compromises such as, aggregation of different output indicators into a single index, dropping of capital price variable from the cost equation etc., thus making the results somewhat circumspect. The authors considered number of branches as an output variable whereas in all other studies the same was considered as a control variable. This specification is quite confusing when used to measure the scope economies of banking.

SECTION IV

Methodology of the Present Study

For reasons discussed in Section III, this study has preferred the cost function approach to measure the scale economies of banks in India.[4] Data on output and costs for the banks included in the study were culled out from the Balance Sheets and Profit & Loss Accounts. Balance Sheets provide information on different components of assets and liabilities in value terms but they do not provide information on number of deposit and loan accounts serviced by the banks. Therefore, 'intermediation' approach was used to define banks' output instead of 'production' approach. Accordingly, total advances and total investments (in value terms) were taken as output indicators and labour, fixed capital and purchased funds (deposits plus borrowings) were taken as inputs. Consistent with the intermediation approach, operating costs included expenses on labour and fixed capital as also interest expenses (on deposits and borrowings). Price of labour was determined by the ratio of establishment expenses to the total number of employees (irrespective of their grades).[5] Price of capital was determined by the ratio of the sum of expenditure on rent, repairs and depreciation to the total value of assets.[6] Price of the purchased fund was determined by the ratio of total interest expenses to the outstanding deposits and borrowings as on the balance sheet date. Apart from the output variables and the input prices, the number of branches was included as a control variable in the cost function.

A Translog model was fitted to the cost function as follows :

$$\begin{aligned} ln\ C = a_0 &+ \Sigma a_i * ln\ y_i + \Sigma b_j * ln\ P_j + 1/2\ \Sigma\Sigma c_{ir} * ln\ y_i * ln\ y_r \\ &+ 1/2\ \Sigma\Sigma d_{js} * ln\ P_j * ln\ P_s + \Sigma\Sigma f_{ij} * ln\ y_i * ln\ P_j \\ &+ g_0 * ln\ B + \Sigma g_i * ln\ y_i * ln\ B + \Sigma h_j * ln\ P_j * ln\ B \\ &+ k/2 * ln\ B * ln\ B. \end{aligned} \qquad \ldots.(1)$$

where, C is total operating cost including interest expenses,
y_i's are the output indicators; i=1,2,
P_j's are the input prices; j=1,2,3,
and B is number of branches.

Symmetry condition required

$$c_{ir} = c_{ri} \text{ for all } i,r \text{ and } d_{js} = d_{sj} \text{ for all } j,s. \quad \ldots. (2)$$

Further, linear homogeneity of the cost function in input prices imposed the following conditions on the parameters:

$$\Sigma b_j = 1; \quad \ldots.(3a)$$
$$\Sigma d_{js} = 0 \text{ for } j=1,2,3; \quad \ldots.(3b)$$
$$\Sigma f_{ij} = 0 \text{ for } i=1,2. \quad \ldots(3c)$$
$$\Sigma h_j = 0 \quad \ldots(3d)$$

All the independent variables were normalised with respect to their means before taking logarithms.

The cost function was augmented by the input share equations as follows:

By Shephard's lemma, factor demand equation for input j is

$$X_j = \delta C/\delta P_j \quad \ldots(4)$$

so that $\delta lnC/\delta lnP_j = P_j * X_j/C$, the share of j^{th} input (S_j) in the cost.

But, $\delta lnC/\delta lnP_j = b_j + \Sigma d_{js} * lnP_s + \Sigma f_{ij} * lny_i + h_j * lnB.$ $\quad \ldots(5)$

Thus,

$$S_j = b_j + \Sigma d_{js} * lnP_s + \Sigma f_{ij} * lny_i + h_j * lnB, \text{ for } j=1,2,3 \quad \ldots(6)$$

This together with the cost function formed the system of equations to be solved.

However, as $\Sigma S_j = 1$, one of the input share equations, *viz.*, that of the capital, was dropped and the remaining 3 equations in (1) and (6) were simultaneously solved through Seemingly Unrelated Regression (SUR) technique.

After obtaining the parameter estimates as above, Ray Scale Econo-

mies (RSCE) were measured as elasticity of cost with respect to output keeping product mix constant.

$$RSCE=\Sigma\delta lnC / \delta lny_i=\Sigma a_i+\Sigma\Sigma c_{ir}*lny_r+\Sigma\Sigma f_{ij}*lnP_j+\Sigma g_i*lnB \qquad ..(7)$$

RSCE < 1 implies economies of scale while RSCE > 1 implies diseconomies of scale. RSCE = 1 means there is no economy of scale.

RSCE for the whole sample was evaluated at the overall means of each variable which by construction equals 1. Therefore, RSCE for the whole sample was Σa_i. To see how scale economies change over the various ranges of output, RSCEs were also evaluated at different data points.[7]

RSCE as defined above, keeps the number of branches fixed as output expands. Thus, it can be considered as a measure of scale economy when output expands from the existing branches (labelled as 'plant' level scale economy and denoted by $RSCE_p$). However, as argued in the literature, banks (firm) normally operate through multiple branches (plants) and output expansion can take place by opening new branches rather than by expanding the output in existing branches. For measuring the scale economies when the number of branches are allowed to vary along with the output, following the approach of Noulas *et al.*, branch variable was dropped from the cost function at (1) as well as from the equation (7). This measure is labelled as 'firm' level scale economy and denoted by $RSCE_F$.

Following Berger *et al.* (1987), Expansion Path Scale Economies (EPSCE), which is defined as elasticity of incremental cost with respect to incremental output along the expansion path (which may have changing product mix) was evaluated through:

$$EPSCE\ (Q^A,Q^B)=\sum\left[\frac{Q_i^B - Q_i^A}{Q_i^B}*\frac{C\ (Q^B)}{C(Q^B) - C(Q^A)}*\frac{\delta lnC(Q^B)}{\delta lnQ_i}\right] ...(8)$$

where $Q^A=\{Q^A_1,Q^A_2\}$ and $Q^B=\{Q^B_1,Q^B_2\}$ are the output bundles on expansion path AB and $C(Q^A)$ and $C(Q^B)$ are the costs associated with the above output, obtained from equation (1). $EPSCE(Q^A,Q^B)<1$ indicates scale economy on segment AB, while $EPSCE(Q^A,Q^B)>1$ indicates diseconomies.

As in the case of RSCE, EPSCEs were also measured at 'plant' and 'firm' levels by including and excluding the 'branch' variable in the cost function (1). They are denoted by $EPSCE_P$ and $EPSCE_F$ respectively.

SECTION V

Empirical Results for India

Estimation of the Cost Function

Translog cost model described in equation (1), together with the input share equations given in (6) fitted the data well as can be seen by the high R^2 value and low standard error (Table-4). There was no evidence of heteroskedasticity of the errors.[8] The parameter estimates are given in Table-5. All output and price coefficients were positive and statistically significant implying positive cost elasticities and input shares. The branch coefficient was positive and statistically significant.

Table 4
Goodness of Fit of the Cost Function and Share Equations under Alternative Models

	With Branch Variable	Without Branch Variable
1. Cost Function		
R^2	0.9978	0.9869
D-W Statistic	2.04	1.97
Mean of Dependent Variable	14.2802	14.2802
Std. Error of Regression	0.0794	0.195
2. Share Equation for Labour		
R^2	0.891	0.398
D-W Statistic	1.87	1.54
Mean of Dependent Variable	0.1965	0.1965
Std. Error of Regression	0.0303	0.0728
3. Share Equation for Borrowings		
R^2	0.8921	0.4492
D-W Statistic	1.93	1.56
Mean of Dependent Variable	0.7511	0.7511
Std. Error of Regression	0.0343	0.0757

For measuring the scale economies at the firm or bank level, the system of equations constituting (1) and (6) was reestimated after dropping the branch variable. The model omitting the 'branch' variable reported slightly lower R^2 and higher standard error for the cost equation. The estimation of the share equations turned out to be more imprecise. Some interaction terms had reverse signs but all output and price coefficients were positive (Table-5).

Table 5
Parameter Estimates of the Cost Function for Alternative Models

Parameter	With Branch Variable		Without Branch Variable	
	Estimate	Std. Error	Estimate	Std. Error
a0	15.643**	0.127	15.554**	0.027
a_1	0.419**	0.042	0.368**	0.086
a_2	0.519**	0.044	0.636**	0.083
b_1	0.270**	0.006	0.195**	0.013
b_2	0.060**	0.006	0.064**	0.008
b_3	0.670**	0.007	0.741**	0.011
c_{11}	0.112	0.071	-0.125	0.126
c_{12}	-0.055	0.066	0.164	0.114
c_{22}	0.044	0.071	-0.178	0.108
d_{11}	0.092**	0.013	-0.052*	0.02
d_{12}	0.023**	0.008	0.042**	0.012
d_{13}	-0.115**	0.011	0.010	0.014
d_{22}	0.056**	0.008	0.042**	0.011
d_{23}	-0.079**	0.007	-0.084**	0.01
d_{33}	0.195**	0.012	0.074**	0.015
f_{11}	-0.064**	0.009	-0.080**	0.023
f_{12}	-0.016	0.01	-0.008	0.015
f_{13}	0.080**	0.011	0.088**	0.02
f_{21}	0.008	0.01	0.082**	0.021
f_{22}	0.008	0.01	0.006	0.014
f_{23}	-0.015	0.011	-0.088**	0.019
g0	0.056*	0.023		
g_1	-0.013	0.013		
g_2	-0.001	0.013		
h_1	0.061**	0.004		
h_2	0.003	0.003		
h_3	-0.065**	0.004		
k	-0.005	0.011		

* : Significantly different from zero at 5% level.
** : Significantly different from zero at 1% level.

The Translog cost function represents a very general production structure which is non-homothetic and has no restriction on elasticities of substitution. However, by imposing restrictions on the values of certain parameters, TL cost function nests more simplified models like homogeneous or homothetic production structure as also production structure with unitary elasticities of substitution. Validity of such restrictions can be tested statistically through likelihood ratio (LR) tests.[9]

Restrictions on parameters which reduce the production structure underlying a TL cost function homogeneous in outputs are,

$$\Sigma c_{ir}=0;\ r=1,2$$
$$\Sigma f_{ij}=0;\ j=1,2,3$$
$$\text{and}\quad \Sigma g_{i}=0. \qquad \ldots(9)$$

However, the validity of such restrictions was rejected as the LR test statistic at 933.7 far exceeded the critical value of 11.1 for Chi-square distribution with 5 d.f.[10] at 5% level of significance.

Homotheticity is tested through separability of the variable cost function in the outputs and all other variables. For the TL function at (1), the testable restrictions for homotheticity are

$$f_{ij}=0;\ i=1,2 \text{ and } j=1,2,3.$$
$$\text{and}\quad g_{i}=0;\ i=1,2. \qquad \ldots(10)$$

The LR test statistic in this case was 205.9 and was also rejected at 5% level of significance (Critical value of Chi-square distribution with 6 d.f.[11]=12.6). This implied that a valid aggregation of banks' outputs into a single index is not possible and the cost function representing the banking firms must take explicit account of the multi-product nature of banks' output.

Ray Scale Economies (RSCE)

Based on the parameter estimates of the cost function, the ray scale economies (RSCE) were calculated for the whole sample as

well as at different data points using the formula at (7). RSCE for the whole sample was evaluated at the sample mean value of each independent variable. RSCE for the whole sample at 'plant' level *i.e.* when output expands at the existing branches, was estimated at 0.9384 with a standard error of 0.0208. Thus, $RSCE_P$ for the whole sample was found to be significantly less than 1[12]. This means that a bank whose output is at the respective averages of the whole sample, will find it cost efficient to increase its scale of operation (equi-proportionate increase in both the outputs) provided it can handle the increased business without increasing the number of branches. RSCE for the whole sample at 'firm' level *i.e.* when output expands through opening of new branches, was however, estimated at 1.0047 with a standard error of 0.0188. Thus, $RSCE_F$ for the whole sample was found to be not significantly different from 1[13]. This means that an average sized bank will not have any cost benefit from equi-proportionate increase in its output if the number of branches also increase alongwith the output.

As TL cost function can have varying scale economies at different output sizes, RSCEs were also evaluated at different data points. Data points chosen in this study were the averages (geometric mean) of output and other variables of banks in 5 size groups detailed in Section II. To neutralise the effect of input price changes on the cost elasticities, input prices were kept constant at the overall mean (G.M.) of all banks.

Table 6 shows that at the 'plant' level, significant economies of scale exists among the commercial banks in India in the first four size classes *i.e.* with deposit size upto Rs.7,000 crore. RSCE for the largest deposit size class was, however, not significantly less than 1. This means that all private sector banks (Indian and foreign) as also the small and medium sized public sector banks will find it cost efficient to increase their scale of operation (equi-proportionate increase in advances and investments) with the help of the existing number of branches.

The picture changes substantially if one looks at the scale economy figures at the 'firm' level. Here the economies of scale operate

only upto the second size class *i.e.* for deposits upto Rs. 2000 crores which include small and medium sized private sector (Indian and foreign) banks. At higher deposit size classes, the scale economy measures are not significantly different from 1. This implies that the cost efficiency which some banks could enjoy from increasing the scale of operation would be lost if the number of branches also increase commensurately with the increase in the output. However, this mode of output expansion will be cost efficient for the very small sized banks. This result also suggests that there exists unutilised capacity at the branch level in a large segment of the banks in India.

Expansion Path Scale Economies (EPSCE)

EPSCE which is defined as the elasticity of cost with respect to output when the output mix changes along the expansion path was estimated through equation (8). The expansion path chosen for this purpose were the mean (geometric) output levels of 5 bank size-groups referred to earlier. Under the condition that output expansion takes place at the existing branches, EPSCE for the first three size classes (*i.e.* banks with deposits upto Rs. 4,000 crore) were significantly lower than 1 while for the size-group 4 *i.e.* banks with deposits Rs. 4,001 - 7,000 crore, EPSCE was not significantly different from 1 (Table 6). Thus if banks expand their output from existing branches but alter their output mix in the process of this expansion, then banks from the first 3 size-groups, which comprise the private sector banks (Indian and foreign) and small public sector banks, will gain in terms of cost efficiency. However, in this process of output expansion, if new branches are opened to handle the increased output, banks in none of the size-groups will gain in terms of cost efficiency as EPSCE measures for none of the size-groups at 'firm' level was found to be significantly different from 1.

Table 6
Scale Economy Estimates by Size Class

Deposit size class (in Rs. crore)	$RSCE_p$	$EPSCE_p$	$RSCE_f$	$EPSCE_f$
Upto 500	0.8599**	0.9284**	0.9316**	0.9899
	(0.0128)	(0.0083)	(0.0216)	(0.0095)
501-2000	0.9156**	0.9355**	0.969*	0.9972
	(0.0112)	(0.0106)	(0.0162)	(0.0076)
2001-4000	0.9424**	0.9006**	0.9888	0.9978
	(0.0135)	(0.0252)	(0.0153)	(0.0083)
4001-7000	0.9478**	0.9688	1.0015	1.0210
	(0.0188)	(0.0305)	(0.0176)	(0.0143)
More than 7000	0.9783	—	1.0292	—
	(0.0265)		(0.0258)	
Whole Sample	0.9384**	—	1.0047	—
	(0.0208)		(0.0188)	

* : Significantly lower than 1 at 5% level.
** : Significantly lower than 1 at 1% level.

SECTION VI

Summary and Conclusions

Based on the accounting data of 73 scheduled commercial banks for the year 1994-95, it was observed that a translog function adequately represented the cost behaviour of the banks in India. The feasibility of explaining the costs through a homogeneous or a homothetic production structure was statistically rejected.

Based on the estimated parameters of the cost function, the study measured scale economies at different output ranges for the banks in India. Two modes of output expansion *viz.*, constant output-mix and changing output-mix were considered. Under each mode, the effect of output expansion from the existing branches as also

through opening of new branches was studied. It is observed that most of the banks in India will gain in cost efficiency if they expand their business from the existing branches and keep the output-mix unaltered. However, with constant output-mix, if new branches are opened to handle the increased business, only the small and medium sized private sector banks will gain in cost efficiency. The scope for increased cost efficiency was found to be narrow in the case of changing output-mix. In this case, private sector banks of all sizes and the small public sector banks will stand to benefit from output expansion from the existing branches. However, with addition of branches alongwith output, the study found no evidence of scale economies in the banks of any size-group. The findings of the study therefore are :

(i) there exists scale economies in the Indian banking industry;

(ii) expansion of output at existing branches is more cost efficient than expansion through new branches; and

(iii) greater cost efficiencies are gained through equi-proportionate expansion of output levels rather than their non-proportional expansion.

One policy implication of the results found in the study is that with increased competition and the need to mininise the cost, a number of banks, notably those in the private sector, may find that they are not operating at the optimum size. This raises the issue of regrouping and merger among the banks with a view to reaping the benefits of scale economy.

The objective of cost minimisation under perfect competition presupposes that firms are price takers and therefore can not alter the revenue structure. In actual practice, this may not be so as individual banks may be able to exercise a fair degree of control on the prices they charge on their financial products. The existence of several imperfections, particularly the information imperfection, and service differentiation are some of the factors contributing to the asymmetric price structure of the banking industry.

With the greater degree of financial liberalisation, the banking industry in India would have to cope up with the increasing pressures of competition in future. Indeed, the competitive forces are going to be further strengthened with greater degree of openness in the external capital account and growing trade in financial services. In this milieu, optimising the size of the firm will be of critical importance. The results of this study showed that while there are unrealised potential of scale economies in the case of a large number of banks which can expand their output without expanding their branch network, there are also opportunities for a smaller number of banks which can increase their cost efficiency by expanding the scale of operation through increased branch network.

Notes

1. A fundamental result of duality theory is, provided that certain regularity conditions are satisfied, there exist cost and production functions which are dual to each other. The regularity conditions on the cost function in multiproduct case are that it be non-negative, real valued, non-decreasing, strictly positive for non-zero output and linearly homogeneous and concave in input prices for each output. In such a case, the structure of production can be studied empirically using either a production function or a cost function - the choice is made on statistical grounds. Panzar and Willig (1977) has further shown that when outputs are produced in cost efficient manner, degree of scale economies is the same, whether it is measured using the transformation function or the cost function. As the specification that input levels are endogenous and the output levels are exogenous is more plausible in the case of banking industry, almost all the studies used the cost function approach to measure the scale economies. Further, the duality conditiitions are generally derived in a deterministic framework. The correspondence of these conditions to the stochastic frameworks could be an area of study.

2. This measure is also known as 'plant' or 'branch' level scale economy.

3. This measure is also known as 'firm' or 'bank' level scale economy.

4. Some doubts may be expressed about the reasonableness of the underlying assumption in this case that banks in India, especially the 27 nationalised banks, produce their outputs in a cost efficient manner. It may, however, be mentioned that while some social objectives were behind nationalisation of the banks, it has been subsequently realised that normal profit maximisation/cost minimisation objective can not be altogether ignored, which formed the very basis of financial sector liberalisation. Thus it may be assumed that over a period of last few years, even the nationalised banks are moving towards the objective of cost minimisation.

5. Arguing that banks vary in composition of their employees, in terms of officers, clerks and subordinates staff, Keshari and Paul (1994) converted the employees

data into homogeneous units of subordinate staff using the ratio of 1/3:1/2:1 for officers, clerks and subordinate staff, respectively.

6. One could use the book value of premises, furniture and fixture in the denominator. However, as rented premises are used for performing a significant portion of the banking business in India, book values of the premises shown in the Balance Sheet are very low. Use of number of branches in the denominator has the limitation in that the cost of maintaining branches located in different areas (viz., rural, semi-urban, urban and metropolitan area) can be very much different. Thus, it was assumed that use of fixed assets is proportional to the total assets maintained.

7. Statistical significance of difference of RSCE values from 1 was tested using the ANALYZ procedure of TSP.

8. Heteroskedasticity of the errors was tested by regressing squares of the residuals on size parameters like deposits, advances, total assets etc., separately. In none of the cases, the regression coefficients were found to be significantly different from zero.

9. It has been shown that estimation through Zellner's SUR procedure are asymptotically equivalent to MLE and therefore, variance-covariance matrix obtained in the final iteration can be reasonably used to perform LR tests.

10. The actual number of additional restrictions are 5 in view of equation 3(c).

11. The actual number of additional restrictions are 6 in view of equation 3(c).

12. Significance of the scale economy measure is tested through H_0 : $RSCE_p = 1$ vs. H_1: $RSCE_p < 1$, the test statistic for which is $(RSCE_p - 1)/s.e.\ (RSCE_p)$ and it follows t-distribution with 52 d.f. under H_0. Critical value for the one-sided test at 5% level of significance is -1.6747.

13. The test in this case is exactly similar to that for $RSCE_p$ described above but the test statistic follows t-distribution with 58 d.f., critical value for which at 5% level of significance is -1.6715.

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Reserve Bank of India Occasional Papers
Vol. 18, No. 1, March 1997

NOTE

Determinants of India's Agricultural Exports

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In the context of the post-GATT international trading conditions and liberalisation of India's hitherto restricted agricultural exports, the paper examines the determinants of India's agricultural exports during 1970-71 to 1994-95. The study undertakes empirical estimation of export demand and supply functions for total agricultural exports as well as for the principal commodities in a simultaneous equation framework.

Introduction

Agricultural exports besides fetching valuable foreign exchange to the country, enable farmers to trade at international prices and contribute to improving the allocative efficiency of the economy. In India, till recently, the role of agricultural exports, to a large extent, had gone unrecoganised, reflecting in the process the restrictions placed on agricultural exports, regardless of the world market situation. In general, agricultural policies were largely driven by the objective of achieving self-sufficiency in production and stability in domestic prices. The restrictions or controls on agricultural exports were believed to be one of the prime reasons for the disprotection of the agricultural sector as compared to the industrial sector [Gulati et al, (1990), Pursell and Gulati, (1993) and Government of India, (1996)]. Of late, however, there has been a growing realisation towards redesigning policies relating to agricultural sector so as

* The author is Research Officer in the Department of Economic Analysis and Policy. He is indebted to Dr. A.Vasudevan for his extremely insightful comments on an earlier version of the paper. The author is grateful to Prof. A. Ramanathan and Dr. Himanshu Joshi for their invaluable guidance in preparation of the paper. Excellent assistance rendered by Smt. Madhura S. Borgaonkar and Smt. Chhaya R. Sheth is thankfully acknowledged.

to promote agricultural exports. Underscoring the importance of agricultural exports, the Eighth Five Year Plan (1992-97) aimed at achieving not only self-sufficiency in food but also generating surpluses for export (Government of India, 1992). The Approach Paper to the Ninth Five Year Plan (1997-2002) has also stressed the importance of agricultural exports for increasing farm incomes, tackling the problem of unemployment, earning foreign exchange and achieving an improvement in the secular growth rate of agriculture (Government of India, 1997). This needs to be viewed in the context of the several measures initiated by the Government of India since mid-1991 to remove restrictions on agricultural exports. The new Export-Import Policy (1997-2002), has in fact gone ahead to place emphasis on enhancing the technological strength and efficiency of Indian agriculture so as to improve its competitiveness and generate new employment opportunities. The external setting of agriculture trade has also seen a momentous change in the last five years or so, with the Post-GATT international trading conditions providing opportunities for countries like India to expand agricultural exports by improving market access and competitiveness of products.

There are not many studies which made comprehensive analysis of India's agricultural exports. Studies which exist are either dated [Kannan (1986) and da Costa and Gaddamwar (1988)] or related to the periods which did not see many policy changes [Chand and Tiwari (1991), Dass (1991), Virmani (1991), Reddy and Narayanan (1992), Pal (1992), Subramanian (1993), and Jeromi and Ramanathan (1993)]. More recently, studies by Nayyar and Sen (1994), Gulati *et al* (1994a and 1994b), Bhatia (1994), Hajra (1994), Bhalla (1994), Vyas (1994), Rao and Gulati (1994), Rao (1995), Kumar and Mittal (1995), Parikh *et al.*, (1995), Singh (1995), Jeromi and Nagarajan (1996), Patnaik (1996), and Gill and Brar (1996), which examined some critical issues on agricultural exports did not throw much light on the factors determining agricultural exports, such as production, domestic absorption, domestic and external prices, etc. This study attempts to fill the gap by examining the determinants of India's agricultural exports for the period 1970-71 through 1994-95.

The study is divided into four sections. First, we provide a brief account of agricultural export policies in India as a backdrop to the sections that follow. Section II presents the methodology and data base of the study. Section III examines the determinants of agricultural exports. The final Section presents the major findings of the study and analyses their policy implications.

Section I
Agricultural Trade Policy in India

With the exception of the initiatives that have been taken in *recent years, India has, by and large, followed an 'inward-looking'* agricultural policy aiming primarily at achieving self-sufficiency in agriculture. As a result, there was little emphasis on agricultural exports as a means of stimulating domestic production and improving international payment situation. In general, agricultural exports reflected the "Vent for Surplus Theory", according to which only excess supply over the domestic needs could be exported. Most of the agricultural exports were subjected to controls of one kind or the other. Exports were regulated by licenses or by various state agencies, and were placed under one of the several categories: viz. 'not allowed', 'allowed', 'allowed on merit', 'limited ceiling' (quotas); 'open general license' subject to prescribed conditions (like a Minimum Export Price (MEP) or quota restriction); and 'canalized export). As many as 60 agricultural and livestock products were subjected to some form of export control at the end of 1992 (Pursell and Gulati, 1993). Since then, however, a number of products were freed from controls.

India has traditionally been following two distinct strategies for agricultural exports. For traditional commodities such as tea, coffee, tobacco, and spices, the trade regime has been relatively open, reflecting in fact the vestiges of the colonial era. On the other hand, in the sphere of foodgrains, cotton, and sugar, the policy regime favoured import substitution. Export of these commodities is taken to mean disposal of excess domestic production while import of these commodities represents supplement to domestic consumption.

Agricultural trade flows in India are as a result viewed as residual item in an *ex ante* sense (Nayyar and Sen, 1994).

The predominant economic consideration behind the export controls has been to maintain the domestic prices at reasonable levels. It is believed that exports can affect domestic prices to the extent that this would cut into domestic supply, especially in times of supply shocks. This has been the main argument which has sustained a policy bias against agriculture. But this overlooks the point that controls on agricultural exports while promoting self-sufficiency could eventually lead to under-development of agriculture and restrain the growth potential of the sector.

It is against this backdrop one needs to examine the contentious issue in the recent phase of agricultural policy reform of the effect of price convergence in the domestic and international markets on the welfare of the low income groups of consumers. It is widely recoganised that price convergence will improve allocative efficiency in the economy, as production and consumption decisions will take into account India's comparative advantage in different commodities. The likely adverse welfare consequences on the poor, however, would need to be tackled by effective targeting of food subsidies.

The virtually closed nature of agricultural exports has led to a situation of high protection to some commodities such as oilseeds and sugar (domestic prices being higher than international prices) and taxation of some others such as foodgrains and cotton (domestic prices being lower than the international prices). For example, cotton exports were subjected to export quotas and MEP which involves a process of intense lobbying and bargaining between the textile industry, the handloom industry and the cotton growers and traders. This created uncertainty for exporters and importers, discouraging them from investing in long term marketing facilities and relationships. As a result, Indian cotton was generally exported at a substantial discount (Pursell and Gulati, 1993).

Estimates by Pursell and Gulati (1993) have shown that on an average, during 1970-71 to 1987-88, the protection level for agri-

culture was about half the level for manufacturing sector. This had a dampening effect on agricultural exports and investment in agriculture (Government of India, 1996). Since mid-1991, a number of policy initiatives were undertaken to liberalise agricultural exports. These are mainly in the form of gradually removing quota restrictions, relaxation of MEP, reduction in export duty etc. These measures represent a fundamental departure from the erstwhile controlled policy regime for agriculture. The basic rational of the reform has been to correct the general disprotection of agriculture by aligning the domestic input and output prices with international prices and creating in the process incentives that are neutral in impact.

Section II
Methodology and Data Base

The major factors determining the export of a commodity are world exports, international prices, export prices, domestic prices, the exchange rate of the currency in question and domestic production and absorption. The first three variables influence the world demand for the export of a commodity, while the rest are essentially supply factors which influence export availability. The price at which a good is exported is jointly determined by the forces of demand and supply. Hence, this study follows a simultaneous equation approach to evaluate the influences of demand and supply side factors on exports. A modified version of the methodology employed by Khan (1974), Hussian and Thirlwall (1984) and Patra and Pattanaik (1994), has been adopted for this purpose.

The world demand function for India's export of a commodity is specified in the log-linear form as:

$$\log X^{D}_{it} = b_o + b_1 \log WX_{it} + b_2 \log(EP/WP)_{it} \qquad ...(1)$$

Where,

i = 'i'th commodity

t = time

X^D = Quantity of exports demanded by the rest of the world.
WX = World agricultural exports at constant prices.
EP = India's export price in US dollar terms.
WP = World Price in US dollar terms.

The coefficient of the ratio of export price to world price provides the elasticity of substitution of sources of supply. If India's export price is lower than the world price the demand for her exports will rise and vice versa. This effect is expected to be strong for commodities like pepper with relatively large share in world exports.

To estimate long-run elasticity, the partial adjustment model of the equation (1) is specified as

$$\log X^D_{it} = b_o + b_1 \log WX_{it} + b_2 \log (EP/WP)_{it} + b_3 \log X^D_{it-1} \quad ...(2)$$

where $b_1/1-b_3$ provides the measure of long-run elasticities.

The major variables influencing the export supply of a commodity are its domestic production, consumption, prices and exchange rate of currency. Given the huge domestic market, agricultural exports of India is largely dependent on the domestic production and absorption. Since agricultural production is highly correlated with exports, it could not be incorporated directly in the supply equation. Hence, the rainfall index, which is highly correlated with production, was used as its proxy variable. The impact of domestic absorption is postulated to be captured by the domestic price of the commodity and it is expected to carry a negative sign. Export prices are supposed to carry positive sign. The coefficient of ratio of export prices to domestic prices represents the impact of relative price change on exports. The supply equation was augmented with an exchange rate variable represented by the nominal exchange rate with a view to study the sensitivity of agricultural exports to exchange rate (Kumar and Mittal, 1995). On the above rationale, the export supply function is specified as:

$$\log X^S_{it} = b_o + b_1 \log (EP/DP)_{it} + b_2 \log R_t + b_3 \log ER_t \quad ...(3)$$

Where,
X^S = Quantity of export supplied
EP = Export price (unit value index in Rupee terms)
DP = Domestic price (Wholesale Price Index)
R = Rainfall index
ER = Nominal exchange rate of the Indian Rupee

The simultaneity between the quantity and the price of exports can be accounted for by specifying the export supply function in inverted form and expressed as export price function as:

$$\log EP_{it} = b_o + b_1 \log X^S_{it} + b_2 \log DP_{it} + b_3 \log R_t + b_4 \log ER_t \quad ...(4)$$

The partial adjustment model of the equation (4) is given by

$$\log EP_{it} = b_o + b_1 \log X^S_{it} + b_2 \log DP_{it} + b_3 \log R_t + b_4 \log ER_t + b_5 \log EP_{it-1} \quad ...(5)$$

The equilibrium [equations (1) and (4)] and disequilibrium [equation (2) and (5)] equations were estimated for all agricultural commodities in aggregate as well as for major commodities by Two Stage Least Squares (2SLS) method.

Basic data for the study have been drawn from various issues of Economic Survey, Report on Currency and Finance, Area, Production and Yield of Principal Crops in India, UNCTAD Commodity Year Book and International Financial Statistics.

Section III
Determinants of India's Agricultural Exports

Based on the methodology given in Section II, commodity-wise determinants of agricultural exports of India were estimated using the data for the period 1970-71 to 1994-95. All the estimated

equations are in double log form and they pertain to the entire study period. The elasticities derived from the static and dynamic demand and supply equations are presented in Table 1 and 2 (details of the regression output is presented in Table 3).

The results indicate that the demand for India's agricultural exports is influenced by the growth of world exports, although the short-run elasticities for a number of commodities are less than unity. In the long-run, with the adjustment of demand, the elasticities for most of the commodities exceed unity. The estimated elasticity reveals that a one percentage point change in world agricultural exports leads to 0.48 percentage point increase in the demand for export of India's total agricultural commodities. Among the commodities, the elasticity of export demand with respect to world export was the highest for pepper (1.27). Since India is one among the largest pepper producing and exporting countries in the world, the result is not unexpected. Similarly, the demand for oilcake exports was highly elastic to world exports (0.82). As in the case of pepper, here also the country has a high share in world export of oilcake (Table 1).

Table 1 : Elasticity of Export Demand

Commodity	Static		Dynamic	
	WX	EP\WP	WX	EP\WP
1. All Commodities	0.48*	0.07	0.45*	0.10
2. Coffee	0.34*	0.26*	1.11*	0.93*
3. Fish	0.53*	0.43*	2.07*	0.49*
4. Tea	0.13	-0.11*	0.13	-0.11*
5. Rice	0.26*	-0.74*	4.67*	-0.91*
6. Oilcake	0.82*	0.95*	1.17*	1.37*
7. Pepper	1.27*	0.38*	1.33*	0.40*
8. Tobacco	0.71*	-0.09	0.93*	-0.04

* : Statistically significant at 95 per cent confidence interval.

The price elasticities, both short-term and long-term, on the other hand, indicate a mixed trend, with three out of seven commodities showing negative response to relative price changes. India's export prices relative to world prices were favorable for coffee, fish and fish preparations, oilcake and pepper and unfavorable for tea, rice and tobacco. Among the commodities which showed positive price response, oilcake turned out to be relatively highly price elastic. The negative price elasticities for rice and tea could be explained by the fact that the domestic demand and prices for these commodities are very high and hence export prices in these cases are not favourable in relation to world prices. Results of dynamic equations indicate that actual exports adjust to the level desired by the demand conditions in the world market and the long-run elasticities are in general higher than short-run elasticities (Table 1).

Table 2: Elasticity of Export Supply

Commodity	Static			Dynamic		
	EP\DP	R	ER	EP\DP	R	ER
1. All Commodities	3.43*	0.82*	2.98*	12.20*	1.00*	6.38*
2. Coffee	4.44*	0.09	0.49	7.39*	0.30	2.04*
3. Fish	2.64*	N.A.	0.11	0.76*	N.A	0.20
4. Tea	3.11	0.71	1.04*	5.14*	1.33*	1.78*
5. Rice	9.14*	5.25*	3.33	8.22*	2.83*	3.73*
6. Oilcake	4.75*	1.19*	0.99	4.37*	0.91*	1.39*
7. Sugar@	3.45*	-0.76	2.29*	3.94*	-0.61	2.83*
8. Pepper	3.78*	0.03	1.27*	6.25*	0.39	2.21*
9. Tobacco	5.03*	1.88*	2.73*	3.32*	0.81	2.19*
10. Raw Cotton@	3.52*	-0.83	2.62*	17.95*	2.64*	11.32*

* : Statistically significant at 95 per cent confidence interval.
@ : Estimates are based on OLS
N.A.: Not applicable

On the supply side, the ratio of export price to domestic prices, which indicates the relative profitability of exports to domestic sales, as expected, was found to be positively influencing the

quantity supplied for exports. The elasticities were higher than unity in the case of all commodities except sugar in static equation and fish in dynamic equation. It can be inferred from the results that India's export supply is indeed price elastic. The high price elasticity of rice export supply need some explanation. Till recently a lion's share of India's rice exports constituted superior quality basmati variety which commanded higher prices in the export market. On the other hand, domestic market for basmati rice is limited and the wholesale price index of rice does not adequately reflect domestic price of this variety of rice. Hence, the high value of price elasticity needs to be interpreted with caution. Rainfall, which is a proxy variable for production, seems to hold an important influence on the export supply of commodities like rice, cotton, and tea. What is also significant is that exchange rate seems to exert a strong influence on export supply of almost all commodities except fish, bringing out the importance of the exchange rate policy for promotion of agricultural exports (Table 2).

Though aggregate agricultural exports includes commodities belonging to varied groups like cereals, beverages, spices, agricultural raw materials, etc., the forces operating on the demand and supply sides are not very much different. In general the domestic absorption of agricultural commodities is quite high. The factors determining the availability of exports such as production, the level of domestic consumption and relative profitability of exports have a dominant influence on agricultural exports. The demand side factors play only a limited role in exports of these commodities.

Results presented in Table 3 shows that the demand for and supply of India's agricultural exports are sensitive to price changes. The adjustment process in the export demand function is evident from the statistically significant coefficient of the lagged dependent variable. In what follows, an analysis of major commodity-wise agricultural export is presented with emphasis on their demand and supply behaviour.

Coffee

Coffee exports from India account for nearly 60 to 70 per cent of annual domestic production and it is traditionally an export oriented commodity. The international market for coffee is dominated by Brazil, followed by Colombia, Indonesia and Mexico (Veena *et al*, 1994). Coffee production is highly erratic in India. Production falls considerably in every alternate year although in recent years production has been found to be more stable in the range of 1.80-2.20 lakh tonnes. Coffee exports accounted for 7.1 per cent of the total value of agricultural exports in 1995-96.

The estimated coffee demand equation shows that world coffee exports and relative prices have significant effect on the demand for Indian coffee exports. The long-run elasticity of demand for coffee exports to world exports was 1.11, higher than the short-run elasticity of 0.34. The supply of coffee exports is elastic to both export and domestic prices. Being an essential commodity, coffee supply is highly elastic (negative) to the rise in domestic prices. Though the coefficient of exchange rate was not statistically significant in the static supply equation, it was significant in the dynamic equation (Table 3).

Tea

In regard to tea there had been a secular upward trend in its production in earlier years (Kumar and Mittal, 1995). However, there was not much improvement in its production during 1990-91 to 1995-96 and it has been hovering around 0.8 million tonnes. Tea exports account for about 20 to 30 per cent of annual production. In recent years, the contribution of tea and mate in the total value of agricultural exports declined considerably from 16.9 per cent in 1990-91 to 5.5 per cent in 1995-96.

The demand equation could explain only 30 per cent of the variations in the demand for Indian tea exports. The results reveal that the world export of tea has no significant influence on the demand for Indian tea. The coefficient of relative price variable is

negative indicating that Indian exports do not enjoy price advantage over other tea exporting countries. Among the supply side variables, relative prices and exchange rate were found to be some of the dominant factors influencing the supply of exports. The domestic pull of the market was quite evident from the coefficient of domestic prices (Table 3).

Oilcake

Oilcake exports include de-oiled extractions of groundnut, cottonseed, soyabean and rapeseed. India contributes about 32.15 per cent of groundnut cake and 6.39 per cent of soyabean cake exports of the world. Exports of this commodity depend upon oilseeds production and the domestic demand for animal feed. Oilseeds production in the country has increased substantially during the eighties and the first half of the nineties and the demand for animal feed is also growing. Oilcake exports share 11.1 per cent of the total value of agricultural exports in 1995-96.

It may be seen from the results that both world exports and relative prices have significant influence on the demand for oilcake export. On the supply side, relative prices and rainfall have favourable effects on the supply of exports. High demand for oil cakes in India had a negative impact on the supply which is reflected in the coefficient of domestic prices (-2.06) (Table 3).

Tobacco

Tobacco is one of the non-essential items exported and its contribution to the total agricultural exports has declined in recent years from 4.6 per cent in 1991-92 to 2.1 per cent in 1995-96. Since 1991-92, tobacco production has decelerated from 584 thousand tonnes to 560 thousand tonnes in 1995-96.

The demand for tobacco export is found to be elastic to its world exports (elasticity 0.71). As the coefficient of relative prices was not positive one could infer that price factors do not have a significant influence on the demand. The demand function is dy-

namic in nature as evident from the statistically significant coefficient of the lagged dependent variable. All the explanatory variables in the supply equations were statistically significant. The elasticity of exports to relative prices and exchange rate are high in the static equation than in the dynamic equation (Table 3).

Sugar

India's export of sugar was quite erratic owing to fluctuations in output and rapidly rising internal demand. India exports only 0.05 per cent of the domestic production of sugar. Depending upon the production and domestic availability, exports are controlled from time to time. The export performance of sugar was as a result not satisfactory. Though sugar production improved considerably during recent years, it is highly volatile. Export of sugar and molasses accounts for 2.4 per cent of the total value of agricultural exports in 1995-96.

The statistical tests suggests that India's sugar exports largely depends on supply factors than demand factors. Demand equations could not provide statistically significant results. The explanatory power of the supply function was also found to be low. This suggests that policy factors played a significant role in exports of sugar. The estimated coefficients in the supply function were significant for domestic prices, and exchange rate. The degree of domestic demand pressure is evident from the significant negative coefficient of domestic prices (Table 3).

Rice

India is the second largest rice producer in the world after China. However, productivity of rice in India is very low. One fourth of the total cropped area in India is accounted for paddy cultivation. Rice contributes nearly 40 per cent of total foodgrain production in the country. However, rice exports account for less than one per cent of production. India is exporting a number of varieties of rice, which could be broadly classified into two: basmati and non-basmati. Till 1989-90, basmati rice exports ac-

counted for more than 90 per cent of the total quantity of rice exported from India. With the overall improvement in rice production, the share of non-basmati rice has increased since 1989-90, and its share stands at 47 per cent in 1994-95. In 1995-96, rice exports accounted for the highest share in the total value of agricultural exports (21.0 per cent).

The major factor influencing rice export demand was the relative prices. Export supply of rice is elastic to rainfall, domestic absorption and prices. The domestic demand exerts a strong negative influence (-4.87) on exports of rice, underscoring the critical importance of internal consumption on export supply. Among the commodities considered in the study, rice exports were most sensitive to rainfall variable indicating its crucial role in production and exports (Table 3).

Fish and Fish Preparations

Fish and fish preparations account for nearly 16.0 per cent of total agricultural exports by India in 1995-96. India is the world's seventh largest producer of fish with a share of 3.8 per cent of world production. There has been an impressive growth in fish production in the country in recent years from 38.36 lakh tonnes in 1990-91 to 49.49 lakh tonnes in 1995-96. Correspondingly, exports have also increased from 1.39 lakh tonnes to 2.96 lakh tonnes, during the above period. High-valued shrimps form the major marine products exported from India. India stands next to China in the production of shrimps in the world.

Demand for India's fish and fish preparations were elastic to world exports and relative prices. It appears that India's export price has been favourable to her exports. The dynamic function yielded higher long-run elasticities as compared to the short-run elasticities. Export and domestic prices were the important variables having statistically significant influence on the supply equation. The high domestic prices reduce export supply, making domestic sales profitable vis-a-vis exports (Table 3).

Pepper

India produces a variety of spices in substantial quantities and she is the largest producer and exporter in the world. Among spices, black pepper (known as the 'black gold' or the 'king of spices'), cardamom (known as the 'queen of spices'), chilies, ginger, turmeric are the major items produced in India. Historically, pepper and cardamom were the major spices exported from India. However, with the emergence of countries like Indonesia, Malaysia, Guatemala and Brazil in the production and exports of the above commodities, the share of India in world exports has declined considerably in recent years.

The results shows that rise in world exports and favourable relative price movements provide boost to India's export demand of pepper. On the supply side, the relative price variable emerged as the dominant factor influencing the export supply besides the exchange rate (Table 3).

Cotton

Raw cotton export is highly erratic due to variations in domestic production. The value of export reached Rs. 846 crore in 1990-91, but declined considerably since then and it could fetch only Rs. 204 crore in 1995-96, constituting 1.0 per cent of the total value of agricultural exports. Domestic demand for raw cotton is increasing at a rapid pace, placing pressure on its prices.

In the case of cotton, an export demand function could not be explained meaningfully. One possible reason for this is that India's cotton exports were largely dependent on policy decisions in this regard. Hence, cotton exports are dominated by the forces of supply. The empirical results reveal that the relative profitability of exports and exchange rate are the significant variables that affect the supply of cotton for exports. Export price seemed to have an effect on export supply (Table 3).

Section IV
Major Findings and Policy Implications

The paper examined the determinants of India's agricultural exports during 1970-71 to 1994-95. The annual compound growth rate of agricultural exports was lower during the 'eighties (10.4 per cent) than in the 'seventies (17.8 per cent). However, a turnaround has been seen during the first half of the 'nineties (27.3 per cent). The demand for India's agricultural exports depends to a significant extent on world agricultural exports. While the relative prices were favourable for coffee, fish, oilcake, and pepper, they were found to be unfavourable for tea, rice and tobacco. Export supply is found to be highly price elastic. While the domestic absorption puts pressure on the export supply, improvements in supply conditions and exchange rate act to improve the supplies.

With the country becoming self-sufficient in most of the agricultural commodities, the scope for agro exports has become wide over the years. The prospects for a boost to agricultural exports have improved in the context of the recent GATT agreement and the institutionalization of the World Trade Organization. How far Indian agriculture could respond to the emerging world trading conditions would crucially depend upon the forces of supply. As the results of the paper reveal, agricultural exports are highly dependent on domestic production and consumption. The yield levels obtained in India of most of the commodities are lower than those of competing countries. Since there is hardly any scope for further expansion of area under cultivation, the future production prospects and thereby exports at competitive prices depend largely on the improvements in the yield levels. This would, *inter alia*, require substantial investment in the agricultural sector. With the rise in income levels the composition of consumption basket is likely to change in favour of non-traditional items like diary products, meat, fish etc. One could, therefore, expect that the domestic demand pressure on traditional commodities like rice, wheat etc. would be somewhat muted in future.

Though the study could not directly incorporate the quality factor in the export functions, the role of these factors in influencing the demand for agricultural commodities are gaining importance in the international market. Therefore, India's success in agricultural exports also depends on the vertical integration of the supply of commodities to meet the specific demand requirements abroad. Further, as per the GATT agreement, India has to take measures for meeting the sanitary and phyto-sanitary conditions which would require improvement in technical expertise, infrastructure and resources.

From the policy point of view, the need for a liberalised trade regime in the agricultural sector can hardly be overemphasised. While this will strengthen the case for removal of remaining export controls on most of the agricultural commodities, there is also a need for protecting the interests of the lower income groups where sensitive commodities like rice, wheat, cotton and sugar are involved. It is essential that safety nets are provided for in our approach to liberalisation.

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Table 3: Two Stage Least Square Estimates of Export Demand and Supply Functions

(Functional form : Log-Linear Period : 1970-71 to 1994-95)

Commodity/ Demand/Supply Equation	Estimated Coefficients	$\bar{R}^2$	D.W./ h Stat.	SEE
1. Total Agricultural Exports				
Demand (S)	X_D = -0.59 + 0.48 WX + 0.07 EP/WP (-0.36) (1.72) (0.56)	0.43	1.85	0.05
Demand (D)	X_D = -0.24 + 0.28 WX + 0.06 EP/WP + 0.38 X^D_{t-1} (-0.18) (1.81) (0.66) (1.95)	0.64	0.11	0.05
Supply (S)	X_S = 0.66 + 1.93 EP - 1.50 DP + 0.82 R + 2.98 ER (0.33) (1.75) (-2.43) (1.86) (2.72)	0.85	1.83	0.05
Supply (D)	X_S = -3.74 + 0.93 EP - 3.95 DP + 0.40 R + 2.55 ER + 0.60 X^S_{t-1} (-1.33) (2.12) (-0.68) (1.51) (4.74) (1.79)	0.96	-0.08	0.06
2. Coffee				
Demand (S)	X_D = 0.83 + 0.34 WX + 0.26 EP/WP (0.66) (2.03) (2.17)	0.52	2.26	0.07
Demand (D)	X_D = -0.58 + 0.30 WX + 0.25 EP/WP + 0.73 X^D_{t-1} (-0.74) (1.96) (2.29) (5.90)	0.92	0.68	0.06
Supply (S)	X_S = -1.38 + 2.17 EP - 2.27 $\hat{DP}$ + 0.09 R + 0.49 ER (-0.66) (2.23) (-3.07) (0.19) (0.50)	0.62	1.99	0.10
Supply (D)	X_S = -1.16 + 0.74 EP-2.29 DP+0.12 R + 0.84 ER+0.59 X^S_{t-1} -(1.19) (2.21) (-2.76) (0.22) (2.05) (2.95)	0.87	3.68	0.10
3. Tea				
Demand (S)	X_D = 1.64 + 0.13 WX - 0.11 EP/WP (2.73) (0.71) (-1.89)	0.30	1.85	0.04
Demand (D)	X_D = 1.47 + 0.12 WX - 0.10 EP/WP + 0.09 X^D_{t-1} (1.89) (0.68) (-1.80) (0.38)	0.32	0.30	0.04
Supply (S)	X_S = 0.23 + 1.61 EP - 1.50 DP + 0.71 R + 1.04 ER (0.09) (0.94) (-4.89) (1.40) (2.19)	0.91	1.89	0.07
Supply (D)	X_S = 10.83 + 1.92 EP-1.63 DP+0.92 R+1.23 ER +0.31 X^S_{t-1} (0.90) (0.22) (-4.03) (1.83) (2.28) (0.90)	0.96	4.17	0.07
4. Oilcake				
Demand (S)	X_D = 4.64 + 0.82 WX + 0.95 EP / WP (5.02) (3.16) (7.27)	0.79	1.82	0.10
Demand (D)	X_D = 5.69 + 0.83 WX + 0.97 EP/WP + 0.29 X^D_{t-1} (3.09) (2.39) (3.85) (2.11)	0.76	1.04	0.06

(Contd.)

Commodity/ Demand/Supply	Equation	Estimated Coefficients	$\bar{R}^2$	D.W./ h Stat.	SEE
Supply (S)	X_s =	4.02 + 2.69 EP - 2.06 DP + 1.19 R + 0.99 ER (3.04) (2.89) (-4.06) (1.89) (1.47)	0.91	1.56	0.05
Supply (D)	X_s =	9.62 + 4.03 EP-3.98 DP+1.66 R+2.55 ER - 0.83 X^s_{t-1} (3.28) (2.27) (-5.62) (1.74) (2.08) (-1.91)	0.76	0.63	0.05
5. Tobacco					
Demand (S)	X_D =	-0.61 + 0.71 WX - 0.09 EP / WP (-0.40) (1.73)* (-1.02)	0.44	1.84	0.07
Demand (D)	X_D =	-0.82 + 0.52 WX - 0.02 EP/WP + 0.44 X^D_{t-1} (-0.57) (1.99) (-0.31) (1.83)	0.46	0.51	0.07
Supply (S)	X_s =	6.58 + 2.95 EP - 2.08 DP + 1.88 R + 2.73 ER (2.09) (1.88) (-2.76) (1.74) (3.13)	0.94	1.97	0.05
Supply (D)	X_s =	3.30 + 1.37 EP-0.99 DP+0.58 R+1.56 ER + 0.29 X^s_{t-1} (2.22) (2.77) (-2.46) (0.92) (4.17) (0.81)	0.96	0.17	0.05
6. Sugar@					
Supply (S)	X_s =	5.48 + 0.38 EP - 3.07 DP - 0.76 R + 2.29 ER (1.38) (0.58) (-2.29) (-0.43) (1.73)	0.34	1.89	0.10
Supply (D)	X_s =	6.11 + 0.41 EP-3.73 DP-0.64 R+2.97 ER - 0.05 X^s_{t-1} (1.46) (0.60) (-2.40) (-0.34) (1.70) (-0.09)	0.37	4.36	0.10
7. Rice					
Demand (S)	X_D =	2.91 + 0.26 WX - 0.74 EP/WP (1.31) (1.94) (-3.59)	0.42	1.24	0.08
Demand (D)	X_D =	-4.54 + 1.50 WX - 0.29 EP/WP + 0.68 X^D_{t-1} (-1.92) (2.12) (-2.18) (5.07)	0.79	2.67	0.03
Supply (S)	X_s =	2.71 + 4.27 EP - 4.87 DP + 5.25 R + 3.33 ER (0.48) (1.87) (-4.85) (1.79) (1.34)	0.85	1.84	0.03
Supply (D)	X_s =	7.20 + 3.44 EP-3.14 DP+2.27 R+2.99 ER + 0.20 X^s_{t-1} (1.30) (2.27) (-5.31) (0.86) (1.34) (0.40)	0.87	-2.64	0.10
8. Fish and Fish Preparations					
Demand (S)	X_D =	4.35 + 0.53 WX + 0.43 EP/WP (7.16) (3.59) (4.08)	0.57	2.68	0.03
Demand (D)	X_D =	1.21 + 0.89 WX + 0.21 EP/WP + 0.57 X^D_{t-1} (4.23) (1.82) (4.14) (4.90)	0.97	0.92	0.03
Supply (S)	X_s =	1.01 + 0.54 EP - 2.10 DP + 0.11 ER (3.99) (3.69) (-2.26) (0.77)	0.97	2.29	0.04

(Contd.)

Commodity/ Demand/Supply	Estimated Coefficients	$\bar{R}^2$	D.W./ h Stat.	SEE
Supply (D)	X_s = 1.17 + 0.58 EP- 0.12 DP + 0.18 ER + 0.09 X^s_{t-1} (3.06) (3.37) (-2.16) (1.18) (0.64)	0.98	1.25	0.04
9. Pepper				
Demand (S)	X_D = 5.26 + 1.27 WX + 0.38 EP/WP (6.08) (3.49) (2.74)	0.52	1.92	0.08
Demand (D)	X_D = 4.86 + 1.20 WX + 0.36 EP/WP + 0.10 X^D_{t-1} (6.08) (3.49) (2.74) (2.31)	0.56	5.13	0.08
Supply (S)	X_s = 1.43 + 1.84 EP - 1.94 DP + 0.03 R + 1.27 ER (1.59) (2.32) (-10.60) (0.88) (7.10)	0.96	1.79	0.04
Supply (D)	X_s = 1.19 + 1.94 EP-1.56 DP+0.22 R+1.24 ER+0.44 X^s_{t-1} (1.12) (2.09) (-5.32) (0.40) (7.55) (2.41)	0.97	0.58	0.04
10. Raw Cotton@				
Supply (S)	X_s = 3.19 + 2.15 EP - 1.37 DP - 0.83 R + 2.62 ER (1.04) (4.71) (-2.37) (-0.50) (3.09)	0.52	2.06	0.09
Supply (D)	X_s = 2.09 + 2.56 EP-1.39 DP-0.58 R+2.49 ER + 0.78 X^s_{t-1} (0.69) (5.36) (-1.36) (-0.35) (2.71) (2.05)	0.57	1.15	0.08

Notes:
Figures in brackets are respective 't' values.
Demand (S) : Demand Static
Demand (D) : Demand Dynamic
Supply (S) : Supply Static
Supply (D) : Supply Dynamic
@ : Based on OLS

Reserve Bank of India Occasional Papers
Vol. 18, No. 1, March 1997

BOOK REVIEWS

The Political Economy of Trade Protection **(Editor)**
Anne O. Krueger, National Bureau of Economic Research,
The University of Chicago Press, 1996, Pp. 112, $28.75

Economists have voiced concern over hindrances to free flow of goods and services across the boundaries of the nations since long. Tariff and non-tariff barriers to trade have been studied in great detail. The analysis however, has remained mainly focused on quantification of the heights and effects thereof. The vast literature available has demonstrated the benefits of free trade. Both the traditional and new theory of international trade which justify trade intervention to swamp away the economic rent that the early entering firms enjoy have shown that free trade policy benefits the country that follows the same even though others do not do so. Yet, in actual practice, free trade has remained elusive for many countries, who are pioneers in world trade.

A major country like the USA which in principle advocates free trade, has been adopting protectionist trade policy for many decades. There is *prima facie* something more than the economic justification for such trade practices. The National Bureau of Economic Research (NBER) undertook a project on the political economy of the U.S. trade policy. The main objective was to find out reasons and factors that determined such a policy. Eminent and renowned scholars were commissioned to study this phenomenon with reference to selected industries that receive high degree of protection, and contribute to the understanding of what generates and sustains the anti-dumping and countervailing duty procedures. The book contains nine excellent research articles, which were presented at a NBER sponsored conference on the political economy of trade protection, preceded by a competent summary by the editor that brings out the major issues highlighted by the individual studies and their implications for future trade policy.

The selection of industries represents diverse characteristics and circumstances. Textiles and apparel, steel and automobiles are labour intensive, age old industries with good geographical concentration, while semiconductor is capital intensive and new. Protection to agricultural interests viz., wheat growers is another area of attention in the book with particular reference to the negotiations leading to NAFTA. The case study of lumber, the commodity that strived and got protection under countervailing duty procedure gives account of the importance of legal precedence in deciding the outcome. An import source-wise study of protectionist policy is done to find out whether any systematic patterns emerge in the industries' approach and solutions to the problem.

The book highlights the political factor as the single most important determining factor of protectionist policy. Effective lobbying by textile and apparel, automobile and steel industries for protection yielded desired results when their congressional representatives' support was needed by the Government. The Government yielded to the pressure of textile and apparel lobby and reached an arrangement with major exporting countries under LTA and later MFA in early 70s. Later it successfully resisted such pressure as it no longer needed the legislators' support. The Government that time was more concerned with protecting USA's markets in other countries, and safeguarding and serving its foreign policy imperatives. It thus, traded the interests of textile and apparels for expanding exports of other industries. The effectiveness of political lobbying depends not only on political strength but on positioning and timing. The Government's stand is influenced by both domestic and external political implications. The political lobbying is not confined to the US industries alone. Japanese semiconductor manufacturers mounted a vigorous campaign in the USA. The USA Election Commissioner's reports showed that spending by the Japanese companies in the USA towards legal expenses and political donations heightened when the process of filing anti-dumping suits was at its peak. The same, however, came down once a bilateral arrangement was negotiated and put in place.

In all the cases studied, consumers and user industries

though affected adversely were passive. They did not organise any counter lobbying mainly because they were numerous and vastly spread over. The adverse prospects of the gains from lobbying efforts proved a great deterrent.

The USA industries, it is found, resort to filing anti-dumping and countervailing duty suits when there is underutilisation of capacity and employment. The process of filing such suits itself has import curtailing effects, even before the final finding of the impact on domestic market is available. It has been estimated that the filing of such suit activities in itself has the effect of curtailing imports equivalent to three-fourths of that of imposition of tariff duty. The analysis of suit-filing reveals that suits were filed against imports from certain regions and/or countries with the intention of getting the market advantage, although the industry was not sure of the final outcome. Suit-filing against imports from Western Europe was prompted by the intention of obtaining benefits that come during the period of investigation while that against Japan and new industrialised countries in the South East Asia were intended with the 'final outcome' in view. The activities of suit-filing varied according to the nature of the commodity in question.

All the seven studies included in the book have shown that protection did not help these industries, except lumber. Protection affected consumer and user industry's interest adversely with considerable cost to the US economy both in terms of money and loss of opportunity to improve efficiency. The cost of protection to apparel and textile accounted for 80% of the total protection cost to the US economy. The protection to the semiconductor industry, in fact, helped the Japanese firms make more profits which they ploughed back to further improve their technology, and also attracted South Korean importers. Only a change in technology from use of macro chips to processing technique helped the semi-conductor industry.

A study by Brucel Gardner showed that by giving protection to domestic wheat growers, the U.S. Government successfully raised the farm income from its depressed levels, and contained

the acreage under wheat crop by raising the support price and providing compensation for leaving farms uncultivated. The wheat stocks acquired under the support price mechanism were used for enhancing export markets. The wheat protection policy was particularly targeted towards displacing the EEC from South African markets under the U.S. Export Expansion Programme. The programme after modification to provide for cross subsidisation, was successful and budget neutral. It resulted in a transfer of about $ 600 million annually from the USA wheat consumers to outside consumers. One positive aspect of wheat protection policy was that it compelled the EEC to make its Common Agricultural Policy more free trade-oriented.

David Orden's study of the US's negotiation of agricultural commodities with Canada and Mexico that eventually led to NAFTA agreement showed that even when the outer time limit for elimination of duties is a bounded one, powerful groups could slow down the speed of duty reduction though they could not extend the time limit. Further, policy emphasis differed in negotiations between Canada and Mexico. In the case of the former the reliance was more on securing safeguards through administrative provisions while in the case of the latter, bilateral negotiations assumed importance.

In the paper by Joseph P. Kalt dealing with countervailing duty, a rather neglected issue, the legal aspects of trade protection policy is put in proper perspective. The author shows how the Canadian lumber trade which had a case on economic grounds under the 'less than fair price clause' proceedings lost it before the International Commerce Department for want of legal precedent, and inadequate and deficient exposition in arguing out its case.

The project studies have raised a number of vital policy issues. The predominance of political factors in giving protection to industries, not justifiable on economic grounds, caused net losses to the U.S. economy, and distorted the global trade flows, leading to overall economic loss to the world. The future trade policy strategy should therefore, aim at devising a mechanism to contain the domi-

nant influence of political factors on the trade regime. The book demonstrates that consumers and the user industries have not raised their voice against protection, which has affected their interest. This is because the perceived gains to this vast sector is thinly spread. As the books shows, organising this sector will help the U.S. economy to save the huge costs of protection. A notable aspect of the book is that it analyses the economic factors that can prevent the political factors becoming prominent in the protectionist trade policies. Technology is one such factor, which by changing the composition of the industry can weaken the various lobbying forces. When the steel industry's composition changed in favour of mini-mills from composite mills, the mini-mills being consumers of steel, exerted political pressure and successfully opposed the bilateral steel arrangement with Japan. The labour support is strong when it is largely immobile as happened in the case of the steel industry. The labour was relatively mute in the case of the semiconductor industry as it was more mobile and skilled to absorb the costs of protection. The book has shown in the context of the US that a mere resort to filing of anti-dumping or countervailing duty suit has powerful import restraining effect. The administration usually prefers a negotiated arrangement to administrative laws, under which the executive is left with least discretionary power and it cannot therefore, attain its political goals. The filing of suit activities are generally aimed to bring the importing country for a negotiated arrangement and wrest concessions. For administrative protection, the US industries targeted those suppliers which accounted for a sizeable share of the USA market. It was found much easier to negotiate, continue and also to load more restrictive clauses in the existing protectionist arrangements. So, once an industry receives protection, chances of its getting further protection becomes brighter. The exporting country needs to put in all efforts in the initial stages itself. The MFA is a case in point.

The developing countries need to be careful about the industry situation in the US, the legal precedent, and the knowledge of the US laws to protect themselves in the US market. Fair trade laws no longer seem to be fair even in the citadel of the free trade philosophy. The book provides a refreshing reading of the

U.S. trade policy, written lucidly to highlight what constitutes the most significant non-economic factor behind the rising protectionism in the world trade environment.

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Reserve Bank of India Occasional Papers
Vol. 18, No. 1, March 1997

***World Food Summit: Technical Background Documents (3 volumes)*, Food and Agricultural Organization of the United Nations, Rome, 1996, unpriced.**

The Technical Report (hereafter referred as the Report) prepared by the Food and Agricultural Organization of the United Nations for the World Food Summit held at Rome (13-17 November 1996) is a review of developments in world food and agriculture and food security from the early 1960s to the present, with particular reference to the period since the last World Food Conference held in 1974. The Report contains fifteen major sections in three published volumes which can be broadly divided into three separate areas, addressing the central issue of food insecurity around the world. The first focussed area is the quantitative assessment of the performance of various countries since the beginning of 1960s along with an attempt to project the scenario in the year 2010. The second area of focus is on policy issues that have a bearing on augmentation of foodgrains production and improvement in distribution in a sustainable manner. The third area of emphasis is on the need for increased international trade co-operation among countries to improve food access to the poor in low-income countries.

It is, by now, generally believed that the world food situation has improved substantially since the mid-seventies. The World Food Conference held in 1974, had ended on a pessimistic note pointing out the possibility of world food production growing at a rate that would hardly match the increasing demand for food. This observation was punctuated by the unfavourable food condition in the early 1970s, when cereal prices in the world market came under strong pressure. Opinions had got around that the neo-Malthusian proposition that world food production would never grow fast enough to meet the effective demand for food of a growing global population was unavoidable. However, the developments in the food front in the post-world food conference years have put such apprehensions to rest. Cereal prices declined dramatically in the world market immediately after 1974 and have continued to remain

subdued since then. Supply constraints, which were considered to be the root cause, have since been over taken by the demand side factors as the majority of the countries failed to raise their income levels to generate adequate effective demand for food. This gave rise to a general notion that the world food problem was not one of production questions but that of demand and/or distribution issues.

The Report, in its introduction, has rightly dispelled some of the misconceptions regarding the world food situation prevalent in the developed world. While distinguishing the nature of food problems in the developed and developing economies, the Report observes that the inadequate growth of food demand in the latter countries reflects the low level of purchasing power of the most of the population, whose very incomes depend on the growth of agriculture itself. The problem of food insecurity in these countries is therefore, essentially a problem of production. The remedial measures as the Report recognizes, must be addressed in terms of improving agricultural and rural development situation so as to raise both demand for and supply of food. The Report substantiates this point by drawing from the experiences of a few successful countries such as China, Costa Rica, Equador, India, Indonesia, Mozambique, Thailand, Tunisia, Turkey, Zimbabwe, and South Africa where the declining incidence of food insecurity and undernutrition has been related to public policy reforms that boosted agricultural production and improved the access of food to the poor. It in this context that the Report has justified protectionist policies in the agriculture and food sector in developing countries in solving their food problems.

The objective of food security is to ensure that all people at all times have both physical and economic access to safe and nutritious food for maintaining a healthy and active life. The Report has mentioned that in the absence of an international data base it is difficult to make a comparable analysis of the food access of individuals or population groups in each country. Indirect information from household food consumption or expenditure surveys have been used to estimate the extent of inequality of distribution of

food supplies within countries. Based on these data the Report has observed that several developing countries had shown substantial progress in the food front in more recent years - faster in 1970's than in 1960's. Emerging from an acute food deficit in 1962, Asia has continually shown improvement and is fast catching up with the situation of Latin America which has attained a stable food situation. In contrast, Africa did not manage to improve its food situation to any substantial degree, South Asia made noticeable gains only in 1980s. While the dependence of the developing countries on developed world increased strongly in 1970s, the trend changed subsequently in 1980s.

The Report has estimated that about 841 million people or 20 per cent of the developing countries' total population are at present suffering from hunger. The projections show that even by the year 2010 a large number of developing countries would still have to grapple with the problem of hunger as around 680 million persons would remain under-fed in terms of their minimum food requirement. It would require a 30 per cent increase in food energy availabilities in Africa (but 40 per cent south of Sahara), 15 per cent in Asia and less than 10 per cent in Latin America to improve their nutritious standards so as to eliminate food insecurity and undernutrition. However, the Report is not very much optimistic about the prospects of world food situation. While there are some positive factors such as the slowdown in the population growth rate, and near saturation of demand for food in developed countries which will help promote the food access of developing countries, the Report notes that negative outcomes would stem from slow growth in per capita incomes in many underdeveloped countries, and the continued prevalence of severe poverty in many countries with very low levels of nutrition. The Report has identified several areas for improving the food situation in low income-countries.

Among the domestic policy issues, technology, irrigation, investment, efficient distribution, and sustainable growth have been given emphasis in the Report. One of the key issues addressed in the Report concerns the lessons that low-income countries must

draw from three decades of experience of the green revolution. Noting the significant achievement in respect of rice and wheat output in Asia, the Report argues that it is unlikely that these gains can be consolidated further without pointed research effort in understanding the factors that has led to a large gap between the potential and actual yield from cultivation. The report has stressed on a number of areas for reducing this gap such as establishing effective communication with farmers, rejuvenating extension systems, conducting more participatory research and providing proper training to farmers. It is, however, pessimistic on the scope of improving productivity level through biotechnology in the near future due to lack of an international consensus on issues relating to ethics, safety and intellectual property rights.

The Report has highlighted the need for intensified effort in extending irrigation for improving the food situation in developing countries. While the existing irrigation infrastructure must be rehabilitated and modernized, the Report argues that farmers should be assisted in assuming ownership rights and management responsibilities for the assets created by the public sector. While strongly recommending the measures to increase the irrigation potential, it tries to dispel the general misperception that investment in water, particularly those in irrigation, is ineffective and inefficient and can be a threat to environment. However, it cautions that human demands for water are about to exceed the ability of the hydrological cycle to generate water. Water is becoming globally scarce; this fundamental resource constraint will have an adverse effect on food production.

Much of the food that is produced is never consumed as production is carried out without adequate information on consumer demand, leading to over-production and consequent wastage. In some cases, government subsidies encourage excessive production of some commodities and too little of others. This also results in misallocation of productive resources such as water and other inputs. There is also some food loss in post harvest chain. Improvements in handling, storage and distribution reduce costs to buyers and improve returns to participants in the food chain. The Report,

however, argues that many post-harvest innovations to help farmers in marketing activities are neither economically viable nor socially agreeable. The Report observes that several governments are now withdrawing from the earlier strategy of direct intervention in the marketing system and reorienting their functions to facilitate marketing, storage and distribution by the private sector.

The Report reviews the critical role of food processing which is a major source of employment and value addition. It is observed that agro-processing in many developing countries is treated as a way of disposing of surplus production, without reference to the demands in the market. This, it is suggested, must be avoided. The Report focuses on the investment requirement of agriculture in finding a long-term solution to the problem of food insecurity in developing countries. The emphasis should be given to on-farm investments in irrigation, land improvement, new agricultural tools and machines, livestock breeds and plant varieties. Investment should become physically possible and privately profitable. Facilitating investments in rural infrastructure will link producers to the mega-cities so that it will enable rural people to respond physically and mentally to new opportunities.

The Report argues that efficiency of investment, is as much an issue as its volume. Focusing on Asia, it points out that emphasis should be placed on improved use of existing capital stock, so that the required amounts of incremental net investment in agriculture declines over time. Pooled investments are more cost effective than individual country efforts in approaching common problems of technology and resource management. Global alliances are required to monitor emerging trends of and possible threats to world food supplies.

With the possible exceptions of limited areas in Africa and Latin America, most additional food demand will have to be produced on land that is already under some use. Expansion of agriculture to less suitable land area means greater input costs, more risk of crop failure and environmental degradation. The use of natural resources will have to be based on their physical and bio-

logical potential, which is strongly influenced by the management practices and technology applications. The focus should be on innovative management and technological development. There is considerable evidence that innovations are rapidly adopted, if farmers find them to be beneficial.

The Report argues that international trade and co-operation is vital to world food security. The Uruguay Round trade negotiations would play a key role in improving income levels and food security of developing countries. The Report, however, feels that these measures are not likely to affect significantly the net availability of food globally, as reduced output in the high cost countries will be generally replaced by increased output in other countries. What is, however, worrying is the impact of GATT agreement on world food prices which will depend on several counteracting factors, such as the positive effects of tariffication and greater share of stocks in private hands and the negative effects of declining global stocks and the supply uncertainty arising from the shifting production locations.

It is contended that trade liberalization may imply some negative impacts on the least-developed and net food-importing countries in terms of the availability of adequate imported supplies of basic food stocks at reasonable terms. International trade, it has been indicated, has a major bearing on access to food via its effect on incomes and employment. While more liberal trade policies over time contribute to economic growth, the main issue for food security is whether economic growth reaches the poor. Although there are some evidence to show that in many developing countries export industries are more labor intensive than import-substituting industries and that employment opportunities are higher in outward oriented economies, the linkages between trade, growth, employment and poverty are not very clear so as to establish a strong causal relation between trade policies and the incidence of food insecurity and undernutrition.

The Report notes that the role of food assistance in improving the lot of the most deprived nations is getting limited. The

international aid for food has suffered major decline during 1980s and 1990s and is now competing with other forms of development assistance. The Report has made a strong case for reversing this trend and making food assistance more effective in solving the world food problem. The Report has at the same time urged nations to become more vigilant against the abuse of food assistance, as unwisely designed and implemented food assistance programs can have deleterious effects on development and future food security.

The Report must be commended for its exhaustive coverage of the issues relating to the world food security. The quantitative assessment on the status of food availability and undernutrition for the majority of the countries gives an opportunity for knowing not only the absolute performance of individual countries but also its relative standing in the world community. The calorie norm used by the Report for assessing the degree of undernutrition may not be agreeable to many; but that does not deter or dilute the focus on the issues of food security. The single most contribution of the Report lies on its success in promoting the awareness about the world food problems and highlighting the role of international cooperation in seeking answers to some of immediate questions concerning food security. Many of the food problems are directly related to development issues. For instance, as the Report has mentioned, increasing the access of food is not a problem of production alone but also a problem of enhancing the purchasing power of the poor. It is here that the developmental issues become important for improving the world food situation. Another notable aspect of the Report is its integrated approach to study the world food problems, emphasizing the inter-linkages between technology, environment and food security. The Report has urged that environment issues particularly those relating to irrigation, and technology, have to be kept in view in framing public policies relating to food. It is slightly pessimistic about the prospects of improving the food situation through increased trade liberalization particularly from the viewpoint of its impact on food prices. While it is possible that liberalization of agricultural trade can bring pressure on domestic prices leading to worsening of real purchasing power, there are brighter aspects of a global market and competitive forces, which

should not be lost sight of in improving food supply and creating opportunities for the less developed countries. The warning in the Report is all clear. The present policy conditions are not very conducive for eliminating the problem of food insecurity. In fact, if things stand as they are, the condition on the food security front in the next 20 to 25 years may not show any significant improvement. It calls for drastic policy initiatives in rural and agricultural sectors in low-income countries in order to reverse this trend. In this context issues relating to technology, irrigation, investment, distribution, sustainability, trade and food assistance highlighted in the Report must receive immediate policy attention. The general policy suggestions in the Report relate to giving equal treatment to agriculture vis-a-vis other sectors, removing disincentives to farmers and other rural investors, creating job opportunities in the rural sector, tackling the problem of urban migration, and improving rural financial infrastructure. A sharper demarcation between public and private sector role in promoting investment in agriculture is also necessary. The Report, however, does not favor active intervention by the government in the food sector for ameliorating the problems of poverty and under nutrition.

The Report seems to have underplayed the role and importance of institutional factors in hindering productive forces to operate smoothly. It is widely known that many of the developing economies are plagued by institutional forces that are not conducive for improving the growth prospect. The governments in these countries need to give importance to these factors while addressing the problems relating to food security. The Report has also not given pointed attention to issues relating income distribution. Many of the problems that are likely to come up are recognized but not addressed to, leaving a room for skepticism.

Many of the suggestions made out in the Report are quite relevant in the context of food security in India. The Report has acknowledged that India's performance in enhancing per capita food availability is significant. Currently, the average per capita food availability is slightly less than 2400 calories per day, up from around 2000 calories in the early 1960s. However, nearly 40 per

cent of India's population continue to remain below what may be regarded as adequate calorie requirement. Further, like the other Asian countries India is also facing the problem of low productivity growth, especially in cereals, which poses a serious limitation to its future prospects on the food front. Decline in investment in agriculture with little scope for enhancing efficiency in capital use and inefficiency in the distribution system are some of the factors that continue to pose policy challenges for sustaining self-sufficiency in foodgrains and improving the accessibility of food to the poor. The Report not only highlights many of these concerns, but also brings out the seriousness of the food problems, needing effective policy intervention.

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phases of growth, saving and capital formation, and look at the sectoral composition of each of these three economic variables. Nevertheless, we will confine ourselves solely to national accounts statistics; though this may not be analytically very complete but we do so for purposes of tractability and expository convenience.[2]

The scheme of the paper is fairly straightforward. Sections I, II and III are devoted to these three variables, *viz.*, growth, saving and capital formation.[3] Section IV seeks to address the issue, whether the Indian economy is characterised by low growth and high saving. Section V presents the lessons and policy messages that are derived from the paper.

Section I
Growth Experience in the Indian Economy

Long-term Growth of the Indian Economy and Various Phases of Growth

Indian growth experience has been an area of intense research for a long time. A basic question that is repeatedly asked in this context is that: what is the long-term trend growth rate of the Indian economy?[4] Does the notion of the so-called '*Hindu* rate of growth' adequately characterise Indian reality [Raj Krishna (1983); Bardhan (1984)]? Or, in actuality, has the long-run growth rate surpassed the 3.5 per cent threshold [Raj (1984)]? Was there an improvement in GDP growth since 1980/81 [Dandekar (1992)]? Is it that the long-term growth of the Indian economy experienced a sharp rise from 3.5 per cent to 5 per cent since the late seventies [Dholakia (1994)]? Is the improvement in growth rate during the eighties largely illusory in the sense that it has been triggered off by a spurt in GDP originating in 'public administration and defence' [Mitra (1988)]? These are some of the important questions that have haunted economists for long.

A Periodisation Scheme

In this context, one needs a choice of periodisation in looking at the secular growth experience. Instead of adopting the somewhat mechanical break-up with regard to decades or plan periods, we tried to look into the breaks in the GDP series. We adopt the following four period scheme.[5]

(i) 1950/51 to 1964/65 (Period I): Starting at 1950/51, we follow Chakravarty (1987) and Joshi and Little (1994), to club the first three plans under a single time period. This is done due to two reasons, as Chakravarty (1987) has aptly put, "... first, they were successive in time, together spanning a period of fifteen years; and secondly, and more importantly, they were all formulated under the active chairmanship of Jawaharlal Nehru" (p.19); thus, our first period ends at 1964/65. Besides, as Rothermund (1993) has noted, the decisive break in the trend of India's economic growth in 1965 was due to three factors, *viz.*, severe drought, Indo-Pakistan war and concomitant increase in defence expenditure and reduction in foreign aid inflow.

(ii) 1965/66 to 1975/76 (Period II): We take the second period from the mid-sixties to 1975/76. It is now widely believed that since the mid-sixties there was an industrial deceleration; there are opinions that it was not only confined to industry but was part of a more grand 'structural retrogression' [Shetty (1978)].[6] As Ahluwalia (1985) has noted, "The mid-sixties witnessed the emergence of a number of latent strains as well as a few new factors which were to change the course of industrialisation in the following period" (p.8).

(iii) 1976/77 to 1990/91 (Period III): There is a wide perception that India broke through the constraint of the *Hindu* rate of growth since the mid-seventies [e.g., Ahluwalia (1988), Chakravarty (1987) and Raj (1984)]. Even in the case of the industrial sector a number of authors have placed the turnaround in industrial growth since mid-seventies [Ahluwalia (1985)]. A key element in this context, as Ahluwalia (1988) has noted, was the improved performance in agriculture, which not only contributed directly to faster GDP growth but also gave fillip to industrial growth.

(iv) 1991/92 to 1995/96 (Period IV): As regards the rest of the time span, we select the crisis year of 1991/92 as the line of demarcation; after all a host of liberalisation measures started since then. Apart from this, the experience of 6 per cent *plus* growth rate on a reasonably consistent basis is a phenomenon of the nineties.

We have subjected the above periodisation to formal statistical testing. Since consequent to our four period segregation, we need three structural breaks, we tested for them at 1964/65, 1975/76, and 1991/92. To start with, we ran generalised trend equations with slope and intercept dummies, for the whole period, *viz.*,

Table 2: Industry-wise Trend Growth Rates

(Per Cent Per Annum)

Sectors \ Periods	50/51 to 95/96	50/51 to 64/65	65/66 to 75/76	76/77 to 91/92	92/93 to 95/96
1. Agriculture & Allied	**2.4**	**2.5**	**3.1**	**2.9**	**2.9**
1.1 Agriculture	2.6	2.7	3.2	3.1	2.8
1.2 Allied	1.3	1.6	2.2	0.2	3.2
2. Industry	**5.6**	**6.8**	**4.2**	**6.4**	**10.1**
2.1 Mining & Quarrying	5.4	5.6	2.5	7.5	5.9
2.2 Manufacturing	5.4	6.7	4.1	6.2	10.7
2.3 Electricity, Gas & Water Supply	9.0	11.4	7.6	8.2	8.3
3. Services	**4.9**	**4.8**	**3.8**	**5.8**	**7.5**
3.1 Construction	4.6	6.7	1.6	4.2	4.7
3.2 Trade	5.1	5.8	3.8	5.5	10.9
3.3 Hotels & Restaurants	5.2	5.6	3.9	5.7	14.6
3.4 Railways	4.0	5.5	2.8	3.8	2.6
3.5 Other Transport	6.8	6.7	6.4	7.8	7.6
3.6 Storage	5.0	2.3	3.5	3.7	2.1
3.7 Communication	6.7	7.2	5.8	6.4	15.2
3.8 Banking & Insurance	8.1	7.4	6.2	10.8	9.8
3.9 Real Estate	3.0	2.3	2.9	3.5	3.7
3.10 Public Administration & Defence	6.4	6.6	6.1	7.0	3.4
3.11 Other Services	3.9	3.3	3.2	5.1	5.6
4. GDP at Factor Cost	**4.0**	**3.9**	**3.6**	**4.9**	**6.8**

Notes: (1) Trend growth rates are derived from a log linear trend. (2) Associated Chow tests are reported in Table 1.

contributions of 'trade', 'hotels and restaurants', and 'communication' for the post-liberalisation period, and that of 'banking and insurance' since the mid-seventies need to be interpreted with care. After all, these sub-sectors have a low base. Finally, the phase-wise improvement in the growth rate of real GDP as well as most of its sub-sectors are significant as revealed from the Chow test.

Growth Experience: Isolating the Crisis Years

The growth trajectory of the Indian economy is often conceived in terms of transitional dynamics from one crisis to another. From this viewpoint a possible lacuna of the above periodisation scheme could be the inclusion of irregular number of crisis years under each phase. What would be the outcome if one treats the crisis years as outliers? Let us, purely for the sake of expository convenience, define a crisis, in an *ad-hoc* manner, as a year in which the rate of growth of output is less than 1 per cent. We get five such years during the period under consideration, *viz.*, 1957/58, 1965/66, 1972/73, 1979/80, and 1991/92.

If we now make the periodisation as continuous but interrupted by the crises, then we get six such periods. GDP growth rates along with its sectoral disaggregations, are reported in Table 3, which underlines the following interesting regularities.

Disregarding the crisis years, Indian economy has experienced a steady growth. Moreover, the average trend growth rate for all the normal periods are at least 4 per cent, thereby casting doubt about the tenability of the proposition of the '*Hindu* rate of growth'. The growth rate of industry for all the periods exceeded that of services. There has been a distinct acceleration of the Indian economy in the post-liberalisation years.

What is the message then? Does the recurrence of crisis indicate the fact that the Indian growth is unsustainable? A detailed answer to this question is beyond the scope of the present paper. However, we venture out some conjectures in this regard.

To do so, let us delve a little into the anatomy of the crises. Note that the proximate reason behind the first crisis (1957/58) was a balance of payment problem. The second crisis (1965/66) was primarily characterised by a severe drought, though was accompanied by India-Pakistan war. Both the 72/73 and 79/80 crises were initially triggered off by oil

Table 3: Growth Rates for the Normal Periods and the Crisis Years

(Per Cent Per Annum)

Sectors \ Periods	50/51 to 56/57	57/58	58/59 to 64/65	65/66	66/67 to 71/72	72/73	73/74 to 78/79	79/80	80/81 to 90/91	91/92	92/93 to 95/96
1. Agriculture & Allied	**3.4**	**-4.5**	**2.0**	**-11.0**	**5.0**	**-5.0**	**3.6**	**-12.8**	**3.1**	**-2.3**	**2.9**
1.1 Agriculture	3.8	-5.1	2.0	-13.5	5.4	-5.6	4.1	-13.4	3.3	-2.6	2.8
1.2 Allied	0.5	0.6	2.5	11.1	2.1	-0.3	-0.5	-7.2	0.7	1.2	3.2
2. Industry	**6.1**	**4.4**	**8.2**	**2.1**	**5.0**	**4.1**	**6.5**	**-2.6**	**7.6**	**-1.9**	**10.1**
2.1 Mining & Quarrying	3.7	6.5	7.6	11.8	1.1	5.9	5.4	1.1	7.7	3.7	5.9
2.2 Manufacturing	6.3	3.9	8.0	0.9	5.0	3.9	6.3	-3.2	7.4	-3.7	10.7
2.3 Electricity, Gas & Water Supply	8.5	15.2	12.9	10.4	9.4	4.7	9.6	1.2	8.9	9.6	8.3
3. Services	**4.2**	**1.7**	**5.8**	**3.2**	**4.3**	**2.8**	**5.7**	**1.0**	**6.5**	**4.6**	**7.5**
3.1 Construction	7.0	-12.2	8.0	6.7	2.6	2.3	7.1	-5.3	4.6	2.2	4.7
3.2 Trade	5.3	2.2	6.9	0.6	4.4	0.4	6.8	-3.2	6.1	0.9	10.9
3.3 Hotels & Restaurants	4.8	1.7	6.9	1.1	4.4	0.3	6.9	-3.5	6.3	2.0	14.6
3.4 Railways	3.9	10.1	5.4	7.6	3.5	4.1	6.3	1.5	4.1	6.0	2.6
3.5 Other Transport	5.0	5.5	7.2	3.9	5.2	9.2	6.5	6.4	8.5	5.4	7.6
3.6 Storage	2.0	0.0	2.3	7.3	2.4	3.8	20.0	8.6	3.7	-1.1	2.1
3.7 Communication	7.0	1.7	8.4	6.2	5.5	5.5	6.3	8.1	6.1	6.9	15.2
3.8 Banking & Insurance	7.5	12.1	6.7	4.4	9.4	6.3	12.1	-3.5	13.0	17.4	9.8
3.9 Real Estate	2.2	2.2	2.4	2.6	2.7	3.0	3.1	3.2	3.6	3.2	3.7
3.10 Public Administration & Defence	4.0	7.8	9.1	3.6	7.2	3.7	4.8	7.1	7.7	2.1	3.4
3.11 Other Services	2.7	3.2	4.1	4.2	3.5	3.0	2.4	7.5	5.5	5.9	5.6
4. GDP at Factor Cost	**4.0**	**-1.2**	**4.3**	**-3.7**	**4.7**	**-0.3**	**5.0**	**-5.2**	**5.5**	**0.8**	**6.8**

Note: While the growth rates for the normal periods are based on log-linear trends, for the crisis years they refer to actuals.

shocks. Nevertheless, the 1991/92 crisis was different in *genre* from the earlier crises. Though the proximate reason of the crisis can be sought in the Iraqi invasion of Kuwait – yet it was primarily marked by a sudden fall in foreign exchange reserves. Joshi and Little (1994) have argued that to a large extent this was a reflection of the fact that India failed to learn any lesson from the earlier crises of oil price shocks. Thus, following Joshi and Little (1994), one may classify the first four crises as pure "exogenous" and the last one as "policy driven".

Sectoral Composition of GDP

Industry-wise Decomposition

Ever since Kuznets has published his famous 1955 paper, we know that the development process of an economy is characterised by some kind of structural transformation. His explanation runs primarily in terms of labour migration from agriculture to industry. Similar, though not entirely the same, insights can be found in Lewis model where the whole dynamics of growth is traced in terms of shifting labour from agriculture to industry. In that light, purely in terms of sectoral shares, the industrial sector has experienced a steady increase from 15.1 per cent in the first period to 25.4 per cent during the fourth period (Table 4). The mirror image is reflected in the shares of GDP originating in agricultural sector.

Interestingly, despite its increasing share, the industrial sector is yet to reach that of agriculture. This is, however, subject to our taxonomic scheme where 'construction' has been included in the services sector. If we include 'construction' under the industrial sector then its share at 29.8 per cent of GDP marginally surpasses that of the agricultural sector at 28.8 per cent during the post-liberalisation period.

The services sector, on the other hand, exceeded the agricultural sector, in terms of its share of GDP since the mid-seventies, with a more pronounced divergence during the post-liberalisation years. If there is one sector that can take the lion's share of this divergence, it is 'trade'. Though 'public administration and defence' has experienced some spurt in its share of GDP since the mid-seventies, it has been exceeded by the share of real estate (at 5.7 per cent) during 76/77 - 91/92 and that of 'banking and insurance' (at 6.6 per cent) during the post-liberalisation years.

However, in India, the declining share of agriculture has not been

Table 4: Industry-wise Sectoral Composition of GDP

(Per Cent Per Annum)

Sectors \ Periods	50/51 to 95/96	50/51 to 64/65	65/66 to 75/76	76/77 to 91/92	92/93 to 95/96
1. Agriculture & Allied	**42.0**	**51.9**	**42.9**	**35.3**	**28.8**
1.1 Agriculture	37.8	46.4	38.0	32.3	26.9
1.2 Allied	4.2	5.5	5.0	3.0	2.0
2. Industry	**19.7**	**15.1**	**19.2**	**22.8**	**25.4**
2.1 Mining & Quarrying	1.5	1.2	1.4	1.7	1.9
2.2 Manufacturing	16.8	13.3	16.6	19.2	20.9
2.3 Electricity, Gas & Water Supply	1.3	0.5	1.2	1.9	2.6
3. Services	**38.3**	**33.0**	**37.9**	**41.9**	**45.8**
3.1 Construction	4.5	3.8	5.0	4.7	4.4
3.2 Trade	10.4	8.8	10.3	11.5	12.5
3.3 Hotels & Restaurants	0.7	0.6	0.6	0.7	0.9
3.4 Railways	0.9	0.8	0.9	0.9	0.7
3.5 Other Transport	2.5	1.6	2.2	3.2	3.9
3.6 Storage	0.1	0.1	0.1	0.1	0.1
3.7 Communication	0.5	0.3	0.5	0.7	0.8
3.8 Banking & Insurance	2.8	1.5	2.0	3.7	6.6
3.9 Real Estate	6.2	7.1	6.3	5.7	4.8
3.10 Public Administration & Defence	3.9	2.5	3.9	5.0	5.1
3.11 Other Services	5.9	5.9	6.0	5.7	5.9
4. GDP at Factor Cost	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

accompanied with the Kuznets' hypothesis of a corresponding fall in labour force engaged in agriculture. This has important implication for agricultural productivity; as Kurien (1992) has aptly noted, "the fact that a sharp fall in the share of agriculture in national income in India is accompanied by a fairly stable proportion in the labour force in that sector shows that there has been a relative decline in productivity there" (p.342).

The above story about sectoral shares gets slightly altered if we consider the sector-wise relative contribution to trend growth (Table 5).[10]

For all the periods, the relative contribution of services sector to the aggregate trend GDP growth surpassed those of the other two sectors. It is since the mid-seventies that industry's relative contribution to GDP growth has exceeded that of agriculture. The earlier statement about the lack of primacy of 'public administration and defence', however, remains unaltered.

Ownership–wise Decomposition [11]

The emergence of a strong public sector has been a conscious outcome of the Indian planning process. There are various facets of the importance of public sector; this is reflected in the share of public sector in value added, employment, investment or saving. The perspective of the presence of the public sector, however, differs depending on which economic variable one is looking into. In this section we will be concerned with the contribution of public *vis-à-vis* private sector solely in terms of GDP.

The contribution of the public sector in the growth process of the Indian economy has been a matter of intense public debate – positions often varied diametrically depending on the ideology of the exponent.[12] Without going into the debate, we turn to the perfomance of public *vis-à-vis* private sector in terms of growth rate (Table 6). Since the data base for GDP originating in public and private sector does not exist earlier to the sixties, as well as for latter years of the nineties, in consonance with our earlier scheme, we stick ourselves to the two-fold periodisation, *viz.*, (i) 1965/66 to 1975/76, and (ii) 1976/77 to 1991/92.[13]

The striking feature about the relative growth rates in the two periods is the near-constancy of the public sector's growth rate, *viz.*, 7.3 per cent and 7.5 per cent in the two periods, respectively. On the contrary, the performance of the private sector, experiencing a trend growth rate of

Table 5: Industry-wise Relative Contribution to GDP Growth

(Per Cent Per Annum)

Sectors \ Periods	50/51 to 95/96	50/51 to 64/65	65/66 to 75/76	76/77 to 91/92	92/93 to 95/96
1. Agriculture & Allied	**25.5**	**33.3**	**37.0**	**20.9**	**12.3**
1.1 Agriculture	24.1	32.1	33.7	20.4	11.1
1.2 Allied	1.4	2.3	3.0	0.1	0.9
2. Industry	**27.5**	**26.3**	**22.4**	**29.8**	**37.8**
2.1 Mining & Quarrying	2.0	1.7	1.0	2.6	1.7
2.2 Manufacturing	22.7	22.9	18.9	24.3	32.9
2.3 Electricity, Gas & Water Supply	3.0	1.5	2.5	3.2	3.1
3. Services	**47.1**	**40.6**	**40.0**	**49.5**	**50.5**
3.1 Construction	5.1	6.6	2.2	4.0	3.1
3.2 Trade	13.1	13.0	10.9	12.9	20.0
3.3 Hotels & Restaurants	0.9	0.8	0.7	0.9	1.9
3.4 Railways	0.9	1.2	0.7	0.7	0.3
3.5 Other Transport	4.2	2.7	3.9	5.1	4.4
3.6 Storage	0.1	0.0	0.1	0.1	0.0
3.7 Communication	0.9	0.6	0.8	0.9	1.9
3.8 Banking & Insurance	5.7	2.8	3.5	8.2	9.5
3.9 Real Estate	4.6	4.2	5.1	4.0	2.6
3.10 Public Administration & Defence	6.2	4.3	6.5	7.1	2.6
3.11 Other Services	5.7	5.0	5.3	5.9	4.8
4. GDP at Factor Cost	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

Note: (i) For methodology of calculating industry-wise relative contribution of GDP growth, see note 10.
(ii) Due to the methodology adopted, components may not add up to the totals.

Table 6: Trend Growth Rates of GDP from Public *vis-à-vis* Private Sector

(Per Cent Per Annum)

Sectors \ Periods	PUBLIC SECTOR				PRIVATE SECTOR			
	65/66 to 91/92	65/66 to 75/76	Chow Test	76/77 to 91/92	65/66 to 91/92	65/66 to 75/76	Chow Test	76/77 to 91/92
1. Agriculture & Allied	**2.7**	**5.2**	*	**1.4**	**2.7**	**3.0**		**2.9**
1.1 Agriculture	4.3	6.6	*	3.1	2.9	3.2		3.1
1.2 Allied	0.0	3.5	*	-2.0	0.4	2.1	#	0.5
2. Industry	**8.3**	**7.8**		**8.6**	**4.7**	**3.3**	*	**5.7**
2.1 Mining & Quarrying	12.6	16.3	*	10.1	N.A	N.A	N.A	N.A
2.2 Manufacturing	6.8	4.6	*	7.8	5.1	4.0	*	5.9
2.3 Electricity, Gas & Water Supply	8.0	8.3		8.3	6.6	1.8	*	6.2
3. Services	**7.3**	**7.3**		**7.5**	**4.0**	**2.7**	*	**5.0**
3.1 Construction & Real Estate	9.4	7.8		8.6	3.0	2.1	*	3.5
3.2 Trade, Hotels & Restaurants	6.3	14.1	*	2.3	4.9	3.5	*	5.6
3.3 Railways	3.7	2.8	*	3.8	N.A	N.A	N.A	N.A
3.4 Other Transport & Storage	6.2	7.7	*	4.0	7.4	5.8	*	9.0
3.5 Communication	6.3	5.8	*	6.4	N.A	N.A	N.A	N.A
3.6 Banking & Insurance	11.3	12.5		11.2	3.3	-3.6	*	8.9
3.7 Public Administration & Defence	6.2	6.1	*	7.0	N.A	N.A	N.A	N.A
3.8 Other Services	7.5	7.7		7.5	2.2	1.9	*	3.5
4. GDP at Factor Cost	**7.3**	**7.3**		**7.5**	**3.6**	**3.0**	*	**4.2**

Note: (1) Trend growth rates are derived from a log-linear trend.
(2) * and # indicate significance levels of 1 per cent and 5 per cent, respectively, for the Chow test.
(3) The full period for the Chow test is 1965/66 to 1991/92, and the break has been tested at 1975/76.

4.2 per cent in the second period as against 3.0 per cent in the first period, has distinctly improved. Though in terms of the absolute number of the growth rate, public sector dominates even now, it must be recognised that as these are calculated over low base, there would be an element of statistical illusion in the calculations. In terms of disaggregated performance, the improvement in the 'industries' and 'services' sector for the public sector in the second period has been found to be statistically insignificant, while for the private sector, both industry and services experienced a statistically significant increase in their growth rates.

What is then the upshot of the growth experience of the Indian economy during this 46-year period? Broadly speaking, the stagnation of the Indian growth seemed to have been over by the mid-seventies; nevertheless, the crisis of 1991/92 underlined the unsustainability and fragility of a rather good growth performance of the eighties. The post-liberalisation years have marked a distinct upturn of the growth trajectory. The recovery of growth since the mid-seventies was almost entirely due to private sector. Nevertheless, the growth story unfolded so far is about the 'what' of it. Coming to 'why' of it, we need to see the role of saving and capital accumulation; to this we now turn.

Section II
Mobilisation of Domestic Savings in the Indian Economy

Against the backdrop of the 'development doctrine' of the fifties, the planners first assessed the prevailing low level of saving and investment rates and then targeted to achieve a self-reliant economic growth by postulating sharp increase in domestic saving and investment rates. Have we achieved the planned high saving and investment? More importantly, have they led to higher growth? While the trends in saving and investment, and answer to the first question are discussed in sections II and III, the answer to the second question is taken up in section IV.

Various Phases of the Long-Term Aggregate Saving Performance

Trends in the Overall Period: 1950/51 to 1995/96

Gross Domestic Saving (GDS) rate broke out of a low rate of 10.4 per cent of GDP in 1950/51 and witnessed an upward trend, *albeit* with occasional oscillations, to 19.0 per cent in 1975/76. A review of the first twenty-five years makes it possible to discern two periods. During the first period up to 1967/68, the financial infrastructure of the Indian

economy was set up by the Reserve Bank and the Government of India. The State Bank of India was brought under public sector, the insurance companies got nationalised under the Life Insurance Corporation and premier financial institutions like the Unit Trust of India (UTI), the Industrial Development Bank of India and the Agricultural Refinance and Development Corporation were established. During this phase of setting up of financial infrastructure, a fillip to household financial saving was imparted. The nationalisation of fourteen major commercial banks and ushering in of Green Revolution more or less coincided with the second period from 1968/69 to 1975/76. The financial infrastructure was expanded and geared up to mobilise potential savings from hitherto untapped rural and semi-urban areas. The onset of Green Revolution increased rural saving propensity and this, coupled with the better accessibility to banks, enabled channelising of saving in bank deposits. After the mid-seventies, there was a sudden acceleration of the GDS rate to 23.2 per cent in 1978/79 attributable to some special factors, leading some commentators to term it as the 'high saving phase'. Household saving improved in terms of both financial and physical assets. However, the GDS rate plunged to a low of 18.2 per cent in the mid-eighties. Subsequently, there was a steady rise in the late eighties, followed by rebounding of the GDS rate to the highest historical rate of 25.6 per cent in 1995/96. In this record-breaking phase, the first two years witnessed posting of high rates because of household financial saving, while in 1995/96 there was a sharp rise in household physical saving.

A Periodisation Scheme

Based on the available narrative evidence we adopt the following periodisation scheme, which is different from our earlier periodisation scheme relating to the analysis of growth experience.

(i) 1950/51 to 1967/68 (Low Saving Phase): This was the pre-bank nationalisation and pre-Green Revolution phase. With the setting up of the financial infrastructure, during this phase, there was some widening of the menu of financial instruments for the household sector. While the organisation of the Life Insurance Corporation provided a fillip to contractual savings, the UTI's issue of *Units 1964 Scheme* added another financial instrument to the household menu. The household financial saving and public sector saving rate increased during this period, while the corporate saving rate stagnated. However, at the end of the period, saving was still low at 13 per cent of GDP mainly due to two factors. First, the propensity to save in agriculture was comparatively low than in the non-agriculture sector during this period in contrast to the outcome in the

following periods.[14] Secondly, there existed a comparatively high share of agriculture in GDP during this period than in the subsequent periods. Both these facts implied that the sector with lower saving propensity had larger share of income, thereby depressing the overall saving rate. Thus, the crucial issue was how to increase the rural propensity to save. This problem was attacked in the next period.

(ii) 1968/69 to 1975/76 (The Initial Years of Increasing Savings): The nationalisation of fourteen major commercial banks along with rapid branch expansion, especially in unbanked rural and semi-urban areas and the setting up of Regional Rural Banks initiated the process of stepping up of household financial saving through bank deposits. The corporate saving rate stagnated but the public saving rate improved. During this phase, the Green Revolution led to more skewed distribution of income within agriculture and there was a relative upward movement of saving propensity of agriculture *vis-à-vis* the non-agriculture sector leading to narrowing of the differential of saving propensities between the two sectors.[15] This implied that even for the same share of agriculture in the overall income in this period, the saving rate turned out to be higher than it was in the first period. This phase thus witnessed a steady increase of GDS rate from 12.8 per cent to 19.0 per cent.

(iii) 1976/77 to 1979/80 (The High Saving Phase): The dramatic acceleration in saving in the late seventies was attributed to some special factors like the accretion of foreign exchange reserves due to foreign inward remittances, which expanded the bank deposits and the large public sector food procurement, which injected currency in the economy. Further, the cumulative impact of bank expansion of the earlier period bolstered bank deposits [Mujumdar, *et.al* (1980)]. Besides the improvement in the household financial saving, the household physical saving also showed an increase [Working Group on Capital Formation and Saving in India (1982), hereafter referred to as Raj Committee]. It showed that gross capital formation rose after the mid-sixties and especially in the late seventies, owing to the improvement in household capital formation or physical savings. This was attributed to the burgeoning of non-farm unincorporated enterprise sector. In contrast to the early seventies, there was widening of saving differential between the agricultural and non-agricultural sectors. Despite the increasing saving in the agricultural sector, the increase in foreign exchange remittances enhanced savings very sharply in the non-agricultural sector [Krishnamurthy and Saibaba (1981)].

(iv) 1979/80 to 1984/85 (A Stagnation Phase): The stagnation phase of saving of the eighties was reflected primarily in the decline in public

sector, private corporate sector and household physical savings. Nevertheless, there was a rise in household financial savings. The decline in public savings was attributed to poor performance of government non-statutory corporations, mounting government employment and wage bill and rising trend in government purchases of goods and services [Virmani (1990)]. Nevertheless, as Ghosh (1990) has noted, the decline in household physical savings and a rise in household financial savings were considered a reflection of non-agricultural sectors providing greater quantum of household savings. During the stagnation phase, the popular belief was that the GDS rate suffered because of low public saving rate and that the aggregate rate could be enhanced, once the public sector saving rate is raised. However, such a view neglects the inherent assumption of mutual interdependence of private and public sector saving rates.[16] In particular, Chakravarty (1990) pointed out that the dampened saving impulse was owing to the growth in consumerism. He also pointed that the low private corporate savings was due to the atypical behaviour of the Indian corporate sector of relying more on borrowed funds as against owned funds, thereby contradicting Kalecki's theory of increasing risk. However, the factor facilitating this behaviour needs investigation as to whether it was because of institutional factors or due to government policies of preventing bankruptcy in the private sector.

(v) 1985/86 to 1992/93 (Recovery Phase): While the aspect of stagnating savings during the eighties had attracted attention, its recovery since the mid-eighties is often missed out. Introduction of early liberalisation measures imparted buoyancy to the capital market. The new issues market responded favourably and there was widening of the mutual funds sector. Thus, the initial years of this phase witnessed a steady recovery of the GDS rate from 19.8 per cent in 1985/86 to 22.4 per cent in 1989/90, mainly attributable to expansion of household investment in shares and debentures. While the corporate saving rate also increased, the downward drift in the public sector saving rate continued because of government current expenditure growth in defence, interest payments and subsidies. Thereafter there was peaking of GDS rate to 24.3 per cent in 1990/91 followed by a decline to 22.1 per cent in 1993/94 mainly on account of volatility of household physical saving.[17] Further, as private corporate investment rate also grew, no *a priori* reason was adducible for the contrary behaviour of the unorganised sector's investment.[18] The issue has been unresolved as the household physical saving rate sharply increased in 1990/91 but steeply fell again. The volatility of the household investment behaviour, thus has complicated the issue.

(vi) 1993/94 to 1995/96 (A New High or An Aberration): Since the high saving phase of the late seventies, this period witnessed for the first time an acceleration in the saving rate. The rate, in fact, accelerated to new peaks in 1994/95 and 1995/96. This followed an abrupt slowdown in the rate during the later years of the preceding period. The household physical saving rate prevailed low amidst peaking of household financial saving rate in the first two years. However, there has again been an increase in household physical saving rate in 1995/96, pointing out to the issue of volatility of household physical saving. Household financial saving rate dipped in 1995-96.

Based on the above narrative evidence, we started with the premise that insofar as saving is concerned, the Indian economy experienced structural breaks in the following years, *viz.*, 1967/68, 1976/77, 1979/80, 1984/85 and 1992/93. As earlier, to test the presence of these structural breaks, we performed standard Chow test for different time periods with a log-linear time trend. This is done both for absolute saving magnitudes as well as their rates with respect to GDP at current market prices, along with their various sectoral counterparts. If we concentrate on the structural breaks in the GDS rates, then excepting the beginning of the high saving phase, i.e., 1976/77, all other breaks, chosen on *a priori* grounds, get vindicated (Table 7).

How do we assess the overall domestic saving performance across our six periods? This can be gauged in terms of three criteria *viz.*, 'trend growth of saving', 'trend growth of saving rate' and 'average saving rate'. We have ranked these phases separately according to these three criteria (Table 8). If we only consider the criterion of 'trend growth of saving', we find that the latest period (i.e., the 'new high saving phase' of the nineties) ranks the first, followed by the 'recovery phase' and the 'increasing saving phase'; the 'high saving phase' ranks the fourth. If we choose the criterion of 'trend growth of saving rate', the last period ranks the first; then follows the 'increasing saving phase' and the 'high saving phase' ranks third. Thirdly, by the criterion of 'average saving rate', while the last period still ranks the first, the 'high saving phase' ranks the second. Three interesting regularities emerge from this analysis. First, the nineties so far, has witnessed the best saving performance with the economy posting record high saving rate. Secondly, though during the 'high saving phase' of the late seventies, high saving rate was achieved, this was essentially due to transient factors and the high level was maintained over the three year period without appreciable growth in saving.

Table 7: Structural Breaks in Savings and Savings Rates: Chow's F and associated p-values

Variables	Period : 50/51 to 75/76 1. Break at 67/68		Period : 68/69 to 78/79 2. Break at 76/77		Period : 77/78 to 84/85 3. Break at 79/80		Period : 80/81 to 92/93 4. Break at 84/85		Period : 85/86 to 95/96 5. Break at 92/93	
	F	p	F	p	F	p	F	p	F	p
I. Levels (of Savings)										
1. Household	7.22	0.004	0.65	0.546	1.04	0.418	6.18	0.018	3.52	0.087
o/w Financial	2.22	0.132	0.07	0.934	4.59	0.074	0.27	0.769	0.60	0.574
o/w Physical	9.54	0.001	0.96	0.423	1.28	0.356	3.99	0.053	1.51	0.286
2. Corporate	1.46	0.254	2.48	0.145	4.22	0.085	7.64	0.010	0.37	0.706
3. Public	2.25	0.130	1.01	0.407	0.01	0.990	0.62	0.558	1.35	0.318
4. GDS	6.64	0.006	0.25	0.783	1.23	0.368	14.88	0.001	5.46	0.037
II. Savings Rates (with respect to GDP at current market prices)										
1. Household	1.66	0.212	2.15	0.179	3.52	0.111	4.85	0.034	2.60	0.143
o/w Financial	4.01	0.033	0.14	0.870	2.57	0.170	0.01	0.994	0.58	0.585
o/w Physical	4.14	0.030	2.23	0.170	3.19	0.128	3.35	0.077	1.43	0.301
2. Corporate	3.90	0.036	2.50	0.144	3.86	0.097	7.92	0.009	1.49	0.289
3. Public	4.93	0.017	2.35	0.158	0.05	0.951	0.59	0.573	2.65	0.139
4. GDS	3.75	0.040	1.61	0.259	8.95	0.022	13.90	0.001	5.84	0.032

Thirdly, the 'stagnation phase' fares poorly, regardless of the type of criterion chosen.

Table 8: Performance of Different Phases of Saving

PERIOD	Characteristic for Performance					
	Trend Growth of Saving@		Trend Growth of Saving Rate#		Average Saving Rate	
	Per Cent	Ranks	Per Cent	Ranks	Per Cent	Ranks
1. Low Saving Phase (50/51 to 67/68)	10.6	VI	2.5	V	11.9	VI
2. Increasing Saving Phase (68/69 to 75/76)	17.3	III	4.8	II	16.2	V
3. High Saving Phase (76/77 to 78/79)	15.7	IV	4.4	III	21.8	II
4. Stagnation Phase (79/80 to 84/85)	10.8	V	-3.7	VI	19.8	IV
5. Recovery Phase (85/86 to 92/93)	19.0	II	2.8	IV	21.5	III
6. New High Saving Phase (93/94 to 95/96)	22.7	I	5.3	I	24.5	I

@ Derived from a log-linear trend of the form, Ln (S) = a + bt, where S is the gross domestic saving.

Derived from a log-linear trend of the form, Ln (S/Y) = a + bt, where Y is GDP at current market prices.

Sectoral Components of Gross Domestic Saving

A sharper examination of the trends in gross domestic saving would require that analysis be made at a disaggregated sectoral level. This is undertaken by using the traditional three-sector classification across the household, private corporate and public sectors (Table 9). There is, however, no gainsaying of the possibility of inter-sectoral transfers and mutual relationships of different components of GDS.

Household Saving

Household sector has contributed the largest to the national pool of savings with its share increasing from around 72 per cent in the first four periods to around 79 per cent in the last two periods. Within the household sector, the share of household financial savings has consistently increased from 28.6 per cent to 49.0 per cent over the first five periods and then moved up to 55.7 per cent during 1993-94 - 1995-96, with a *per contra* decline in household physical savings.[19]

Table 9: Nominal Gross Domestic Saving Rate and Its Components

(As Percentage of GDP at current market prices)

PERIOD	50/51 to 67/68	68/69 to 75/76	76/77 to 78/79	79/80 to 84/85	85/86 to 92/93	93/94 to 95/96
1. Household Saving	**8.4** (70.9)	**11.7** (72.2)	**15.8** (72.2)	**14.3** (72.2)	**17.1** (79.4)	**19.2** (78.5)
1.1 Household Financial Saving	2.5 (20.1)	3.6 (22.1)	6.1 (27.8)	6.5 (33.1)	8.4 (38.8)	10.7 (43.8)
1.2 Household Physical Saving	6.0 (50.7)	8.1 (50.1)	9.7 (44.4)	7.8 (39.1)	8.8 (40.6)	8.5 (34.6)
2. Private Corporate Saving	**1.3** (10.7)	**1.5** (9.4)	**1.4** (6.6)	**1.7** (8.6)	**2.4** (10.9)	**3.9** (15.8)
3. Public Sector Saving	**2.2** (18.4)	**3.0** (18.4)	**4.6** (21.2)	**3.8** (19.2)	**2.0** (9.7)	**1.4** (5.7)
3.1 Public Authorities	1.8	2.0	3.1	1.8	-1.1	-1.8
3.2 Non-Departmental Enterprises	0.4	1.0	1.5	2.0	3.1	3.2
4. Gross Domestic Saving	**11.9**	**16.2**	**21.8**	**19.8**	**21.5**	**24.5**

Note : Figures in brackets are percentage shares in gross domestic saving.

Three factors have contributed to this development. First, the rapid branch expansion of commercial banks and setting up of RRBs in the post-bank nationalisation phase together with phenomenal growth in financial institutions and mutual funds have resulted in a well differentiated financial infrastructure and a wide spectrum of financial instruments. Secondly, the inherent indivisibilities of physical capital prompts the households to save in the form of financial assets for a considerable period of time till such savings are adequate for investment in the desired physical assets. Third, the long-term motive of saving in financial assets as a regular source of income and the wide menu of financial assets suiting the preference of different classes have encouraged financial savings.

Household Financial Savings: Instrument-wise pattern

Household sector enhanced its financial saving rate between periods 1950/51 – 1967/68 and 1993/94 – 1995/96, in terms of both non-contractual assets and contractual assets (i.e., life insurance funds and net claims on government) with the former type displaying a sharper rise than the latter. The non-contractual saving rate more than doubled till the 1976/77 to 1978/79 period, owing to the expansion of bank deposits while contractual saving rate also almost doubled up to the period 1968/69 to 1975/76, owing to increase of provident and pension funds. Within the household financial saving, if we ignore the peaking of provident funds in the second period, contractual savings have garnered a share of around 33 per cent of total net financial savings (Table 10).

Table 10: Distribution of Household Financial Savings (net)

(Per cent)

Period	54/55 to 67/68@	68/69 to 75/76	76/77 to 78/79	79/80 to 84/85	85/86 to 92/93	93/94 to 95/96
1. Currency	25.3	22.4	19.2	17.3	14.3	15.1
2. Net Deposits	18.2	27.2	42.6	31.5	24.9	31.8
3. Shares and Debentures	12.9	4.9	3.3	5.6	14.4	11.1
4. Net Claims on Government	8.7	-3.1	1.8	11.8	12.9	9.6
5. Life Insurance Funds	11.0	13.4	9.7	9.9	10.2	11.3
6. Provident & Pension Funds	23.9	35.1	23.3	24.0	23.3	21.1
7. Household Financial Saving (net)	100.0	100.0	100.0	100.0	100.0	100.0

Note: @ We have dropped the period, 1950/51 to 1953/54 to exclude outlier estimates in some of the financial instruments.

Analysis of household non-contractual financial saving suggests a decline in the proportion of the most liquid instrument i.e., currency, a fall-out of diversification of financial structure and households switching to new financial instruments including bank deposits in the post-nationalisation phase. The sharpest rise in non-contractual savings rate in the late seventies was contributed by an increase witnessed across all the constituent instruments, with the largest rise being in deposits due to the special factors discussed above. As against the depressed capital market conditions of the seventies, in the late eighties there was a widening and deepening of capital market as also the emergence of a number of financial institutions and mutual funds. This encouraged switching of household financial saving from bank deposits to shares and debentures and may have led to financial disintermediation. Better returns offered by the capital market both through direct investment in shares and debentures and indirect investment in mutual funds provided a better hedge against inflation. However, the gloomy capital market conditions in early nineties and the dwindling position of mutual funds have again reduced the share of household financial savings in shares and debentures and increased the shares of currency and bank deposits. Household savings in the form of net claims on government, which had contributed the lowest share in the non-contractual savings, improved its share in financial saving to around 12 per cent in the eighties, due to the tax concessions offered on the small savings schemes and the hike in interest rate of public provident funds.[20]

Private Corporate Saving

Private corporate savings had stagnated over the first three periods of our analysis but accelerated over the latter three periods. This stagnation and the relative poor saving performance compared to household and public sectors were attributable to the corporate sector being caught in a low profitability cycle. The tendency on the part of the corporate sector to rely more on borrowed funds and less on owned funds led to increased interest outgo, resulting in poor saving performance of the sector. Traditional industries like tea, jute, cotton textiles, cement and some other units of engineering became a drag on profitability.[21] However, in the liberalised environment of the eighties and the nineties, the corporate saving rate increased. A striking feature of this acceleration phase of the private corporate saving has been a rise in the share of financial joint-stock companies from 2.1 per cent in the period 1979/80 to 1984/85 to 10.6 per cent in the period 1993/94 to 1995/96. This has been the result of the development of new financial institutions and mutual funds in the private corporate sector. Private corporate sector saving rate crossed the public sector saving rate for the first time in 1988/89 and has remained higher ever since. In the liberalised environment, with increased internal and foreign competition, as well as foreign direct investment in various sectors, the profits of private corporate sector have registered a high growth, leading to increased saving.

Public Sector Saving

Contrary to the private corporate savings behaviour, in the initial phase public sector saving rate exhibited two up-turns in the early halves of sixties as well as seventies. The first up-turn was attributable to two factors. First, the conventional remedial measures of controlling public deficit were put in place as a response to double-digit inflation and an initial balance of payment crisis in 1956/57. Secondly, government saving increased due to increased tax efforts. However, as Joshi and Little (1994) have pointed out, the drought and recession of the mid-sixties resulted in a fall in tax revenue while expenditure cuts were directed towards investment expenditure rather than current expenditure.

The second up-turn in the early seventies, notwithstanding oil shock, was owing to current expenditure cuts of government administration, reflecting on the increase in saving rate from 1.3 per cent of GDP in 1970/71 to 2.7 per cent of GDP in 1975/76. There was also a marginal increase in the rate of saving of statutory corporations. Thus, public

sector saving could achieve its all time peak rate of 4.9 per cent of GDP in 1976/77.

The public sector saving rate has, however, declined thereafter. In the latter half of seventies a public saving rate exceeding 4 per cent could be sustained principally due to the increase in government revenue owing to economic recovery from the oil shock (despite increasing government expenditure) and also because of higher savings in financial enterprises (a fall-out of bank nationalisation). However, since 1983/84 the public sector saving rate has been on a downward drift with the rate plunging to 2.0 per cent in 1988/89 and to 0.6 per cent in 1993/94. This has been solely due to the negative savings of government administration. Savings of government administration deteriorated from (-)0.1 per cent of GDP in 1984/85 to (-)2.8 per cent of GDP in 1990/91 when the Indian economy trundled to balance of payment crisis. Thereafter, a couple of years of stabilisation measures halted the slide. But there was again a fiscal slippage in 1993/94 with the saving rate of government administration coming down to (-)3.3 per cent of GDP. However, there has been some stabilisation in the subsequent two years with the rate improving to (-)2.4 per cent of GDP in 1995/96. A number of factors have been responsible for this dwindling government dissaving, the principal one being the increases in subsidies and interest payments due to rising debt. The only silver lining in the public sector saving in the drift phase has been the steady increase in the saving rate of non-departmental enterprises from 1.4 per cent of GDP in 1977/78 to 3.3 per cent of GDP in 1995/96, essentially on account of the highly profitable oil sector.

Section III
Trends in capital formation

The Indian planners in the fifties recognised that the material shortage of capital in relation to labour was the principal constraint to growth process. It was envisioned that increased capital formation would usher in a 'virtuous circle' of growth through vertical interrelationships on the basis of according primacy to heavy industry. In order to obviate the structural limitations of converting saving to productive investment, the *modus operandi* was an active state policy of investment.

As per the current methodology, the economy-wide gross capital formation (GCF) is estimated independently across three types of assets, *viz.*, construction, machinery and equipment, and change in stocks. However, the estimates of capital formation of the public and private corporate

sectors are directly obtained from the budgets and accounts. The excess of GCF over the organised sector capital formation is treated as household capital formation and is set equal to household physical saving. Thereafter, the aggregate saving (including foreign) is taken as the controlling total to adjust the GCF estimates. The GCF, adjusted for errors and omissions, is termed as aggregate investment or *gross domestic capital formation* (GDCF). Despite this adjustment, the errors and omissions associated with residual estimation of household physical saving do not get weeded out. This remains one of the weakest points in the estimation methodology.[22]

Long-term Trends in Capital Formation and its various Phases

For capital formation we follow the same periodisation that we have adopted for saving. This is confirmed from the usual Chow test for both levels and rates of capital formation in nominal terms (Table 11). However, in real terms there are some discrepancies in adopting this periodisation. Moreover, the supposed break during the high saving phase of the late eighties is not confirmed for capital formation. Nevertheless, for the sake of comparability we choose to stick to the earlier periodisation.

Trends in the overall period (1950/51 to 1995/96)

A comparative analysis of aggregate investment (gross capital formation adjusted for errors and omissions) as well as gross capital formation across the various periods, as presented in Table 12, brings to fore the following features. First, there has been an increase in investment rate over time although the tempo has dampened in the last three periods. This resulted directly from the shift in emphasis of the plan objectives from quantitative targeting of investment rate to the need for efficient use of available investment. Reorientation of the strategy was essential, as commensurate growth had not fructified despite achievement of the envisaged high investment rates in the 'high saving phase'. Secondly, there has been a decline in the share of construction in gross capital formation and a rise in machinery and equipment over the various phases. Thirdly, while household and public sectors contributed heavily to capital formation in the first three periods, private corporate investment has been rising in the last three periods. The setting up of infrastructure in the initial phase facilitated corporate investment later. Finally, except for the 'high saving phase', domestic saving has been below the aggregate investment, reflecting the need for inflow of foreign resources. However, for the rest

Table 11: Structural Breaks in Investment and Investment Rates: Chow's F and associated p-values

Variables \ Period	Period : 50/51 to 75/76 1. Break at 67/68		Period : 68/69 to 78/79 2. Break at 76/77		Period : 77/78 to 84/85 3. Break at 79/80		Period : 80/81 to 92/93 4. Break at 84/85		Period : 85/86 to 95/96 5. Break at 92/93	
	F	p	F	p	F	p	F	p	F	p
I. Levels of Investment										
Real GCF	3.17	0.062	0.67	0.540	0.79	0.514	0.34	0.720	5.19	0.041
Real GDCF	2.99	0.071	1.66	0.257	8.94	0.033	2.32	0.154	13.53	0.004
Nominal GCF	1.26	0.304	0.71	0.528	0.42	0.682	0.59	0.572	1.21	0.354
Nominal GDCF	1.24	0.310	0.32	0.735	3.82	0.118	3.91	0.060	5.44	0.038
***II.* Investment Rates** (with respect to GDP at current / constant market prices)										
Real GCF	2.44	0.110	0.56	0.597	1.46	0.334	0.41	0.671	4.58	0.054
Real GDCF	2.20	0.134	0.77	0.500	18.25	0.010	3.04	0.098	11.22	0.007
Nominal GCF	4.91	0.017	0.38	0.697	2.04	0.245	0.12	0.884	1.98	0.208
Nominal GDCF	4.31	0.026	1.23	0.349	23.97	0.006	2.23	0.163	10.326	0.008

of the period the net capital inflow from abroad was required to sustain the investment levels, although the level was contained below 2.0 per cent, barring the period, 1985/86 to 1992/93.

Table 12: Sector–wise and Asset-wise Distribution of Investment

(As percentage to GDP at current market prices)

Item/Period	50/51 to 67/68	68/69 to 75/76	76/77 to 78/79	79/80 to 84/85	85/86 to 92/93	93/94 to 95/96
1. Sector-wise GCF						
Household	5.9 (43.4)	8.1 (45.7)	9.7 (46.2)	7.8 (35.4)	8.8 (36.8)	8.5 (35.3)
Private Corporate	2.4 (16.7)	2.6 (14.3)	2.0 (9.7)	4.0 (18.2)	4.9 (20.8)	6.9 (28.9)
Public Sector	5.8 (39.9)	7.2 (40.0)	9.3 (44.0)	10.2 (46.3)	10.1 (42.4)	8.5 (35.7)
2. Asset-wise GCF						
Construction	7.8 (56.9)	8.9 (50.5)	10.1 (48.2)	9.9 (45.0)	10.6 (44.6)	10.0 (42.1)
Machinery and Equipment	4.8 (33.5)	6.3 (35.3)	7.9 (37.8)	9.5 (43.4)	11.3 (47.7)	12.8 (53.6)
Change in Stocks	1.5 (9.6)	2.6 (14.1)	3.0 (14.0)	2.6 (11.6)	1.9 (7.7)	1.1 (4.3)
3. Gross Capital Formation (GCF)	**14.1 (100.0)**	**17.8 (100.0)**	**21.0 (100.0)**	**22.1 (100.0)**	**23.8 (100.0)**	**24.0 (100.0)**
4. Investment (GDCF)	**13.7**	**16.9**	**20.8**	**21.1**	**23.8**	**25.7**
5. Domestic Saving— Investment Gap	**(-)1.8**	**(-)0.7**	**1.0**	**(-)1.1**	**(-)2.3**	**(-)1.1**

Note : Figures within brackets are percentages to Gross Capital Formation.

Period-Wise Features of Investment

(i) 1950/51 to 1967/68 (Period i): The greater part of the increase in economy-wide capital formation in this period took place in the public sector. However, the wars in the sixties necessitated stepping up of public defence expenditure and there was a cut back of public investment. This, coupled with increased rupee cost due to devaluation of rupee, depressed the aggregate investment in the late sixties [(Joshi & Little, (1994)]. There was also a rise in saving-investment gaps, which peaked in 1957/58, culiminating into a balance of payments crisis. This was perhaps a reflection of underestimation of import content in the strategy of heavy industrialisation that India has followed since the Second Plan.

(ii) 1968/69 to 1975/76 (Period II): During this period, the aggregate investment rate increased owing to the public sector investment recovering from the cut-backs in the late sixties and the expanding household investment. The saving-investment gap fell during the initial years till the first oil shock, after which it rose but was contained within 1.0 per cent of GDP. Finally, in 1975/76, the domestic saving rate exceeded investment rate by 0.1 percentage point of GDP.

(iii) 1976/77 to 1978/79 (Period III): During the third period, the aggregate investment rate moved up from 19.7 per cent to a peak of 23.3 per cent, principally due to improvement in the private (both household and corporate) investment rate despite a decline in public investment rate. The average rate of investment crossed the 20 per cent mark. As already pointed out during the 'high saving phase', the domestic saving rate exceeded the investment rate for the first two years, owing to a dramatic rise in foreign inward remittances.[23]

(iv) 1979/80 to 1984/85 (Period IV): In this downward drift period, the aggregate investment rate continuously deteriorated till 1984/85. However, the order of deterioration was lower than that experienced in the saving rates, indicating increase in net inflows from abroad.

(v) 1985/86 to 1992/93 (Period V): As the rate of net inflow from abroad increased substantially and the GDS rate recovered, the aggregate investment rate showed a sharp rise to attain an overall peak rate of 27.7 per cent in 1990/91. However, following the crisis in 1990/91, the aggregate investment rate showed a decline owing to reductions in both domestic saving and net inflows from abroad.

(vi) 1993/94 to 1995/96 (Period VI): There was again increase in the aggregate investment rate in this phase, attributable to the record improvement in domestic saving rates. Net foreign inflows also increased but were below 2.0 per cent of GDP. A sudden spurt in the household investment rates in 1995/96 resulted in the peaking of the GCF rate at 26.2 per cent of GDP. However, unlike the other periods the private corporate and household sector investment rates increased contemporaneously during this period.

Asset-wise Distribution of Gross Capital Formation

The asset-wise distribution of gross capital formation, presented in Table 12, shows an increase in the share of machinery and equipment

over the successive periods to cross the fifty per cent mark. This indicates that the focus on building up machinery and equipment was needed to overcome a binding constraint to growth process. However, during the first three periods, the increasing share of machinery and equipment was contemporaneous with the enhancement of shares of inventories, reflecting bulge in undesired investment. Consequently, the ultimate objective of acceleration of growth rate could not be realised during the first three periods, despite a rise in investment rates. However, in the latter three periods, the situation reversed with shares of inventories falling and investment in machinery going up, enabling the achievement of higher growth.

Sectoral Distribution of Gross Capital Formation

Public Sector Capital Formation

Public sector was in charge of the 'commanding-height' of the industrial sector, representing infrastructure, heavy industries, and defence, and requiring heavy doses of investment. The public sector investment rate broke out of a paltry 2.8 per cent of GDP in 1950/51 to attain the peak rate of 11.7 per cent in 1986/87. There was, however, an interim downward drift, due to fiscal restrictions imposed to cope with the macro-economic crisis of inflation and balance of payments caused by the drought of the mid-sixties [Joshi & Little (1994)]. The decline in foreign aid after 1966/67 also contributed to decreasing public investment rate. However, the acceleration of the public investment rate from the late seventies to a record rate in 1986/87 was attributed to government's response to the second oil-shock by 'expansionary adjustment'. This was intended to be achieved, *inter alia*, through increased investment and reorienting investment for boosting oil production and removing infrastructural constraints. The economy again faced two successive monsoon failures in 1986 and 1987 and the government had to resort to expenditure cuts that affected capital formation.

Despite slackening of public investment since 1986/87, the public sector's saving-investment gap has persistently increased over the years, implying a higher pace of reduction in public sector saving *vis-à-vis* its investment. Based on their calculation of the rise in 'long run sustainable public sector deficit', Joshi and Little (1994) showed that the public sector had crossed this limit in the eighties. The mounting foreign debt and current account deficits eventuated the 1990/91 crisis.

The asset-wise pattern of public sector investment shows that the rate of public investment in construction has always been greater than that in machinery and equipment, reflecting the accent placed on public investment in infrastructure. Notwithstanding this, the rate of investment in machinery and equipment in the public sector has displayed a sharper increase from 1.6 per cent of GDP to 4.1 per cent of GDP between the periods 1950/51 to 1967/68 and 1993/94 to 1995/96 than the slower increase from 3.8 per cent of GDP to 4.4 per cent in the case of construction. The high level of inventories in the case of the public sector in the mid-seventies was due to high levels of food procurement and stocks of foodgrains.

Private Corporate Investment

The private corporate investment has always had the lowest share in aggregate investment. In the first three periods of our analysis, the private corporate investment rate hovered around 2.0 per cent of GDP. However, in the next three periods since the early eighties the private corporate investment rate has accelerated to touch 6.9 per cent in 1993/94 to 1995/96. The bulk of the corporate investment has always been in machinery and equipment and also it is the rate of investment in this form, which has displayed a sharper rise as against that in construction. The relative stagnation of the private corporate sector saving rate and its delayed acceleration has resulted in an increase in its saving-investment gap.

Household Sector Investment

The dynamics of household sector investment (which is its physical saving) rate can be split into three phases. In the first phase, which approximately coincides with our first period, the rate had stagnated at a shade below 6.0 per cent of GDP. As described above, during this phase the public sector investment had dominated.

In the next phase, during the late sixties, and the early seventies, the rate hovered around 8.0 per cent of GDP and was followed by a steady climb to a peak rate of 10.6 per cent in 1978/79. The Raj Committee had taken note of this uptrend in household investment and attributed it to two factors. First, it cited the sharp increases of income-tax assessee registered firms as well as a rise in income tax quantum and the enhancement of share of unincorporated enterprises in the total private fixed capital as a major factor for the high growth of household investment rate. These evidently indicated a substantial growth of unincorporated

enterprises outside the farm sector. Secondly, larger quantities of machinery and equipment were available in the seventies.

During the last three periods, since 1976/77, the household investment rate has displayed a high degree of volatility, plunging from the peak rate of 10.6 per cent in 1978/79 to 6.0 per cent in 1984/85. Again it peaked to a high rate of 11.2 per cent in 1990/91. After a plunge again, it has again registered a high rate of 10.7 per cent of GDP in 1995/96.

Section IV
Is India characterised by High Saving/Investment and Low Growth?

Is the growth rate of the Indian economy compatible with its saving rate? This has been a major concern for economists, since long. It has often been pointed out that though the Indian saving rate is not comparable with the 'East Asian tigers', experiencing a 30 per cent *plus* saving rate, still a 20 per cent *plus* saving rate is on the high side, going by the standard of other less developed countries. Does such a rather high saving rate of India get reflected in her growth rate? The issue is important in the sense that it throws light on the nature of relationship between saving/investment and growth. In this context we will examine the following three explanations.

Are there Estimational Errors in Saving and National Income in India?

Rakshit (1982, 1983) pointed out to an in-built bias of estimation in the official saving statistics as an explanation of the saving-investment puzzle of the Indian economy. He found three sources of such over-estimation. First, the use of commodity-flow method in investment in his opinion, injects an upward bias. This is due to the fact that the ratio of labour intensive construction (i.e., *kutcha*) seems to have declined over the years, which CSO failed to account for even in the early eighties. Secondly, in calculating household financial saving, the official statistics fails to account for the 'bunching' effect of intra-year fluctuations. Thirdly, there is also an upward bias in the estimation of changes in stocks. Based on some rough and ready estimates, his calculations point out to an over-estimation of savings by 6.2 percentage points of NDP for 1980/81.

Doubts have also often been raised about the veracity of capital formation numbers compiled through the commodity flow method. Following the Raj Committee Report, it has been widely recognised that saving estimates are more reliable than estimates of capital formation. Thus, official statistics puts the difference between 'gross domestic capital formation' (i.e., gross domestic savings + foreign savings), and 'gross capital formation' as 'errors and omissions'.

If one takes the 'errors and omissions' as a percentage of GDP at current market prices over the forty-six year period, an interesting pattern emerges. It is during the high saving phase of the late seventies that the 'errors and omissions' exceeded one per cent of GDP.

It is not that the compiling agencies are unaware of these errors. Both the Raj Committee and the Expert Group on Saving and Capital Formation (Chairman: Professor Raja J. Chelliah, henceforth referred to as Chelliah Committee), which submitted its report recently, recognised various sources of errors in estimating saving and capital formation in India.[24] Nevertheless, so long as there is no systematic overestimation of saving and capital formation in India, a partially faulty methodology cannot be an explanation of the phenomenon of 'high saving and low growth'. In fact, on the contrary, one may point out that there are a number of sources through which Indian saving numbers can be underestimated as well. As for example, Mühleisen (1997) finds household saving for the post-liberalisation years to be underestimates due to non-inclusion of some preferred assets like jewellery and gold. On the other hand, Athukorala and Sen (1995) argue that household physical saving is likely to be an underestimate during the nineties.

Another explanation of 'high saving, low growth' phenomenon is offered in terms of underestimation of real growth of the Indian economy. It has been argued that since the growth of parallel economy gets unrecorded in the official national income statistics, growth is underestimated [Chakravarty (1984), EPWRF (1996)]. However, there is a flaw in this argument. In fact, to regard the non-inclusion of the parallel economy in official statistics, as an explanation of the phenomenon of 'low growth, high saving', as Bhagwati (1993) rightly observed, "we would have to assume either that the parallel economy's income is unrecorded more relative to its investment or that, if both are symmetrically unrecorded, the productivity of investment in the parallel economy exceeds that in the recorded legal, economy" (p. 43). In fact, Bhagwati and Srinivasan (1984) examined this argument in quantitative terms and tried to measure the

extent of differential undeclared income and investment that is required for explaining low growth. They found that such differentials have to be substantial for explaining low growth.

Thus, in retrospect it seems that while issues relating to estimational errors in growth, saving and investment are important, they are unlikely to offer a consistent explanation of the puzzle of high saving and low growth.

What is the performance in the Indian Productivity Front?

In a Harrod-variety growth model, growth is conceptualised to be dependent not only on savings but also on productivity of capital. Thus, a possible explanation of this 'high saving, low growth' phenomenon can be in terms of declining productivity in India, as Bhagwati (1993) succinctly puts it, "...the weak growth performance reflects, not a disappointing saving performance, but rather a disappointing productivity performance" (p. 40). The standard measure of measuring productivity is through 'total factor productivity growth', but it is beyond the ambit of the present paper.[25] Thus, to gauge productivity performance of Indian economy within the domain of national income statistics, we turn to the intertemporal behaviour of three crucial Harrodian parameters, *viz.*, saving rate, growth rate and incremental capital-output ratio (ICOR). Since we have already discussed the first two parameters, in this section we focus our attention primarily on the third one, *viz.*, ICOR.

ICOR, as a physical concept, refers to the amount of capital required to produce an additional unit of output and is normally measured by dividing the investment (I_t) made in a given period by the incremental output ($Y_t - Y_{t-1}$) produced during the period.[26,27] In the above formulation, there are two distinct sources of confusion of measuring ICOR. First, considerable confusion exists as to what should be the proper definition of Y, i.e., at factor cost, or at market prices? Secondly, as incremental GDP for some years are negative, to avoid negative values of ICOR one uses estimated series of GDP. As regards the first confusion, it is widely held that the use of GDP at factor cost "would render an upward bias in the estimated ICORs" [Rangarajan and Kannan (1994), p.4]. However, there are instances of calculating ICOR on the basis of GDP at factor cost. Needless to say, the calculation of ICOR will vary depending on the definition of GDP. In our calculation of ICOR, we have adopted Rangarajan-Kannan (1994) method, whereby ICOR for each year is calculated as a ratio of investment (at constant prices) to increments in estimated real GDP at market prices.[28]

How does Indian productivity fare in terms of intertemporal behaviour of ICOR? In doing so, we adopt the four-period classification used for discussing Indian growth experience. Interestingly, even if the growth performance within this four-period classification varies, savings experienced a fairly secular increasing trend. A mirror image of this variation in growth and saving performance is reflected in the movements in ICOR. Thus, during the period 1965/66 to 1975/76, even when saving rate increased from 16.56 per cent to 19.94 per cent, growth suffered from 4.22 per cent to 3.52 per cent. This is reflected in the upward movement in ICOR – from 3.92 to 5.66 (Table 13). There has been some improvement in the saving rate since the mid-seventies, with the improvement being most pronounced during the post-reform period. Interestingly, the ICOR during the post-reform period at 4.00, while being higher than that prevailed during the early fifties to the mid-sixties, was lower than that in the second and third periods.

Table 13: Saving Rates, ICOR and Growth Rates of Real GDP at Market Prices

Period	Growth Rate@ (Per cent)	Saving Rate# (Per cent)	ICOR*
Period I : 1951/52 to 1964/65	4.22	16.56	3.92
Period II : 1965/66 to 1975/76	3.52	19.94	5.66
Period III : 1976/77 to 1991/92	5.05	22.62	4.48
Period IV : 1992/93 to 1995/96	6.67	26.71	4.00
Full Period : 1950/51 to 1995/96	**4.12**	**20.11**	**4.88**

@ Average of real GDP (at market prices) growth is on the basis of semi-log trend.

\# Saving Rate is calculated as real gross domestic capital formation of a year as a percentage of GDP at constant market prices of the *preceding* year (see note 27); period averages are calculated as geometric means.

* ICOR is calculated as per Rangarajan-Kannan (1994) method; period averages are on the basis of geometric means.

Some Explanations behind rising ICOR

Nevertheless, the notion of ICOR is at best a tautology. It has been pointed out in Chakravarty (1984) long back, "...viewing the growth rate as a product of the marginal capital-output ratio and the savings ratio is at best an equilibrium relationship and often little more than an accounting framework. In either case, it does not tell a causal story" (p. 847). However, opinions regarding interpreting the movements in ICOR differ and differ quite radically. A detailed examination of the views is beyond the scope of the present paper. What follows below is a quick run-down

of some dominant views. It may be noted that most of these interpretations have been offered to explain the increasing ICOR during period II.

(i) There has been a tendency to overstate the increase in ICOR in the late seventies due to use of the 'nominal' instead of 'real' investment series as evident in some studies [Rao (1983)]. The Raj Committee pointed out that since the mid-seventies, the price-index of capital goods had risen faster than the GDP deflator. In real terms, therefore, a large chunk of capital formation is eaten away. Since we have avoided exaggerations by using ICOR based on real investment rate and computed the average ICOR for a longer period III from 1976/77 to 1991/92 (thereby reducing the impact of outlier phase of high saving of the late seventies), our numbers are not subject to the limitations pointed out by the Raj Committee. Admittedly, there was a rise in ICOR in period II, but it declined in the subsequent periods.

(ii) A number of authors have stressed the issue of demand constraints in the Indian economy in this context. In particular, it has been argued that deceleration in the rate of growth of public investment is the chief factor behind a rising ICOR of the Indian economy. A capital-intensive agriculture in the post-green revolution period, the increased cost of energy related investment, and delays in the completion of projects have also been pointed out in this context [Chakravarty (1984, 1987)].

(iii) Raj (1984), on a cross-country basis, argued that increases in ICOR appeared to be internationally quite comparable. He found that the rise in ICORs had been an almost universal phenomenon, which could be rationalised in terms of Lewisian proposition that the infrastructural capital costs tended to be very high in periods of urbanisation.

(iv) The dominant neo-classical view behind the rise in ICOR is India's falling productivity. We can do no better than to quote Bhagwati (1993),

> "The main elements of India's policy framework that stifled efficiency and growth ... are easily defined. I would divide them into three major groups:
>
> 1. extensive bureaucratic controls over production, investment, and trade;
> 2. inward-looking trade and foreign investment policies;
> 3. a substantial public sector, going well beyond the conventional confines of public utilities and infrastructure.

The former two adversely affected the private sector's efficiency. The last, with the inefficient functioning of public sector enterprises, additionally impaired the public sector enterprises' contribution to the economy. Together, the three sets of policy decisions broadly set strict limits to what India could get out of its investment" (pp. 46-47).

Does Growth cause Saving or Saving cause Growth?

Although we did not specify, the discussion so far is couched in terms of an implicit notion that more saving generates more growth. This is, after all, consistent with the predictions of both Solowian as well as endogenous growth model. In the former, higher saving leads to higher per capita income in steady state and higher growth rate in the transitional trajectory [e.g., Solow (1956)], while in the latter, higher saving leads to a permanently higher rate of growth [e.g., Romer (1987)]. Nevertheless, if higher saving does not matter *per se* for growth, then we may get an explanation for the Indian puzzle of 'high saving and low growth'. It is to this that we devote our attention in the present subsection.

Causality between Growth and Savings: Some Recent Results

Recently, in a path breaking paper, Carroll and Weil (1994) arrived at quite a startling result on the relationship between saving and growth. Using two separate data sets, one with a subset of Summers and Heston (1991)'s Mark 5 data set comprising 64 countries, and the other with 22 OECD countries for the period 1960 - 1987, they arrived at two basic results, *viz.*, (i) growth Granger-causes saving with a positive sign; (ii) saving does not Granger-cause growth; even the insignificant causation from saving to growth is with a negative sign.

In other words, while growth encourages saving, if there is any impact of saving to growth, it is adverse. Apart from the fact that the Carroll-Weil results are counter-intuitive, the direction of causation is not only important for comprehension of growth process but also for policy design.

The Carrol-Weil results have been extended to different countries.[29] For India too Balakrishnan (1996), and Mühleisen (1997) got similar results. Mühleisen (1997) ran Granger causality tests between growth on the one hand, and total, private and public saving on the other. His results indicate that while causality from saving to growth is consistently rejected, causality from growth to saving is accepted.

Causality between Growth and Savings: Indian Evidence

The above line of research can be seen from two angles. First, this may be interpreted in line with the evidence that direct measures to boost saving are rarely effective, and policies to encourage saving should take the indirect path to enhance growth.[30] However, there could be a second line of reasoning, perhaps too literal, that may emerge from the Carroll-Weil results, namely that saving does not matter for growth. While appreciating the first approach, we have serious reservation about the second interpretation. To do so we checked the Granger causality results between saving and growth for India.

As a first step, we tried to generate a series of *real* saving and investment. Though real investment numbers, at least in its aggregate form, are available from official sources, data on real saving are absent for India. While an ideal method would be to use instrument-specific deflators, we have generated real saving series by using the GDCF deflators; an alternative real saving series have been derived through the use of GDP deflators.[31] On the other hand, investment is derived by using GCF deflator.[32]

For ensuring stationarity in the data series, we checked Dickey-Fuller (DF) and Augmented Dickey-Fuller (ADF) statistics, both for levels and first differences (not reported). All the saving/investment variables, as well as real GDP, are found to be stationary in their first differences.

The Granger causality results for the first differenced variables are reported in Table 14. The causality directions are almost uniformly from growth to saving, with non-significant causality from saving to growth. Furthermore, as in Carroll-Weil (1996), we too found a negative impact from growth to saving.

How far these results are robust? Considering the fact that as a technique Granger causality is archaic and neglects any cross-feedback, we checked the pattern of impulse responses within the framework of a two variable vector autoregression (VAR), involving first difference of real GDP (ΔY), and real saving (ΔS) or real investment ((ΔI), along with its various sectoral break ups. The impulse responses of a unit standard deviation shocks in ΔS or ΔI on ΔY, and in ΔY on ΔS or ΔI are given in Table 15. A look at it makes it clear that any shock in saving influences the output positively, and thus, it is not adverse in nature.[33] We do not claim that these evidences are extremely definitive in nature, however, the point to be noted in this connection is that deciding the direction of

causation solely based on Granger causality, which are atheoretical in nature, is essentially premature. To sum up, while we accept that the claim that generating growth is perhaps the best incentive for saving, saving matters for growth too.

Table 14: Causality between Savings, Investment and Growth

Variable/Causality	Causality from growth to Saving/Investment		Causality from Saving/ Investment to Growth	
	Granger's F	p-values	Granger's F	p-values
1. Real Saving (Deflated by GDCF Deflator)	**6.3443**	**0.016**	**0.0067**	**0.936**
Private	6.3496	0.016	0.0028	0.957
a) Household	5.9541	0.019	0.4371	0.512
b) Corporate	25.3560	0.000	6.9538	0.012
Public	1.6077	0.212	0.0032	0.955
2. Real Saving (Deflated by GDP Deflator)	**8.9089**	**0.005**	**0.5219**	**0.474**
Private	8.4699	0.006	0.3259	0.571
a) Household	7.9945	0.007	1.4868	0.230
b) Corporate	31.4263	0.000	6.3790	0.016
Public	1.3345	0.255	0.0375	0.847
3. Real Investment (GCF)	**13.8601**	**0.001**	**0.7809**	**0.382**
Private	7.1852	0.011	0.0008	0.993
a) Household	2.1052	0.154	0.7190	0.401
b) Corporate	6.5999	0.014	1.3101	0.259
Public	9.5808	0.004	4.5070	0.040

Note : (1) All the variables are in first differences. (2) Granger causality regressions uniformly take one lag.

Table 15: Impulse Responses of a shock in Saving/Investment and Output

(Rs. Crore)

LAGS	1: VAR1 (with ΔS and ΔY)		2 : VAR2 (with ΔS and ΔY)		3 : VAR3 (with ΔI and ΔY)	
	Impulse of GDP on Saving	Impulse of Saving on GDP	Impulse of GDP on Saving	Impulse of Saving on GDP	Impulse of GDP on Investment	Impulse of Investment on GDP
1	—	2952.2	—	3188.0	—	2465.8
2	1031.9	1449.0	1084.2	1287.8	1634.1	716.6
3	507.1	725.3	536.5	574.1	272.0	477.2
4	253.8	363.0	244.0	258.6	282.4	183.4
5	127.0	181.6	110.1	116.6	86.5	99.8

Note : (1) Impulse responses are based on Choleski Decomposition of the variance covariance matrix of the error vector of the VAR process.
(2) All the variables are in first differences.
(3) While Saving for VAR1 is deflated by GDCF deflator, that in VAR2 is deflated by GDP deflator.
(4) All the VAR processes have been estimated uniformly with one lag.

Section V
Conclusion

It is rather difficult to tie up the story of India's growth, saving and capital formation over the forty-six year period. We have not considered a number of important issues which have a bearing both on normative and prescriptive aspects of Indian economy in her limited sphere of these three economic variables. Nevertheless, at the risk of broad generalisations we venture the following observations.

First, the growth experience of Indian economy has been beset with a number of crises. While disregarding the crisis years, it is shown that Indian growth has followed rather a smooth upward trajectory. One may, therefore, justifiably question the extent of sustainability of such a growth process. There has been a distinct jump in India's growth since the early nineties. Nevertheless, if one views the crisis of 1991/92 as 'policy-driven', then a definitive answer to the nature of this high growth path in terms of sustainability requires to be explored, which is beyond the domain of the present paper.

Secondly, *ex post,* the phasing of saving and capital formation of the economy matched reasonably well, with the nineties ushering in a new era. However, it is premature to decide whether it is a permanent feature or a 'mere blip in the screen'.

Thirdly, we found a reasonably close correspondence (not necessarily a one-to-one variety), between the growth experience of the economy on the one hand, and saving and capital formation on the other.

Fourthly, in resolving the riddle of 'low growth and high saving/capital formation', we found that productivity performance of the Indian economy has not been a satisfying one.

Fifthly, as a possible clue to the above riddle we found that the performance of the Indian public sector has been rather poor in terms of its contribution to both growth and saving. Its impressive growth on the investment front has hinted indirectly to the adverse sustainability of the growth process.

Finally, in the policy area, the impact of growth to saving has been found to be more prominent than that of saving to growth and calls for breaking the bottlenecks to growth in order to get rid of the savings constraint.

Notes

1. We are not considering the pre-plan three-year period 1947/48 to 1949/50. For this and for a discussion on the macro-aggregates for pre-independent India, see Mukherjee (1970).

2. The basic sources of all the data reported both in the tables and the text are the various issues of *National Accounts Statistics*, New Delhi: Central Statistical Organisation (CSO).

3. Throughout the paper investment and capital formation are used interchangeably.

4. See for example, Rao (1983), Raj (1984), Bardhan (1984), Chakravarty (1987), Nagraj (1990), Bhargava and Joshi (1990), Joshi and Little (1994), and Datta Roy Choudhury (1995), among others.

5. See Nagraj (1990), and Bhargava and Joshi (1990) for alternative periodisation of India's growth experience.

6. A detailed discussion of the literature and issues on industrial deceleration is beyond the scope of the present paper; for opinions, counter-opinions, their empirical verification and a synthesis see Ahluwalia (1985).

7. The coefficients of dummy variables, with t-statistics in brackets are as follows,

	Intercept Dummies for			Slope Dummies for		
	Period I	Period II	Period III	Period I	Period II	Period III
1. GDP from Agriculture & Allied	0.1494 (0.17)	-0.0311 (0.04)	-0.0315 (0.04)	-0.0032 (0.16)	0.0022 (0.11)	0.0001 (0.01)
2. GDP from Industry	1.7191 (2.78)	2.0816 (3.35)	1.4954 (2.41)	-0.0304 (2.16)	-0.0551 (3.88)	-0.0335 (2.39)
3. GDP from Services	1.0249 (2.29)	1.2081 (2.68)	0.6797 (1.51)	-0.0253 (2.48)	-0.0353 (3.42)	-0.0160 (1.58)
4. GDP	1.1265 (2.15)	1.1478 (2.18)	0.7669 (1.45)	-0.0273 (2.29)	-0.0309 (2.56)	-0.0179 (1.51)

8. We have also tried CUSUM and CUSUM squared plots for the log-linear trend equations, for all the twenty variables considered in Table 1. These plots failed to help in deciding any economically meaningful choice of sub-periods. Considering the fact that these are merely trend equations for estimating growth rates, and have no explanatory content, this is not an unexpected outcome.

9. As for example, if the whole period is taken to be [0, T], and we are interested to detect three breaks at t_1, t_2, and t_3, then we can either do it over [0, T] or over [0, t_2], [t_1 + 1, t_3], and [t_2 + 1, T], respectively, for structural breaks at t_1, t_2, and t_3, respectively. Of course, t_1, t_2, and t_3 are to be determined *via* sequential searching through a variable Chow test.

10. Our methodology of calculating sector-wise relative contribution to GDP growth rate needs some explanation. Strictly speaking if $Y_t(i)$ is the ith sector's output at period t, then, aggregate GDP (Y_t) is simply,

$$Y_t = \sum_{i=1}^{n} Y_t(i).$$

Denoting g^x as the growth rate (x=Y, Y(i)), it can be shown that,

$$g_t^Y = \sum_{i=1}^{n} \left[\frac{Y_{t-1}^{(i)}}{Y_{t-1}} \right] g_t^{y(i)}.$$

However, following Chakravarty (1987), we have deviated from this method slightly, and each sectors relative contribution to growth is given by its trend growth rate relative to trend GDP growth rate, weighted by its share in GDP in the current period (as against last period). Thus, the sum may not add up to 100.

11. As the data base for disaggregation of GDP into private and public sector did not exist prior to the sixties, the time span for this subsection is 1965/66 to 1990/91. However, as the industry-wise decomposition of GDP from the private sector is not reported in the official statistics, following Bhargava and Joshi (1990), this is derived from industry-wise classification of overall GDP and public sector GDP.

12. As for example, see the two consecutive chapters on Indian public sector by Ahluwalia, and Bagchi in Byres (1997).

13. While we have essentially followed Bhargava and Joshi (1990)'s methodology, the periodisation differs.

14. See Chakravarty (1973) and Krishnamurthy and Saibaba (1981).

15. This is clearly reflected in Krishnamurthy and Saibaba (1981), who postulated real saving (s) function of the following form:

$$s = B_n + \frac{C}{\bar{Y}} + (B_a - B_n)\frac{Y_a P_a}{Y P},$$

where s, B_n, B_a, Y, $(Y_a P_a)/YP$, Y and C are real saving rate, marginal propensity to save in non-agricultural, and that in agricultural sector, real NNP, per capita real NNP and share of agriculture in current national income, respectively. With $(B_a - B_n)$ being negative, a higher share of agriculture in income meant a lower real saving rate.

16. See for example Chakravarty (1990) and Shetty (1990a).

17. Athukorala and Sen (1995) discussed this issue in detail.

18. It is often alleged that due to its residual nature, household physical saving is overestimated. However, it was contradicted by Athukorala and Sen (1995), who argued that aggregate capital formation is underestimated in its commodity flow measurement, as it does not capture the ongoing informalisation of Indian industry.

19. Nevertheless, it needs to be noted that definitionally 'household' sector is rather a catch-all residual entity, comprising such heterogeneous entities like pure households, unincorporated enterprises, and non-profit organisations; see CSO (1989).

20. Since, Household sector physical savings is the same as household investment, this is discussed in section 4.

21. See Shetty (1990a).

22. See for details the Raj Committee Report (1982).

23. However, Shetty and Menon (1980) noted that as these higher remittances were not invested productively, commensurate growth did not fructify.

24. Consider, for example the following statements from Chelliah Committee Report, *viz.*, (i) "....notwithstanding the fact that the private corporate sector is organised, estimates of this sector are subject to errors"(p 6); (ii) "The estimates for the household sector are worked out on the basis of the available data from various censuses, sample surveys, research studies and assumed relationship. The estimates, therefore, would have errors" (p. 6); (iii) "... the estimation of *Kutcha* construction of household sector is based on obsolete data/information from distant NSS results, and is, therefore, weak" (p. 7).

25. There is a considerable literature on sectoral estimates of total factor productivity growth (TFPG) in India. Ahluwalia (1991) is perhaps the most detailed study in this regard. Taking the overall period to be 1960-1985 and segregating it over various time periods and industries her major conclusions are as follows: (i) Indian economy has experienced a decline in productivity over the period 1959/60 to 1979/80; (ii) there has been a turnaround in productivity during the eighties; (iii) consumer goods sectors (both durable and non-durable) were the leaders in the turnaround in productivity growth; (iv) pattern of growth within the manufacturing sector was no more distorted in favour of consumer durable during the first half of eighties than in the first half of sixties. A notable exception to this view is Goldar (1986), who, on the basis of a translog production function, found that Indian large scale registered manufacturing experienced a positive TFPG. His calculations for small-scale manufacturing also indicated similar results.

26. A basic limitation of this approach is that the very working out of ICOR ignores the effect of other factors of production on output; for details see Rangarajan and Kannan (1994).

27. Note that, in discrete time, the physical definition of ICOR (v^{PD}), and the definition derived from Harrodian growth equation, $g = s/v^{H}$, are not equivalent, as shown below,

$$v^{H} = \frac{s}{g} = \frac{S_t/Y_t}{(Y_t - Y_{t-1})/Y_{t-1}} = \frac{I_t}{(Y_t - Y_{t-1})} \cdot \frac{Y_{t-1}}{Y_t} = v^{PD} \cdot \frac{Y_{t-1}}{Y_t}.$$ However, if the saving or investment propensity is expressed as percentage of output of the previous period (so that $s = S_t / Y_{t-1}$), then the two definitions are equivalent.

28. Besides this, we got at least two other methods of calculating ICOR, *viz.*, World Bank Method (in which ICOR is calculated by dividing 'real investment as a share of real GDP at factor cost' by 'corresponding rate of growth of real GDP at factor cost'), and Planning Commission Method (in which ICOR is derived by calculating the ratio of investment rate (i.e., investment as a ratio of investment of a year with GDP at market prices of the same year) to the growth rate of GDP at

market prices); see for details Rangarajan and Kannan (1993), and Planning Commission (1996).

29. See Gavin, Hausmann and Talvi (1997) for an extension of Carroll-Weil results in Latin American case.

30. See for example, Schmidt-Hebbel and Webb (1992) and Carroll and Weil (1994).

31. See Shetty (1990b) for an alternative derivation of real saving series.

32. While aggregate, as well sectoral (i.e., for household, public and private corporate), GCF is available both at current and 80/81 prices from 1980/81, prior to that, estimates for only the aggregate GCF exist. Thus, our real investment (together with its sectoral decomposition) are official statistics for post 80/81 period, but for 50/51 to 79/80, while aggregate GCF are based on official numbers, sectoral GCF is derived by deflating nominal sectoral GCF by aggregate GCF deflator.

33. In fact, corresponding to 10 saving and 5 investment variables, we generated 30 impulse responses, out of which only three are reported in the text. The impact on ΔY from a unit s.d shock of sectoral saving / investment have also been found to be positive.

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