

Investment Behaviour in Private Manufacturing Sector in India: An Empirical Analysis

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Abstract

This paper explores the investment behaviour of Indian private manufacturing industries at an aggregate level using the neoclassical theory of investment. Results indicate that the responsiveness of investment is higher with accelerator and profitability variables than financial liberalization and policy variables. In other words, industries consider the demand factors, internal liquidity and prior capital expenditure decisions than the policy variables as the major indicators of investment behaviour.

1. Introduction

1.1 Understanding the behaviour of investment provides an important insight into the process of economic development, where economic growth critically depends on capital accumulation and it stems from investment. "Industrial investment makes countries richer". This idea is commonly accepted among economists who argue that the speed of development closely depends on industrial investment level as well as on its structure, orientation and efficiency. In recent years, emphasis has been put on the development of the private sector to boost economic growth in developing countries. However, the idea of participation of the private sector as an alternative development strategy to boost growth in developing economies has started in latter part of 1980s. Recent theoretical and empirical studies on investment behaviour focused on the role of government policy and tried to derive an explicit relationship between the principal policy instruments and private investment (Blejer and Khan 1984, Greene and villaneuva 1991). More importantly, as evidenced, it is the private investment that plays a greater role than public investment in determining economic growth in developing countries. Henceforth the pace and pattern of business investment are central to the understanding of economic activity, where private investment is an important part of total investment.

1.2 Investment refers to increase in the total assets of a corporation, where new investment consists of addition to its assets, which enables it to produce more output. The growth in industrial output is primarily associated with new investment in plant and machinery. If firms are confident that demand will remain buoyant, they investment more in new plants and machineries which generate even more demand and increases productivity through the introduction of new technology which in turn accelerates economic growth.

1.3 In respect to India, it has been undergoing significant changes both in its structure and pattern owing to the policy changes. Since the early 1950s up until the early 1980s the evolution of manufacturing sector was guided by protected industrial and trade policies,

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which restricted the growth of the economy in general and manufacturing sector, in particular. Under old industrial and trade policy regime, manufacturing sector was characterized by extensive public sector participation, regulation of the private sector firms, restrictions on foreign investment, high tariff and non-tariff restrictions on imports, which held up the growth of the manufacturing sector. This has been replaced by a more liberal industrial and trade policy regime, through the inception of new economic policy in 1991. The major focus of these policies had been to dismantle the complex web of controls that severely constrained the emergence and operation of the private entrepreneurs. Investment performance has been a key emphasis in the policy debate following the reforms (Athukorala and Sen 1998). It is observed that new policies had tremendous effect on the industrial sector, in terms of creating conducive business environment for investment and for future growth process of industries. Besides these policies few more additional macroeconomic and structural adjustments, such as financial liberalization, development of securities market, boom in equity prices and growth of institutional investors have given rise to enhanced interest in the behaviour of investment and its link to growth.

2. An Outline of Investment Patterns in India

2.1 The capital formation in the country has been marked by some significant developments. The gross capital formation has gone up sizably since the 1950s with significant jumps during the 1980s. The rate of gross capital formation more than doubled by the 1980s and increased more than two and half times during the 1990s. However, for subsequent three years the rate of gross capital formation remained depressed and it fluctuated around 21% of GDP. The process of recovery started in 1994-95 and the gross capital formation rose to 25 percent in 1995-96 and it substantially increased to 34% of GDP in 2007-08. At present the rate of investment in the country is more than double the rate of investment in the early years of economic reforms. Figure 1 presents the time series plots of private, public and total investment rates in percent to GDP. As evident, private investment rate surged in late 1980s, and increased at a rapid pace since reforms. Private investment as a percent of GDP is marginally high compared to public investment in pre reform period. It rose from 9.5 percent in 1980-81 to 13.6 percent in 1990-91 and during post reform period private investment amplified to 25.7% of GDP. However, total investment rate as a percent to GDP increased gradually over the years from 23% in 1990 to 34% in 2007. On the other side public investment declined gradually from its peak of 11.6% in 1986-87 to 9.8% in 1991 and to abysmal of 8.2% in 2007.

2.2 Overall, as a consequence of economic liberalization it is the private corporate sector which performed well, due to the privatization of several industries. The escalating domestic demand and growing export orientation has brought an upsurge in the manufacturing sector. Phenomenal growth is registered in automobile sector, iron and steel, machinery and equipment, including transport and basic chemicals sector in recent years. However, concerning with private investment and its allocation among different sectors and factors that influence investment is central in theoretical macroeconomics. As adequate capital investment in industries is critical for accelerated industrial growth, forecasts of investment of the private sector assumes considerable significance in determining the performance of industrial sector, and it provides the necessary backdrop to gauge the impact of reform policies on private investment.

2.3 However, a number of empirical studies exist on the above issue, where few studies used pre-reform as well as post liberalization data on private investment in India. However, the current study is another attempt in a broader dimension, where it comprehensively evaluates the empirical determinants of private investment activity. The paper investigates three interrelated core issues: firstly, the role of accelerators and financial variables in influencing business fixed investment across various industrial groups and second, emphasis on the implications of financial sector reforms on manufacturing investment behaviour. Third, the role of equity finance in determining capital expenditure is examined for the post reform period. It is observed that an extensive volume of research works have emerged, both at the theoretical and empirical levels, to counter the above issues. Theoretically, in modeling the determinants of investment behaviour of a firm, five broad approaches are considered; which include the simple accelerator model, the liquidity theory, the expected profits theory and the neo classical theory of investment. One of the first theories of investment and the base for other approaches was the simple accelerator model, (Clarke, 1917) which maintains expected future sales as the main determinant of investment. This acceleration concept hypothesized a direct functional relationship between a rate of change in a flow and additions to a stock, (Meyer. J and Edwin Kuh, 1955). Specifically, additions to the stock of physical capital were considered, as a simple function of the rate of change in output. This model was soon transformed into the flexible accelerator model of investment behaviour (Chenery, 1952 and Koyock, 1954), which states that, the adjustment of capital stock to the desired level is not instantaneous because of delivery lags and delayed responses to changes in the level of demand. They incorporated financial variables along with future sales as the determinant for investment decisions, where they assumed the level of desired capital to be proportional to output. There are other theories, which are propounded as alternatives to the rigid accelerator theory, i.e. Liquidity theory and Expected Profits theory. In the liquidity theory of investment behaviour, desired capital is proportional to liquidity (Jorgenson and Calvin D. Siebert 1968), whereas in expected profits theory desired capital is proportional to profits. The Profits theory holds that the amount of investment spending depends on the amount of profits that firms and industries are making i.e. profit expectations determine investment behaviour. As, against the above investment theories, the neo classical investment path, based on firm profit optimization, has been most dominant in applied research (Robert. S. Chirinko 1993). There are two major variants of this approach; one is the user cost of capital model, pioneered by Dale Jorgenson (1963), which postulates that output levels and user cost of capital are the two key determinants of investment. The theory of a profit maximizing firm, subject to a production function through which a technical relationship between inputs and outputs get defined is central in the neo classical model. The model assumes flexible accelerator prices and capital markets. The other variant of the optimizing approach is the q theory pioneered by Tobin (1969), which incorporates Keynes's analysis of share (stock) price instability into fixed investment volatility. According to Tobin, firm investment opportunities are summarized by the market value of its capital stock. In particular, firm investment expenditure is positively related to average q (also known as Tobin's q) defined as the ratio of the market value of the firm to the replacement cost value of its assets. The use of q is based on the idea that investment opportunities can be captured by equity market.

2.4 On the other hand, a vast literature suggests that in addition to real sales growth and the user cost of capital, financial factors are also imperative in explaining short run fluctuations in investment. However, firms first utilize internal funds for investment purposes

so as to maintain their control. But, the external finance is also sought for financing their investment plans if the desired rate of growth is higher than that permitted by the internal finance. According to financing hierarchy hypothesis, i.e. Myers(1984) “pecking order” theory of financing, the firm’s capital structure will be driven by the desire to finance new investments, first internally, then with low-risk debt, and finally with equity only as a last resort. In contrast, transaction costs or information asymmetries induce a cost premium that makes external finance an imperfect substitute for internal finance. Therefore, in a world of heterogeneous firms, financing constraints would clearly influence the investment decisions of firms. In particular, investment may depend on financial factors, such as availability of internal finance, access to new debt or equity finance, or the functioning of particular credit markets. In the following empirical works we found contradictory views regarding investment determinants. The studies like Dhrymes, P. J. and M. Kurz (1967), Sachs, Reynolds and Albert. G. Hart (1968) investigated the determinants of fixed investment in a broader dimension, where they determined the structure underlying the dividend - investment – external finance triad of decision making process and found external finance activity of firms to be strongly affected by their investment policies. They indicated the considerable relevance of accelerator and profit theories in explaining the empirical behaviour of investment. Krishnamurthy. K and Sastry (1971, 1975), Bhattacharya.S (2008), also argued along similar lines, found the positive effects of accelerator, retained earnings and flow of external finance in determining investment behaviour of Indian manufacturing sector. These studies claim a significant support for the investment –accelerator relationship. Similarly, Bilsborrow E. Richard (1977) analyzed the determinants of investment in manufacturing firms with a different institutional and cultural context of a developing country, Colombian firms where along with the accelerator and financial variables he appraised the importance of foreign exchange as a significant influence on annual variation in investment. Recent empirical works, revealed the dependence of investment on financial factors. Hubbard. G (1998) emphasized on the contemporary models of capital market imperfection and the implications of these models in firm’s investment process. The study considers the applications of these models to a range of investment activities including research on inventory investment, research and development, employment, business formation, survival, pricing and corporate risk management. However, identifying a specific channel (debt covenants) and the corresponding mechanism (transfer of control rights) through which financing frictions impact corporate investment, Chava. S and Michael. R. Roberts (2008), shows that capital investment declines sharply following a financial covenant violation, when creditors use the threat of accelerating the loan to intervene in management.

2.5 Further, the reduction in investment is concentrated in situations in which agency and information problems are relatively more severe, highlighting how the state contingent allocation of control rights can help mitigate investment distortions arising from financing frictions. On the other hand, Cava La, Gianni (2005), Bond. S and Costas Meghir (1994), explored the impact of financial factors on corporate investment, and indicated the severity of financing constraints of firms. The innovation of the study is that they distinguish financially distressed firms from financially constrained firms. The presence of financially distressed firms appears to bias downwards the sensitivity of investment to cash flow. The paper also explores the effects of cash flow on investment, where the availability of internal funding could significantly affect the investment of financially constrained firms. Real sales and the user cost of capital, which incorporates both debt and equity financing costs, also appears to be an important determinant. In contrast to their views, several studies

argued for government intervention in the allocation of investment finance. Emphasizing on the implications of the recent structural adjustment policy reforms of 1990s, on investment behavior Athukorala and Sen (1996) examined the determinants of private corporate investment in India. The results of their econometric analysis suggest that the net impact of the reforms on corporate investment has been salutary. The decline in real public sector investment brought about by the fiscal squeeze carried out as part of the reforms seems to have had a significant adverse impact on corporate investment. However, this adverse impact was outweighed by the salutary effects of the reform process on investment operating through the decline in real rental cost of capital and favorable changes in investor perception in the aftermaths of the reforms. Finally, they indicated the strong complimentary relationship of public investment with private corporate investment in India.

3. Theoretical Framework

3.1 In order to encompass sound theoretical underpinnings on the determinants of investment, we make use of neoclassical model of investment with appropriate consideration to the dynamic structural and institutional features of the Indian economy. The theory of a profit maximizing firm subject to a production function through which a technical relationship between inputs and outputs get defined is central in neoclassical model. This production function connects the capital stock to the relative price between capital and output. Jorgenson's basic assumption for a firm to maximize its present value is that the rate of change of the input of capital services is equal to the rate of net investment. This means that the provision of capital to a firm is derived function of the acquisition of investment goods by that firm. The neo classical model postulates that output levels and user cost of capital are the two key determinants of investment where the demand for capital is assumed to positively related to expected output (Y) and inversely related to the expected rental cost of capital (C). Assuming a conventional neoclassical model where a profit maximizing firm is subject to constant returns to scale and a constant elasticity of substitution production function, the function optimal capital stock (K^*) can be represented as:

$$K_t^* = \alpha Y_t C_t^{-\sigma} \quad (1)$$

Where, K_t^* is the desired capital stock, Y_t is the expected level of output in period t, C is expected cost of capital, in period t. The variable user cost of capital (Hebbel and Muller, 1992), is equal to $C_t = PK (r (1-t) + \delta - \pi^e)/P$. Where, PK = price of capital 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.

3.2 Similarly, if expectations are static, so that future changes in output are unanticipated, net investment can be represented as a distributed lag on past changes in desired capital stock.

$$I_t^n = \alpha \beta_j \sum_{j=0}^N \Delta K_{t-j}^* \quad (2)$$

Assuming, that capital depreciates at a constant rate, the replacement investment (I_t^r) is given as:

$$I_t^r = \delta K_{t-1} \quad (3)$$

By combining both net and replacement investment and adding a stochastic error term (u_t) we obtain the neo-classical investment model as:

$$I_t = \delta K_{t-1} + \sum_{j=0}^N \alpha \beta_j \Delta(Y_{t-j} C_{t-j}^{-\sigma}) + u_t \quad (4)$$

3.3 For empirically estimating investment function we approximate K^* linearly on the assumption that expectations of the output and rental cost terms are based on extrapolations of past values. Thus with inclusion of additional variables such as borrowings (BR_t), equity capital (EQ_t), Operating profit (OP_t), and Financial liberalization Index ($FlibDF_t$) the model can be written as:

$$I_t = C + \alpha K_t + \sum \Phi_{1j} Y_{t-j} - \sum \Phi_{2j} UCC_t + \Phi_3 OP_t + \Phi_4 BR_t + \Phi_5 EQ_t + \Phi_6 FlibDF_t + u_{it} \quad (5)$$

Where the distributed lag co-efficient are an amalgam of the delivery lag, expectations and production parameters. The equation (5) provides a useful framework for examining the relationship between the macroeconomic stabilization programmes initiated in the early 1990s and the behaviour of private corporate investment in India.

4. Data, Methodology and Empirical Results

4.1 In order to examine the investment determinants the study uses two digit industries and for classification we have followed the Annual Survey of Industries, National Industry Classification (NIC) code 2004, which is regarded as benchmark for industry classification, prepared according to their economic activity. According to National Industry Classification (NIC), the manufacturing sector commences from NIC 15 and ends at NIC 36. In whole the manufacturing sector contains 22 two digit industries, out of it the study selected 15 major industries for time series analysis starting from 1990 to 2007 [see table 1].

4.2 In econometric theory it is generally found that, time series data are often encountered with the problem of Non-Stationarity and Autocorrelation. The study tested for these problems by employing Augmented Dickey Fuller (ADF) and Breusch Godfrey Serial Correlation LM (BGLM) test. The study makes use of Generalized Least Squares (GLS) technique for estimation of the regression model.

4.3 The study begins empirical analysis by carrying out unit root test for each of the variables across fifteen industries, the results of the unit root test both at level and difference along with the descriptive statistics results are reported in tables 4-4.1. According to the test results, the variables under consideration do not have the uniform order of integration, some variables are integrated of order one $I(1)$ and some are integrated at order two $I(2)$. Therefore the Stationarity problem is worked out by taking respective differences for all the variables. The results of the BGLM test are presented in table 3. If the test is significant null hypothesis is rejected indicating the presence of autocorrelation in the model. The results show that, the industries are significant at 1% and 5% level of significance, depicting the presence of autocorrelation in all the industries. Moreover, under the presence of autocorrelation the usual estimators of the covariance matrices of the OLS are not valid. Thus we need new estimation methods to handle regression models with error terms that are heteroskedastic and serially correlated or both. Therefore the study makes use of

Generalized Least Squares [GLS] technique for estimation, which is an efficient estimator where it satisfies the conditions of Gauss-Markov theorem. Finally, to examine the determinants of investment, the study followed Jorgensen's neoclassical theory of investment. The theory implies that investment is dependent on the level of output and the user cost of capital. The study along with output and user cost of capital as a determinants, considers other key determinants of investment such as operating profit, borrowing, equity and financial liberalization index.

4.4 The study hypothesizes that, sales affects investment with a lag i.e., previous period sales induces current investment. Additionally, current profitability of industries signal expected future profits that may affect investment expenditure, emphasizing the forward looking nature of investment decisions. The results of the estimated model displaying the contribution (coefficients) of the explanatory variables to capital formation are reported in table 2. The coefficient of sales lag is significant in Manufacture of Textiles (NIC 17), Manufacture of Paper and Paper Products (NIC 21), Manufacture of Rubber and Plastic Products (NIC 25), Manufacture of Fabricated Metal Products (NIC 28), Manufacture of Electrical Machinery and Apparatus (NIC 31), Manufacture of Radio, television and communication Equipment (NIC 32), Manufacture of Motor Vehicles trailers and Semi-trailers (NIC 34) and Manufacture of Transport Equipment (NIC 35). Meanwhile in industries such as, Manufacture of Food Products and Beverages (NIC 15), Manufacture of Tanning and Dressing of Leather (NIC 19), Manufacture of Coke, Refined Petroleum products (NIC 23), Manufacture of Chemicals and Chemical Products (NIC 24), Manufacture of Other non-metallic mineral products (NIC 26), Manufacture of Basic Metals (NIC 27), Manufacture of Machinery and Equipment (NIC 29), the coefficient is not statistically significant. In these industries the financial variables such as operating profit, capital stock and borrowings have a significant impact on investment. The results reveal that in half of the industries, the accelerator variable doesn't have greater influence on investment, where it is the financial variables which have a bigger influence in determining the level of investment.

4.5 On the other hand, capital stock is considerably influencing investment in few industries such as Manufacture of Food Products and Beverages (NIC 15) and also in heavy industries such as Manufacture of Other non-metallic mineral products (NIC 26), Manufacture of Basic Metals (NIC 27), Manufacture of Fabricated Metal Products (NIC 28), Manufacture of Machinery and Equipment (NIC 29), Manufacture of Motor Vehicles trailers and Semi-trailers (NIC 34), Manufacture of Transport Equipment (NIC 35), the coefficient is positive and significant at 1% and 5% level. Across the industrial sectors and within the industries, the mean value of capital stock [see table 5] is relatively higher compared to other variables, implying a greater amount of impact on capital formation. Meanwhile, in Manufacture of Textiles (NIC 17) and Manufacture of Chemicals and Chemical Products (NIC 24) the variable is significant with a negative coefficient values. Although these two industries have a higher mean value of capital stock but its influence on investment is negative, this is due to a larger control of sales and profitability respectively in determining capital expenditure in these two industries. On contrary to these findings, few industries for instance, Manufacture of Tanning and Dressing of Leather (NIC 19), Manufacture of Paper and Paper Products (NIC 21), Manufacture of Coke, Refined Petroleum products (NIC 23), Manufacture of Rubber and Plastic Products (NIC 25), and in two electrical and electronic industries such as Manufacture of Electrical Machinery and Apparatus (NIC 31),

Manufacture of Radio, television and communication Equipment (NIC 32), the variable capital stock is insignificant in explaining investment patterns. The descriptive statistics reveals that the mean value of capital stock is relatively less, implying a meager influence on investment spending in these six sectors.

4.6 The research finds internal sources of funds as a major source of financing investment. In fact, over the years operating profits increased in all the industries, in the sample out of fifteen industries, operating profits is a significant determinant in ten industries. Industries such as Manufacture of Textiles (NIC 17), Manufacture of Coke, Refined Petroleum products (NIC 23), Manufacture of Chemicals and Chemical Products (NIC 24), Manufacture of Other non-metallic mineral products (NIC 26), Manufacture of Fabricated Metal Products (NIC 28), Manufacture of Machinery and Equipment (NIC 29), Manufacture of Electrical Machinery and Apparatus (NIC 31), Manufacture of Radio, television and communication Equipment (NIC 32) and Manufacture of Transport Equipment (NIC 35) have positive and significant coefficients. The large and significant coefficient of the profit variable in these industries suggests the strong influence of operating profit in determining investment, a result which is consistent with earlier empirical works. On the other hand in, Manufacture of Paper and Paper Products (NIC 21) and Manufacture of Fabricated Metal Products (NIC 28), it is statistically significant with 5% and 10% level with negative coefficient estimates. Similarly, in contrast to these findings, operating profit is irrelevant in influencing investment in few industries such as Manufacture of Food Products and Beverages (NIC 15), Manufacture of Tanning and Dressing of Leather (NIC 19), Manufacture of Rubber and Plastic Products (NIC 25), Manufacture of Basic Metals (NIC 27) and Manufacture of Motor Vehicles trailers and Semi-trailers (NIC 34). The larger performance of accelerator, capital stock and borrowings led to irrelevance of this variable in determining investment patterns, it is evident from descriptive statistics.

4.7 The study also explores industry accessibility to external capital (Borrowings and Equity capital) and its relation to investment activities. Theoretically, the demand for external finance is influenced by growth objectives of industries, which determine the extent of borrowings. Industries resort to external finance if market opportunities warrant a faster rate of expansion than is permissible through internal resources. The results reveal that industries such as Manufacture of Food Products and Beverages (NIC 15), Manufacture of Tanning and Dressing of Leather (NIC 19), Manufacture of Chemicals and Chemical Products (NIC 24), Manufacture of other non-metallic minerals products (NIC 26) and Manufacture of Basic Metals (NIC 27), the coefficient of borrowings is positive and significant and in Manufacture of Rubber and Plastic Products (NIC 25) and Manufacture of Electrical Machinery and Apparatus (NIC 31) the coefficient is negative and statistically significant. The descriptive statistics reveals that in these industries the variable borrowings have marginally higher mean value compared to other variables in the model. Meanwhile, in remaining industries such as Manufacture of Textiles (NIC 17), Manufacture of Paper and Paper Products (NIC 21), Manufacture of Coke, Refined Petroleum products (NIC 23), Manufacture of Fabricated Metal Products (NIC 28), Manufacture of Machinery and Equipment (NIC 29), Manufacture of Radio, television and communication Equipment (NIC 32), Manufacture of Motor Vehicles trailers and Semi-trailers (NIC 34), Manufacture of Transport Equipment (NIC 35) borrowings is insignificant in determining investment.

4.8 Meanwhile, another important component of external finance is equity capital which also influences investment patterns in few high growth industries. The coefficient of equity capital is positively associated with the capital expenditure of industries such as Manufacture of Paper and Paper Products (NIC 21), Manufacture of Coke, Refined Petroleum products (NIC 23), Manufacture of Machinery and Equipment (NIC 29), Manufacture of Radio, television and communication Equipment (NIC 32) and Manufacture of Transport Equipment (NIC 35). In contrast to this, in few industries such as, Manufacture of Chemicals and Chemical Products (NIC 24) and Manufacture of Motor Vehicles trailers and Semi-trailers (NIC 34) the coefficient is negative with significant p values. Meanwhile in Manufacture of Food Products and Beverages (NIC 15), Manufacture of Textiles (NIC 17), Manufacture of Tanning and Dressing of Leather (NIC 19), Manufacture of Rubber and Plastic Products (NIC 25), Manufacture of Other non-metallic mineral products (NIC 26), Manufacture of Basic Metals (NIC 27), Manufacture of Fabricated Metal Products (NIC 28), Manufacture of Electrical Machinery and Apparatus (NIC 31) equity capital is insignificant in determining investment. Overall the results reveal that in majority of industries equity capital is not playing a significant part in determining investment.

4.9 As for as the user cost of capital (UCC) is concerned, its influence on investment is negative and statistically insignificant implying that the long-run impact of the user cost of capital on investment is irrelevant and uninfluential in almost all the industries. This suggest that the tax and non-tax (economic depreciation rate of capital, interest rate and price level) incentive policies in India do not have a major impact on manufacturing investment. In this sense, the empirical results lend support to prior studies of developing countries where the user cost of capital doesn't surprisingly determine capital accumulation in the private sector.

4.10 Further, the study examined the impact of financial sector reforms on corporate investment patterns. The results reveal that the coefficient of financial liberalization defacto index is negative in all the industrial sectors except Manufacture of Fabricated Metal Products (NIC 28) and Manufacture of Motor Vehicles trailers and Semi-trailers (NIC 34). However, these two industries have positive coefficient but they are not statistically significant. In general, the result presents a low-key association between financial liberalization and corporate investment. Previous empirical studies (World Bank 1989, Harrigan and Mosley 1998, Nair.P 2005) evaluating the impact of reforms on private investment showed less impact in developing countries. Overall the results intend that the responsiveness of investment is higher with accelerator and profitability variables than the financial liberalization policy variables. In other words, industries consider the demand factors, internal liquidity and prior capital expenditure decisions than the policy variables as the major indicators of investment determinants.

4.11 By and large the results imply the greater relevance of accelerator as well as the profit theories in determining fixed investment. The study exposes the lesser power of accelerator in determining capital expenditure, but this should not be interpreted as a denial of the expediency of the accelerator variable.

5. Conclusion

“Business investment is ideally decided on the basis of anticipations of the future.... If our implicitly and explicitly assumed relations between past and future prove different from those of business decision makers, we can hardly expect to estimate a stable or reliable relation between business investment and past or current variables.” quoted from Eisner [1978b. in pages 12 and 13].

5.1 However, there is ambiguity, regarding the theories and empirical works relating to the factors influencing investment, where different theories emphasized diverse factors as major determinants of investment namely accelerator, cash flow, liquidity, cost of capital etc. In this structure, the study examined the factors influencing investment behaviour in Indian industries. The investment analysis indicates the complex nature of manufacturing industries where the factors influencing investment are not uniform across the industries. In some industries accelerator variable plays a significant part whereas in some other industries financial factors such as operating profit and external finance have significant influence on investment. The results of the study indicate that the responsiveness of investment is more with profitability followed by accelerator and other determinants. Both accelerator hypothesis as well as profit theory have been found to be important in explaining investment behaviour. Numerous studies have established a positive relationship of investment with accelerator and profit theories, although in all cases the results were not robust. The fact that accelerator and profit theory functioned well as an explanation of investment for Indian industries lends additional support to it being considered as a crucial determinant of long-run investment. Meanwhile in few industries factors such as bank borrowings, equity capital and capital stock also found to be significant determinants. In majority of industries consistent with neo classical theory user cost of capital is inversely related to investment with negative coefficient value. Overall the empirical results upheld the importance of accelerator and profit theories of investment. As for as the impact of financial sector reforms is concerned, the results display a meager association between financial liberalization index and investment in Indian industries.

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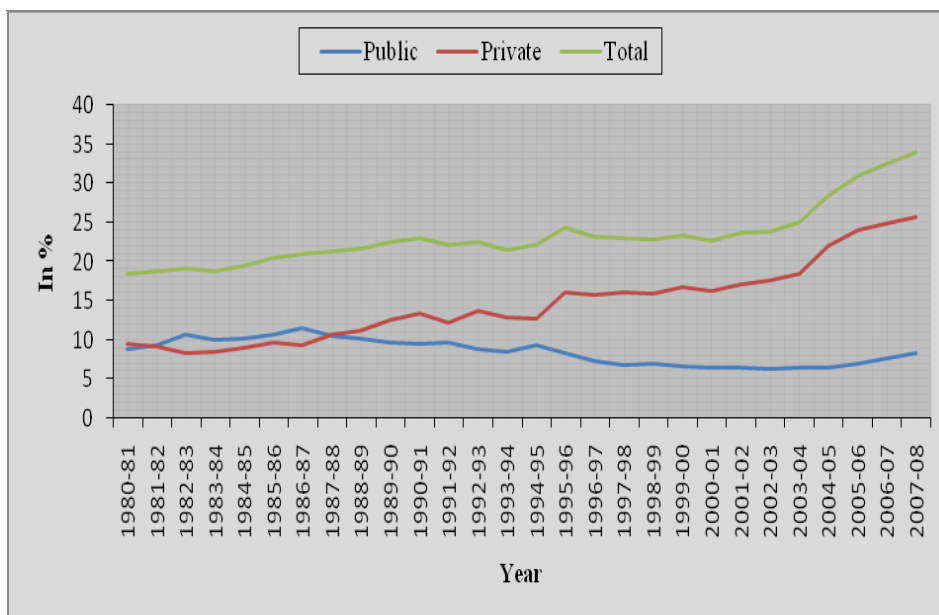
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Fig: 1 Public, Private and Total Capital formation in percent of GDP**Table 1: Sample of Industries draw for empirical analysis**

Industries selected by Economic Activity [NIC 2004]	CODE
Manufacture of food products and beverages	NIC 15
Manufacture of textiles	NIC 17
Manufacture Tanning and dressing of leather; manufacture of luggage, handbags, saddlery, harness and footwear	NIC 19
Manufacture of paper and paper products	NIC 21
Publishing, printing and reproduction of recorded media	NIC 22
Manufacture of coke, refined petroleum products and nuclear fuel	NIC 23
Manufacture of chemicals and chemical products	NIC 24
Manufacture of rubber and plastics products	NIC 25
Manufacture of other non-metallic mineral products	NIC 26
Manufacture of basic metals	NIC 27
Manufacture of fabricated metal products,	NIC 28
Manufacture of machinery and equipment	NIC 29
Manufacture of electrical machinery and apparatus	NIC 31
Manufacture of radio, television and communication equipment	NIC 32
Manufacture of motor vehicles, trailers and semi-trailers	NIC 34
Manufacture of other transport equipment	NIC 35

Table 2: Factors Influencing Investment Behaviour in Indian Manufacturing SectorDependent variable: *Investment (I_t)*

Industry Variables	C	K _t	Y _{t-1}	UCC _t	OP _t	BR _t	EQ _t	FlibDF _t	R ²	DW
NIC15	130.302	0.246	0.054	-0.030	-0.093	0.111	-0.169	-242.990	0.91	1.95
t-statistics	1.688	2.700	1.884	-1.226	-0.615	3.411	-1.458	-1.505		
Prob	0.135	0.0307**	0.102	0.226	0.558	0.0113*	0.188	0.176		
NIC 17	559.575	-0.334	-0.348	-0.328	0.792	0.083	0.471	-1143.200	0.82	2.06
t-statistics	1.453	-2.553	-2.203	-1.389	3.204	0.799	1.144	-2.543		
Prob	0.184	0.0340**	0.0587**	0.202	0.0125*	0.448	0.286	0.0345**		
NIC 19	-18.681	-0.019	-0.063	-0.271	-0.135	0.323	0.079	-0.066	0.74	2.45
t-statistics	-0.388	-0.099	-0.600	-1.112	-0.430	1.897	0.492	-3.517		
Prob	0.708	0.924	0.565	0.298	0.679	0.099***	0.636	0.727		
NIC 21	378.210	0.088	0.195	-0.058	-0.188	-0.110	0.363	-34.826	0.89	2.18
t-statistics	10.303	1.406	5.577	-0.313	-1.978	-1.545	4.283	-0.859		
Prob	0.0000*	0.197	0.0005*	0.756	0.0833***	0.161	0.0027*	0.415		
NIC 23	34.854	-1.130	0.143	-0.029	1.235	0.336	0.388	-72.058	0.71	2.58
t-statistics	1.004	-1.741	1.314	-0.529	3.162	0.742	3.058	-2.118		
Prob	0.345	0.120	0.230	0.599	0.0159**	0.480	0.0184**	0.0720**		
NIC 24	-451.350	-0.294	0.053	-0.305	0.972	0.200	-0.662	-413.030	0.68	2.46
t-statistics	-0.445	-2.428	1.158	-2.455	2.276	1.942	-2.472	-1.087		
Prob	0.670	0.0456**	0.285	0.0438**	0.0569**	0.093***	0.0427**	0.313		
NIC 25	-28.368	-0.051	0.343	0.378	0.117	-0.145	0.079	-77.314	0.66	1.90
t-statistics	-0.349	-0.344	3.152	3.404	0.402	-2.272	0.213	-1.021		
Prob	0.736	0.740	0.0136**	0.0093*	0.698	0.0573**	0.837	0.337		
NIC 26	115.421	0.372	-0.085	-0.128	0.376	0.119	-0.204	-660.133	0.65	3.19
t-statistics	0.247	2.076	-0.545	-0.506	2.137	2.211	-0.477	-1.945		
Prob	0.812	0.0832**	0.603	0.629	0.0700**	0.069***	0.648	0.0923***		
NIC 27	-3961.070	0.289	-0.114	-0.093	0.091	0.949	-0.179	-1232.760	0.57	1.95
t-statistics	-0.718	3.293	-0.955	-0.738	0.668	3.833	-0.659	-0.820		
Prob	0.496	0.0133**	0.496	0.485	0.526	0.0064*	0.531	0.439		
NIC 28	-45.372	0.291	0.140	0.123	-0.237	-0.083	-0.103	35.245	0.85	2.26
t-statistics	-2.640	2.082	4.295	0.915	-2.409	-0.555	-0.912	1.744		
Prob	0.0297**	0.0709**	0.0026*	0.387	0.0527**	0.594	0.388	0.119		
NIC 29	278.856	0.846	0.269	-0.724	0.713	-0.015	1.682	-312.080	0.61	2.63
t-statistics	0.979	1.999	1.417	-1.522	2.660	-0.045	3.351	-0.765		
Prob	0.360	0.0857**	0.199	0.131	0.0325**	0.965	0.0122**	0.469		
NIC 31	110.580	0.104	0.238	-0.004	0.172	-0.190	-0.013	-31.322	0.72	2.25
t-statistics	2.284	1.517	2.891	-0.030	2.377	-2.295	-0.067	-0.457		
Prob	0.0517**	0.168	0.0233**	0.977	0.0491**	0.0508**	0.948	0.660		
NIC 32	455.690	-0.349	0.245	-0.524	1.367	0.366	0.518	-591.740	0.68	2.49
t-statistics	1.304	-1.169	3.103	-1.409	2.494	1.322	2.123	-0.754		
Prob	0.289	0.276	0.0173**	0.162	0.0469**	0.223	0.0780***	0.472		
NIC 34	248.350	0.474	0.949	0.030	0.301	-0.127	-0.780	180.306	0.84	1.99
t-statistics	0.745	3.579	3.833	0.182	1.234	-1.197	-2.244	0.484		
Prob	0.481	0.0090*	0.0064*	0.861	0.257	0.270	0.0598**	0.643		
NIC 35	69.816	-0.182	-0.061	-0.108	0.203	0.092	0.369	-33.351	0.86	1.94
t-statistics	2.671	-4.511	-2.650	-0.899	2.647	1.401	3.860	-0.549		
Prob	0.0283**	0.0020*	0.0293**	0.394	0.0294**	0.199	0.0048*	0.598		

* 1%, **5% and *** 10% level of significance.

Industries abbreviations are provided in [table 1]

Table 3: Breusch Godfrey Serial Correlation LM Test for Investment Determinants

Industry	F statistics	Breusch Godfrey Serial Correlation LM Test		
		Prob F(2,7)	Obs*R-squared	Prob.Chi-Square (2)
NIC 15	7.681090	0.0222	12.22521	0.0022*
NIC 17	6.138710	0.0289	10.82697	0.0045*
NIC 19	2.419051	0.1697	7.588758	0.0225**
NIC 21	1.118073	0.3969	5.253416	0.0723***
NIC 23	1.912286	0.2417	7.367806	0.0251**
NIC 24	5.683876	0.0516	11.80686	0.0027*
NIC 25	2.872194	0.1477	9.088893	0.0106*
NIC 26	3.855009	0.1483	10.07844	0.0065*
NIC 27	21.64789	0.0034	15.24001	0.0005*
NIC 28	11.60826	0.0087	12.71419	0.0017*
NIC 29	6.732296	0.0382	12.39659	0.0020*
NIC 31	1.494456	0.2974	5.320175	0.0699***
NIC 32	5.977336	0.0472	11.98663	0.0025*
NIC 34	2.617472	0.1668	7.672163	0.0216**
NIC 35	2.229391	0.2032	8.013643	0.0182**

* 1%, **5% and *** 10% level of significance

Table 4: Results of Unit Root (ADF) Test at Level for factors influencing Investment behavior in Indian Manufacturing Sector

Variables	Investment (I _t)		Sales lag (Y _{t-1})		Borrowing (BR _t)		Operating Profit (OP _t)		Equity (EQ _t)		NFA (K _t)		UCC (UCC _t)		FlibDF _t	
	t-stats	Prob	t-stats	Prob	t-stats	Prob	t-stats	Prob	t-stats	Prob	t-stats	Prob	t-stats	Prob	t-stats	Prob
NIC 15	3.757	1.000	4.431	1.000	1.257	0.997	2.603	1.000	-0.989	0.729	1.178	0.996	-1.359	0.575	2.375	1.000
NIC 17	-1.352	0.580	-1.014	0.721	-1.038	0.714	-0.077	0.938	-1.726	0.402	0.589	0.984	-1.270	0.616	2.375	1.000
NIC 19	-1.962	0.299	-0.724	0.813	-1.649	0.438	-0.300	0.902	-4.693	0.003	-1.780	0.377	-1.915	0.317	2.375	1.000
NIC 21	-3.046	0.051	0.375	0.974	-1.111	0.686	-0.451	0.879	-1.765	0.383	-0.659	0.832	-2.028	0.273	2.375	1.000
NIC 23	-2.611	0.110	-0.226	0.917	-1.962	0.299	-1.648	0.438	-1.909	0.320	-1.762	0.385	-1.844	0.348	2.375	1.000
NIC 24	4.079	1.000	2.339	1.000	-1.326	0.592	1.055	0.995	-2.734	0.089	-1.887	0.330	-3.273	0.035	2.375	1.000
NIC 25	3.485	1.000	0.286	0.969	-0.514	0.866	-0.169	0.926	-2.376	0.162	-1.627	0.447	-2.167	0.224	2.375	1.000
NIC 26	2.816	1.000	2.739	1.000	-0.586	0.850	3.428	1.000	-1.648	0.434	1.345	0.998	-1.620	0.450	2.375	1.000
NIC 27	1.539	0.998	2.787	1.000	-1.439	0.539	2.048	1.000	-1.237	0.631	-0.590	0.849	-3.086	0.051	2.375	1.000
NIC 28	4.029	1.000	2.259	1.000	-1.093	0.692	1.454	0.998	-1.485	0.515	-1.164	0.664	-1.222	0.638	2.375	1.000
NIC 29	-0.629	0.839	0.689	0.987	-2.460	0.142	-0.424	0.883	-1.418	0.549	-1.303	0.603	-2.379	0.163	2.375	1.000
NIC 31	1.675	0.999	0.398	0.974	-1.486	0.516	1.125	0.956	-1.738	0.396	-0.811	0.790	-1.435	0.539	2.375	1.000
NIC 32	-0.543	0.859	3.665	1.000	-0.299	0.906	-1.631	0.442	-1.346	0.583	-0.139	0.930	-1.727	0.400	2.375	1.000
NIC 34	1.791	0.999	2.385	1.000	-0.840	0.780	2.489	1.000	-1.264	0.619	-0.027	0.942	-0.999	0.727	2.375	1.000
NIC 35	-0.865	0.772	2.746	1.000	-1.925	0.314	0.704	0.988	4.699	1.000	2.296	1.000	-0.569	0.852	2.375	1.000

Table 4.1: Results of Unit Root (ADF) Test at difference for factors influencing Investment behavior in Indian Manufacturing Sector

Variables	Investment (I _t)		Sales lag (Y _{t-1})		Borrowing (BR _t)		Operating Profit (OP _t)		Equity (EQ _t)		NFA (K _t)		UCC (UCC _t)		FlibDF _t	
	t-stats	Prob	t-stats	Prob	t-stats	Prob	t-stats	Prob	t-stats	Prob	t-stats	Prob	t-stats	Prob	t-stats	Prob
NIC 15	-4.111	0.009	-5.990	0.001	-5.534	0.001	-6.303	0.001	-5.231	0.001	-3.785	0.014	-3.915	0.011	-5.638	0.0034
NIC 17	-3.763	0.015	-4.708	0.003	-4.543	0.003	-5.380	0.001	-4.334	0.006	-2.809	0.081	-3.587	0.020	-5.638	0.0034
NIC 19	-4.762	0.002	-3.389	0.029	-3.285	0.033	-10.215	0.000	-4.142	0.009	-3.909	0.010	-2.810	0.080	-5.638	0.0034
NIC 21			-5.741	0.000	-5.068	0.001			-5.795	0.000	-4.877	0.002	-7.501	0.000	-5.638	0.0034
NIC 23	-5.225	0.001	-4.243	0.007	-3.585	0.019	-4.408	0.004	-10.228	0.000	-3.896	0.013	-4.356	0.005	-5.638	0.0034
NIC 24	-3.838	0.016	-5.261	0.001	-4.983	0.002	-3.231	0.037			-5.386	0.001			-5.638	0.0034
NIC 25	-3.173	0.041	-3.894	0.011	-2.879	0.075	-3.662	0.017	-3.998	0.009	-4.258	0.006	-5.956	0.000	-5.638	0.0034
NIC 26	-5.197	0.001	-4.742	0.003	-3.985	0.009	-5.138	0.001	-6.895	0.000	-2.815	0.083	-4.776	0.002	-5.638	0.0034
NIC 27	-4.760	0.003	-3.408	0.033	-2.927	0.064	-7.885	0.000	-6.397	0.000	-2.689	0.097			-5.638	0.0034
NIC 28	-4.137	0.008	-6.151	0.000	-5.380	0.001	-3.389	0.028	-6.765	0.000	-3.902	0.010	-5.581	0.001	-5.638	0.0034
NIC 29	-5.010	0.001	-3.714	0.017	-3.257	0.035	-3.260	0.036	-3.330	0.031	-6.357	0.000	-3.789	0.015	-5.638	0.0034
NIC 31	-3.370	0.029	-3.162	0.047	-3.659	0.017	-2.961	0.063	-3.576	0.049	-3.954	0.010	-3.667	0.017	-5.638	0.0034
NIC 32	-3.471	0.024	-3.451	0.029	-5.130	0.001	-5.023	0.002	-3.548	0.021	-4.871	0.002	-5.235	0.001	-5.638	0.0034
NIC 34	-3.030	0.053	-5.358	0.001	-3.910	0.011	-5.319	0.001	-3.769	0.015	-3.160	0.043	-3.874	0.012	-5.638	0.0034
NIC 35	-3.675	0.017	-3.315	0.034	-2.794	0.084	-3.579	0.020	-4.112	0.008	-3.499	0.024	-3.286	0.035	-5.638	0.0034

Descriptive Results for factors influencing Investment behavior in Indian Manufacturing Sector

Table 5: Mean

Industry/Variables	Investment (I _t)	Sales lag (Y _{t-1})	Operating Profit (OP _t)	NFA (K _t)	Borrowing (BR _t)	Equity (EQ _t)	UCC (UCC _t)	FibDF _t
NIC 15	2570.242	35205.17	3440.385	13095.68	12303.85	3181.344	-24811.8	0.997607
NIC 17	3052.813	27261.87	22901.42	3466.211	4286.152	16466.83	-8668.65	0.997607
NIC19	109.81	1700.728	613.8561	147.3612	242.0011	562.1461	-285.052	0.997607
NIC 21	454.6472	6890.515	4349.488	1001.406	1829.908	5880.363	-3031.17	0.997607
NIC 23	116.7589	2587.492	325.0006	306.93	312.1278	467.25	-244.569	0.997607
NIC 24	5902.266	80003.44	45783.97	11537.08	51479.77	-27998.8	13784.48	0.997607
NIC 25	792.2994	7493.591	4739.334	930.5906	1318.58	4738.591	-2396.25	0.997607
NIC 26	2901.823	23478.29	16195.05	3957.981	3687.779	20316.69	-10548.9	0.997607
NIC 27	7307.086	75505.36	57047.68	13150.44	19334.41	69551.62	-37760.8	0.997607
NIC 28	237.6806	2918.002	1106.682	317.8165	415.0411	1114.487	-575.859	0.997607
NIC 29	1537.559	20697.08	6354.271	2455.686	2227.136	5619.641	-3105.78	0.997607
NIC 31	770.3078	11702.16	4172.656	1299.862	1194.497	-2162.02	4027.197	0.997607
NIC 32	1702.1	12246.86	5838.651	1000.311	1650.343	-2338.89	4760.224	0.997607
NIC 34	3614.029	41887.73	12128.96	4996.425	3572.271	-7448.71	14864.31	0.997607
NIC 35	858.3589	7996.381	1757.71	1036.458	631.8544	2267.186	-1063.53	0.997607

Table 5.1: Maximum

Industry/Variables	Investment (I _t)	Sales lag (Y _{t-1})	Operating Profit (OP _t)	NFA (K _t)	Borrowing (BR _t)	Equity (EQ _t)	UCC (UCC _t)	FibDF _t
NIC 15	6976.51	72862.58	8244.29	27929.47	26814.06	5904.86	-1609.64	4.006385
NIC 17	6942.96	43019.7	38238.78	7584.8	6988.3	35255.08	-2267.8	4.006385
NIC19	205.64	2864.41	1002.3	276.78	373.2	895.41	-21.3119	4.006385
NIC 21	780.93	12936.27	7236.54	1920.03	3134.1	10190.24	145.0017	4.006385
NIC 23	245.2	4791.68	530.15	528.68	713.78	766.88	-57.3944	4.006385
NIC 24	16842.91	161236.6	71190.72	23331.14	77096.48	-8845.34	19227.09	4.006385
NIC 25	2602.54	14586.15	8832.32	1647.12	1997.22	7789.8	-211.561	4.006385
NIC 26	8763.5	49533.65	27282.36	9122.99	6332.56	42010.1	-3434.73	4.006385
NIC 27	26447.95	190915	90002.27	40442.78	28091.56	121241.6	-14243.7	4.006385
NIC 28	936.62	6988.05	1789.21	946.25	861.08	1911.74	-153.574	4.006385
NIC 29	4037.06	41056.1	8768.29	5778.62	3914.01	8838.9	-1239.45	4.006385
NIC 31	2135	25869.46	6186.45	3241.7	1869.79	-660.943	6854.26	4.006385
NIC 32	4155	26299.77	11367.47	1929.03	2919.13	869.4999	10842.95	4.006385
NIC 34	11779.58	109839.9	26375.3	13915.67	6649.55	-1722.72	32981.16	4.006385
NIC 35	2788.49	19926.92	2633.8	2835.21	1548.75	6383.65	-491.448	4.006385

Table 5.2: Minimum

Industry/Variabiles	Investment (I _t)	Sales lag (X _{t-1})	Operating Profit (OP _t)	NEA (K _t)	Borrowing (BR _t)	Equity (EQ _t)	UCC (UCC _t)	FlibDF _t
NIC 15	239.49	7474.11	953.58	1686.92	1601.7	468.51	-39665.6	0.008617
NIC 17	190.43	8318.02	3490.45	889.74	514.65	2531.42	-13729.5	0.008617
NIC19	1.35	447.82	98.7	31.4	16.23	51.8	-538.009	0.008617
NIC 21	45.35	2129.27	847.6	389.27	400.95	1250.24	-4620.08	0.008617
NIC 23	4.75	484.91	107.35	47.72	29.82	92.37	-415.541	0.008617
NIC 24	551.11	22152.52	11822.31	3296.27	11839.17	-37903.1	4897.36	0.008617
NIC 25	8.21	1129.2	463.06	106.5	117.09	356.32	-3805.89	0.008617
NIC 26	522.25	6804.06	4305.14	975.39	877.59	4333.25	-15464.3	0.008617
NIC 27	1245.83	20755.84	14435.42	3636.8	7691.27	15689.32	-47471.2	0.008617
NIC 28	1.75	742.73	286.3	65.48	56.57	191.93	-867.052	0.008617
NIC 29	168.71	7100.3	1894.12	884.43	491.42	1497.27	-4353.09	0.008617
NIC 31	52.14	3404.95	1074.99	342.69	281.28	-3263.99	817.21	0.008617
NIC 32	38.65	2631.22	1066.94	342.35	248.15	-5648.27	635.82	0.008617
NIC 34	397.6	8039.94	2440.98	949.42	577.36	-12800.3	2115.12	0.008617
NIC 35	75.75	2061.46	1165.02	208.81	228.89	748.54	-2296.24	0.008617

Table 5.3: Standard Deviation

Industry/Variabiles	Investment (I _t)	Sales lag (X _{t-1})	Operating Profit (OP _t)	NEA (K _t)	Borrowing (BR _t)	Equity (EQ _t)	UCC (UCC _t)	FlibDF _t
NIC 15	2008.755	20109.87	1838.863	7454.926	7351.914	1759.01	16219.08	0.980468
NIC 17	2141.147	11473.37	12677.72	1780.004	2310.725	8836.914	3447.292	0.980468
NIC19	76.78701	767.5248	311.3005	78.72816	126.1241	297.297	166.5223	0.980468
NIC 21	203.245	3368.192	1951.359	482.5338	886.4904	3120.916	1355.626	0.980468
NIC 23	72.99296	1414.038	122.2952	150.8152	222.4312	229.3612	110.1333	0.980468
NIC 24	5077.294	41265.34	19694.83	5549.479	23398.11	9194.36	4707.352	0.980468
NIC 25	831.0105	4141.854	2703.917	486.5442	676.0741	2607.127	1203.642	0.980468
NIC 26	2372.753	12574.02	7784.043	2215.28	2021.084	11542.87	3985.957	0.980468
NIC 27	6581.506	49378.72	21181.94	10955.94	5866.717	29246.09	10199.49	0.980468
NIC 28	254.3534	1691.644	545.5125	212.7799	256.1776	583.3132	239.7845	0.980468
NIC 29	1061.475	9052.074	2190.695	1133.948	1114.935	2212.493	915.3966	0.980468
NIC 31	606.8371	5921.285	1803.947	691.5225	556.9989	886.5196	2014.445	0.980468
NIC 32	1562.998	7793.953	3201.208	447.979	897.2594	1418.745	3118.387	0.980468
NIC 34	3242.188	29932.1	7010.209	3718.675	2416.027	3977.379	9566.909	0.980468
NIC 35	998.2336	5857.59	432.2233	890.886	422.2432	1771.598	571.0085	0.980468

