DOES FINANCIAL LIBERALISATION REDUCE CREDIT CONSTRAINTS: EVIDENCE FROM A PANEL OF INDIAN PRIVATE CORPORTE SECTOR

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1. The Background

In 1991 India started a vigorous transition process from a centrally planned economy to a market oriented one with the launching of a programme of economic reforms. In the pre reform period, India followed administered financial regime with a view to channel resources in to desired investment. It has been argued that, administered interest rate ceilings suppress the savings rate, thus reducing the availability of loanable funds and investments, and also leads to inefficient allocation of resources. Therefore, financial sector liberalisation is recommended (McKinnon 1973; Shaw 1973). The motivation underlying economic liberalisation in India was the recognition that central planning fostering state controls failed to work and that the private sector could play an important role in boosting investment and spurring economic growth. The changes in economic policies led to reversing the roles of the public and private sector, with private sector being given a pivotal role in the growth of the economy.[1] With this, private corporate sector (here after corporate sector)[2] acquired a lead role in the economy. Thus rate of capital formation or investment[3] of corporate sector became central to the economic performance of the country.

[1] Since public sector investment in most developing countries is effectively a policy variable, economists have focused on private sector investment as being susceptible to extensive analysis. Also contributing to the interest in private investment activity is recent research suggesting that private sector investment has been more directly related to economic growth in developing countries than has public sector investment (Khan and Reinhart 1990). In recent years, there have been several studies about the determinants of private investment in the context of policy changes in developing countries.

[2] In this study, the corporate sector is defined as non-financial, non-government join stock companies. The corporate sector consists of closely held (private limited) and publicly held (public limited) companies, with approximately 6.19 lakh registered companies as of June 2003, about slightly less than half of them are engaged in manufacturing. As a percentage of GDP, the estimated paid-up capital of the non-government companies constitute 12.1 per cent (Government of India 2003)

[3] Coen and Eisner point out, "classical and neoclassical economists have stressed the role of investment in providing for the future. Maintaining the current level of output requires keeping up the existing means of production. Economic growth, or the increase in the rate of output, is then seen as depending considerably on the acquisition of additional means of production, that is investment in excess of the wearing away or depreciation of existing capital" (1987: 981). The empirical literature on economic growth consistently showed that accumulation of physical capital or investment is an important determinant of economic growth.

The broad objective of financial sector liberalisation in India was to ensure that the market oriented financial sector contribute positively to economic growth by providing access to external funds[4] and by channelling investment towards growing profitable industries and firms. In the new milieu of financial reforms, market forces increasingly govern the allocation of funds and this has implications for the availability, cost and quantum of funds, which *ceteris paribus* will enable the corporate sector to make an optimum combination of sources of funds for industrial investment and its pace. Financial sector liberalization, it was expected, will alter the parameters of investment functions because of the relaxation of credit constraints and influence of reduced borrowing costs on investment decisions (Guncavdi et al. 1998).

An analysis of financing pattern of Indian private corporate sector reveals certain interesting results. We have made use of data on sources of finance obtained from '*Hand Book of Statistics on the Indian Securities Market*' provided by Securities and Exchange Board of India (SEBI). This will help us to study the financing pattern of private corporate sector at macro level during the period 1984/85 to 2004/05. One of the most striking aspects of Indian private corporate financing is the increasing dependence of firms on internal funds rather than external funds. By the year 1994-95 external sources as a share in total sources started declining. It is noticed that the share of internal resources increased from 33.30 per cent during 1984-92 to 42.94 per cent during 1992-2005. The corporate sector is now more dependent on internal sources of funds rather than external sources in recent years.

External resources declined to 57.06 per cent in 1992-2005 from 66.70 per cent in 1984-92 with varying patterns after financial reforms. In the early 1990s, i.e., 1992-98, the increase in external sources was mainly from capital markets. The increase in capital market funds was basically due to the sharp increase in the share premium[5]. There was a growing popularity of debt securities in the 1980s[6]. But during 1990s,

[4] A firm can mobilise resources mainly from two sources viz., internal and external. While internal sources are retained earnings and depreciation, external sources include borrowings (Banks and Development Financial Institutions) and equity capital.

[5] If we consider all resources from the capital market, the share of share premium that was 4.64 per cent in the 1980s has increased to 12.64 per cent in 1992-1996 (CMIE 2005).

[6] Debentures were more attractive to subscribers since the return was higher than that of alternative modes of savings. They also had the advantage of being convertible in to equity. Borrowing companies preferred debentures since their convertibility would help to realign their debt-equity position. This is

this became less important though interest rates were declining especially after 1992-93. This is because companies were able to attract additional funds in the form of share premium from equity issues.[7] Contributed by the increase in share premium, funds from capital markets increased from 6.93 per cent in 1984-92 to 18.38 per cent in 1992-1998 period. However, this boom was short lived in nature. It is evident that during 1998-2005, funds from capital market sources declined. From a high percentage of 18.38 per cent in 1992-1998, it has declined to 12.24 per cent in 1998-2005.[8] A similar picture is seen in the case of total borrowings (debt) also. Except an upward movement in some years total borrowings witnessed wide fluctuations with sharp decline in many years. Total Borrowings has declined from 35.33 per cent in 1984-92 to 16.23 per cent during the period 1998-2005.

Total borrowings include bank borrowings, institutional borrowings (FIs) and debentures. While institutional borrowings showed consistent decline through out the period, bank borrowings has increased in the second half of 1990s after a decline in 1992-98. Thus the sharp decline in the share of borrowings in the 1990s is contributed by decline in institutional borrowings on the face of an increasing trend of bank borrowings. While the share of bank borrowing has increased from 10.58 per cent during 1984-92 to 17.44 per cent during 1992-05, institutional borrowings registered a decline from 9.15 per cent to 3.84 per cent for the same period. More over, during 1998-2005, its average share became negative (-0.25).

It is interesting to see that a booming stock market has not witnessed any significant increase in money raised by firms from the capital market. Though there was boom in the new issues market in the initial years of reforms, the number of issues and amount raised by the corporate sector met with wide fluctuations in the later period of reforms. The number of issue of capital had gone up from 86 in 1992 to 577 in 1995 and then

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seen from the fact that debentures and bonds constituted a high share of 7.64 per cent in capital market funds in 1980s.

[7] A study by ICICI on financing pattern of companies also showed that share premium has increased tremendously in the 1990s. It shows share premium has increased from 0.5 per cent in 1972-80 to 4.5 per cent in 1988-96.

[8] It is pertinent to see that almost all sources of capital markets witnessed a decline. Pal (2000) observed that after a spurt during 1992-94, the importance of the capital market as a source has declined for Indian firms. He emphasized that there has been a steep decline in proportion of funds raised through equity related instruments in the post 1994-95 phase. He concluded that the Indian firms have substituted external equity by external debt as their most important source of external finance.

registered a decline to 22 in 2004. The amount of capital raised has come down after 1994 though it increased slightly in the last two years. Even with this low performance, the average BSE Sensex has increased tremendously. The Bombay Sensex rose from 3,727 on March 3, 2003 to 5,054 on July 22, 2004, and then on to 6,017 on November 17, 2004, 7,077 on June 21, 2005, 8,272 on September 2, 2005 and 10, 113 on February 15, 2006. The implied price increase of more than 100 per cent over a 19-month period and 33 per cent over the last few years is indeed remarkable. The increase in new capital issues raised grew only at a lower rate than the BSE Sensex. A much noted point is that increase in BSE Sensex is associated with huge surge in FII investments. The data reveals that while cumulative net FII flows in to India amounted to $15,804 million since the liberalization of rules since early 1990s till March 2003, the increment in cumulative value till December 2005 was $ 25,267 million (SEBI 2007). To conclude the jigsaw puzzle, even the regime of low interest rates and, more intriguingly, even in the phase of a booming stock market, firms have a clear preference for retained earnings over external sources of finance. The private corporate sector has placed increased dependence on internal resources than on borrowed funds (debt and equity). After a boom in equity resources in the initial years, capital market resources met with a drastic decline after reforms. With regards to bank borrowings, it has been stagnant, but with an upward bias. However, this upward bias is seen in the context of a declining share of external sources of funds of firms. As we stressed, firms are opting for internal financing over external sources of funds. Further, as revealed by data on low levels of new capital issues, equity is the last option. This pattern supports the pecking order theory[9] and the existence of information asymmetry even after financial liberalization[10].Against this

[9] The reason for questioning the role of financial liberalization in the recent empirical literature is due to the emergence of 'financing hierarchy hypothesis' or 'pecking order hypothesis'. Based on asymmetric information, the managers of a firm have more knowledge than investors, Myres (1984) has developed the pecking order theory of corporate finance. Accordingly, firms prefer internal finance and if external finance is required, firms issue the safest security first. That is, they start with debt, then possibly hybrid securities like convertible bonds, then as a last resort equity. To restate, the hypothesis says that firms prefer internal funds to external funds because external funds are more expensive. Contrary to the widely held belief, Mayer (1992) found, using the company balance sheet data that internal resources finance bulk of corporate investment in major OECD countries and stock market's role is very limited. While reiterating the same stylized fact Stiglitz (1988) highlights the problem of information failure that are severe in financial markets which makes the hopes of mobilisation capital market resources unreasonable.

[10] The financial liberalization thesis posits its likely positive effect on the economy's saving, investment and efficiency. A well functioning stock market also has a screening and monitoring role. However, recent advances in analytical literature highlight the possible inefficiencies in financial markets due to imperfect information that could be acute in LDCs, and underscores the need for state intervention.

dismal performance, it is to be analysed that in spite of a substantial decline in interest rates and stock market liberalisation, why is the Indian corporate sector depending more on internal resources than on external resources from financial markets? Though financial liberalisation is still on the way, based on the theoretical argument of financial liberalisation and its limitation in the context of asymmetric information,[11] it is pertinent to analyse relationship between financing choices and investment of firms. It presents the case of Indian private corporate manufacturing sector to examine whether the process of financial liberalization had any impact of mitigating the financing constraints for firms. Relying on recent theoretical and empirical studies on the link between financial market imperfections and real activity, we will examine whether the deregulation of the financial sector has resulted in any relaxation of financial constraints that firms face in their investment behaviour.

The paper comprises of five sections after this introduction. The remaining sections deal with the determinants of Investment. Towards this end, section 2 discusses the theoretical background, i.e., the links between financial reforms, financial constraints and investment. In section 3, we have undertaken a review of empirical studies available on the topic. Section 4 describes the model, data and variables used for the study. In section 5 issues in estimation and results are discussed. Section 6 gives the conclusion.

2. Financing Patterns and Investment: The Theory

Finance is an integral part of investment activity and if it is inadequate, investment will be blocked. Firms generally depend on financial markets to finance their investment. During 1950s, studies on corporate finance argued that under perfect financial market setting, financial structure does not affect the investment decision of firms. In other words, the role of financial intermediaries was ignored till the late 1960s. The neutrality of financial factors, however, confronted with criticisms after the emergence

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Further, reviving the financing hierarchy hypothesis, the new evidence on corporate financial structure in major OECD countries shows that the stock markets contributed very little to fixed investment (Nagaraj 1996).

[11] This is because in recent times, the neo-liberal paradigm of financial development and the McKinnon-Shaw argument of financial liberalisation are limited by certain micro economic arguments based on market failures and information asymmetries in financial markets. The neo-liberal approach of financial liberalisation is based on perfect competition, which says that all information is freely available to all economic agents in the market. However, in reality information failures in loan markets and the consequent credit rationing may occur between the buyers and suppliers of productive capital (Stiglitz and Weiss 1981).

of theoretical and empirical studies with results inconsistent with earlier models[12]. The thrust of the literature opted to move away from the traditional theories and placed emphasis on the role of financial sector, since it is argued that changes in the financial factors will have its influence on the allocation of capital. These studies emphasise the relationship between finance and investment, and provide a framework for analysing the financing patterns and investment behaviour of corporate sector.

This section aims to discuss the relationship between financing patterns and investment in the context of financial liberalisation to provide a theoretical background for the empirical analysis that we intend to carry out to study the determinants of investment. According to the neoclassical theory of firm investment, since financial markets are perfect, there is neither transaction nor information costs, internal and external funds are perfect substitutes in terms of financing investment, and, firms have access to unlimited sources of funds. The essence of this theory is that, in such a situation, firms will not face any constraints and they have access to unlimited sources of funds. In other words, financial structure of firms does not matter in investment decisions and firm investment should not be constrained by any lack of funds (Modigliani and Miller 1958). However, M-M theorem fails to explain the firm's investment decisions, if there is asymmetric information in the market. Financial markets, especially those of developing countries are imperfect in nature in the sense that the suppliers of funds have less information about the profitability and risks of investment projects than firms have[13].

The financial structure of firms affects investment when there exists a wedge between the costs of external and internal finance in an imperfect financial market. The theoretical literature focuses on three factors for costly external finance. First, market participants have different access to information. Myers and Majluf (1984) demonstrate that the cost of external funds is higher than that of internal funds owing to information asymmetry between lenders and borrowers. Second, managerial agency problems arise when managers who are not owners pursue their own interests (Jensen and Meckling 1976). The firm is required to pay a premium for external financing if outside investors suspect the managers who are not owners pursue the interests of shareholders. Finally, transaction costs associated with the issuance of debt and equity might raise the cost of

[12] See Stiglitz (1988), Fazzari (1992), Gordon (1992), Harris et al. (1994), Gelos and Werner (2002), Beckaert et al. (2005).
[13] The need for perfect information arises from the fact that in firm financing, though the firms receive finance today returns will be provided to suppliers of capital only in the future.

external financing. The combined effects of asymmetric information, managerial agency problems and transactions costs suggest a disparity between the cost of internal and external funds. Under such financial constraints, investment decisions depend on the availability of internal funds. Furthermore, the heterogeneity of firms implies that investment of financially constrained firms' is more likely to be affected by the availability of internal funds.

Myers and Majluf (1984) and Greenwald, Stiglitz and Weiss (1984) show that firms may pass up profitable investment opportunities by refusing to issue shares, because managers have valuable inside information and act in the interest of the old stockholders. As a result of this adverse selection problem, there is a tendency to rely on internal sources of funds, and to prefer debt to equity if external financing is required. In an attempt to examine the endogenous interaction between financial structure and real activity, Bernanke and Gertler (1987, 1990) and Calomiris and Hubbard (1987) concluded that with credit market imperfections, borrower's investment decisions will be "excessively sensitive" to current cash flow. The external finance premium and credit rationing and other imperfections suggest that investment is sensitive to its internal funds.

Recent theoretical developments have also shown that cash flows and the financial structure of firms may have an important influence on investment. Establishing a link between cash flows, leverage (debt), and investment also provides insights in to the way in which monetary policy and cyclical factors more generally influence the corporate sector. If cash flows are an important determinant of investment, changes in monetary policy by changing interest rates will influence investment of indebted firms through a cash flow effect as well as through altering the rate at which the returns to investment are discounted. If this is the case, the higher leverage of the corporate sector implies, other things being equal, that monetary policy may have a larger impact on investment than in the past. More over it implies that changes in monetary policy may not be transmitted evenly across sectors (Mills et al. 1994). To put it in a concrete way, the cash flows of more highly leveraged firms will be more sensitive to changes in interest rates and financial sector policies than cash flows of firms with minimal leverage.

From the above discussion it is evident that financial structure of firms can be shown to be a function of the extent of asymmetric information problems and agency costs. Accordingly, the financial structure of a firm will influence its investment decision and shocks to the balance sheet will alter the evolution of investment over time. Shifts in cash flow, financial assets and leverage may thus influence the dynamics of investment. Since the degree of asymmetric information and agency costs depends on firm characteristics, certain firms may be more sensitive to financial factors than others. Consideration of these links between investment and the balance sheet of the corporate sector enriches the theoretical representation of the way the financial sector policies are transmitted. In theoretical models, monetary policy affects corporate investment directly by altering the rate at which the expected returns to investment are discounted and indirectly through its effect on demand in the economy. Adding financial factors in to the analysis means that financial sector policies will also affect investment through its effect on the financial position of the corporate sector. A tightening in policy will increase interest payments and reduce cash flow. This will reduce the availability of relatively cheap internal funds and also increase the cost of external funds. The importance of these factors will vary across firms depending on their size and financial structure; financial liberalization policies will be transmitted unevenly across the corporate sector**.**

3. Empirical Literature

3.1 Empirical Models of Investment

A large number of studies have analysed whether financial constraints affect corporate capital investments. The policy changes in terms of a paradigm shift towards a market-based allocation of financial resources from a repressed regime became popular in both developing and in transitional socialist countries. The impact of these reforms on investment or capital accumulation also got due recognition in the growth process of these economies. More specifically, the financial factors also acquired importance in the real investment process rather than hovering around the real variables (World Bank 1989b; Kessides et al. 1989; Caprio et. al. 1994). In this section, we review the empirical models on firm investment in the context of financial market imperfections. The empirical works generally adopted a framework to identify an *a priori* proxy for the degree of financial constraints and then used this proxy to sort the firms in question in to categories of different degrees of financial constraints.

In the empirical literature, the impact of money and capital market imperfections on the firm's investment decisions has been examined through several approaches. By adding an internal-funds (cash flow) variable to the standard accelerator and Tobin's Q models, economists have developed the augmented accelerator and Tobin's Q model which is suitable for testing the argument that if financial markets are imperfect, firm investment may be sensitive to internal funds. A large number of studies used the role of cash flow, liquid assets, or debt as important variables in the investment model[14]. Among various approaches the first group concentrates on q-based approach that adds financial variable to a base investment model to study the impact of firm's Tobin Q-value on investment.[15] The Tobin's q refers to the ratio between two valuations of the same physical asset, namely, market valuation and book value (Tobin and Blenchard 1977). The market valuation is the going market price for exchanging existing assets, where as the book value is the replacement cost or reproduction cost which indicates the prices in the market for the newly produced asset. The excess of market valuation over replacement cost encourages investment, that is, investment will be undertaken if the market value is greater than book value (q remaining more than one). The q, thus, reflects market valuation of firms' future investment opportunities. This model, however, assumes existence of perfect capital market**.** The impact of Tobin's q on investment is studied by a number of other studies. Devereux and Schianterelli (1989) and Oliner and Rudenbusch (1989) found that indeed, liquidity plays an important role for firms that have resource constraints for investment.

However, there are empirical studies without making use of Tobin's q. These studies followed the "Euler Equation misspecification approach"[16] to assess the impact of imperfect capital markets on investment behaviour. For instance Hubbard and Kashayp (1990) and Gilchrist (1990) found that cash flow plays an important role in the investment decision and the significance is dissimilar for groups having different characteristics of

[14] A comprehensive review of investment models can be found in Lensink et al. (2001).
[15] In the 1960s James Tobin proposed a relationship between the rate of investment and the ratio of the market value of an additional unit of capital goods to its replacement cost. This ratio is known as the marginal Tobin's Q. The relationship proposed by Tobin maintains that if the market valuation of invested capital held by a firm exceeds the cost of capital on the open market, the firm should increase its value by investing.
[16] An alternative to study financial constraints facing firms that is based on the same underlying model used to derive the augmented Tobin's Q model is, to estimate an Euler equation. The main advantage of the Euler equation approach is that it does not rely on Q. Therefore, this approach seems to be applying for studying the investment behaviour of firms in developing countries, where stock markets are not well developed or are absent. Although this approach has a number of other advantages, it is also subject to some serious disadvantages (Lensink et al. 2001), making it less often used in studying financial constraints facing firms as compared to the augmented accelerator and Tobin's Q model.

firms. Fazzari et al. (1988) pointed out that there are differences in access to external finance by firms according to relative maturity. They found that less matured firms have inferior accesses to external finance. They also concluded that cash flow, as a measure of liquidity is an important determinant of investment. Utilising the dividend-payout ratio as a measure of financial constraint faced by firms, they had demonstrated that investments of financially constrained firms respond more sensitively to changes in cash flow. Since then, it has become a basic research methodology to examine the difference in sensitiveness of investment to cash flow between a priori segmented firms. [17]

Existing empirical studies have used various segmenting variables to identify unobservable financial constraints, for example, group affiliation in Hoshi et al. (1991), firm size in Devereux and Schiantarelli (1989), issuing commercial paper and bond ratings in Gilchrist and Himmelberg (1995) and Whited (1994) and exchange listing in Oliner et al. (1992). More recently, Gomes (2002) use GMM to estimate a stochastic investment Euler equation and show that investment and financing frictions provide a significant factor in explaining the cross-section of expected returns. Hoshi et al. (1991) in the context of firms in Japan, suggest that individual firms not belonging to particular group have informational problems that bring them to rely more on internal sources for investment.

Estimating a simple augmented accelerator model[18], Budina et al. (2000) find that cash flows have a significant and positive effect on investment by the entire sample. By re testing the model by eliminating those firms having negative cash flows; he found that the cash flow variable still displays a significant and positive coefficient. He further classified the firms in to small and large samples and carried out the analysis. The interesting finding is that the cash flow is significant and positive for small firms while it is insignificant for large firms. Thus the study argues that small firms are financially constrained than large firms.

[17] These studies have employed the *a priori* firm classification approach initiated by Fazzari et al. (1988) to investigate financial constraints facing firms. These studies suggest that investments of firms that are more financially constrained are more sensitive to internal funds than those firms that are less financially constrained. In other words, according to these studies higher investment-cash-flow sensitivities indicate greater financial constraints. Fazzari et al. (2000) also strongly believe that the *a priori* firm classification approach is feasible to be used in investigating financial constraints facing firms.

[18] The recognition of the effect of financial market imperfections on firm investment suggests that internal funds should be accounted for when estimating firm investment. Therefore, the "lagged" accelerator model is augmented by adding a measure of internal funds. If financial markets are perfect or financial constraints are absent, coefficient of cash flow should be zero; otherwise, coefficient of cash flow should be positive and statistically significant, meaning that investment is positively sensitive to internal funds.

In a different approach Agung (2000) applies an augmented Tobin's Q model[19] to Indonesian non-financial companies. He found that the coefficient of the cash flow variable is large, positive and significant for the entire sample. However, for small firms the investment-cash flow sensitivity is smaller compared to large firms. In a cross country study of Asian countries Driffield and Pal (2001), however, found mixed results in which Malaysian case seems to support the argument that small firms are more financially constrained than larger ones, while Thai firms show the reverse. Almost all the studies reviewed so far find evidence that investment by larger firms is less sensitive to internal funds than by small firms. What emerges from these studies is that firm size can be a good indication of the degree of financial constraints.

A large number of studies considered the investment behaviour between firms having different age structure. Regarding age, it is generally opined that banks should have better information about older and more matured firms due to longer relationships and repeated contracts. Hermes (1995) found that the coefficient of the internal funds variable is significantly larger for young Chilean than for old ones, implying that the former is more financially constrained than latter ones. The same conclusion is also given by Hermes and Lensink (1998). In an attempt to study the variation of financial constraints with respect to firm age Jaramillo et al. (1996) also found the existence of significant financial market imperfections for young firms compared to old firms. The same results hold for studies conducted by Schaller (1993), Chirinko and Schaller (1995), Vans Ees and Garresten (1994) etc.

A comprehensive analysis of financial factors in corporate investment is carried out by Mills et al. (1994). Having classified the firms in to many sub groups, the results suggest that internal sources of funding are more important for small firms, highly leveraged firms and firms that have high retention ratio. These results have a number of important implications for monetary policy. The importance of cash flows as a determinant of investment suggests that monetary policy will influence investment through cash flow as well as through influencing the discount rate applied to investment projects and to overall economic conditions and these effects will be unevenly distributed across the corporate sector.

[19] In order to measure the effect of imperfect financial markets, the standard Tobin's Q model is adjusted to include the level of cash flows, i.e., a proxy for internal funds.

Turning to the Indian context, it is seen that, though a large number of studies at aggregate level using time series data are available on the determinants of investment, the micro level studies that analyses the relationship between financing patterns and investment are very limited in number. Athey and Lumas (1994), using the firm level information from 256 Indian manufacturing firms listed on the stock exchanges in India between 1978 and 1986, found that internal funds are less important for smaller firms than for large ones. In a similar study Athey and Reeser (2000) employ firm level data from 142 Indian listed manufacturing firms showed the same result of Athey and Laumas (1994). This may be due to the specific feature of Indian industrial policy in which small firms were beneficiaries of the selective policy adopted by Indian government. However, changes in the policy regime in 1991 necessitate further analysis of determinants bt taking in to account the financing patterns. In the next section we attempt to undertake the empirical estimation of investment equations for various groups of firms to analyse whether credit constraints has reduced after financial liberalisation.

4. Empirical Model, Data and Construction of Variables

4.1 The Model

In what follows we attempt to study empirically the investment behaviour in India across different groups of firms using an augmented accelerator model. The basic theoretical path is of the view that the Indian manufacturing firms increase their investment to increase their capital stock mainly in response to the potential profit enhancing opportunities. Even in perfect competitive markets of developed industrialized countries, there are financial constraints to investment finance. These constraints basically emerge from the problems of asymmetric information, monitoring costs, moral hazard etc. As a result lenders will be willing to lend a higher proportion of costs of proposed investments only at increasing interest in order to compensate for increased risk. In other words agency cost plays a major role in determining the flow of funds for investment. This may result in the increasing divergence between average and marginal interest-rates for individual borrowing firms as the degree of financial leverage increases (Gertler and Rose 1991). If the financial markets are segmented as in the case of most developing countries, the access of financial resources may differ for firms according to their market status, group, age, size etc. There will be a situation where some group of firms will be more dependent on internally generated funds for

investment. These firms may sometimes have to forgo some investment levels due to extreme financial constraints in the financial system. In this type of situation, we expect the investment to be positively associated with cash flow or retained earnings of the firm.

The empirical work in this chapter relates the traditional study of financial effects on investment to recent literature on capital market imperfections, especially on financial reforms, by studying investment behaviour in different category of firms with different financial characteristics. We carried out our empirical analysis by estimating an unrestricted investment equation of the lagged augmented accelerator model. An advantage of the augmented accelerator model[20] is that it consists of variables that are observable. The output term ($\Delta Y_{i,t}/K_{i,\,t-1}$) forms the basic variable in the model[21]. The general specification for our regression equation is:

$$I_{it}/K_{i\,t-1} = \alpha + \beta_1 (I_{t\,t-1}/K_{t\,t-2}) + \beta_2 (\Delta Y_{it}/K_{i\,t-1}) + \beta_3 (S_{it}/K_{i\,t-1}) + \beta_4 (D_{it}/K_{\,t-1}) + u_{it}$$

where, I = Investment
K= Capital Stock
Y = Output
S = Cash Flow
D = Stock of outstanding debt
$\beta_1, \beta_2, \beta_3$ and β_4 are parameters
u_{it} is the disturbance term

$u_{it} = \varepsilon_{it} + \lambda_i$ in which λ_i is the firm specific fixed effect, and ε_{it} is a random error term.

4.2 Data and Variables used for the study

The data used is the centre for Monitoring Indian Economy's (CMIE) firm level data available from the electronic database PROWESS. The sample consists of 19852

[20] Although this model is fairly standard in the investment literature, it is subject to criticism. First the output and the level of cashflows may be correlated because an increase in output may lead to an increase in cashflows. As a result, the simultaneous inclusion of both variables may reduce their explanatory powers. Second, cash flows may also proxy for investment opportunities because the level of cashflows is likely to hold information about future investment opportunities. For instance, if firms with higher cash flows are more profitable, which is likely to be the case, their investment would be positively responsive to cash flows, even though they encounter no financial constraints. If so, the investment-internal funds sensitivity does not necessarily need to be interpreted only as an indication of financial constraints. Despite these criticisms, a number of empirical studies have used the level of cash flows as a proxy for the change in net worth (from internal funds) because cash flows are virtually the only measure available for many firms. In fact, the augmented accelerator model is among the most successful empirical ones in the sense that it better explains the behaviour of firm investment, according to Fazzari et al. (1988). This model fits best to our data set for analysis.

[21] The accelerator theory of investment, posits that firms have a desired level of capital stock and undertake investment to achieve this level. It maintains that firms adjust their capital stock in response to demand so that investment has a direct relationship with output (Eisner and Nadiri 1968, Kuh 1971). The basic assumption of any accelerator model is that the desired capital stock at any point in time is a constant multiple of output, Y, at that time. That is $K_d = \alpha Y$, where K_d is the desired capital stock.

observations 19852 on 2269 firms. The period of analysis is 1993/94 to 2003/2004. The variables used for study are as follows.

Change in Output ($\Delta Y_{it}/K_{i\ t-1}$)**:** The inclusion of change in output will enable us to capture the expected change in demand for the firm's product. This forms the basis of accelerator theory. It suggests that the growth rate of real output is positively related to investment because it indicates changes in aggregate demand for output that investors seek to meet. Acceleration principle explains a direct positive relationship between the output and or rate of change of output (Chenery 1952) with investment. The acceleration principle assumes a technical relationship between output and capital stock, suggesting that investment demand is induced by increase in demand for output. Inclusion of output controls for demand effects in the model. It is likely that investment lags behind the change in demand for output because (i) since the change in demand may be considered to be transitory in nature, the firm may not immediately adjust its capital stocks to the change in the demand for their output in one period but rather to that in several periods; (ii) there may be lags either in the investment decisions and/or in the implementation of these decisions; and (iii) there may still be excess capacity that allows the firm to increase output without investment (Eisner 1960). We take the ratio of value of change in output to capital stock ($\Delta Y_{i,t}/K_{i,\ t-1}$) as a measure of output.

Lagged value of Investment (INV (-1)): Regarding the effects on investment we included the lagged value of investment-to-capital ratio ($I_{t\ t-1}/K_{t\ t-2}$). This is because the importance of the previous investment level may some times determine the present investment decision of firms.

Cash Flow (CASHFLOW): To the basic general accelerator type, we added cash flow. The cash flow measures the liquidity position of the firm and its ability to depend on internal sources of funds to finance its investment decisions. In other words it represents the ability of a firm to finance investment from its own profits (Fazzari et al. 1988). In case a firm faces constraints on external financing, its investment will be determined partly by its internal resource. In our study we use the ratio of gross cash flow before interest and a tax ($S_t/K_{t-1,}$ gross operating surplus) to capital is used to capture the liquidity. Cash flow is a widely used explanatory variable to capture the

effects of financial constraints in many studies (Love 2003, Leaven 2003) [22] . Specifically, the positive and significant coefficient of cash flow is indicative of no finance constraint.

Debt to Capital Ratio (DEBT): Another regressor used is Debt to Capital ratio (leverage ratio) (D_t/K_{t-1}). The rationality behind debt-to-capital ratio as an additional regressor is that it is likely that the cost of outside finance is positively correlated with the degree of leverage, which is referred as agency cost in the literature on investment and credit constraints. Thus we can argue that the asymmetric information and imperfections implies that the availability of finance, in terms of debt (borrowings) may constraint the investment decisions. We have taken debt as the sum of both short-term (banks) and long-term (development financial institutions) borrowings of firms. A better functioning of financial system would imply investment is less determined by the firm's internal resources and less negatively affected by leverage, which, in turn, would imply significant and non-negative magnitude on the coefficient DEBT (Fazzari et al. 1988).

Financial Liberalization Index (FLIN): We use the same Financial Liberalization Index (FLIN) constructed and used for the analysis in the last chapter. Financial Liberalisation Dummy as we assigned, takes value zero, one, two or three, depending on whether the financial sector is fully repressed, partially repressed, largely liberalized or fully liberalized along each of the dimensions of financial sector liberalisation in each year. These dimensions include (a) interest rate liberalisation, (b) reduction in reserve requirements, (c) money market reforms, (d) pro-competition measures, (e) capital market reforms, (f) legal reforms, (g) international financial liberalisation etc. As mentioned the previous chapters, to construct the financial liberalisation index we consider these policy dimensions as inputs to the creation of an aggregate index (See Appendix I for details on methodology). The use of financial liberalization is to assess the impact of financial liberalization in reducing the credit constraints for firms. The summary measures of variables used in the model are given in table 1.

Table 1: Summary Measures of Variables

Variable	Mean	Standard Deviation
I/K	0.201	0.252

[22] Studies have considered profit as a determinant of investment. Kuh (1971) argued that due to certain structural relationships between output and profit, accelerator theory indirectly considered the impact of profit.

Y/K	0.312	0.395
S/K	0.243	2.246
D/K	0.375	0.2986
Number of firms	2269	
Number of observations	19910	

Source: Prowess Database, CMIE

5 Estimation and Results

5.1 Issues in Estimation

In the case of panel data, the estimation of the model using the ordinary least squares (OLS) may yield unsatisfactory results, because dynamic investment models are likely to suffer from endogeneity problem. The endogeneity problem arises mainly due to two reasons. First, in a dynamic investment model, there is the presence of lagged dependent variable. The presence of lagged dependent variable makes the estimates inconsistent. Second, there is the problem of correlation of error term with output and cash flow. Suppose there is a technology shock in terms of increase in productivity, then investment will increase and as a result output and cash flow will be higher. Since the error term captures a technology shock to the profit function, it may be correlated with explanatory variables such as output and cash flow. In order to overcome these problems, the Generalized Method of Moments (GMM) estimation is widely used for dynamic panel data models.

The investment equations in our empirical analysis have been estimated in first differences to eliminate the fixed effects in the model. This will help us to control for the firm specific effects. We have used the Generalised method of Moments to allow for the potential endogeneity of the independent variables. The appropriate lagged values of the right hand side variables are used as instruments. We have used full instruments of second lag onwards in the models estimated. The consistency of the GMM estimator depends on whether the lagged values of the micro variables are valid instruments in the regression procedure. A necessary condition for the validity of such instruments is that the error term be serially uncorrelated. If the model has been transformed to first difference as we do in our estimation, first order serial correlations are to be expected but not second order. In the absence of higher-order serial correlation, the GMM estimator provides consistent estimates of the parameters.

To address these issues, we present two specification tests suggested by Arellano and Bond (1991). The first is the Sargan test of over-identifying restrictions, which tests for the overall validity of the instruments by analyzing the sample analog of the moment conditions used in the estimation process. The second test examines the hypothesis that the error term differentiated regression is not-second order serially correlated, which implies that the error term in the level regression is not serially correlated. The failure to reject the null hypotheses in all cases provides support to model estimation. From the Regression, we report m1 test of the existence of first-order serial correlation, m2 test of the second order serial correlation, and a robust Sargan test of the over identifying restrictions that the estimator exploits. For the estimation of our unbalanced panel data on Indian private corporate manufacturing firms we have used the Dynamic Panel Data (DPD) technique[23]. The estimation is carried out using the OX Package.

5.2 Results

We estimate different specifications of the model. In our empirical analysis, our central question is that, what are the variables that are most likely to determine a firm's decision to invest? In order to carry out the empirical investigation we have to capture the importance of market segmentation. We try to estimate investment levels as determined by cash flow (expected profitability) and debt-to-capital ratio (the degree of financial leverage). The theoretical considerations suggest that, while profitability should have a positive effect, degree of financial leverage should have a negative effect on the level of investment under market imperfections. In a perfect financial market world, since the costs of internal and external funds are the same and the firm is supposed to have access to an unlimited amount of external funds, the investment of the firm is not sensitive to internal funds. If the financial market is imperfect, the additional cost of external funds increases at an ever-increasing rate. Therefore, an increase (decrease) in internal funds will lower (raise) the cost of funds that the firm uses to invest, thereby increasing (decreasing) its investment. This means that investment of the firm is positively correlated with its internal funds. More over, if the measure of cash flow has a positive impact on investment; it means the existence of constrained access to credit markets. Because in the absence of constrained access to resources, firms would borrow as much as needed to maximise profits, and cash flow would not be constraining.

[23] The program DPD (Dynamic panel data) has been used in the estimation. See Arellano and Bond (1988, 1991) for specification of Dynamic Panel data.

Initially, we had estimated the regression equation by assuming the condition that the slope coefficients are same for all firms. The results of the model 1 and model 2 estimated by assuming equal slopes are given in table 2. We start with the coefficient of lagged investment in the model. The coefficient on lagged investment had shown significant impact on investment in both models in table 2 with a positive and significant coefficient. A positive and highly significant coefficient of lagged investment (INV (-1)) means that investment rates show inertia. That is, overtime, they are serially correlated even after controlling for all relevant variables. This implies that the effects of a change in a given investment decision will fully realise only after a number of years. Thus for the entire period considered, we observe a significant dynamic component represented by the lag of the investment to capital ratio. As in the case of lagged investment, the estimated coefficient for the output is also positive and significant. This shows that the standard accelerator mechanism is important in explaining corporate investment behaviour. In other words, an increase in output leads to an increase investment. It indicates a determining role of accelerator (demand) and investment opportunities in the investment behaviour.[24]

Table 2: Estimation Results of Financial Liberalisation and Investment–All Firms

Dependent Variable (I_t/K_{t-1})	All Firms	
	Model 1	Model 2
Constant	-0.146* (-5.53)	-0.056* (-4.32)
INV (-1)	0.002** (2.03)	0.005** (1.89)
OUTPUT	0.019** (2.82)	0.036* (3.99)
CASH FLOW	0.062* (3.25)	0.105** (2.49)
DEBT	0.171** (2.32)	0.235* (4.91)
FLIN*CASH FLOW	-	-0.332** (2.08)
FLIN*DEBT	-	0.403* (4.99)
m1	-2.306 [0.000]	-2.167 [0.000]
m2	-1.096 [0.173]	-0.1280 [0.230]
Sargan Test	139.2 [0.538]	207.6 [0.469]
Number of Firms	2269	
Observations	19852	

Note: * and ** shows significance levels at 1 percent, and 5 percent
Given in Parentheses are t - statistics except for m1, m2 and Sargan test.
m1 is the test for first order serial correlation
m2 is the test for second order serial correlation

[24] A large number of studies have also showed the importance of accelerator in the Indian context. For instance, see Sarkar (1970), Krishnamurthy and Sastry (1975), Swamy and Rao (1974), Tanwar (1978), Venkatachalam and Sharma 1978), Athey and Laumas (1994), Anand (1995), Rajakumar (2001). However, some studies like Rao and Misra (1976), Johar et al. (1982) did not support the existence of accelerator mechanism. However, one should note that, being constrained with time series data, majority of these studies could not take in to account the market imperfections to augment the accelerator model. However, in our model we include these factors.

Sargan test gives the over identifying restrictions X^2 (p)

It is seen from model 1 that the coefficient of cash flow is positive and highly significant. The positive and significant coefficient of the cash flow (0.062) variable indicates that cash flow strongly affect investment. This result is consistent with the existence of a financing hierarchy. Cash flow provides the only source of finance for those firms that are liquidity constrained, and for those firms that do have access to external market, cash flow provides a relatively cheaper form of finance (Mills et al. 1994). It is also seen that the sign of the coefficient on the debt to capital ratio (leverage) is positive (0.171) and significant at 5 per cent level, which means that accumulation of debt does not hinder outside financing. This goes against the basic theoretical understanding of its negative association with investment based on agency-cost arguments in the presence of asymmetric information. Because it is often pointed out that, higher levels of debt result in an increased probability of financial distress and the demand for higher returns by potential suppliers of funds. If external financing costs increase with the degree of leverage, the leverage ratio should be negatively associated with investment. But the result of debt ratio in our model for all firms does not support the argument that it will impede investment[25].

Financial Liberalisation and Credit Constraints

Up to this, we were discussing the investment behaviour for the entire period considered for the study. Now our question is, does this behaviour changes with financial deregulation? To investigate this, we now analyse how firms' behaviour has been affected by the deregulation in financial markets. The main emphasis of the study is on the response to liberalisation in financial markets and hence of the coefficients of cash flow and debt variables. To test whether financial liberalization has affected the financing constraints of firms, the variables cash flow and debt are interacted with financial liberalization index (FLIN). In model 2, estimates of the interaction terms (CASHFLOW*FLIN and DEBT*FLIN) for all firms are given. We estimate the coefficients of cash flow and debt ratio to analyse how the financing behaviour of sample firms have changed with financial liberalisation. Its coefficients therefore reflect the change in the importance of cash flow and debt ratio after financial reforms. It is evident that the behaviour of cash flow and debt ratio indicates changes in the relative importance of these variables in determining investment, when we interact

[25] Harris et al. (1994) find a negative association between investment and the debt-to-capital ratio for Indonesian firms.

with financial liberalisation index (FLIN). From model 2, it is seen that when we interact with FLIN, the coefficient of cash flow has come down and became negative and significant (-0.332) showing less importance for internal resources in financing investment. This means that financial liberalisation has led to a significant reduction in financing constraints. In the case of debt ratio, the coefficient of debt has increased with financial liberalization indicating a larger role for debt in financing investment after liberalisation of financial markets. This suggests that with financial liberalisation credit constraints has reduced. The overall conclusion is that the measures of deregulation in financial markets have had its impact of mitigating resource constraints in terms of external finance for investment, which is evident from the results we get, once we introduce liberalisation effect in the model. The positive and significant debt ratio even after liberalization for all firms tends us to make further analysis in the light of our theory showing the possibility of a negative association between debt and investment under financial market imperfections.

Impact across Size Categories

In the above analysis, it is noted that, it is the coefficient of debt to capital ratio (leverage ratio) that contradicts the relationship predicted by the theory. As postulated in theory, if external financing costs exist due to asymmetric information it will render the coefficient of debt variable sometimes negative. To cast light on the source of the positive sign of debt on investment, we try to experiment the estimation for different size categories of firms. For the analytical purpose we use size as a base to identify firms that should be more likely to face information-based liquidity constraints in resource mobilization.

Table 3: Estimation Results for Liberalisation on Investment- Size groups

Variables	Model 3 Small Firms	Model 4 Large Firms
Constant	-0.295** (-2.92)	-0.509* (-3.86)
INV (-1)	0.038** (2.19)	0.008** (2.52)
OUTPUT	0.012** (1.95)	0.114** (2.05)
CASH FLOW	0.166 ** (2.98)	0.072 (1.58)
DEBT	0.139* (3.28)	0.214** (2.88)
CASH FLOW*FLIN	0.237** (2.36)	-
DEBT *FLIN	-0.019** (2.12)	-
CASH FLOW*FLIN		0.108** (2.29)
Debt*FLIN		0.389** (1.99)
m1	-0.113 [0.000]	-0.365 [0.000]
m2	-2.125 [0.169]	-2.824 [0.156]
Sargan Test	63.45 [0.188]	115.74 [0.298]

Number of firms	819	1450

Note: * and ** shows significance levels at 1 per cent, and 5 per cent
Given in Parentheses are t - statistics except for m1, m2 and Sargan test.
m1 is the test for first order serial correlation
m2 is the test for second order serial correlation
Sargan test gives the over identifying restrictions X^2 (p)

In models 3 and 4 of table 3 we differentiate between small and large firms respectively to analyse whether investment behaviour and finance constraints differ across different firm sizes. We have considered firms having value of gross fixed assets below 50 million Rs as small firms and firms having value of gross fixed assets above 50 million Rs following Government of India (2003). We specifically examine the effect of cash flow and debt variables on investment with financial liberalization for small and large firms.

We estimate the impact of financial liberalization on small firms separately as given in model 3. The picture obtained from this model seems very interesting. We find that financial liberalization has not reduced or relaxed the dependence of small firms on internal funds. The estimated coefficient of cash flow on investment has increased from 0.186 before financial liberalization to 0.237 when we interact with financial liberalization index. Evidence also suggests that, with financial liberalisation, investment remains to be negatively affected by the debt-to-capital ratio (-0.019) at 5 per cent level significance. These results support the hypothesis that they were dependent on internal funds to finance their investment even after financial reforms. They also faced an increasing cost of external funds as their leverage increased, as suggested by the negative and significant sign of the leverage coefficient. This suggests that small firms are still credit constrained and liberalisation has not made any significant improvement in smaller firms' access to external finance.

Now if we consider large firms' investment behaviour in model 4, it is noted that changes in financial markets does not seem to have similar effects on large firms' financing behaviour. For large firms internal funds or profit was less important in augmenting investment. However, the positive coefficient of cash flow which was relatively small and insignificant for large firms (0.072) before liberalisation has increased (0.108) and became highly statistically significant when we interact with financial liberalization index.[26] On the other hand, the debt-to capital ratio coefficient is significantly positive for large establishments

[26] It will be worth mentioning in this context the study by Devereux and Schiantarelli (1989) on Italian firms. In their study they showed that large firms are more sensitive to cash flow than small firms. They argued that large firms have a lower relative cash flow, and the agency costs are higher due to the complex ownership structure.

even after considering the effect of financial liberalisation. According to the theoretical expectations due to asymmetric information, the leverage coefficient is expected to be negative and significant. However, our result seems to suggest that for larger firms, having a higher degree of leverage increase their capability to mobilize external funds. In other words, unlike small firms, large firms were not credit constrained irrespective of financial liberalisation policies[27]. One possible explanation for this is that, having obtained debt in the past may act as a signal to financial intermediaries like banks and other institutions about the firm's credit worthiness. Once they found that a particular firm is able to repay the debt without much transaction cost for the intermediaries, they will be ready to lend them without formalities as required in the former times.

We would like to conclude that the positive coefficient of debt ratio for entire sample could be attributed by the similar behaviour of a positive impact for large firms. In other words, while small firms are liquidity constrained, large firms' access to credit market is sufficient to augment their investment. From the estimated coefficients of cash flow and debt ratio, it can be concluded that while cash flow exerts a positive influence, debt is negatively affecting investment of small firms. On the other hand, while for large firms debt shows positive and significant coefficient, small firms conform to a negative and significant relationship predicted by the theory of asymmetric information and agency costs. To summarise, the results lend credence to the fact that the financial liberalization though reduced financing constraints; it was mainly confined to large firms.

Testing for Other Attributes – Group and Export Orientation

The above result of positive and significant coefficient of debt for large firms in both periods poses a question for further enquiry. The question is that, what are the factors that can explain this result? We may have to think that, there are attributes other than firm's size that affects the investment behaviour. We would hypothesis that being in a group (business house) or in export oriented firms help firms to have better access to various sources of external finance.[28] Thus we intend to study the impact of these

[27] In the pre liberalisation period, large firms often tend to corner a significant chunk of the preferential credit by virtue of political economy considerations, which tends to disappear once liberalisation begins to take effect, when commercial considerations assumed importance. However, our analysis tends to suggest that even after financial liberalisation small firms continued to be credit constrained.

[28] It is generally argued that large firms are quite often belongs to group firms (business houses) or export-oriented firms. Thus the positive and significant relationship between debt and investment for large firms may be the impact of firms association with foreign markets. This association mainly comes from the export

attributes on investment behaviour. More precisely, our attempt is to shed light on the question, why the coefficient on the degree of leverage is positive for large firms? For this, in table 3, we allow the debt (degree of leverage) to differ between larger firms that belong to a business house (group) and those which do not belong to a business house (non business house or non- group) in model 5. We also made estimation by allowing the coefficient of the degree of leverage of the larger firms to differ between those who are exporting and domestic market oriented firms (non-exporting) in model 6. The select coefficients on cash flow and debt are given in table 4.

Table 4: Estimated Results of Debt for Large Firms according to Market Orientation and Group-Select Coefficients

Dependent Variable (I_t/K_{t-1})	Large Firms Model 5
DEBT*Export	0.220** (1.83)
DEBT*Export* FLIN	0.132** (2.34)
DEBT*Non-Export	-0.169* -(3.55)
DEBT*Non-Export, FLIN	-0.010** (0.220)
m1	-0.868 [0.000]
m2	-1.023 [0.451]
Sargan Test	160.81[0.532]
Dependent Variable (I_t/K_{t-1})	Large Firms Model 6
DEBT*Group	0.158** (2.22)
DEBT*Group*FLIN	0.196** (2.98)
DEBT*Non-Group	-0.056* -(2.98)
DEBT*Non-Group* FLIN	-0.006** -(1.82)
m1	-0.145 [0.000]
m2	-1.310 [0.756]
Sargan Test	206.4 [0.452]

Note: * and ** shows significance levels at 1 percent, and 5 per cent
T-statistics are given in parantheses
M1 is the test for first order serial correlation, n (0,1)
M2 is the test for second order serial correlation
Sargan test gives the overidentifying restrictions X^2 (p)

orientation. If firms are export oriented, they may be less sensitive to foreign exchange risk and therefore have a better position to borrow in the cheaper foreign markets. One plausible explanation is in the way a group's head office assigns its borrowings to establishments that belong to the group or business houses. Since the assignment of a particular liability to a specific unit is arbitrary and should be recognized as such by lenders, it is unclear whether the degree of leverage reported for an individual subsidiary unit of a group should indeed increase the cost of borrowing (Harris et al. 1992).

In model 5 and 6 of table 4, the behaviour of the cash flow remains the same as in the case of previous models.[29] But the debt variable for group and export firms gives an interesting pattern. Following the theoretical links, in a world of asymmetric information and agency cost, the leverage coefficient is expected to be negative. Among large establishments different behaviour is seen for the coefficients of debt for different category firms. While large group and exporting firms shows a positive and significant debt ratio coefficient in both pre and post liberalisation periods, in the case of non-group (individual) and domestic oriented (non-exporting) firms, the coefficient on debt to capital ratio was significantly negative in both periods. What emerges from this is that the positive and significant relationship between the leverage and investment for large firms does not hold for non-group and non-exporting large firms. It is negative and significant for both larger individual firms and non-exporting firms indicating credit constraints existing for such firms. One may conclude that the positive and significant debt to capital coefficient for large firms is due to the advantages derived by them being a group or an exporting firm.[30] The only difference in result between large group and large exporting firms is in the magnitude of the coefficient and not the sign of the coefficient. The basic investment behaviour is that being an export firm or belonging to a group firm explains the positive coefficient of debt to capital ratio for large firms.

6 Conclusion

The theoretical discussion in recent times emphasises the role of information asymmetries and agency costs in explaining investment decisions. The impacts of financial liberalization measures, which have recently been implemented in India, have received much attention. We analysed whether financial liberalization affects manufacturing investment in India. In other words, we tested the hypothesis that whether financial liberalization had an impact on firms' investment decisions with respect to cash flow and debt. The theory implicitly assumes that asymmetric information and market imperfections in the credit and capital markets prevent the efficient mobilisation of resources, which hinder an economy wide efficiency. The econometric evidences in our study provide qualified support for these theories.

[29] Since our primary interest is on debt coefficients we have not reported all the results including coefficients on cash flow. Cash flow coefficients for all the categories remain the same as similar for large firms in model 4, except small difference in magnitudes.

[30] To put in another way, the positive and significant relationship between debt and investment for large firms may be the impact of firms association with foreign markets. This association mainly comes from the export orientation. If firms are export oriented, they may be less sensitive to foreign exchange risk and therefore have a better position to borrow in the cheaper foreign markets.

At the aggregate level, the result suggests that with financial liberalisation credit constraints have reduced. We have analysed whether this result is true for different size firms. It was found without doubt that small firms are facing financial market imperfections in the form of liquidity constraints since it is seen from the analysis that such credit constraints were not eliminated or relaxed for these firms. This is also evident from the fact that the prominence of cash flow variable has increased for small firms in the post liberalisation period. This implies that financial liberalisation has not improved the access to external finance for small firms. However, one surprising result is the positive and significant coefficient of debt-to capital ratio for large firms irrespective of the financial liberalization effect. This goes against the basic theoretical understanding of a negative association. It means that financial liberalisation has made improvement in access to debt for large firms after financial liberalisation. From further enquiry we found that the positive and significant impact of debt on investment for large firms has changed once we estimate the model for large firms belongs to various categories. It is seen that the positive and significant impact of debt does not hold for large non-group and non-exporting firms. On the other hand the positive effect of debt remains the same for large group and exporting firms. This implies that being in a group or having export orientation helped them to have access to credit markets. Thus it is concluded that the financial liberalisation reduced the financial constraints basically for large group and exporting firms. We have noted that the impact of firm specific factors on debt reflects information asymmetry and adverse selection after financial reforms. The differences in the results on the determinants of investment across different sized firms in the Indian context suggest that the impact of financial liberalisation on investment is influenced by the differences in the financial structure of firms. To conclude market imperfections exists in the financial markets that prevent an economy wide efficiency in the post liberalisation period.

Appendix I

Financial Liberalisation Index: Methodology

There are two widely used measures of liberalization: (1) the stock or flow measure of some macroeconomic variable and (2) liberalization dating. The first approach is more objective and does not rely on convention of dating. Second approach relies on country reports that provide an update on the status of reforms programs either voluntarily or under requirement of international financial institutions (Laeven 2003). The timing methodology has been more often used to identify a year with distinct liberalization component, and then frequency of components in one year is aggregated and defined as liberalization index for that year. It is important to note that financial liberalization is a process and rather than a one shot event.

This section provides methodological and technical details for preparing financial liberalization index. Specifically, we identify two important sectors: banks and equity markets for this purpose. It has two distinct dimensions: internal and external (international) liberalization respectively (Bandiera et al. 2000). Internal liberalization measures are aimed at reducing government intervention from financial intermediation and increasing depth of stock markets by relaxing regulations. Major internal liberalisation measures for banks are interest rate liberalisation, reduction in reserve requirements, reduction in directed credit, foreign bank entry, increased prudential regulations etc. Stock market internal liberalisation measures are stock market opening to foreigners, stock trading system, incentives to foreign investors etc. The external liberalization measures are removing restriction on Foreign Direct Investment (FDI) and Portfolio Investment (PIs), removing quantitative restrictions on imports of capital goods, increasing degree of freedom to receive investments through Global Depository Receipts (GDRs), investments from NRIs, Overseas commercial Borrowings (OCBs) etc. The use of liberalisation indices derived from reform component/dimension has been widely used in empirical work in developing countries.[31]

The liberalisation index of India for our study is an aggregation of different sub indices constructed to represent the liberalisation measures in the respective sectors of the economy. We will use convention of dating deregulation in banking and stock markets to construct the financial liberalization index. The basic methodology followed for this purpose is from Bandiera et al. (2000) and Abiad and Modi (2003). In this methodology, various reform policy measures are assigned dummy values, which cannot be otherwise determined quantitatively. Financial liberalisation includes both domestic and international sectors. More over, it consists

[31] For instance, capital account liberalisation index (Quinn, 1997); banking market liberalisation index (Bandiera et al. 2000), and financial liberalisation index (Abiad and Modi 2003). Studies that are more recent have either used discrete or continuous overall financial liberalisation indices in investment and growth models (Henry 2000; Eichergreen 2002).

of both deregulatory and institutional building reform measures. Thus any attempt to construct a liberalisation index should capture both deregulatory and institutional building components of liberalisation/reform policies. To construct financial liberalisation index, we consider different dimensions of these components, which are likely to exert influence on the investment behaviour. Following Abiad and Modi (2003), policy changes are assigned a score on a graded scale, from zero to three, in a given year. Here, zero corresponds to being fully repressed, one to partially repressed, two to largely liberalised, and three to fully liberalised. Though these are subjective, some guidelines were used as to reduce the subjectivity. For example, interest rates were considered fully repressed where the government set all interest rates, partially repressed where interest rates were allowed to vary within a band or subject to a ceiling or floor, largely liberalised if some interest rates were allowed to be completely market-determined (or if new floating rate instruments were introduced), and fully liberalised where all interest rate restrictions were removed (Abiad and Modi 2003). The focus is on those indicators of bank and stock market liberalization and external liberalization measures that reflects financial market deepening and increase in credit availability, and having theoretical relationship at firm level financing. The dummy values were reduced to an index in each year using principal component analysis as explained below.

Principal Component Analysis (PCA)

Using the various components of financial sector reforms mentioned above, we develop a financial liberalization index. In our study, after putting dummy values, we obtained a matrix of 51 dummies. Each column represents a single dummy and each row represents a year. In order to reduce the dimensionality of the matrix, principal component has been used. We have used the method of principal component analysis to reduce a large set of variables to a small set that still contains most of the information in the large set. The use of principal component analysis is due to the fact that it enables us to create and use a reduced set of variables called 'principal factors' that suits an easier analysis and interpretation. Principal component technique helps to reduce the dimensionality from say for example 'n' variables to something much less while preserving the variance-covariance structure intact. The variance-covariance structure is explained through a few linear combinations of the original variables. Following principal Component Analysis (PCA), it is possible to interpret the first few principal components in terms of the original variables, and thereby have a greater understanding of the data. The first principal component is the linear combination that explains the most variation. The second principal component is the linear combination that accounts for most of the remaining variation, while being uncorrelated to the first principal component. Each subsequent principal component accounts for as much as variation while being uncorrelated with previously determined principal components. To reproduce the total system variability of

the original variables there appears the requirement of ‘n’ principal components. However, if the first principal components account for a large proportion of the variability, say for instance 90 per cent, the objective of dimension reduction is achieved. It means that all the original ‘n’ variables are replaced by first few principal components.

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