MPRA
Munich Personal RePEc Archive

Are listed Indian firms finance constrained: Evidence for 1991-92 to 1997-98

Bagchi, A. K. and Das, Pranab Kumar and Moitra, B.

Centre for Studies in Social Sciences, Calcutta

23 February 2002

Online at https://mpra.ub.uni-muenchen.de/41611/
MPRA Paper No. 41611, posted 28 Sep 2012 20:13 UTC

Are Listed Indian Firms Finance Constrained?

Evidence for 1991-92 to 1997-98

We formulate a simultaneous equations model and with the data of a panel of 600 Indian firms for the period 1991-92 to 1997-98 test the hypothesis of finance constraint. The firms are classified by the dividend pay-out ratio into high-cost and low-cost groups; a high dividend pay-out ratio implies a low cost of information faced by the firms and vice versa. In the context of developed countries, earlier researchers found that the firms in the high-cost group shows evidence of finance constraints and severity of the constraint goes down with the decrease in the cost of information. In our study we found that the firms with medium dividend pay-out ratios are constrained in the loans market so far as investment in fixed capital is concerned. This is quite a surprising result that requires careful explanation.

AMIYA KUMAR BAGCHI, PRANAB KUMAR DAS, BHASWAR MOITRA

I
Investment Behaviour with Imperfections in Capital Market

There was no theory of aggregate investment in a market economy before the emergence of the macro-economic theory in the 1930s. In classical political economy it was assumed that investors invested what they wanted to save. But there was an idea that capitalists would cease to save and invest if the profitability of investment sank below a 'normal' level. So it would be possible to build up a theory of investment by making it a function of the rate of profit. Another idea, that relates investment to a rise in sales had been advanced by J M Clark. The question of finding the determinants of investment moved to centre stage with the *General Theory* of J M Keynes (1936) and the parallel work of Michal Kalecki, who had arrived independently at many of the ideas that went into the making of the Keynesian revolution.

However, the central quest of Keynes and Kalecki was for variables that could be seen as powerful influences on aggregate investment than for variables that determined investment at the firm level. Keynes solved the problem of constructing the micro-foundations of aggregate investment by treating that aggregate as the sum of investments of representative firms operating under rules of pure competition. As a first approximation, as every beginning student of economics knows, he took investment as a monotonic function of income and the going market rate of interest (the signs of the two partial derivatives of investment with respect to the two independent variables would, of course, be opposite of each other). Kalecki, more realistically, endowed the firms with a degree of monopoly power, but basically still treated them as representative units, whose investment levels could be aggregated to arrive at the value of investment for the economy as a whole.

Kalecki was aware that the financial structure of a firm could have an influence on its investment behaviour. In Kalecki (1937), he admitted the proposition that controllers of firms might not want to resort to the stock market or to banks for financing beyond a point, not because the investment could be unprofitable (after taking account of interest cost) but because they might fear losing control. The possible diversity of firm behaviour in the presence of such financial constraints, however, was not formally modelled for long after the seminal work of Keynes (and to a much lesser extent Kalecki) had become the commonsense of macro-economics. Keynes (1939) and Tinbergen (1939) engaged in a famous controversy over the statistical testing of theories of business cycles, of which theories of investment behaviour formed a critical ingredient. This controversy centred on the question as to whether elementary regression or correlation analysis could be applied to 'non-homogeneous' and non-stationary economic data. Keynes also criticised Tinbergen for using statistical analysis without a proper specification of the models used. However, neither in the Keynes-Tinbergen debate nor in the later, much quoted work of Meyer and Kuh (1957) did credit constraint figure as an influence on investment behaviour of firms.

The senior author of this paper tackled the issue of private investment of Indian joint stock companies in the decade of 1950s [Bagchi 1963, Chapter VIII]. That study suffered from several limitations. The data that could be easily assembled were those of firms grouped into industries, and not panel data of an assembly of individual firms. Secondly, in a situation in which government regulations acted as a constraint on the behaviour of some firms (but not others) in some years, it was difficult if not impossible, to isolate the influence of a finance constraint. Thirdly, statistical methods for handling essential non-linearities were simply not yet available. A finding of the study – not very strong – that changes in sales, rather than profit, were the proximate determinant of investment by joint stock firms during those years might have indicated that at least before the serious onset of foreign exchange shortage from 1958, most firms were demand constrained rather than constrained by finance, especially since the government essentially implemented a cheap money policy for private investment during those years.

There is now a large literature on the behaviour of firms in an imperfect capital market. If the capital market is imperfect then the costs of external and internal finance differ, violating the Modigliani-Miller theorem [Modigliani and Miller 1958] regarding the irrelevance of the financial structure of a firm. In an imperfect capital market, unlike in the neo-classical theory of investment, neither the interest rate (as in Hall and Jorgenson 1967) nor Tobin's Q (as in Lucas 1967)[1] is the determinant of investment. Tobin's Q is defined as the ratio of the shadow price of the firm to the current replacement cost of the capital of the firm. If the capital market is perfect, a typical firm's investment decision is governed by the expected profitability of the investment project. The firm invests up to the point where the expected profit from the project balances the cost of investment at the margin or when their ratio, which is essentially the marginal Q, equals unity. The change in investment due to change in marginal Q is the investment function of the firm. But in reality it is difficult to measure Tobin's Q unambiguously. Hence what one employs is the average Q, defined as the ratio of the stock market valuation of the firm to its replacement cost. The essential idea is that the expected profitability of the firm is reflected in its stock market valuation and the cost of investment is the replacement cost of existing capital. The marginal and the average Q coincide under very restrictive conditions. The assumption of perfect capital market underlying investment functions derived from Tobin's Q implies that the cost of external financing does not differ from that of internal financing. Hence investment is independent of modes of financing, say between equity or bank loan. That is to say we are back in the world of Modigliani-Miller.

Imperfections in the capital market arise, among other things, because of asymmetric information, leading to moral hazard and adverse selection between the lenders and the borrowers. Hence the costs of financing differ: internal funds cost less than external funds. Thus investment is also dependent upon the informational costs faced by the firm and hence availability of external finance in the capital market. In that case, firm investment is constrained by the availability of loans.

In an imperfect capital market, a firm's net worth is an important determinant of its creditworthiness because it represents the stake of the owners of the firm. The outside investors have little control over the funds they invest in a project, while the insiders, i e, owners of the firms, can very well divert the funds to other uses, so that the project turns bad. However the project may become unprofitable owing to an adverse state of nature. This contingency is indistinguishable to the outside investors from the fund diversion or bad management case. It is generally assumed that the larger the net worth of a firm, the higher is the insiders' (the owners' and managers') stake in it, and hence the less they are prone either to mismanage the project or cheat on its profitability. Hence in the presence of asymmetric costs of information, the net worth of the firm in relation to its borrowing is often used as a basis for judging its creditworthiness. Ceteris paribus, an increase in net worth would prompt lenders to lend more, and any credit constraint on investment will be thereby loosened. Since the net worth of a firm or its change is not generally free from noise or bubbles in the observable data most of the empirical studies use the firm's cash flow as a proxy for the change in the net worth.

Models of investment that incorporate asymmetric information were formulated by Jaffee and Russell (1976), Myers and Majluf (1984), Stiglitz and Weiss (1981), Williamson (1987)[2] among others. A major piece of empirical work in the field of imperfect capital market and firm investment is Fazzari, Hubbard and Petersen (1988). Later work includes Froot, Scharfstein and Stein (1993), Gertner, Scharfstein and Stein (1994), King and Lavine (1993). Hubbard (1997) is a good survey paper in this area; Chirinko (1993) is good survey of neoclassical theories of investment.

In some early writings, viz, Bagchi (1962), Krishnamurty (1964), Krishnamurty and Sastry (1971)[3] studied the problems of investment of Indian firms, but they had not dealt with the problems of investment in an imperfect capital market. In a recent study Ganesh-Kumar, Sen and Vaidya (2001) studied the investment behaviour of Indian firms in an imperfect capital market. They found that the firms with more outward orientation, measured by the export intensity of their sales, are less constrained in the financial markets and vice versa. We are not aware of any other study in the Indian context.

The paper is organised as follows. Section II describes the methodology, Section III describes the data and variables, Section IV reports the empirical results. The overall conclusions are presented in Section V.

II
Investment Behaviour of Firms in India: Methodology

In India, prior to 1991, the financing decisions of firms were regulated since the amount of equity issue was subject to the approval of the Controller of Capital Issues. The banks and the financial institutions were also subject to various regulations in respect of lending. So prior to 1991 it was not possible to test how far the firms were on their desired path of financing or not. Hence we concentrate on the post liberalisation era in India, viz, since 1991-92.

There are two principal approaches in the empirical literature for tackling the problem of firm investment in an imperfect capital market, viz, reduced form regression, using Tobin's Q and structural model estimation and using the Euler equation. In the former approach, a reduced form regression equation is estimated using Tobin's Q and cash flow as the regressors. In a situation where the finance is not a binding constraint, Tobin's Q is likely to explain the investment equation and the null hypothesis that the coefficient of cash flow is zero should be accepted. In the other case, the null hypothesis that the coefficient of cash flow is zero is rejected. In the structural model estimation, the investment equation is derived from the dynamic programming problem of firm investment incorporating the constraint on the availability of credit.

The investment decision of a typical firm is defined as the solution to the dynamic optimisation problem:[4]

$$\max_{I_{is}} E_t\left\{ \sum_{s=t}^{\alpha} \beta_i^s [\Pi(K_{is}, \theta_{is}) - C(I_{is}, K_{is}, \lambda_{is}) - p_s I_{is}] \right\}$$

subject to the capital accumulation constraint

$$K_{it} = (1\text{-}\delta)\, K_{it-1} + I_{it},$$

where β_i = subjective discount factor, $\Pi(\cdot)$ = Profit function, θ_{it} = exogenous shock to the profit function, $C(\cdot)$ = adjustment

cost function, p_s= tax adjusted relative price of capital goods, λ_{it}=exogenous shock to C, δ = depreciation rate.
The first order condition gives

$$p_t + C_I(\cdot) = q_{it}$$

where $q_{it} = E_t\{\sum_{s=t}^{\infty} \beta_i^s (1-\delta)[\Pi_K (K_{is}, \theta_{is}) - C_K (I_{is}, K_{is}, \lambda_{is})]\}$

The right hand side of the last equation is just the marginal Q. Specifying a linear homogeneous C function yields an investment specification

$$(I/K)_{it} = a_i + b\,[q_{it} - p_t] + \lambda_{it} + \in_{it}$$

where b is a parameter of the C function and $\in_{it}$ is an optimisation error.

Under certain assumptions (perfect competition in product and factor markets, homogeneity of fixed capital, linear homogeneity of production and adjustment cost functions, independence of financing and investment decisions) average Q can be used as a proxy for marginal Q so that the estimable equation becomes.[5]

$$(I/K)_{it} = a_i + b\,Q_{it} + \lambda_{it} + \in_{it} \qquad (1)$$

where Q_{it} is the tax adjusted value of Tobin's Q.

This form of the investment function holds when there is no friction in the capital market. In the presence of friction, we can estimate the following equation

$$(I/K)_{it} = a_i + b\,Q_{it} + c\,(CF/K)_{it} + \in_{it} \text{ (assuming } \lambda_{it} \text{ zero)} \qquad (2)$$

where cash flow (CF) serves as a proxy for change in net worth. While testing for credit constraints, firms are sorted a priori into groups of those likely to be 'constrained' and those likely to be 'unconstrained' on the basis of some measure of capital market imperfection. Fazzari, Hubbard and Petersen (1988) sorted the firms by dividend pay-out ratio. They can also be sorted by year of incorporation (or age of the firm), size of the firm, existence or absence of association with reputed industrial group, or values of interest to interest plus cash flow, etc.

In the reduced form approach, if H_0: c=0 is rejected in equation (2) then we can infer that there is no capital market imperfection affecting the investment decision of the firm.[6] Fazzari, Hubbard and Petersen (1988) and earlier researchers adopted this approach. However, the value of cash flow has some serious shortcomings as a measure of finance constraints. For example, a change in cash flow may result from a demand shift or a change in investment opportunities rather than from the change in productivity of investment. In such a situation a strong correlation between cash flow and investment may not result from capital market imperfection. The maintained assumption in the literature is that the change in cash flow is due to change in expected future profitability. If this is caused by, say a demand shift, it should be captured by some measure of investment opportunities, like Tobin's Q. Again it has also some shortcomings as a regressor in empirical applications. Firstly, the appropriate measure should be the marginal Q, which is not observable. In all empirical applications, researchers use the average Q that is observable. These two are assumed to coincide in equilibrium or assumed to move in the same direction. The structural form estimation seeks to tackle some of these problems.

In the structural estimation approach, the same value maximisation problem is set up together with an explicit constraint on the availability of outside finance. Theoretically two sets of Bellman equations[7] are derived, depending upon whether the finance constraint binds or not. As discussed earlier, the firms are classified a priori into groups of those that are likely to be constrained and those that are likely to be unconstrained using some measure of financial imperfection. Accordingly two sets of regression equations are estimated using these two groups of firms.[8] But this approach also has its limitations, particularly because the derivation of the estimable equation becomes very difficult. In

Table 1: Descriptive Statistics for Some Important Variables (Groupwise)

	M1				M2				All			
Var	Mean	Median	SD	Skew	Mean	Median	SD	Skew	Mean	Median	SD	Skew
I	42	0.19	21.69	11.61	9.14	0.47	60.09	18.67	6.78	0.37	45.23	22.64
FK	31.33	10.78	72.56	6.42	51.50	10.78	174.74	9.19	41.41	10.77	134.15	10.81
WK	4.10	1.40	10.99	5.52	6.49	1.75	18.83	8.50	5.30	1.56	15.46	8.78
ΔWK	0.89	0.09	15.57	1.92	1.49	0.06	24.76	6.51	1.19	0.08	20.68	6.01
CF	69.52	31.83	111.06	3.87	118.80	38.10	284.92	6.49	916	34.72	217.60	7.79
MV	49.84	11.98	204.13	19.78	87.28	12.51	301.33	6.84	68.56	12.19	258.0	10.42
Q	4.30	0.91	36.71	20.89	3.09	0.90	18.72	19.85	3.69	0.90	29.14	23.53
ΔQ	1.59	-0.09	34.88	20.23	1.13	-0.10	18.48	20.56	1.36	-0.09	27.91	22.72
D/E	3.97	0.76	20.22	12.33	8.51	0.74	132.22	34.81	6.24	0.75	94.60	47.62
AGE	28.95	23.00	21.29	1.36	29.32	24.00	20.50	1.49	29.13	23.00	20.94	1.42
RTD	81.03	90.46	22.52	-1.56	81.79	90.09	21.71	-1.68	81.41	90.32	22.12	-1.62
DPIY	0.08	0.16	0.57	13.87	0.35	0.32	1.01	14.84	0.33	0.2445	0.70	9.97

Notes: I= Investment, FK= Fixed capital, WK= Working capital, DWK= Investment inworking capital, CF= Cash flow, MV= Market value of the firm, Q= Average Q, DQ = Change in Q, Age= Age of the firm, RTD = Relative trading days of the equity, DPIY= Dividend pay-out ratio in 1991-92.
All the variables are calculated at constant prices.

Table 2: Descriptive Statistics for Some Important Variables Deflated by Fixed Capital (Groupwise)

	M1				M2				All			
Var	Mean	Median	SD	Skew	Mean	Median	SD	Skew	Mean	Median	SD	Skew
I/FK	0.241	0.028	4.22	41.95	0.217	0.057	0.94	22.09	0.229	0.043	3.06	55.46
WK/FK	0.273	0.12	41.68	3.05	0.43	0.155	1.69	13.02	0.351	0.142	29.49	4.29
ΔWK/FK	-0.63	-0.086	44.48	-29.7	0.116	0.006	2.18	24.73	-0.26	0.007	31.48	-41.8
CF/FK	6.02	2.49	29.63	22.37	5.95	3.14	15.2	15.56	5.98	2.85	23.56	24.34
MV/FK	5.52	1.08	41.65	18.21	4.54	1.26	21.5	15.91	5.03	1.17	33.15	20.25

Notes: I= Investment, FK= Fixed capital, WK= Working capital, ΔWK=Investment in working capital, CF= Cash flow, MV= Market value of the firm. All the variables are calculated at constant prices.

fact non-linearity of some of the functions and the presence of more than one constraint makes the derivation of the closed form solution almost impossible.

We have adopted the reduced form approach but with some amendments of the investment equation (2) as proposed by Fazzari and Petersen (1993). They emphasise the importance of the supply of working capital for running a firm.[9] If the firm faces a binding finance constraint or if the internal and external costs of finance vary because of the presence of informational costs, the supply and cost of working capital is affected. This in turn affects the profitability and the investment behaviour of the firm.

Investment in working capital[10] is more liquid and less costly to adjust compared to investment in fixed capital. For the latter, its cost of reversal is much higher. Thus when firms face a constraint in the credit market, firm investment in working capital competes with fixed investment for the limited pool of finance available. It follows that if a firm is finance-constrained, as its investment in fixed capital rises that in working capital falls, ceteris paribus. Thus when the change in working capital is included in the investment equation, it has a negative coefficient for financially constrained firms. On the other hand, a positive coefficient of investment in working capital in the fixed investment regression implies a change in the investment opportunities arising out of, say, a positive demand shift or a loosening of the finance constraint. Hence a change in working capital is a better regressor than cash flow to measure the impact of credit rationing. The marginal valuation of working capital of a firm falls with a rise in the level of working capital stock while the marginal valuation of investment in fixed capital rises as finance constraint tightens. As this happens, firms will be more willing to substitute more of working capital for fixed investment. Hence one would expect investment in working capital to bear a positive relation with the stock of working capital.

Working capital is defined as current assets (accounts receivables, inventories, and cash) less current liabilities (accounts payable and short-term debt). However, it may be noted that working capital is correlated with sales and cash flow. These problems can be avoided if one considers two sets of regressions. The first is a set of regressions of investment on Q, cash flow, changes in working capital, etc. The second is a set of regressions of change in working capital on cash flow, Q and the stock of working capital. Thus we have a system of simultaneous equations which could be estimated employing 2-SLS or 3-SLS.

III
Data and Variables

For empirical analysis we use the firm level panel data compiled by the Centre for Monitoring Indian Economy (CMIE) and distributed through its software 'ProwesS'. The CMIE provides firm level data for several variables from the annual audited financial results of the respective firms and the data on share price and related variables from the Bombay Stock Exchange (BSE) (or any other stock exchange in India, if that firm is not listed in BSE) daily transaction statements. From the database of ProwesS we have taken the firms listed in any stock exchange in India, incorporated prior to 1991 and the accounting year is (or at least for our period of coverage) April to March.[11] Given these criteria we found 600 firms in the database for which seven years of data are available, viz, 1991-92 to 1997-98. However, there are several variables in a form of annual changes. Hence for actual estimation, total number of years covered is six. Thus we have a panel of 600 firms with six years of observations, 1992-93 to 1997-98. These 600 firms belong to 40 broad industry groups. The industry groupings are based on the criteria of sales: if for a firm 50 per cent or more of sales come from a particular product then the firm is classified into that industry group and if a firm does not satisfy this criterion for any product, then it is classified into the category of diversified firms.

For empirical study, we need data on the following variables or some variables computed from them, viz, investment, capital stock at replacement cost, working capital stock, change in working capital, inventory, cash flow, tax adjusted value of Tobin's Q, dividends, etc. Many of these variables are required to be taken at con-

Table 3: Descriptive Statistics for Some Important Borrowing Ratios (Groupwise)

	M1		M2		All	
Var (Per cent)	Mean	Median	Mean	Median	Mean	Median
TB	44.34	42.65	39.85	39.97	42.10	41.14
TBB	41.28	37.72	42.47	39.33	41.87	38.49
TBBS	35.16	31.74	36.82	33.06	35.99	32.43
TBF	31.99	30.44	25.56	21.77	28.78	25.79
ES	68.10	63.12	33.12	68.22	50.62	66.06
KM	21.31	0.22	28.31	2.30	24.81	1.03
SB	56.28	45.71	13.53	46.41	34.92	46.11
SBB	72.53	48.49	34.49	51.84	53.53	50.06
SBBS	58.51	36.12	28.79	41.28	43.17	38.55
SBF	-2.99	22.66	4.27	16.50	0.64	19.71
R	17.07	15.76	16.57	15.61	16.82	15.70
RL	21.77	13.04	21.98	13.02	21.87	13.04

Notes: TB= Total borrowing as per cent of total liability; TBB= Total bank borrowing as per cent of total borrowing; TBBS =Total short-term bank borrowing as per cent of total borrowing; TBF= Total financial institute borrowing as per cent of total borrowing; ES= External source of funding as per cent total funds; KM= Capital market source as per cent of external funding; SB= Borrowing as per cent of external funding; SBB= Bank funding as per cent of total borrowing source; SBBS= Short-term bank funding as per cent of total borrowing source; SBF= Financial institute funding to total borrowing source; R= Interest expenditure as per cent of total borrowing; RL= Long-term interest expenditure as per cent of total non-bank borrowing.

Table 4: Some Important Rates of Return (Groupwise)

	M1			M2			All		
Var	Mean	Median	SD	Mean	Median	SD	Mean	Median	SD
R_MV1	20.17	8.22	246.83	8.94	9.21	50.91	14.55	8.70	178.27
R_MV	33.23	7.14	453.27	90.54	8.04	2356.2	61.89	7.61	1696.6
R_FK1	18.23	10.03	110.77	19.88	11.16	45.09	19.05	10.65	84.56
R_FK	14.84	8.95	102.76	16.03	9.87	31.09	15.43	9.38	75.90
R_IK1	5.72	6.89	319	8.98	7.49	20.99	7.35	13.07	28.39
R_IK	4.91	6.16	51.56	7.08	6.81	21.35	5.99	6.52	39.49

Notes: R_MV1= Rate of profit on last period's equity; R_MV= Rate of profit on current period's equity; R_FK1= Rate of profit on last period's fixed capital; R_FK= Rate of profit on current period's fixed capital. R_IK1= Rate of profit on last period's invested capital R_IK= Rate of profit on current period's invested capital.

stant prices. This was achieved by deflating the current price values with appropriate price indices. The value of capital stock at constant price is taken to be the value of plant and machinery deflated by the price index of gross domestic fixed capital formation. Instead of gross (or net) fixed capital formation, we consider only change in the value of plant and machinery because of the fact that the former also includes land. Following precedence, we also define cash flow as income plus amortisation plus depreciation that is deflated by the wholesale price index for the industry group to which it belongs. Working capital is defined as current assets less current liabilities. The former comprises accounts receivables, inventories and cash while the latter comprises accounts payable and short-term debt (debts of less than one year maturity). Working capital is deflated by the price index for stocks (of inventories).

Tobin's Q is defined as the ratio of the market value of the firm to its replacement cost. The market value is defined as the sum of market value of equity plus market value of long-term debt. The market value of equity is the price of shares multiplied by the number of shares outstanding. To get a representative annual average price of equity we take the simple average of daily prices. As there is no significant secondary market for long-term debt of the firms, the book value of such debts is taken as their market value. The replacement cost of capital is difficult to calculate – there is arbitrariness in the selection of depreciation rate, valuation of old capital at current prices, etc. Moreover, the companies periodically revalue their capital. Hence, we treat the value in the company accounts as replacement cost of capital.[12] To make the numerator and denominator comparable we have to either deduct the stock of inventories from the numerator or add it to the denominator. We tried both in our empirical analysis. There is no difference in result. To arrive at the tax adjusted value of Tobin's Q we take the tax net of the Q ratio where the tax rate in each year for each company is calculated on the basis of its actual tax payment made in the current year. The tax rate is calculated as the proportion of profit before tax, if there is a payment of tax; otherwise it is set at zero. The market value of the firm is deflated by the GDP deflator while capital at replacement cost is deflated by price index for gross domestic fixed capital formation. Thus the tax adjusted value of Tobin's Q and the tax rate are given by:

$$Q = (1-t)\ \frac{P^s N^s + TL - INV}{K}\ \frac{P^k}{P}$$

$$\text{and } t = \frac{PBT - PAT}{PBT}$$

where P^s = annual average of equity price, N^s = number of equities outstanding, TL= long-term loans, INV= stock of inventories, K = capital stock at replacement cost, P^k = price index of gross domestic fixed capital formation, P = GDP deflator, PBT = profit before tax, PAT = profit after tax.

As discussed earlier the degree of credit constraint depends upon the extent of the informational problems that the firms face in the loans market. Fazzari, Hubbard and Petersen (1988), as mentioned above, used the dividend pay-out ratios in some initial years to classify firms facing different degrees of informational incompleteness. The dividend pay-out ratio is defined as the ratio of dividend payment to profit after tax. The data for the initial years are not used for estimation purposes and are called off sample year data. The logic of using dividend pay-out ratio to classify firms into more (or less) costly information groups is borrowed from the public economics literature [Auerbach 1979, Bradford 1981, King 1977] in which dividends are treated as residuals in firm decisions. Let us consider a firm for which the cost of external finance is higher than that of internal finance and the adjustment cost of capital is higher than the cost of adjusting payouts. Then paying high dividends for such firms is not consistent with value maximisation in the presence of profitable investment opportunities. Hence the firms that retain a larger proportion of their current profit than others belong to the group of firms facing a high cost of external finance and, hence, are likely to face finance constraint. However, the underlying assumption in this approach is that the firms are free from any take over bids in the period under consideration. Otherwise a low dividend may lead to a take over of the firm.

However, the grouping of firms by dividend pay-out ratios may be inappropriate if the cost of adjusting pay-out is lower than the cost of adjusting capital stock. Even if the cost of pay-out is higher, it may not work if the firms deliberately adopt a policy of paying large dividends so as to give a wrong signal to the outside investors. Hence, one should also look for other criteria for classifying firms. Other such possible criteria are the value of capital stock, age of the firm, growth of sales, credit rating in the initial years, market capitalisation, underwriting cost, association with some industrial group or bank, concentration of ownership, or the frequency of trading of its equity in the stock market.

Instead of classifying the firms on the basis of off sample years one can also employ the classification criteria in the sample years or take the average of the criteria in the sample years and then use them to classify the firms.[13] We employed the dividend pay-out ratio of the initial year (i e, 1991-92)[14] to classify the firms into two different groups, viz, the firms to the left of the median dividend pay-out ratio and to the right of the median dividend pay-out ratio (M1 and M2 respectively, for short). M1 comprises of the firm with dividend pay-out ratio [0 per cent 24 per cent] and M2 with dividend pay-out ratio (24 per cent 100 per cent].[15] Fazzari, Hubbard and Petersen (1988) classified the firms into two groups, viz, zero dividend paying and positive dividend paying firms. The zero dividend paying group in our case is by and large the first quartile.[16] We also grouped firms on the basis of below average and above average dividend pay-out ratio, but the corresponding regression results are found to be extremely poor implying a meaningless classification.

Table 5: Panel Data Estimation of Investment Function: the Case of Single Equation (Coefficient: Q)

	Estimated Coefficients of		R^2
	CF	Q	
Group: M1	0.026	-0.0002	0.181
	(5.19)	(-0.06)	
Group: M2	0.031	0.00003	0.266
	(13.24)	(0.02)	

Notes: (1) All the level variables are deflated by capital stock.
(2) The figures in the parentheses are the respective t-ratios.

Table 6: Panel Data Estimation of Investment Function: The Case of Single Equation (Coefficient: ΔQ)

	Estimated Coefficients of		R^2
	CF	ΔQ	
Group: M1	0.02	-0.018	0.200
	(3.95)	(-5.94)	
Group: M2	0.031	-0.0004	0.266
	(13.19)	(-0.32)	

Notes: (1) All the level variables are deflated by capital stock.
(2) The figures in the parentheses are the respective t-ratios.

We also classified firms on the basis of percentiles other than the median as will become evident as we proceed.

IV
Empirical Results

The empirical results are divided into two subsections – results on the basis of descriptive statistics and those based on the econometric results.

Descriptive Statistics

In Tables 1 through 4 we give descriptive statistics for some of the variables of importance while in Tables 5 through 9 we give the regression results. All the variables except the ratios are taken at constant prices. We denote those firms with lower dividend pay-out ratios as M1 and those with the higher ratios as M2. Table 1 shows that the mean investment is lower for M1 than for M2 while Q as well as its change, ΔQ, is higher in M1 than in M2. The median investment is also lower in M1 than in M2 but the median value for Q is the same for both the groups and for ΔQ they are very close. The corresponding standard deviation is higher for M1. These suggest that there are some firms in M1 for which Q and ΔQ values are very large relative to those for M2 firms. This factor raises the Q and ΔQ values for M1 firms. Though the mean value of fixed capital is higher for M2 than for M1, the corresponding median values coincide. This means that there are some relatively large firms in M2 whose presence raises the mean value of fixed capital stock of M2. This inference is also confirmed by a lower standard deviation of capital for M1 than for M2. The data indicate that there are important diversities within M1 and M2. The mean cash flow is lower for M1 than M2 while the medians are very close but the standard deviation is higher for M2. This also suggests that the presence of some very large firms is raising the mean cash flow in M2, and is influencing the market values of the firms. Both the mean debt-equity ratio and the corresponding standard deviations are higher for M2 than M1 while the median values for both the groups are pretty close. This also suggests that there are some firms in M2 with very high debt-equity ratios for which the mean is higher for M2. However there is no marked difference in respect of the mean age of the firms and the relative trading days of the two groups.

Table 2 gives the descriptive statistics for some of the variables deflated by the capital stock, the deflation is expected to nullify the size effect.[17] In some cases the relative position of the descriptive statistics for the deflated variables for the two groups are the reverse of those of the non-deflated values. This observation applies to cash flow, market value of the firms and less strongly, for investment. As explained earlier there are some firms in M2 with relatively large values for investment, capital stock, market value, cash flow, etc, and, hence, the mean values of M2 in those cases are higher though the medians are very close. As a result of deflating, the size effect gets reduced so that they are reversed in some cases. In the case of investment, the deflated values for the mean are very close across groups. In the case of change in working capital, the mean is still lower in M1; it actually becomes negative in M1 while that in M2 it is still positive.

Table 3 gives some of the borrowing ratios, for stocks as well as flows. The variation is not significant for the stock ratios across groups. Total borrowing as a percentage of total liability is around 40 per cent for both the groups – 43.4 per cent for M1 and 39.85 per cent for M2. The medians are also very close to the respective means implying both an intra- and an inter-group similarity in this ratio. However, the proportion of borrowing from financial institutions is around 10 per cent more for M1 than M2. Among the ratios for the flow variables, that for external source of borrowing is more than double in the case of M1 compared with M2. That is to say, M2 firms finance a larger share of investment with retained earnings. But one would expect it to be the other way round when firms are classified by the dividend pay-out ratio. The distribution of external source of borrowing as judged by median values is more symmetric for M1 than for M2 firms and the standard deviation is three times higher for M1 firms. Thus one can infer that there are a few firms with very low levels of external source of funding in M2 so that the average is lowered. Of the total external funding, the capital market as the source is slightly less important in M1, but bank funding is very important for M1. Bank funding for short-term loans is used mainly for working capital purposes and it accounts for 58.51 per cent in case of M1 as against 28.79 per cent for M2. Banks as the source of total finance as well as for short-term requirement are more prominent in the case of M1. The financial institutions as the source of new loans is not important for both the groups, it is in fact negative for M1 implying that more of the financial

Table 7: Regression Results : Simultaneous Equations Model (Coefficient: Q)

	Dependent Variable	Estimated Coefficients of CF	Q	WK	ΔWK^f	R^2
Group: M1	ΔWK	0.452	-0.369	0.735		0.716
		(14.56)	(-16.81)	(46.23)		
	I	0.025	0.0021		0.003	0.182
		(5.01)	(0.50)		(0.92)	
Group: M2	ΔWK	0.145	0.0002	0.461		0.776
		(38.0)	(0.14)	(16.66)		
	I	0.062	0.0004		-0.165	0.272
		(6.86)	(0,03)		(-3.52)	

Notes: (1) All the level variables are deflated by capital stock.
(2) The figures in the parentheses are the respective t-ratios.

Table 8: Regression Results : Simultaneous Equations Model (Coefficient: ΔQ)

	Dependent Variable	Estimated Coefficients of CF	ΔQ	WK	ΔWK^f	R^2
Group: M1	ΔWK	0.279	-0.047	0.702		0.766
		(9.58)	(-25.73)	(48.78)		
	I	0.019	-0.021		-0.004	0.201
		(3.9)	(-5.15)		(-1.12)	
Group: M2	ΔWK	0.145	0.59	0.461		0.776
		(37.98)	(0.37)	(16.66)		
	I	0.062	-0.0003		-0.165	0.272
		(6.85)	(-0.26)		(-3.52)	

Notes: (1) All the level variables are deflated by capital stock.
(2) The figures in the parentheses are the respective t-ratios.

institutions' loans are repaid than is borrowed. This is not very surprising, as very often the funding from the financial institutions such as LIC, GIC, IDBI, ICICI takes the form of equity rather than loans. The mean as well as median interest cost as a percentage of aggregate loans are very close across groups though the standard deviation is higher in case of M1. However, the distributions for the groups are quite symmetric. The distribution of interest expenditure as the percentage of non-bank loans that is more long term in nature is more asymmetric for the groups (though the nature of the asymmetry is similar across groups).

In Table 4 we have calculated rates of return on selected values such as equity, fixed capital and invested capital and these variables have also been differentiated according to dates. Though we have reported rates of return on current as well as lagged values of equity, fixed capital and working capital, the lagged rates are conceptually more appropriate. Also the standard deviation for the current rates of return is generally higher and therefore they are more volatile. Hence we concentrate on the lagged rates of return. We have found no particular pattern for the rates of return across groups.

Regression Results

The regression results are given in Tables 5 through 9. We test whether c, the coefficient of cash flow in the equation in (1) is different from zero. If H_0: c=0 is rejected, it implies a correlation between investment and cash flow, which in turn implies the presence of credit constraint. The results are reported in Table 5. We employed here the method of panel data estimation [Baltagi 1995]. As per the standard econometric practice we reported only the within firm estimates. Moreover, we found the fixed effects model to be the appropriate one for all the groups as per the results of the Hausman test.[18]

From Table 5 we find that the coefficient of cash flow is positive and significant for both the groups and the sensitivities of investment to cash flow are pretty close across groups. On the other hand, Q has no effect on the investment of a firm belonging to any group. The overall performance of the regression equation, as measured by R^2, is better for M2 than for M1. We also estimated the investment equation with change in Q (ΔQ) and report the results in Table 6. The results are similar to those in Table 5 except that ΔQ is now significant for M1 with a negative sign. This implies that investment is negatively related with the rate of change in Q.

As stated earlier, the significance of cash flow is not a conclusive proof of credit constraint. Cash flow and investment would be positively correlated if investment opportunity increases. In the existing literature the standard position is that a change in investment opportunities is reflected in the Q values. But in our case, as reported in Table 5, the coefficient of Q is insignificant.

This needs further exploration. We have already argued in the spirit of Fazzari and Petersen (1993) that in a situation of binding credit constraint, firms substitute investment in fixed capital by investment in working capital. Thus we also include investment in working capital, i e, change in working capital, in the investment equation (3). However, investment in working capital is itself a decision variable for the firm. Hence we set up a simultaneous equations model. Investment in working capital equation (4), depends on Q, cash flow and the stock of working capital.

$$\frac{I_{it}}{K_{i,t-1}} = a_1 + b\,Q_{it} + c\,\frac{CF_{it}}{K_{i,t-1}} + d\,\frac{\Delta WK_{it}}{K_{i,t-1}} + U_{it} \qquad (3)$$

$$\frac{\Delta WK_{it}}{K_{i,t-1}} = a_2 + \mu\,Q_{it} + \theta\,\frac{CF_{it}}{K_{i,t-1}} + \gamma\,\frac{WK_{it}}{K_{i,t-1}} + V_{it} \qquad (4)$$

where I_{it} = investment, K_{it} = capital stock (plant and machinery in our definition), CF_{it} = cash flow, Q_{it} = tax adjusted value of Q, WK_{it} = working capital, ΔWK_{it} = change in working capital, a_i = firm specific factor for investment equation, θ_i = firm specific factor for change in working capital equation, U_{it} = disturbance term for investment equation, V_{it} = disturbance term for change in working capital equation, i and t are the indices for firm and year respectively. In order to take care of heteroscedasticity each variable in the regression equations other than those that are ratios is divided by $K_{i,t-1}$.

Given their nature, the equations can be estimated by 2-SLS. First we estimate equation (4) and use it to get the forecast values of change in working capital, ΔWK_{it}^f which is then used to estimate equation (3). The identification problem fortunately does not raise its head here. The estimation results are reported in Tables 7 and 8. Here also we only reported the within firm estimator. As before, the Hausman test shows that the model is that of fixed effects type for all the groups.

The results, as reported in Tables 7 and 8, show that cash flow is still an important explanatory variable for fixed investment. But unlike in the single equation case, now the value of its coefficient is strikingly different between the two groups, viz, 0.025 for M1 and 0.062 for M2. Q is still insignificant in the fixed investment equation for both the groups, though the coefficient of ΔQ in the fixed investment equation is negative and significant. The coefficients of the explanatory variables in the investment in working capital equation (4) are of expected signs. The striking result is the value of the coefficient of ΔWK^f in fixed investment equation (ΔWK^f is the forecast value of ΔWK obtained from the estimated equation of (3)). It is insignificant for M1 and negative and significant for M2. In other words this result suggests that the firms in M2 with a high dividend pay-out ratio face problems in the loans market. The firms of this group cannot borrow in the loans market as they like and/or the cost of internal finance is lower than that of the external finance. Hence these firms resort to working capital funds for investing in

Table 9: Properties of ΔWK^f in the Fixed Investment Equation

Cut Off Percentile	Dividend Pay Out Interval (Per Cent)		Coeff of ΔWK^f in Investment Equation	
	Lower	Upper	Lower	Upper
(1)	(2)	(3)	(4)	(5)
20	≤ = 0	(0 1000%]	+ve significant	non-significant
25	[0 3.51]	(3.51 1000]	+ve significant	non-significant
30	[0 12.39]	(12.39 1000]	non-significant	-ve significant
40	[0 19.56]	(19.56 1000]	non-significant	-ve significant
50	[0 245]	(245 1000]	non-significant	-ve significant
60	[0 30.52]	(30.52 1000]	non-significant	-ve significant
70	[0 36.51]	(36.51 1000]	non-significant	non-significant
80	[0 448]	(448 1000]	non-significant	non-significant
90	[0 55.59]	(55.59 1000]	non-significant	non-significant

fixed capital. Fazzari, Hubbard and Petersen (1988) and Fazzari and Petersen (1993) obtained the expected result, viz, finance constraints are more stringent for low-dividend paying firms compared to the high-dividend paying firms, but our result indicates a contrary phenomenon.

This apparently striking result needs to be carefully examined. The classification of the firms into lower and upper pay-out groups on the basis of the median, as we indicated earlier, is rather arbitrary. In order to minimise the degree of arbitrariness, we further classified the firms into low-dividend paying and high dividend paying groups on the basis of the other percentiles of dividend pay-out ratio in 1991-92. We divided the firms into two groups by taking 20 percentile and the rest, 25 percentile and the rest, and so on up to 90 percentile and the rest. Thus in the case of 20 percentile cut-off ratio, all the firms with dividend pay-out ratios higher than those obtaining for the 20 percentile groups form the upper dividend pay-out group. A similar observation applies to the classes obtained by using 25 percentiles, etc. These percentiles and the corresponding dividend pay-out intervals are given in Table 9. We estimated the simultaneous equations model for the low and high pay-out groups for all the percentiles. The results are by and large the same as before except for the coefficient of investment in working capital in equation (4). As the fourth column of Table 9 shows, the coefficient of ΔWK^f is positive and significant for low pay-out group when the cut-off is at 20 percentile and 25 percentile, i e, up to pay-out ratio of 12.39 per cent. For the rest, the coefficient of ΔWK^f is non-significant. For the high paying group (last column of Table 9), the coefficient of ΔWK^f is negative and significant up to the cut-off of 40 percentile, i e, up to when the upper pay out interval is 30.52 per cent and higher. Thereafter it becomes non-significant when the upper pay-out interval is 36.51 per cent and higher. Thus we see that when the upper pay-out interval is in between [12.39 per cent 1,000 per cent] and [30.52 per cent 1,000 per cent], the firms in this group are finance constrained, while firms in the lower pay-out group for any pay-out interval are unconstrained. To check whether the result is biased by differences in weightage of particular industries in the groups classified by dividend pay-out ratios, we computed the industrywise distribution of firms in the high and low pay-out groups. No significant differences in industry weightage between the different dividend pay-out groups were observed. We also checked for the relative importance of top 50 business houses in the two groups. It is also found to be uniform across groups: 81 in M1 and 83 in M2.

As we have already observed, Table 9 also reveals that the financial constraint binds for the group of firms in the 30th to 70th percentile range. We subjected these firms to some closer inspection. In particular, we divided these firms by the ratio of their investment to previous year's capital stock for each year. For each year there were three categories: firms belonging to the bottom 10 per cent; firms belonging to the top 10 per cent; and the rest. We eliminated those firms that had investment to previous year's capital stock in either of the first two groups in at least two years of the study period. The idea was to concentrate on those firms whose ratios of investment to previous year's capital stock were in general outside the tails of the distribution. For these firms, the value of γ was -1.36 (significant). This result supports our conjecture that the finance constraint is strongest for firms within this group. We found no evidence that membership of firms in the set of top 50 business groups plays any significant role.

A tentative interpretation of our results is as follows. The firms in the low dividend-paying group by definition retain most of their profits and can then use them for making investment, or for ploughing them into other firms of the business group or transfer them in other ways. We find in fact that they invest less than the high paying group – the average investment is lower in this group than in the other group. We also find that they have a lower average cash flow. In addition to the factors mentioned above, it is also likely that lower profitability prospects prompt the firms to invest at a lower rate. A low dividend pay-out ratio is not a hurdle to get outside finance. The debt-equity ratio of these firms, which is based on the stock variables is lower so that availability of new external funding is not very difficult. In fact this group has higher average external finance (68.1 per cent) than the other group (33.12 per cent). The proportion of borrowing in external finance (56.28 per cent for M1 and 13.53 per cent for M2) and bank borrowing in total borrowing (72.53 per cent for M1 and 349 per cent for M2) are also higher for the low dividend paying group.

The firms in the very high dividend-paying group, viz, 36.51 per cent and above have also no difficulty in getting external finance. This is consistent with the results of Fazzari et al. The firms in the medium dividend-paying group, viz, in the interval [12.39 per cent to 30.52 per cent] have difficulty in getting external finance for investment. These firms have a very high retention ratio and they finance their investment mainly through retained earnings because they cannot borrow as much in the loans market as they want.

To find out the effects of some other variables on the firm investment we used some other possible regressors, like age of the firm, relative trading days, debt-equity ratio, rate of return (all the rates of return as in Table 4), etc. The coefficients of these variables in the investment equations were found to be insignificant.

V
Conclusion

The purpose of this paper has been to analyse the effects of imperfections of the capital market on investment in fixed capital by Indian firms. Does an imperfect credit market act as a binding constraint on investment of the Indian firms? To pursue our goal we investigated the role of working capital in a finance constraint regime. We set up a simultaneous equations model that incorporate the interactions of investment in fixed capital with that of working capital. The firms that face higher cost in the loans market are more likely to face finance constraint. Hence firms are classified into high information cost group and low information cost group. We employed the dividend pay-out ratio in the initial year as the classification criterion as is the standard practice in the literature. The firms below the median dividend pay-out ratio in 1991-92 are classified into high information cost group and the firms above the median dividend pay-out ratio in 1991-92 is classified into low information cost group. We estimated the single equation model of investment and also the simultaneous equations model for each group.

The main conclusions of this study are the following. First, cash flow is the most important determinant of firm investment for the low dividend as well as the high dividend paying groups. But the sensitivity of investment to cash flow is higher for the high dividend paying group. Tobin's Q has no role in explaining investment, though the coefficient of changes in Q is significant for the low dividend-paying group. Second, the investment levels in fixed capital for the low dividend paying group (i e, high information cost) are not found to be finance-constrained. The very high dividend-paying group is also not constrained in the loans market for financing investment. It is the medium dividend-paying group who are really finance-constrained as far as fixed investment is concerned.

This result can arise because of two sets of reasons that are polar opposite of each other. A firm may pay high dividends, because the managers know that they can raise whatever finance they need by borrowing from banks or by floating debentures or equities. Hence, the firm is not finance-constrained in its decisions. A firm may also pay high dividends because it faces low investment opportunities: it is not constrained by finance as it has few profitable projects to finance anyway. In the case of low dividend pay-outs, the reason may be again that either the profitability is low and hence the firm simply does not intend to squander internal resources by pleasing outside shareholders. In the opposite case, while the profitability of new projects is high, the groups in control wants to use mainly internal resources for financing projects, so that they can be sure of retaining control. When an active market for corporate control arises, of course, the firms with low dividend payout ratios become candidates for hostile takeover bids. Our experience points to the need to do further work to pinpoint the exact position of these two groups of firms in respect of investment opportunities, the nature of corporate control and threat of takeover bids. EPW

Notes

1 For original formulation of Q theory of investment see Brainard and Tobin (1968) and Tobin (1969).

2 Jaffee and Russel (1976), and Stiglitz and Weiss (1981) apply the informational problems in the loans market and Williamson (1987) also applies it in the loans market with costly state verification while Myers and Majluf (1984) applies it to the equity market.

3 A survey of the literature could be found in Krishnamurty and Sastry (1975) and also in Desai (1973).

4 See Auerbach (1979) for the dynamic formulation used here

5 The dependent variable or the regressors that are in levels in the estimable equation when divided by K also takes care of heteroscedasticity in panel data.

6 See Hubbard, Kashyap and Whited (1995), Lamont (1997), Calmoris and Hubbard (1990), Devereux and Schiantarelli (1990).

7 Bellman equation is the first order condition of maximisation of the dynamic programming problem.

8 See Whited (1992) who employed this approach.

9 Earlier discussions on the role of working capital could be found in Dewing (1941), Meltzer (1960). Also see Mckinon (1973) and Shaw (1973) for the role of working capital in the developing countries in general and Rakshit (1987), (1989) for the Indian case.

10 In Das (1996) it has been showed that when firms are constrained by the availability of fixed capital lonas, it increases the use of working capital loans compared to that in a free optimum situation. It follows from the production function relation.

11 Different firms in India follow different types of accounting years, such as January to December, April to March, September to August, etc. Also some firms switch over from one type of accounting year to another type. As a result the reported annual statements are not always comparable across different firms or for a particular firm over the years. To get rid of this problem we chose only those firms which adopt April to March as their accounting year.

12 It may however be noted that the revaluation or adjustment for depreciation is more dependent on tax considerations.

13 It may be noted that the classification criteria of the initial year may change in the sample years and as a result low information cost firm(s) may find a position in the high information cost group and vice versa. But separate classification for each year poses another problem with panel data, viz, the panel becomes an unbalanced panel. However this problem does not arise in our case as the classification as of 1991-92 does not change much in the sample years. We calculated the correlation between 1991-92 rank with that of the other years both by dividend pay-out ratio and capital stock and these are found to be very high: higher than 0.9.

14 It may be noted it is in fact since 1991 that one may adopt such classification because prior to 1991 the Controller of Capital Issues regulated both the dividend payments as well as the equity dividend. So firms' dividend decisions were not a free choice.

15 Ganesh-Kumar et al (2001), classify the firms in their paper by the proportion of exports in total sales. For Tobin's Q they employed the change in sales as a proxy.

16 The first quartile is the group of firms for which dividend pay-out ratio belongs to [0 per cent 3.5 per cent). There is only one firm in this group with positive dividend pay-out ratio in 1991-92, viz, 1.24 per cent.

17 An alternative deflator to take care of size effect is sales. However sales and capital stock are found to be very closely related and either one can be used to deflate the variables. This is true for regression results also.

18 In this test H_0: Random Effects Model is tested against the H_1: Fixed Effects Model.

References

Auerbach, Alan J (1979): 'Wealth Maximisation and the Cost of Capital', *Quarterly Journal of Economics*, 94(3), pp 443-56.

Bagchi, A K (1962): 'Investment by Privately Owned Joint Stock Companies in India', *Arthaniti* (July).

– (1963): 'Private Investment in a Partially Planned Economy', unpublished PhD thesis, University of Cambridge.

Baltagi, Badi H (1995): *Econometric Analysis of Panel Data*, John Wiley, Chichester.

Bond, Stephen and Costas Meghir (1994): 'Dynamic Investment Models and Firm's Financial Policy', *Review of Economic Studies*, 61(2), pp 233-58.

Bradford, David F (1981): 'The Incidence and Allocation of a Tax on Corporate Distributions', *Journal of Public Economics*, 15 (1), pp 1-22.

Brainard, W C and J Tobin (1968): 'Pitfalls in Financial Model Building', *American Economic Review*, 58, 2, 99-122.

Calomiris, Charles W and Hubbard R Glenn (1990): 'Firm Heterogeneity, Internal Finance, and Credit Rationing', *Economic Journal*, 100(1), pp 90-104.

Chirinko, Robert S (1993): 'Business Fixed Investment Spending: A Critical Survey of Modelling Strategies, Empirical Results, and Policy Implications', *Journal of Economic Literature*, 31(4), pp 1875-1911.

Das, Pranab Kumar (1996): 'Stochastic Rationing of Credit and Economic Activities in a Model of Monopolistic Competition', Occasional Paper No 154, Centre for Studies in Social Science, Calcutta.

Desai, M J (1973): 'Macroeconometric Models for India', *Sankhya*, Series B, Vol 35, Part II.

Devereux, Michal and Fabio Schiantarelli (1990): 'Investment, Financial Factors, and Cash Flow: Evidence from UK Panel Data' in Glenn Hubard (ed), *Asymmetric Information Information, Corporate Finance, and Investment*, University of Chicago Press, Chicago.

Dewing, A S (1941): *The Financial Policy of Corporations* (4th ed), The Ronald Press, New York.

Fazzari, Steven M, Hubbard, R Glenn and Bruce C Petersen (1988): 'Financing Constraints and Corporate Investment', *Brookings Papers on Economic Activities*, pp 141-95.

Fazzari, Steven M and Bruce C Petersen (1993): 'Working Capital and Fixed Investment: New Evidence on Financing Constraints', *RAND Journal of Economics,* 24(4), 328-41.

Froot, Kenneth A, David S Scharfstein and Jeremy C Stein (1993): 'Risk Management: Coordinating Corporate Investment and Financing Policies', *Journal of Finance*, 48(5), pp 629-58.

Gertner, Robert H, David S Scharfstein and Jeremy C Stein (1994): 'Internal versus External Capital Markets', *Quarterly Journal of Economics*, 109(4), pp 1211-30.

Ganesh-Kumar, A, K Sen and R R Vaidya (2001): 'Outward Orientation, Investment and Finance Constraints: A Study of Indian Firms', *Journal of Development Studies*, 37, 4, pp 133-49.

Gilchrist, Simon and Charles P Himmelberg (1995): 'Evidence on the Role of Cash Flow in Reduced-Form Investment Equations', *Journal of Monetary Economics*, 36, pp 541-72.

Hall, Robert and D W Jorgenson (1967): 'Tax Policy and Investment Behaviour', *American*

Economic Review, 57, pp 391-414.
Hubbard,R Glenn, Anil K Kashyap and Toni M Whited (1995): 'Internal Finance and Firm Investment', *Journal of Money, Credit, and Banking*, 27(4), pp 683-701.
Hubbard, R Glenn (1997): '*Capital Market Imperfection and Investment*', NBER Working Paper No 5996.
Jaffee, D and T Russel (1976): 'Imperfect Information and Credit Rationing', *Quarterly Journal of Economics*, 90(4), pp 651-66.
Kalecki, M (1937): 'The Principle of Increasing Risk', *Economica*, reprinted as 'Entrepreneurial Capital and Investment', Chapter 8 in Kalecki (1954).
– (1954): *Theory of Economic Dynamics*, Allen and Urwin, London.
Kaplan, Steven N and Luigi Zingales (1997): 'Do Financing Constraint Explain Why Investment Is Correlated With Cash Flow?', *Quarterly Journal of Economics*, 112(1), pp 565-92.
Keynes, J M (1936): *The General Theory of Employment, Interest and Money*, Macmillan, London.
– (1939): 'Professor Tinbergen's Method', [Review of Tinbergen (1939)], *Economic Journal*, September, Reprinted in Keynes (1973), pp 306-17.
– (1940): 'On a Method of Statistical Research: Comment', *Economic Journal*, March, Reprinted in Keynes (1973), pp 318-20.
– (1973): *The Collected Writings of John Maynard Keynes, Vol XIV, The General Theory and After: Defence and Development*, London Macmillan for the Royal Economic Society.
King, Mervyn (1977): *Public Policy and the Corporation*, Chapman and Hall, London.
King, Robert G, and Ross Lavine (1993): 'Finance and Growth: Schumpeter Might Be Right', *Quarterly Journal of Economics*, 108(3), pp 717-37.
Krishnamurty, K (1964): 'Private Investment Behaviour in India: A Macro Time Series Study', *Arthaniti*, January.
Krishnamurty, K and D U Sastry (1971): 'Some Aspects of Corporate Behaviour in India – A Cross-Section Analysis of Investment, Dividends and External Finance for the Chemical Industry, 1962-67', *Indian Economic Review*, October.
– (1975): *Investment and Financing in the Corporate Sector in India*, Tata McGraw-Hill, New Delhi.
Lamont, Owen A (1997): 'Cash Flow and Investment: Evidence from Internal Capital Markets', *Journal of Finance*, 52(1), pp 83-110.
Lucas, Robert E Jr (1967): 'Adjustment Costs and the Theory of Supply', *Journal of Political Economy*, 75, pp 321-34.
McKinon, R I (1973): 'Money and Capital in Economic Development', The Brookings Institution, Washington DC.
Meltzer, A H (1960): 'Mercantile Credit, Monetary Policy, and Size of Firms', *Review of Economics and Statistics*,Vol 42, pp 429-37.
Meyer, J R and E Kuh (1957): *The Investment Decision*, Harvard University Press, Cambridge, Mass.
Modigliani, F and M Miller (1958): 'The Cost of Capital, Corporation Finance and the Theory of Investment', *American Economic Review*, 48, pp 261-97.
Myres, S C and N S Majluf (1984): 'Corporate Financing and Investment Decisions When Firms Have Information That Investors Do Not Have', *Journal of Financial Economics,* Vol 13, pp 187-221.
Rakshit, Mihir (1987): 'Monetary Policy in a Developing Economy', Working Paper, Centre for Economic Studies, Presidency College, Calcutta.
– (1989): 'Towards an Integration of Monetary and Real Models for Mixed Economies', Working Paper, Centre for Economic Studies, Presidency College, Calcutta.
Shaw, E S (1973): *Financial Deepening in Economic Development*, OUP: NY and London.
Stiglitz, Joseph E. and Andrew Weiss (1981): 'Credit Rationing in Markets with Imperfect Information', *American Economic Review*, 71(3), pp 393-410.
Tinbergen, J (1939): *A Method and its Application to Investment Activity*, League of Nations, Geneva.
– (1940): 'On a Method of Statistical Research: Reply', *Economic Journal*, 50, March, pp 141-54.
Tobin, J (1969): 'A General Equilibrium Approach to Monetary Theory', *Journal of Money Credit and Banking*, 1, February, pp 15-29.
Whited, Tony M (1992): 'Debt, Liquidity Constraint, and Corporate Investment: Evidence from Panel Data', *Journal of Finance*, 47(4), pp 1425-60.
Williamson, S J (1987): 'Recent Developments in Modelling Financial Intermediation', *Federal Reserve Bank of Minneapolis Quarterly Review* (Summer), pp 19-29.