

DETERMINANTS OF FIXED INVESTMENT BEHAVIOUR: A STUDY OF INDIAN PRIVATE CORPORATE SECTOR WITH EMPHASIS ON FINACIAL LIBERALISATION

1. INTRODUCTION

It is consistently shown that the rate of accumulation of physical capital or investment is an important determinant of economic growth¹. More importantly, in developing countries, as evidenced by some studies, it is the private investment that plays a greater role than public investment in determining economic growth². As a result, in recent years, this has produced some studies about the determinants of private investment in developing countries³. It is noted that changes in macro economic variables due to financial liberalization is likely to alter the parameters of estimated investment functions because of the relaxation of credit constraints and the increased influence of borrowing costs on investment decisions (Guncavdi et al, 1998). These studies on the determinants of investment developing countries focused on the role of government policy and tried to derive an explicit relationship between the principal policy instruments and private investment⁴.

Like many developing countries, in 1991, India also, with an objective of promoting economic growth through higher savings and investment, as a part of the structural adjustment and macro economic stabilization programmes, adopted various macro economic, trade and financial sector policies. The broad objective of financial sector reforms and other macro economic policies in India was to ensure that market oriented financial sector contribute positively to economic growth by providing access to external funds and by channelling investment towards growing profitable industries and firms. In this context, increased reliance on market forces for determining the cost and availability of funds, which *ceteris paribus*, will enable the corporate sector to make an

¹ See Levine and Renelt, 1992, for understanding the sensitivity of cross country regressions of growth.

² As Galbis pointed out, it is necessary in the analysis of investment in developing countries to distinguish between private and public investment, as the latter is an important fraction of the total in many of them. Only private realized investment may be related positively (1) to the profit rate and (2) to the expected real interest rate within the range of low real interest rates observed in many developing countries (1979: 429). Also see Khan and Reinhart, 1990.

³ See Chibber et. al. 1992; Serven and Solimano, 1993; Blejer and Khan, 1984, 1987; Khan and Knight, 1981, 1982; Sioum, 2002, Greene and Villaneuva, 1991; Tun Wai and Wong, 1982.

⁴ See for example, Hall, 1977; Blejer and Khan, 1994; Guncavdi et. al, 1998; Sioum, 2002.

optimum combination of efficient sources of funds for industrial investment and its pace.

Recent theoretical and empirical studies have produced results consistent with the idea that the economic policy of a nation is crucial determining the domestic investment behaviour (Blejer and Khan, 1994, Greene and Villaneuva, 1991, Sioum, 2002, de melo and Tybout, 1990). These studies emphasised the role of financial sector development on private investment, and provide a framework for understanding the effects of changes in economic policies on private investment. However, there had not been any major attempt to analyse the impact of financial liberalisation measures on the private corporate sector investment in India⁵. The present study is an attempt to learn more about the empirical determinants of private corporate investment activity in India during the post 1970 period with special emphasis to post liberalisation period. This paper provides a preliminary look at how various macro economic factors, especially liberalisation policies in the 1990s have affected corporate investment in India. The primary objective of our study is to analyse the impact of various policy changes on corporate investment behaviour in India. For this we use the time series data from the National Accounts Statistics (NAS) for the period 1970-71 to 2000-02.

The paper is organised as follows: After the introduction in section 2 various theoretical perceptions on the determinants of investment is discussed. Section 3 we briefly discuss the changes in macro economic policies and its implications for domestic investment in India.. After this, we had carried out econometric analysis on the determinants of investment in section 4. Final section gives conclusions based on results and its implications for the policy.

2. DETERMINANTS OF INVESTMENT-THEORETICAL PERCEPTIONS

2.1 Traditional Approaches

The oldest and the most familiar explanation came from the theory of user cost of capital whereby a firm maximizes its market value by adjusting its capital stock to a point where the marginal value product of capital equals the market interest rate. This is

⁵ One exception is Athukorala and Sen (2002). Though this study concluded that there is a structural break in the investment function after liberalisation, it has not gone beyond using a dummy for structural adjustment programme. Moreover, the time period of the study ends in 1996.

based on the theory of diminishing marginal product of capital, which says that the demand for investment will decline with an increase in interest rate. The classical theory of investment also maintained that, investment depends on the rate of interest. It assumed that given the full employment of existing resources, investment and rate of interest assumes an inverse relationship (Cohen and Eisner, 1987). Keynes criticized the classical notion, by arguing that the fluctuations in the economy which results in the pessimistic or optimistic behaviour of different economic agents also affects the expectations and thereby investment (Keynes, 1936). According to Keynes, a firm will invest only up to the point where the marginal efficiency of capital (MEC) equals the discount rate or interest rate that equates the present value of an expected net income stream from an investment project with the project cost.

The rest of the traditional literature on investment behaviour seems to have developed through the formulation of theoretical models for empirical investigation. The base one and the simplest among them was the ‘accelerator theory’ or ‘acceleration principle’ which says that the level of output or the changes in aggregate demand determines investment or the change in capital stock⁶⁷. As against the accelerator model, Jorgenson (1967) developed a neo-classical flexible accelerator model incorporates the user cost of capital (interest rate, depreciation and price of capital goods) and also the accelerator effect to explain the investment behaviour. This approach maintains that changes in cost of capital induce changes in investment behaviour by changing the implicit rental price of capital services and further the changes in the implicit rental price of capital services lead to changes in the desired stock of capital.

Yet another investment model is Tobin’s q-theory, which is based on the idea that investment depends upon the ratio of the market value of financial assets to their replacement cost, i.e, the q-ratio. The q-ratio is expressed by Tobin is $q = Mv/Rc$, where Mv - market value of existing assets and Rc -Replacement cost.

⁶ 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 $Kd=\alpha Y$, where Kd is the desired capital stock.

⁷ Accelerator model was further modified by many studies, by introducing the concept of flexible accelerator, which says that, the adjustment of the capital stock to be desired level is not instantaneous because of delivery lags and delayed response to changes in the level of demand. see for example, Koyck, 1954 and Chenery, 1952.

As an alternative to the accelerator models, financial theories explain the determinants of investment in terms of financial variables. These theories based their analysis on the assumption that, investments are influenced by the availability of internal funds. According to Fazzari and Papadimitriou (1992), the ability of a firm to undertake an investment project may depend not only on the fundamentals of the project under considerations, but also on the firm's financial condition. Projects in which, the firm should invest if they had sufficient internal funds, might not be undertaken if the firm must raise external funds to finance the project. This is the idea that is central to the links between financial sector and real economic activities, especially that of investment⁸.

In recognition of the limitations to adopt the above theoretical models in their context, developing countries moved from traditional theories to focus on the role of economic policies in determining investment. In what follows we discuss the links between various policies and investment.

3.2 Policy reforms and investment

Inspired by the influential works of McKinnon (1973) and Shaw (1973) and the structural adjustment programmes by IMF and world Bank, the effects of various macro economic policies on private investment in developing countries have drawn much attention. Financial sector liberalization with interest rate reduction constituted an integral part of this new economic policy. It has been argued that, administered interest rate ceilings suppress the savings rate, thus reducing the availability of loanable funds and investments, but also leads to inefficient allocation of resources and therefore, financial sector liberalisation have been recommended (McKinnon, 1973; world Bank, 1989). McKinnon (1973) and Shaw (1973) argued that the clearing interest rates and reduced government intervention by financial liberalisation can raise allocative efficiency through higher savings and investment. The existence of a very low or negative real interest rate would result in the support and expansion of unproductive, non-viable projects, and the channeling of funds in to consumption rather than

⁸ The literature regarding this mainly includes Stiglitz and Weiss (1981), Myers and Majluf (1984), Blinder and Stiglitz, 1988; Bernanke and Gertler, 1990. The ideas regarding finance and investment in particular can be seen in Fazzari, Hubbard, and Peterson, 1988; Fazzari and Athey, 1987; Kashyap, Hoshi and Scharfstein, 1991.

investment, which would be detrimental to the growth process. The theory of financial liberalization argues that raising real interest rates at the market clearing levels induces more saving and investment and therefore acts as a positive stimulus to economic growth.

It is argued that domestic financial sector generally necessitates external sector or the capital account liberalization to yield the best results. Domestic liberalization can lead to a re-flow of capital flight and improvements in capital accounts, especially if accompanied by external sector liberalisation⁹. Financial capital has become highly mobile across countries as a result of the gradual globalisation of financial markets. As capital mobility increases the flow of resources to the specific country increases making provision for increased investible resources (references). External liberalization will increase the level of investment through foreign capital flows in terms of direct and portfolio foreign management. The case for foreign capital is based on the fact that, foreign investment can supplement domestic investible resources in a developing economy, enabling higher rates of growth. Eichengreen (2002: 13) pointed out that capital mobility is an engine of growth through the relaxation on resource mobilization for investment.

As in the case of capital account, changes in current account (trade) policies also affects investment behaviour through policies like sustained relaxation of import controls mainly for capital goods, reduction in customs tariff rates, abolishment of licences etc, since these policies aimed at greater openness of the economy. According to McKinnon, “trade liberalization and financial liberalization are the two measures that will lead to increase in investment” (1981: 366). In other words, they are complementary. Financial liberalization complements trade liberalization on both demand and supply side. On the demand side, interest rate deregulation gives opportunities for those earning increased income from a trade liberalization to hold financial assets as alternatives to non-tradeables. Now, if we consider the supply side, financial sector reform augments the loanable funds stimulated by trade liberalization¹¹.

⁹ See Calvo, Leiderman, and Reinhart, 1993; Johnston and Ryan, 1994; and Schalder and others, 1995.

¹¹ For a detailed overview of this subject, see Athukorala and Rajapatirana (1993).

Trade liberalization sparks investment led growth by lowering the prices of goods and services to those of non-traded goods and services. This price change induces an inter-sectoral expenditure shift that favours the capital-intensive sector. As a result, rate of return to capital accumulation rises thus triggering investment led growth (Baldwin and Seghezza, 1996: 8). Trade liberalization affects investment also through the changes in the relative prices of capital. Global trade liberalization can lower the relative prices of capital goods in both countries, thereby creating an incipient increase in the stock of capital. In this case trade liberalization lowers the marginal cost of investment goods by lowering the cost of input, and thereby lowers the price of capital¹². As a consequence, the steady-state capital stock rises and transitional growth ensues.

Following the introduction of financial liberalisation under the structural adjustment programmes in developing countries, fiscal variables has been given considerable importance as the determinants of investment. In the theoretical literature, fiscal variables are treated as important determinants of investment. McKinnon (1991: 4:10) argued that, one important macro economic pre requisites for successful financial liberalisation is fiscal control because many of the regulations imposed on domestic banks raise revenue which helps to finance the government deficit. Since liberalisation involves the removal of many of these regulations, it is clear that, other sources of revenue must first be found. The endogenous growth models which incorporated economic policy where fiscal policy is a dominant aspect, concluded that fiscal policy can increase the steady state economic growth rate, if they aim at influencing the quantity and or quality of the capital stock (Baro, 1990; Barro and Sala-I-Martin, 1992; King and Rebelo, 1990 and Rebelo, 1991). Public investment, particularly infrastructure investment is identified as a factor affecting private investment. Theoretical discussion identified both complementarity (Blejer and Khan, 1984; Greene and Villanueva, 1991) and substitution (Fitzgerald et al., 1992) effects between public and private investment.

Crowding out can occur in three ways. First, limited market size in many developing countries implies public investment in productive sectors may displace private ventures, causing a *real crowding effect*. Second, *financial crowding out* may take place as both

¹² This trade openness and growth is related to the literature on imported capital, which played an important role in the trade-growth literature. See for example, Cairncross, 1962; Lee, 1992, 1994.

agents run for the same and often limited credit pool. If financial resources are scarce or if it is financed through monetary financing, it may reduce the possibilities of the private sector to get credit to finance investment. If public investment is financed through monetary financing, then also private investment may be discouraged. Finally, financing public investment through its effect on inflation and debt accumulation, which render the business environment uncertain, will crowd out private investment (Sioum, 2002). Crowding out may occur when the investment involves parastatal enterprises producing goods that compete with the private sector, or when heavy spending for public capital projects leads to high interest rates, severe credit rationing, or a heavier current or future tax burden (Aschauer, 1989).

Theoretical literature also pointed out that, fiscal deficits crowd out private investment, increase inflationary potential, weaken the balance of payments, render financial sector reform more difficult and impose a serious burden of adjustment on future generations (Acharya, 2001). In a recent pamphlet¹³ in the World Summit on Sustainable Development, pointed out the effect of fiscal imbalances on development through interconnection in the movement of certain key economic factors. One of the important points in this was that, lower fiscal deficits increase the pool of savings for high level of investment, leading to higher levels of economic growth. High fiscal deficits will lead to higher interest rates in financial markets, which will reduce investment. This can also increase risk premiums on interest rates, especially raising the inflation risk and the default risk premium, which can be detrimental to private investment (Alesina and Perotti, 1997). High deficits can also reduce the opportunities of private sector borrowing, if it is financed by financial market loans (Bevan, 2000). In certain times high deficits may act a signal of high tax burden in the future which may discourage current aggregate expenditures and thereby investment¹⁴.

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¹⁴ Models by Bertola and Drazen (1993), Giavazzi and Pagno (1990 and 1996; Sutherland, 1997 etc discussed this issue. However, the expectation of the people to the future effects of current budget deficits was crucial assumption in all these models. These models also show that reducing expenditure on particular components of the budget may provide a positive signal with respect to the seriousness of the government to implement a fiscal policy. Though difficult in the political economy context, cutting the wage bill and reducing subsidies may lend credibility to the adjustment programme, which may increase private investment in developing countries

Against this theoretical background, we now turn to the macro economic policy changes in India and its implications for investment. Because for our study, it is pertinent to understand the policy changes and changes in priorities given to different aspects of the overall policy regime over the period. Instead of giving a comprehensive discussion of Indian economic policies, we confine to particular aspects of the policy regime that could be argued to have had an impact on investment behaviour in India.

2. MACRO POLICY CONTEXT IN INDIA

Indian macro economic policy during 1950s to 1970s emphasised on a conservative stance with respect monetary and fiscal policy and the consequent tight control on the budget deficit and the monetisation of deficit. However, towards the mid 1970s, this has resulted in fiscal erosion due to the change in the political economy of the country¹⁵. In 1980s, there was deterioration in government finances in terms of rise in centre's fiscal deficit to GDP ratio, growing size of liabilities and huge debt-service burden. Attempts of expansionary fiscal policies and limited measures of liberalisation in the mid 1980s, though resulted in increase in output (GDP), the widening budget deficit and rapid increase in imports without corresponding exports led to widening current account deficit and deterioration in external reserve position. Towards the end of 1980s, reduction in remittance inflows and increase in oil price due to Gulf War pushed the economy to face an unprecedented macro economic crisis in 1991. The result was the introduction of structural adjustment and macro economic stabilisation programmes under the World Bank and International Monetary Fund (IMF) in almost all sectors of the economy in various degrees¹⁶.

Restructuring of the tax system¹⁷ constituted a major plank of fiscal reforms in 1990s. The statutory corporate income tax rate (corporate tax rate + surcharge) was above 50 per cent during 1970s and 1980s. But in the 1990s, this has reduced drastically, except in 1992-93 and 1993-94. There was no surcharge in the later years of 1990s. Moreover,

¹⁵ For example, various socio-economic groups in the country such as public sector workers, small scale industrialists and medium and large farmers' claims became very assertive and they demanded greater share of government subsidies (see Kohli, 1991).

¹⁶ It was argued that the BOP crisis and macro economic crisis originated from the structural inadequacies and problems within the economy. According to IMF-World Bank strategy. This can be corrected only through a long term structural adjustment programme. Similar view is due to Bhagawati and Srinivasan (1993), who argued that the macro economic crisis in India was basically originated from the 'micro economic' inefficiencies that distorted the structure of incentives to producers.

¹⁷ The main objective of the tax reforms was to simplify and rationalize both direct and indirect taxes. The basis of this was formed from the recommendations of the Tax Reforms committee in 1991 under the Chairmanship of Raja. J Chelliah.

the depreciation allowance¹⁸ in the late 1980s has increased compared to the previous decade. Though less compared to late 1980s (33.3 per cent), through out 1990s it remained at a reasonable level of 25 per cent¹⁹. This may help the corporate sector to find more internal resources for capital formation. In the case of investment allowance, it has been abandoned in the 1990s. To sum up, though the corporate income tax is reduced, the reduction in depreciation allowances and the abandonment of investment allowances may sometimes be detrimental to the stimulation of investment.

Another major implication of the fiscal policy was the increase in non-development expenditure during 1990s. As a percentage of GDP, it has increased from 10.45 in the 1980s to 11.69 per cent during 1990-91 to 1996-97. It has further increased to 13.35 per cent in 1997-98 to 2001-2002. This shows that the Indian public finance has led to a shift in the composition of government expenditure from investment to consumption (salary bills of government employees and subsidies) (Mundle and Rao, 1997)²⁰. This is evident from the fact that the public investment, especially public infrastructure investment as a ratio of GDP has drastically declined from mid 1980s onwards. The gross fiscal deficit though improved both in terms of average growth and percentage of GDP in the first phase of the reforms, has sharply deteriorated in the second phase of the reform period. As a percentage of GDP it had declined from 8.03 per cent in the 1980s to 7.38 per cent during 1990-91 to 1996-97. But in the second phase of the reforms (1997-98 to 2001-2002) it has increased considerably to 9.13 per cent, which is greater than the level in 1980s. Thus keeping inflation at a low level with widening fiscal and revenue deficits in the 1990s, especially in the second half of the 1990s could adversely affect the long run economic growth by reduction in savings and investment rates through continuing high real interest rates. Thus the fiscal situation with decline in

¹⁸ While investment allowance is given in a proportion to new investment in fixed assets in the form of plant and machinery in the year of acquisition, the depreciation is a tax incentive in computing net profits for a year, with an appropriate reduction from gross receipts on accounts of depreciation of capital assets (GoI, 1992: 11-12)

¹⁹ Depreciation allowance rate is fixed by the Government of India according the changing rules from time to time. Union budget 1991-92 fixed a rate of 25 per cent fixed on the basis of the recommendations of Chelliah Committee (GoI, 1992).

²⁰ The growth in central government spending on wages, salaries and pension was restrained during the period from 1990-91 to 1996-97. As a proportion to GDP, it dropped by around 0.8 percentage point. With the implementation of first pay commission award towards the late 1990s, the wage bill could not be kept constricted. Though the present expenditure on salaries and pensions for the central government employees as a percentage of GDP is still lower than it was at the end of the 1980s, the sharp rising trend is worrisome (RBI, 2002). See also Acharya (2001), Rao (2002) etc for the role of rising wage bill in fiscal deterioration in India.

public investment and high fiscal deficit may be detrimental to the performance of private investment.

After financial repression in 1970s to mid 1980s and a period of mild reform up to 1991, financial sector liberalisation has been introduced, which shifted the focus of financial repression, from the ‘control of financial products prices’ to prudential regulation, supervision and promotion of competition’ (Joseph, Nitsure and Sabnavis, 1999). The thrust of these reforms was the deregulation of capital markets and banks, deregulation of interest rates, withdrawal of credit targetting and interest subsidies, introduction of stricter accounting norms in the banking sector and the integration of domestic financial markets with the international financial markets through external sector liberalisation of capital flows (Government of India (GoI), 1991; GoI, 1993). As a result, the CRR, which was 15 per cent in 1991-92 has been reduced to only 5.5 percent in 2001-02. The base SLR that stood at 38.5 percent in 1990-91 has come down to a uniform level of 25 percent from 1997-98 onwards. More importantly, almost all major interest rates have been set free with banks and financial institutions themselves determining their own lending rates and deposit rates, except the saving deposit rate, which is set by the RBI. Consequently, the nominal interest rate structure had undergone drastic changes, with all the rates showed a declining trend during 1990s. Along with these reforms, the RBI has sought to ensure that the new entrants are professionally managed, financially viable, technologically strong, and that there are no adverse consequences such as concentration of credit. Internationally accepted prudential norms relating to income recognition, asset classification, provisioning and capital adequacy etc has introduced which are considered to be fundamental in ensuring the soundness and solvency of commercial banks. These initiatives have set the stage for the sectors having resource scarcity to augment investible resources for boosting the investment.

Apart from the money market reforms, policy changes in the capital market such as permission to raise partly convertible debentures and permission to public sector enterprises to raise resources through bonds led to substantial increase in total resource mobilisation from the primary market (Centre for Monitoring Indian Economy (CMIE), 1995, p.7). the abolition of Controller of Capital issues (CCI) in May 1992 led to the increased channellisation of household savings in to shares and debentures, elimination of under pricing by CCI and the determination of price of issues by the companies

themselves. Government had opened up the Indian securities market for foreign investment through FIIs, GDRs and FCCBs. In short, the deregulation of financial system during 1990s have led to a relatively easier access to capital markets, both domestically and internationally for firms and industries in India.

The earlier controls in the industrial sector through licensing and MRTP, inhibited competition and led to a wasteful misallocation of investible resources among alternative industries and also accentuated the under utilization of resources with these industries (Bhagawati and Srinivasan, 1975: 191)²¹. However, the removal of licensing policy and the resultant increase in capacity through increased output and investment followed substantial opening of FDI and trade liberalization through the elimination of quantitative restrictions and reduction in custom tariffs, resulted in greater access to foreign technology and capital after 1991. From high levels of relative prices of capital goods under protective trade regime (De Long and Summers, 1993; Jones, 1994), there was a tremendous fall in the relative price of machinery during 1980s and particularly in 1990s (Athukorala and Sen, 2002) which is indicative of a possibility for boosting fixed capital formation in India. Along with this, the share of capital goods in total imports has tremendously increased from 24.2 per cent in 1991 to 28.2 per cent in 1995-96 though declined to 18.1 per cent in 2001-02.

The industrial and trade sector policies introduced in the 1990s resulted in a receptive attitude towards foreign investment and foreign licensing collaboration²² and as a positive response to the changed policy regime, the foreign investment flows in India has picked up sharply from Rs. 185 Crores in 1990-91 to Rs. 28, 258 Crores in 2001-02²³. FDI, which was Rs. 316 Crores in 1991-92 has gone up sharply to Rs. 18, 619 Crores in 2001-02. FPI on the other hand, has shown variations in different years, but increased from Rs. 129 Crores in 1991-92 to Rs. 3,904 Crores in 2001-02. Evidence of

²¹ The high relative price of capital goods under the restrictive trade policy was mainly due to the high level of custom tariffs and taxes levied on imported capital goods (Ettori, 1990) and the inefficiency of the public sector with majority in the capital and intermediate goods sector.

²² India generally adopted a highly regulated regime in the arena of foreign investment. This policy was little eased first with the change in the industrial policy regime in India. The major policy decision regarding the foreign direct investment was made in the New Industrial Policy of 1991. Only after this, the norms and procedures regarding FDI have been declared to liberalise the foreign capital flows.

²³ The years 1997-98 and 1998-99 are exceptions. In these years foreign capital flows faced an aberration. This may be attributed to the contagion effect in the aftermath of East Asian Crisis that affected the global capital flows.

strong complementarity with domestic investment suggests that capital flows brighten the overall investment climate and stimulate even when a part of the capital flows actually gets absorbed in the form of accretion to reserves (RBI, 2001). Having said about the major policy changes in India that could be argued to have had impact domestic investment, we now turn to the discussion on the trends in fixed investment behaviour in India before we go in to the analysis of determinants.

It is noted that the private corporate sector investment emerged as the single most contributor to the gross fixed investment in India after the liberalisation period. As a percentage of GDP, Gross Fixed Capital Formation²⁴ has generally increased from 17.91 percent in 1970-71 to 23.77 percent in 1999-00. But the relative importance of each sector²⁵ in GFCF has changed over time. The share of public sector as percentage of GDP has declined from the later years of 1980s. From 10.71 in 1986-87, it has declined considerably to a low level of 6.30 percent in 1999-00. This decline is more prominent during the second half of 1990s. But the private corporate sector showed tremendous increase during the period under consideration. This increase in GFCF in private corporate sector was however, more in 1990s. From 3.62 percent in 1991-92, it has reached its peak at 9.26 per cent in 1996-97, though declined little afterwards (Table.1). Household sector's contribution to the total GFCF remained generally at the same levels through out the period, with fluctuations in some years, especially in the later years of 1990s. Thus the considerable increase in GFCF in private sector from 12.57 per cent in 1991-92 to 17.47 per cent in 1999-00 was mainly attributable to the increase in private corporate investment.

The relative share of each sector in gross fixed capital formation has also changed in favour of private corporate investment. The percentage share of private corporate investment in total investment, which varied in the range of 10 to 20 per cent up to

²⁴ Gross Fixed Capital Formation (GFCF) represents additions to fixed assets comprising fresh construction and acquisition of machinery and equipment including transport equipment and breeding stock, draught animals, dairy cattle and the like (EPW, NAS, 2002).

²⁵ Public sector comprises government administrative departments, departmental and non-departmental enterprises. Estimates for public sector are based on budget documents of the central and state governments and the annual reports of public sector undertakings. Private corporate sector is defined as non-government joint stock companies engaged in financial and non-financial activities, and both credit and non-credit cooperative societies. Household sector is defined to comprise, apart from individuals, all non-government non-corporate enterprises like farm and non-farm business, unincorporated establishments like sole proprietorship and partnership

1980s, increased to nearly 40 per cent in the 1990s, where as the share of public investment has declined from a range of 40 to 50 per cent during the earlier decades to only 27 per cent in 1990s. In the case in household sector also, its share has declined during 1990s. From 50.81 percent in 1970-71, it fell down to 33.47 percent in 1999-00 (Table. 2). This shows the increased importance of private sector, especially private corporate sector investment in the economy during 1990s. Thus the increase in gross fixed capital formation during 1990s may be due to the increase in private corporate sector investment, on the face of a steady decline in public sector share.

The composition of sector wise GFCF shows that in the case of public sector, both construction and machinery has declined over the years. Against this, for the private corporate sector both construction and machinery has gone up over the years. This increase was substantial especially in machinery and equipment. From a low range of 2 to 3 per cent during 1980s it has reached a level of 7 to 8 per cent of GDP in 1990s, with its peak reached 8.11 per cent in 1996-97 (Table 3). As a percentage of GDP, both construction and machinery in the household sector has increased in the late 1990s, though remained stagnant during 1970s, 1980s and first half of 1990s. While in the case of the public sector, this may be due to the shift away from taking up of infrastructure projects such as roads, highways, bridges etc, for the private corporate sector, this pattern may be explained as being the result of the growth in manufacturing activities. Thus from the analysis it is evident that investment in private corporate sector is the main contributor to GFCF. Moreover, machinery and equipment has acquired a major share in the total fixed investment. Here it is important to note that this substantial increase in machinery has come solely from the private corporate sector. Our analysis suggests that increase in corporate sector investment during 1990s, led to a rise in GFCF and this increase is entirely due to the increase in private corporate investment, especially in machinery and equipment.

From the discussions so far made, it is almost clear policy changes affects investment. India also adopted various macro economic liberalisation policies with the objective of achieving a high growth trajectory through increased levels of investment, and improvements in productivity, efficiency and competitiveness. And we have noted that there is a tremendous increase in private corporate fixed investment after the policy

reforms. Thus in the next section we will empirically analyse the determinants of private corporate fixed investment.

4. ESTIMATION PROCEDURE

4.1 Model and Variables

Our specification of the private investment function will draw from the recent empirical literature on investment behaviour with appropriate consideration of the structural and institutional features of the Indian economy. The most relevant literature on the investment behaviour on which an investment specification will be based includes the survey by Serven and Solimano (1990), Chibber and Shafik (1990), De melo and Tybout (1990), Greene and Villanueva (1990), Khan and Reinhart (1990), Solimano 1989; Musalem, 1989; Schmidt-Hebbel, 1987. We have considered some variables identified in the traditional literature like level of output (LY), change in cost of capital (DCCP) (see Appendix III for the caculation of cost of capital), one year lagged value of capital stock (CAPSTOCK_1), one lagged value of profit after tax to net worth (PATNW_1) etc as explanatory variables in our model. Both public policy related variables and liberalisation policies are also given special emphasis in our model. Among them are direct fiscal policy variables like fiscal deficit and public investment and financial variables such as interest rates and credit flows. To capture the impact of various policy changes on investment we have constructed liberalisation policy indices to be used as explanatory variables. These liberalisation indices had been constructed using the methodology adopted by Abiad and Modi (2003) (see Appendix. II for details). Besides aggregate financial liberalisation index (FLI), it is divided in to index of domestic financial liberalisation (INDFL), index of international financial liberalisation (INIFL). Further each of these indices are divided again in to two sub indices for each viz., index of current account liberalisation (INCUAL) various sub indices like index of money market liberalisation (INMML), index of current account liberalisation (INCUAL) and index of capital market liberalisation (INCAPML). We also included variables like Real Interest rate on lending (RIRL), Bank Credit to the Private Sector (BC) and one year lagged value foreign direct investment (FDI) as outcome variables of financial liberalisation. Finally, one year lagged value of the dependent variable (GFCF_1) is entered in to the model as an additional explicator²⁶.

²⁶ See section 5.2 on Granger non-causality for the selection of these explanatory variables

The impact of each of the explanatory variables mentioned above on private corporate investment and their significance are estimated using private corporate sector gross fixed capital formation (gross fixed capital formation/GDP) as the dependent variable (GFCF). For our estimation purpose, instead of using any particular framework, the determinants of investment in the private corporate sector in India for the period 1970-71 to 2001-2002 is examined using a general model. This enables us to include a wide range of possible determinants identified in the theoretical literature. The general model used for the analysis is $GFCF_t = a + b X_t + u_t$, where $GFCF_t$ is private corporate investment rate, a is the constant term, X_t is the set of potential explanatory variables, u_t is the error term and t represents the time period. In order to reduce the problems derived from spurious correlation and non-stationarity of both dependent and independent variables, rates of GDP instead of absolute levels are considered for private fixed capital investment and all relevant right hand side variables, except Y . This is specified as log of GDP (LY).

Using the explanatory variables explained before, we had carried out regression analysis using Ordinary Least Squares (OLS) for four different specifications. Here, variables output (LY), change in cost of capital (DCCP), capital stock (CAPSTOCK_1), Profit after tax to net worth (PATNW_1), lagged value of dependent variable (GFCF_1), Fiscal Deficit (FD), Public infrastructure investment (PUBINFIN_1) etc. form the base model for all five specifications. In the first specification along with these variables, we had used aggregate financial liberalisation index (FLI). For the second specification, instead of FLI, two sub indices viz., INDFL and INIFL are used. Further, in the third specification, INDFL and INIFL are replaced by indices INMML, INCAPML, INCUAL and INCAL. In the fourth specification, instead liberalisation indices, liberalisation outcome variables are used in the base model.

4.2 Granger non ‘causality’

We confined to the above mentioned explanatory variables to ensure sufficient degrees of freedom. For this, we carried out Granger Causality Test. The final selection is carried out in terms of the significance of the variables in a temporal lead-lag relationship, to find, through pair-wise Granger-non-‘causality’ tests, whether the independent variables under consideration are the causing factors of the gross fixed

investment²⁷. Further the reverse causality from independent to dependent variable is also tested. The results of granger non-'causality' tests are given in table.4 The results show that for the variables DY, INF, SCGIM, RPCGs, SDY, SDINF, SDRER, PUBIN and PI, the null hypothesis of Granger-non 'causality' is not rejected. Hence we exclude these variables from the final model.

The results obtained from the testing of reverse non-'causality' for the included variables are given in table.5. It shows that for the variables FDI, PUBINFIN, PATNW and CAPSTOCK the null hypothesis of Granger-non 'causality' is rejected. This means that there is causality from these variables to the dependent variable, which can result in biased coefficients. Thus, to reduce the problem of simultaneous equation bias in the coefficient estimates, we had used one year lagged values of these variables in our analysis.

4.3 Estimation Procedure

We begin the estimation process by testing the time series properties of the data. The stationarity problem²⁸ of both dependent and independent variables is examined. For this, we used Augmented Dickey Fuller Test (ADF) for checking the unit roots of the selected variables (see appendix for methodology). The results for the ADF test (table. 6) suggests that all variables except DCCP, FD, RIRL are found to be non stationary and integrated of order 1. Since some variables are found to be non-stationary there may be a possibility for the regressions with such variables to be spurious²⁹. This requires to make these variables stationary through differencing to solve this problem. While checked for cointegration with first difference, they became stationary. This means that they are integrated of order one, i.e, I (1) variables. However, use of these differenced variables instead of original ones may sometimes result in the serious loss of long run information. It is essential to keep the long-run information on the variables and to avoid the problem of spurious regression. These two problems has to be avoided simultaneously. For this, possible cointegration between the variables has to be checked.

²⁷ Indices were not considered for granger non-causality test, since these are policy variables

²⁸ In a time series, if the mean, covariance and auto covariances of the series are all constants, it is said to be weakly stationary. This means that, they are invariant with respect to time. If the time series is not stationary, then it is not possible to model the process with a single equation with fixed parameters estimated from the past data.

²⁹ A regression is said to be spurious when R^2 might appear very high even though there is no relationship between the corresponding variables (Granger and New Bold, 1974).

Since our specified model includes a number of variables, we carried out cointegration test in the framework of an unconstrained Vector Auto Regression (VAR) model of Johansen and Juselius (1990) cointegration (JJ) test.

There are two likelihood ratio tests for checking the co-integration relationships when there exists more than two variables (Johansen, 1988; Johansen and Juselius, 1990). The first one is trace test having null hypothesis there are r ($0 \leq r \leq n$) cointegrating vectors against the alternative $r+1$ cointegrating vectors. The second one is maximum eigenvalue test having null hypothesis, there are ' r ' cointegrating vectors against alternative $r+1$ cointegrating vectors. In order to obtain satisfactory size properties in small samples, these test statistics should be corrected for the number of estimated parameters (Reimers, 1992). This can be done by replacing T by $T-np$ in the test statistic, where T is the number of observations, n is the number of variables and p is the lag length of the VAR. In our case, the interpretation of the cointegration results is based on the test statistics of the small sample correction. The JJ cointegration results of various specifications are reported in tables 7, 8, 9 and 10. Table 7 shows results when aggregate financial liberalisation is used with other variables. Table 8 and 9 gives the results with sub indices instead of aggregate financial liberalisation index. Finally, table 10 show the results with outcome variables of liberalisation.

The maximum eigen value and trace tests indicates the there is only one cointegrating vector between the variables used in the first two specifications (Table 7 and 8). However, in the third specification using four sub indices, both the maximum eigen value test and trace test suggests that there are two cointegrating vectors (table. 9). Specification using outcome variables instead of index along with other variables (table. 10) shows the presence of two cointegrating vectors according to both the tests.

In JJ method, since all the variables are treated as endogenous, determining the direction of cointegrating vectors obtained or relationship is difficult. If the direction of the cointegrating vector obtained in all the cases is the intended one (investment as a function of all other variables) there may not any possibility for spurious regression. Therefore levels of variables can be used in the regression model instead of first

difference. Here we do not know whether the direction of the obtained cointegrating vectors in various specifications is the intended one. However, we carried out the regression on the basis of the assumption that the obtained cointegrating vector is the intended one. In order to check whether the assumption is valid, we carried out the analysis of the residuals obtained from the regression in each specification. The residuals in each specification is subjected to unit root tests using the standard Dickey Fuller procedure. This test is otherwise known as Augmented Engle-Granger test for cointegration (Engle and granger, 1987). The results obtained from the unit root test for residuals from all specifications are given in table. 11. It shows that residuals obtained in all the specifications are stationary (i.e., without unit roots). Thus our earlier assumption that the obtained cointegrating vectors are the intended ones is valid. Therefore we proceed with the level variables for our estimation.

Table 11: Unit Root Test for Residuals-using indices

Residuals from the model	ADF test statistic
	Without constant and trend
Using FLI	-2.9892**(1)
Using INDFL and INFL	-3.1063** (1)
INMM, INCAPM, INCUAL & INCAL	-3.1412**(1)
Using only outcome variables	-3.1636**(1)

Note: * and ** denotes significance at 1 per cent and 5 per cent respectively

To test for possible structural instabilities in the model, Chow test using recursive estimation is carried out, which shows no structural instability in all the specifications at one and five percentage significance level. Thus our model is suitable for policy inferences. We can make conclusions for both pre and post liberalisation periods using the same model³⁰.

³⁰ Since our model is a reduced form model, there is a possibility for parameter instability between pre and post reform periods. Because the coefficients are a combination of both expectational and structural parameters and are not invariant to policy changes. To guard against this, we tested for possible structural instability of the empirical model.

4.4 Determinants of Private Corporate Fixed Investment - Results

The regression results using OLS from different specifications of the model are reported in table. 12

Table 12: Ordinary Least Squares (OLS) Regression Results for different specifications

Variable	Coefficients			
	Alternative specifications with			
	FLI	IDFL & INFL	INMM, INCAPM, INCUAL & INCAL	With liberalisation outcome variables
Constant	-0.33(0.004)***	-0.28(0.02)**	-0.27(0.05)**	-0.28 (0.05)**
GFCF_1	0.69(0.0001)***	0.68(0.00)***	0.78(0.0001)***	0.81 (0.00)***
LY	0.03(0.009)***	0.02(0.03)**	0.02(0.08)*	0.02 (0.08)*
CAPSTOCK_1	-0.12(0.09)*	-0.09(0.20)	-0.08(0.37)	-0.05 (0.53)
DCCP	-0.001(0.54)	-0.0006(0.59)	-0.001(0.41)	-0.001 (0.35)
PATNW_1	0.16(0.00)***	0.14(0.003)** *	0.13(0.005)***	0.12 (0.02)**
FD	-0.01(0.95)	-0.01(0.64)	-0.01(0.51)	-0.10 (0.45)
PUBINFIN_1	0.05(0.75)	0.02(0.89)	0.05(0.77)	0.01 (0.96)
FLI	0.001(0.09)*	-	-	-
INDFL	-	0.001(0.04)**	-	-
INFL	-	-0.0006(0.50)	-	-
INMM	-	-	0.001(0.09)*	-
INCAPM	-	-	0.03(0.25)	-
INCUAL	-	-	0.003(0.35)	-
INCAL	-	-	-0.003(0.10)*	-
RBC				0.03 (0.40)
RIRL				-0.002 (0.03)**
FDI_1				-0.10 (0.93)
R ²	0.96 F(8,22)=69.24 (0.00)	0.97 F(4,21)=15.95(0.00)	0.97 F(4,19)=17.09(0.00)	0.97 F(10,20)=60.26 (0.00)
DW	1.87	1.81	2.04	2.00

Note: Figures in brackets show t probabilities

*, ** and *** denotes significance at 10, 5 and 1 per cent level respectively

Table 13: Long run solution-regression using liberalisation indices

Variable	Coefficients			
	Alternative specifications with			
	FLI	IDFL & INFL	INMM, INCAPM, INCUAL & INCAL	With outcome variables
CAPSTOCK	-0.39 (0.09)*	-0.28 (0.20)	-0.36 (0.37)	-0.24 (0.53)
PATNW	0.51 (0.001)* **	0.43 (0.003)***	0.61 (0.005)***	0.62 (0.02)**
PUBINFIN	0.16 (0.75)	0.07 (0.89)	0.21 (0.77)	0.04 (0.96)
FDI	-	-	-	-
Significance of Lag 1 (F probability)	(0.0000) **	(0.0000)**	(0.0000)**	(0.0000)**

Note: Figures in brackets show f probabilities

Table 14: Model Adequacy Tests-regression using liberalisation indices

Tests	Stastistic and probabilities			
	Alternative specifications with			
	FLI	IDFL& INFL	INMM, INCAPM, I NCUAL & INCAL	With outcome variables
Auto regression	0.04 (0.96)	0.09 (0.90)	0.09 (0.92)	0.01 (0.98)
ARCH	1.09 (0.30)	0.84 (0.36)	0.98 (0.33)	1.74 (0.20)
Normality	0.72 (0.69)	0.52 (0.77)	2.08 (0.35)	2.05 (0.35)
Reset	0.20 (0.65)	0.57 (0.46)	0.05 (0.83)	0.00 (0.99)

Note: Figures in brackets show probabilities

In all the five specifications in table 12, model explains about 97 percentage of the variation in gross fixed capital formation rate as given by R^2 . ‘F’ statistic shows that all models are statistically significant (table.12). Results of Model adequacy tests also are satisfactory in all the specifications of the model (Table. 14). The Durbin Watson (DW) statistic (table.12) and Auto Regression ‘F’ statistic (table. 14) shows that the residuals are not serially correlated over time. ARCH result shows constant variance for residuals. These two show that there is nothing predictable from the residuals. Normality assumption and reset results are not violated indicating no functional misspecification (no omitted variable bias) in the model. Since the Partial R^2 is less than R^2 for each variable in all the specifications (table. 15) it can be concluded that there is no multicollinearity problem.

Table 15: Partial R² obtained from OLS regression for all specifications

	Alternative Specifications with			
	FLI	IDFL & INFL	INMM, INCAPM,INCUAL &INCAL	With outcome variables
Constant	0.06	0.06	0.17	0.17
GFCF_1	0.50	0.51	0.57	0.60
LY	0.27	0.20	0.14	0.14
CAPSTOCK_1	0.10	0.06	0.04	0.02
DCCP	0.02	0.01	0.04	0.04
PATNW_1	0.39	0.33	0.34	0.23
FD	0.002	0.01	0.02	0.03
PUBINFIN_1	0.004	0.009	0.77	0.00
FLI	0.11	-	-	-
INDFL	-	0.17	-	-
INIFL	-	0.02	-	-
INMM	-	-	0.02	-
INCAPM	-	-	0.02	-
INCUAL	-	-	0.03	-
INCAL	-	-	0.02	-
PRD	-	-	-	-
RBC	-	-	-	0.04
RIRL	-	-	-	0.20
FDI_1	-	-	-	0.00

The results obtained from the OLS regression which are estimated over the period 1970-2002, suggest that the findings reported in table.6 mask rather different effects of certain macro economic variables during the period. On the outset it is clear that certain macro economic variables such as change in cost of capital (DCCP), real bank credit to the private sector (BC), fiscal deficit (FD), public infrastructure investment (PUBINFIN_1), foreign direct investment (FDI_1) does not have any significant impact on corporate investment for the period under consideration. Thus the results does not provide any support either for complementary or substitutability of PUBINFIN and FDI with private corporate investment. Among the policy variables we captured through liberalisation indices, index of capital market liberalisation (INCAPML) and index of current account liberalisation (INCUAL) had not shown any significant impact on the corporate investment. This means that, these variables do not determine the accumulation of investment in the corporate sector for the period of analysis.

The estimated coefficient for the level of output (LY) is positive and significant in all the specifications though has only weak significance in specifications with outcome variables. This shows that the standard accelerator mechanism is important in explaining corporate investment behaviour. The coefficient on output is statistically significant at 1 per cent level when aggregate financial liberalisation is used in the model. It suggests

that one unit increase in output lead to an increase of 0.03 units increase in fixed investment. However, in the specifications 3 and 5 (with sub indices and liberalisation outcome variables), though the coefficient is positive and same, the significance has been reduced to 5 and 10 per cent levels. Regarding Capital stock, only in the first specification with aggregate financial liberalisation, the result supported the hypothesis that business investment (replacement investment) is negatively affected by the size of the initial capital stock, though the significance is weak at 10 per cent level. Thus the capital stock cannot be treated as a major determinant of private corporate investment in India for the period under study. Even in the long run (table 14) the coefficient and significance of capital stock does not show much difference in the result.

One interesting result is that profitability taken as one year lagged value of profit after tax to networth (PATNW_1) is a major determinant of corporate investment in all the specifications. The coefficient of PATNW_1 is positive and highly significant at 1 per cent level in both short run and long run. It suggests that a unit increase in the lagged value of PATNW_1 will lead to an increase in fixed investment by 0.12 to 0.16 units in the short run and by 0.43 to 0.61 units in the long run. The profit as a main determinant suggests that firms make use of internally generated funds retained from the profits and in turn uses for further investment. There are studies show that internal financing has increased increased in the corporate sector after liberalisation (Singh, 1995).

Among the variables in the base model, one year lagged value of dependent variable (GFCF_1) is the major contributing factor to corporate investment. A positive and highly significant estimated coefficient of GFCF_1 in all the specifications considered means that private fixed investment rates show *inertia*. That is overtime they are highly serially correlated even after controlling for all relevant variables. This implies that the effects of a change in a given investment decision may fully be realised only after a number of years. Our result shows that gross fixed investment of the private corporate sector were more influenced by the momentum of past investment decisions of the private corporate sector itself, rather than by expectations about the possible supply or demand side effects of public investment. Policy Reforms and Corporate Investment: Generally studies regarding the impact of structural adjustment programmes (SAP) on private investment showed a negative impact in developing countries (World Bank, 1988; Harrigan and Mosley, 1998; Greenway and Morrissey, 1992). But our analysis

produced mixed results in the Indian policy context. As we have explained earlier in our study, in 1991, following a balance of payments crisis, the India Government introduced a comprehensive policy of macro economic stabilisation and structural adjustment programmes and we noted a marked increase in private corporate investment in India in the post-liberalisation period. The statistically significant (though weak at 10 per cent level) and positive coefficient on the aggregate financial liberalisation index (FLI) in the estimated regression of the first specification, is consistent with the view that the liberalisation have had a positive impact on corporate investment. Our result shows that one unit increase in the aggregate financial liberalisation index leads to a decline of 0.001 units of corporate invetsment in the long run. The indication is that the corporate sector may have treated the liberalisation policies to be credible in creating conducive environment for fixed investment. Because the liberalisation policies adopted were of the nature of forceful and explicit interventions to make the system more competitive and efficient, in a number of sectors, in rapid succession (Bhagawati, 1993: pp 84-85).

The results from the model using the domestic (IDFL) and international (INIFL) financial liberalisation shows that, while the coefficient on INDFL is positive and statistically significant at 5 per cent level, INDFL had not shown any impact on corporate investment. The positive effect of INDFL on corporate investment could be seen as the result of regulatory and legal reforms in the domestic financial markets focused on removal of structural bottlenecks, introduction of new players and instruments, free pricing of financial assets, relaxation of quantitative restrictions, improvement in trading, clearing and settlement practices, more transparency etc which contributed to increased mobilisation and channelisation of investible resources by imparting liquidity in the financial system.

Our interest to know whether the various components of domestic and international financial liberalisation had any impact on investment lead us to use various subindices. In this specification, it is clear that, while the coefficient on the index of money market liberalisation is positive and significant at 10 per cent level, the coefficient on index of capital market liberalisation (INCAL) is negative and significance at 10 per cent level. But the index of capital market liberalisation (INCAPML) and index of current account liberalisation (INCUAL) does not show any relationship between investment. These

results are interesting. The negative and significant relationship between INCAL and investment raises many concerns over the credibility of external reforms.

On the basis of the logic that certain outcome variables of liberalisation could affect investment independently of the policy variables, we had done analysis by including main outcome variables like Bank credit (BC), Real interest rate lending (RIRL) and lagged value of foreign direct investment (FDI_1). Among these three liberalisation outcome variables only real interest rate on lending (RIRL) showed significant impact on private investment. There is evidence of a significant negative impact of real interest rates on investment. This suggests that an increase in real interest will lead to a decrease in investment. This significant negative impact is more consistent with the neoclassical investment theory than with the Mc-Kinnon Shaw hypothesis, as it would suggest that high real interest rates serve more to deter investment by raising the user cost of capital than to promote investment by increasing the volume of financial savings. This view can be supported by the findings of a recent study where the interest rate appears to be negatively and highly significant related to domestic investment rate for 31 developing countries including India for much of the Post-World War II period (Haque,Lahiri, Montiel, 1998). The finding that it is the rate of interest that affects investment rather than cost of capital is significant. Contrary to the expectations, the cost of capital index has increased during 1990s. The dominant force behind this was the increase in real lending rates brought about by the financial liberalisation. Interestingly, the increase in the real lending rate was much larger in magnitude to offset the favourable effect of a decline in the price of capital goods due to liberalisation.

5.5 Conclusion

This paper examined the major determinants of corporate sector investment in India using a general model for the period 1970-2002. We found that the traditional determinants still play a major role in determining corporate investment. The results show that the responsiveness of corporate investment is more with output and profit than other macro economic and policy variables. Though the liberalisation produced a favourable environment for investment as evident from the positive coefficient, it is rather difficult to conclude that, it had created a substantial impact on the investment behaviour. Only index of domestic financial liberalisation shows strong association with corporate investment. Index of money market liberalisation also shows positive impact

though the significance is weak at 10 per cent. One disturbing result is the significant negative association between index of capital account liberalisation and corporate investment. What emerges from this is that, reforms aimed at creating liquidity and depth and an efficient price discovery process might not have created the desired impact in the international arena. Alternatively, it can be argued that, excessive liberalisation prior to the achievement of full fledged domestic liberalisation might have adversely affected the benefits of international financial liberalisation which in turn will affect investment. The investment boom in the initial years of financial liberalisation may be due to the increase in output and profit after the liberalisation along with financial liberalisation. Though the impact of FLI is positive and statistically significant, its estimated effect (0.001 units) is only marginal. What does it imply for corporate investment? The major issue is that the liquidity constraints exist to prevent the efficient mobilisation and channellisation of resources even after the financial sector liberalisation. Even the interest rate liberalisation could not produce desired effects on corporate investment. Though the aggregate financial liberalisation produced an environment conducive for environment it could not succeed in creating a sustained increase in capital formation. Though our study given an indication of the impact of major policy transitions occurred in India on corporate investment, these results has to be analysed further to get robust conclusions. More micro level studies may give better insights in this regard.

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Appendix. 1: Tables

Table.1: Sector-wise Gross Fixed Capital Formation and its Components as a Percentage of GDP, 1970-71 to 1999-00

Year	Public	Private corporate	Household	Total private	Total GFCF
1970-71	7.03	1.78	9.10	10.88	17.91
1971-72	7.46	2.04	8.79	10.82	18.28
1975-76	7.77	2.39	7.85	10.24	18.01
1981-82	9.49	3.73	7.00	10.73	20.22
1985-86	10.03	3.64	6.80	10.44	20.47
1990-91	8.68	3.62	9.84	13.45	22.13
1991-92	8.95	5.29	7.27	12.57	21.52
1992-93	7.94	5.47	8.33	13.80	21.74
1993-94	8.01	5.98	7.45	13.44	21.45
1994-95	8.90	5.94	7.42	13.36	22.26
1995-96	7.64	8.52	8.56	17.09	24.73
1996-97	6.70	9.28	7.40	16.68	23.37
1997-98	6.23	8.97	7.65	16.62	22.85
1998-99	6.43	7.78	9.22	17.00	23.44
1999-00	6.30	7.18	10.28	17.47	23.77

Source: National Accounts Statistics

Table. 2: Percentage Shares of public, private corporate and household sector in capital formation

Year	Gross Fixed Capital Formation		
	Public	Private Corporate	Household
1970-71	39.24	9.95	50.81
1971-72	40.81	11.14	48.06
1974-75	40.09	10.63	49.28
1975-76	43.13	13.28	43.59
1981-82	46.93	18.46	34.61
1985-86	48.99	17.79	33.23
1990-91	39.21	16.35	44.44
1991-92	41.59	24.60	33.81
1992-93	36.52	25.15	38.32
1993-94	37.36	27.88	34.76
1994-95	39.98	26.70	33.32
1995-96	30.90	34.47	34.63
1996-97	28.65	39.70	31.65
1997-98	27.28	39.26	33.47
1998-99	27.45	33.22	39.33
1999-00	26.52	30.21	43.27

Source: Calculations using Table 1

Table.3: Composition of Gross Fixed capital Formulation as percentage of GDP

Year	Public		Private Corporate		Household		GFCF	
	Const.	M/C	Const.	M/C	Const.	M/C	Const.	M/C
1970-71	4.50	2.53	0.32	1.46	6.40	2.70	13.6	4.9
1975-76	3.99	3.78	0.32	2.07	5.58	2.27	12.5	5.9
1980-81	5.50	3.85	0.42	2.38	4.80	3.74	13	7.7
1985-86	5.57	4.46	0.55	3.09	4.45	2.35	11.4	9.2
1990-91	4.41	4.27	0.53	3.09	5.71	4.13	10.9	11.2
1991-92	4.59	4.36	0.71	4.58	5.56	1.71	11.2	10.3
1992-93	4.20	3.74	0.71	4.75	5.69	2.64	10.9	10.8
1993-94	4.26	3.76	0.86	5.12	5.08	2.37	10.2	11.3
1994-95	4.54	4.36	0.77	5.18	4.75	2.67	10	12.3
1995-96	4.20	3.44	1.30	7.23	4.37	4.20	9.8	14.8
1996-97	3.77	2.92	1.17	8.11	4.44	2.96	9.4	14
1997-98	3.33	2.91	1.29	7.68	5.49	2.16	10.1	12.7
1998-99	3.43	3.00	1.05	6.74	5.60	3.62	10.3	13.2
1999-00	3.54	2.77	0.94	6.24	5.70	4.59	10.3	13.4

Source: National Accounts Statistics

Table 4: Results of Pair-wise Granger Non-‘Causality’ Tests

Null Hypothesis : GFCFGDP is not Granger- ‘caused’ by	
variables	P values
DY	0.89 (6)
LY	0.00 (7)
INF	0.93 (5)
PUBIN	0.26 (8)
PUINFIN	0.00 (7)
PATNW	0.01 (7)
DCCP	0.05 (7)
CAPSTOCK	0.00 (6)
SDINF	0.34 (8)
SDGDP	0.85 (6)
SDRER	0.37 (7)
FDI	0.05 (7)
PI	0.41 (7)
FD	0.00 (7)
RBC	0.02 (7)
RIRL	0.04 (6)
SCGIM	0.58 (6)
RPCGs	0.28 (7)

Note: Figures in brackets show optimum number of lags used

Table.5: Results of Pair-wise Reverse Granger Non-‘Causality’ Tests

Null Hypothesis : GFCF does not Granger- ‘cause’	
variables	P values
LY	0.87 (6)
PUINFIN	0.00 (6)
PATNW	0.00 (7)
DCCP	0.95 (5)
CAPSTOCK	0.68 (6)
FDI	0.00 (6)
FD	0.69 (8)
RBC	0.78 (5)
RIRL	0.88 (5)

Note: Figures in brackets show optimum number of lags used

Table 6: Results of Unit Root Tests

Variables	Level				First Difference			
	With Constant	With Constant and Trend	Without Constant and Trend	Res ult	With Constant	With Constant and Trend	Without Constant and Trend	Res ult
GFCF	-1.30 (0)	-3.47(5)	-0.062 (1)	I (1)	-4.58** (7)	-2.55 **(6)	-3.44 **(0)	I(0)
LY	3.04 (4)	-2.39 (4)	4.69 (1)	I (1)	-0.94 *(6)	-5.00** (3)	-5.84** (1)	I(0)
PUINFIN	-1.46 (0)	-0.85 (0)	-0.57 (0)	I (1)	-4.71** (0)	-0.85*(0)	-4.78** (0)	I(0)
PATNW	-2.58 (1)	-3.01 (1)	-1.08 (0)	I (1)	-4.50** (0)	-3.01** (1)	-4.56** (0)	I(0)
DCCP	-5.21 **(0)	-5.16**	-5.08** (0)	I (0)	-5.50** (1)	-4.04** (7)	-5.63** (1)	I(0)
CAPSTOCK	-0.23 (1)	-1.93 (1)	5.69 (0)	I (1)	-2.61* (0)	-1.92** (1)	-1.48*(0)	I(0)
FLI	-1.25 (3)	-2.30 (3)	-1.16 (3)	I (1)	-1.25*(6)	-2.30 **(2)	-0.70 *(2)	I(0)
INDFL	-0.19 (1)	-1.87 (1)	0.38 (1)	I (1)	-2.45 (0)	-2.01** (1)	-1.97*(0)	I(0)
INIFL	0.543(1)	-0.81 (0)	-1.64 (5)	I (1)	-2.61*(0)	-2.07*(0)	-0.81** (0)	I(0)
INMM	-0.99 (4)	-2.28 (4)	-0.75 (4)	I (1)	-2.72*(0)	-2.29*(4)	-1.31*(2)	I(0)
INCAP	-2.79 95)	-3.29 (5)	-2.82 (5)	I (1)	-4.31** (7)	-2.24 * (6)	-2.03*(0)	I(0)
INCAL	0.69 (3)	-0.69 (2)	-0.15 (3)	I (1)	-3.04*(1)	-1.45*8(2)	-0.69*(2)	I(0)
INCUAL	-1.91 (5)	-0.08 (4)	2.76 (0)	I (1)	-1.97*(4)	-0.07*8(4)	-0.42** (4)	I(0)
INLEG	1.46 (0)	-1.11 (0)	2.71 (0)	I (1)	-3.22*(0)	-1.11 (0)	-2.69** (0)	I(0)
FDI	11.07 (7)	13.00 (7)	0.56 (0)	I (1)	20.14 *(7)	13.00 **(5)	8.31 (0)	I(0)
FDG	-4.91 **(0)	-4.76** (0)	-3.30** (0)	I(0)	-4.01** (6)	-3.62* (5)	-4.48 ** (2)	I(0)
RBC	-4.88 (0)	-4.94 (0)	-3.50 (0)	I(1)	-5.47 **(1)	-3.32 ** (6)	-4.78** (0)	I(0)
RIRL	-5.35 **(0)	-5.37 ** (0)	-5.33 ** (0)	I(0)	-3.15*(6)	-5.85** (1)	-5.37** (0)	I(0)

Note: GFCF

= Ratio of Real Gross Fixed investment in private corporate sector to GDP

LY = Level of GDP

PUBINFIN = Ratio of Public Infrastructure Investment to GDP

PATNW = Ratio of profit after tax to net worth

DUCCP = Change in User Cost of Capital

CAPSTOCK = Ratio of Capital Stock to GDP

FLI = Aggregate Financial Liberalisation Index

INDFL = Index of Domestic Financial Liberalisation

INIFL = Index of International Financial Liberalisation

INMM = Index of Money Market Liberalisation

INCAPM = Index of Capital Market Liberalisation

INCAL = Index of Capital account Liberalisation

INCUAL = Index of Current Account Liberalisation

RBC = Ratio of Bank credit to the private sector to GDP

RIRL = Real Interest Rate Lending

FDI = Ratio of Foreign Direct investment to GDP

Figures in bracket show the optimum number of lags in the test

* and ** shows the significance at 5 per cent and 1 per cent respectively

Table 7: Cointegration test Results with Small Sample Correction
 Variables:GFCF,LY,DCCP,PUINFIN,PATNW,CAPSTOCK,GFCF,FLI.

Null hypothesis	Maximum Eigenvalue test			Trace Test		
	Alternative	Statistic	95 per cent critical value	Alternative	statistic	95 per cent critical value
r=0	r=1	114.2**	51.4	r≥1	229.2**	156
r≤1	r=2	34.79	45.3	r≥2	114.9	124.2
r≤2	r=3	31	39.4	r≥3	80.15	94.2
r≤3	r=4	25.03	33.5	r≥4	49.15	68.5
r≤4	r=5	11.55	27.1	r≥5	24.13	47.2
r≤5	r=6	10.18	21.0	r≥6	12.58	29.7
r≤6	r=7	2.325	14.1	r≥7	2.399	15.4
r≤7	r=8	0.073	3.8	r≥8	0.07346	3.8

Note: ** shows statistical significance at 1 per cent level

Table 8: Cointegration test results with Small Sample Correction
 Variables:GFCF,LY,DCCP,PUINFIN,PATNW,CAPSTOCK,GFCF,INDFL,INIFL

Null hypothesis	Maximum Eigenvalue test			Trace Test		
	Alternative	Statistic	95 per cent critical value	Alternative	statistic	95 per cent critical value
r=0	r=1	244.7**	192.9	r≥1	110.6**	57.1
r≤1	r=2	134.1	156	r≥2	36.29	51.4
r≤2	r=3	97.84	124.2	r≥3	30.49	45.3
r≤3	r=4	67.35	94.2	r≥4	26.7	39.4
r≤4	r=5	40.64	68.5	r≥5	22.39	33.5
r≤5	r=6	18.25	47.2	r≥6	11.51	27.1
r≤6	r=7	6.75	29.7	r≥7	4.43	21.0
r≤7	r=8	2.32	15.4	r≥8	2.20	14.1
r≤8	r=9	0.12	3.8	r≥9	0.12	3.8

Note: ** shows significance at 5 per cent level

Table.9: Cointegration test Results with Small Sample Correction
 Variables:GFCF,LY,DCCP,PUINFIN,PATNW,CAPSTOCK,GFCF,INDFL,INIFL,INM
 M,INCAPM

Null hypothesis	Maximum Eigenvalue test			Trace Test		
	Alternative	Statistic	95 per cent critical value	Alternative	statistic	95 per cent critical value
r=0	r=1	371.2**	277.7	r≥1	121.8**	68.8
r≤1	r=2	249.3**	233.1	r≥2	69.14*	62.8
r≤2	r=3	180.2	192.9	r≥3	44.84	57.1
r≤3	r=4	135.3	156.0	r≥4	39.44	51.4
r≤4	r=5	95.89	124.2	r≥5	31.49	45.3
r≤5	r=6	64.39	94.2	r≥6	21.09	39.4
r≤6	r=7	43.3	68.5	r≥7	18.39	33.5
r≤7	r=8	24.91	47.2	r≥8	14.6	27.1
r≤8	r=9	10.31	29.7	r≥9	6.37	21.0
r≤9	r=10	3.94	15.4	r≥10	3.83	14.1
r≤10	r=11	0.11	3.8	r≥11	0.11	3.8

Note: * and ** denotes significance at 5 per cent and 1 per cent respectively

Table 10: Cointegration Test Results with Small Sample Correction
 Variables:GFCF,LY,DCCP,PUINFIN,PATNW,CAPSTOCK,GFCF, RIRL, RBC and FDI

Null hypothesis	Maximum Eigenvalue test			Trace Test		
	Alternative	Statistic	95 per cent critical value	Alternative	statistic	95 per cent critical value
r=0	r=1	427.3**	233.1	r≥1	173.2**	62.8
r≤1	r=2	254.1**	192.9	r≥2	116.3**	57.1
r≤2	r=3	137.8	156.0	r≥3	37.21	51.4
r≤3	r=4	100.6	124.2	r≥4	32.25	45.3
r≤4	r=5	68.3	94.2	r≥5	29.84	39.4
r≤5	r=6	38.46	68.5	r≥6	13.47	33.5
r≤6	r=7	25	47.2	r≥7	12.69	27.1
r≤7	r=8	12.31	29.7	r≥8	6.98	21.0
r≤8	r=9	5.33	15.4	r≥9	4.88	14.1
r≤9	r=10	0.45	3.8	r≥10	0.45	3.8

Note: ** refers to 5 per cent level significance

Appendix. II: Description of Data and Methodology of INDEX construction

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. Financial liberalisation includes both domestic and international sectors. Moreover, it consists 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 affect investment behaviour. The basic methodology followed for this purpose is from Abiad and Modi (2003). In this methodology, various reform policy measures are assigned dummy values, which cannot be otherwise determined quantitatively. Various liberalisation policy indices such as domestic financial liberalisation and international financial (both capital account and current account liberalisation) are constructed. The aggregation of these indices gives us an aggregate liberalisation index for India.

Following Abiad and Modi (2003) policy changes are assigned a score on a graded scale, from zero to one, in a given year. Here, zero corresponds to being *fully repressed*, one to *partially repressed*, two to *largely liberalised*, and three to *fully liberalised*¹. The

¹ 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).

main components of financial liberalisation included for index construction are given below².

1. Domestic Financial Sector Liberalisation
 - a. Interest rate liberalisation
 - b. Reduction in Reserve Requirements
 - c. Money Market reforms
 - d. Pro-Competition Measures
 - e. Capital Market reforms
 - f. Legal Reforms
2. External Sector Liberalisation
 - a. Exchange Rate Regime/Current account (Trade Policy)
 - b. Institutional or Legal framework
 - c. Foreign Direct Investment
 - d. Foreign Equity Inflows (Foreign Institutional Investors (FIIs))
 - e. Capital Issues on foreign bourses
 - f. NRIs/OCBs
 - g. External Commercial Borrowing (ECB)

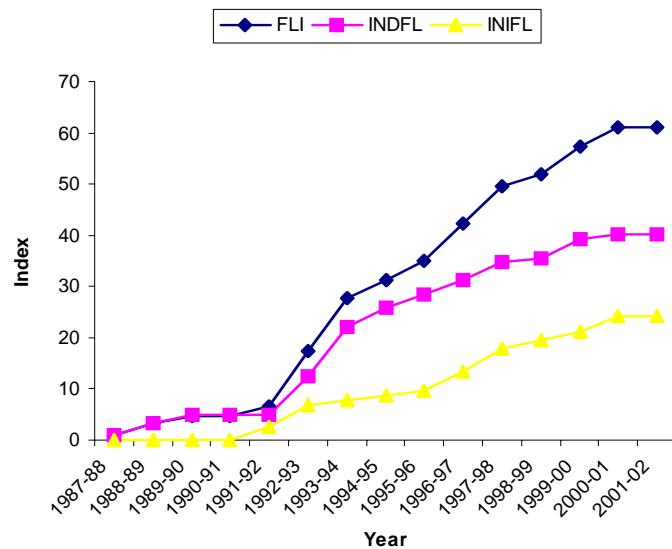
After putting dummy values, we obtained a matrix of 59 dummies. Each column represents a single dummy and each row represents a year. Inorder to reduce the dimensinality of the matrix, principal component have been used³.

The graphs 1 and 2 shows that the degree of liberalisation has increased gradually over the years. Though the liberalisation started towards the end of 1980s, only from 1991-92 onwards, it got momentum because of the introduction of structural adjustment and macro economic liberalisation programmes.

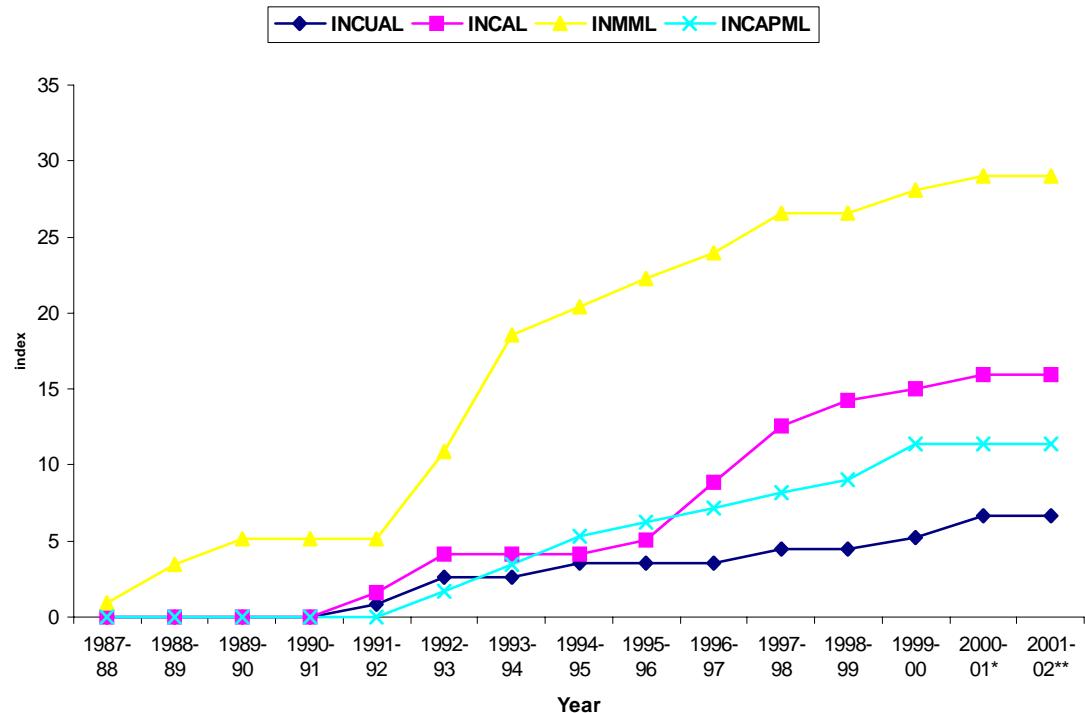
² The details on the selection of variables, values for dummies, data on indices etc will be available from the author on request.

³ The results of the principal component analysis are not given in this paper.

Graph 1: Trends in Indices-FLI,INDFL,INIFL



Graph 2: Trends in Sub indices



Appendix III: Methodology of Calculation of Cost of Capital

This appendix draws on the methodology of calculating cost of capital services (rental price of capital) for the private corporate sector. Following Hebbel and Miller (1992), the user cost of capital is equal to: $ucc = PK (r(1-t) + \delta - \pi^e) / P$. Where, PK = price of capital (investment) goods, r = bank lending rate, t = corporate tax, δ = depreciation rate, π^e = expected rate of change in capital goods price (inflation), and P = the general price level.

Price of Capital goods (PK) is measured in terms of the implicit deflators for private corporate fixed capital formation (1993 = 1.00). The lending rate charged by the State Bank of India is taken as bank lending rate (r). The corporate income tax (t) is directly collected from the budget documents, Government of India. π^e is the expected inflation of investment goods price PK, which is measured as the three year moving average of the rate of capital goods price measure by the implicit deflators for private corporate sector, with a one year lag. The depreciation rate is calculated from the CSO's National accounts Statistics for the private corporate sector. Finally, the general price level, P is captured by the term GDP deflator.