Allocation of capital in the post liberalized regime: a case study of the Indian corporate sector

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The paper investigates the prevalent trends in the allocation of capital in an emerging economy, India, during the post financial liberalization regime. In contrast to the conventional wisdom that financial liberalization leads to better allocation of funds, the study could not find any obvious evidence of increase in the efficiency over the reform period, especially during the early years of reform. Further, the study highlights the disturbing trend of convergence of efficiencies across various strata of firms towards a lower level over the reform period. The paper rationalizes the decline as a result of excessive capacity creation in certain industries, financed by cheap external sources of finance, without any consideration of return or demand conditions. The paper, as a policy recommendation, highlights the importance of creating appropriate institutions prior to pursuing financial liberalization in developing countries like India.

JEL Classification: G1

1. Introduction

A fundamental job of the financial sector of any economy is to allocate capital efficiently. To achieve this, capital is supposed to be invested in the sectors that are expected to have high returns and be withdrawn from sectors with poor prospects. It has been argued that formal financial markets and associated institutions improve the capital allocation process and thus contribute to the economic growth. However, there is little actual evidence on whether and how financial markets improve the allocation of capital. There is a small body of work that provides only indirect evidence of the effect of financial liberalization on the efficiency of resource allocation. Using a panel of Ecuadorian firms during the 80's, Jaramillo, Schiantarelli and Weiss (1992) find that there was an increase in the flow of credit accruing to more efficient firms after liberalization, controlling for other firms' characteristics. Siregar (1992) obtained similar results for Indonesian establishments in the 80's. Using firm level data Chari and Henry (2002) show that a typical firm experiences an increase in both Tobin's *q* and investment after account liberalization. However, they have concluded that reallocation of investment is not significantly correlated to changes in systematic risk or investment opportunities. More recently, Wurgler (2000), using a data set comprising of 65 countries and 28 industries over 33 years finds that the developed financial markets, as

measured by the size of the domestic stock and credit markets relative to GDP, are associated with a better allocation of capital which is achieved by increasing investment in the growing industries and decreasing investment in the declining industries. Thus, although financially developed countries might not invest at a higher level (Carlin and Mayer, 1998; Beck, Levine, and Loayza, 2000), they do seem to allocate their investment better. For example, the elasticity of industry investment to value added is several times higher in Germany, Japan, the United Kingdom, and the U.S. than in financially underdeveloped countries such as Bangladesh, India, Panama, and Turkey. Compared to the countries with large financial markets, other countries both over-invest in their declining industries and under-invest in their growing industries.

Though there are strong evidences from a set of cross-sectional studies that the development of financial markets lead to better allocation of capital there is hardly any in-depth country-specific study to substantiate this evidence. Ideally, one could test these theories by comparing the model's predictive power in parallel universes for economies that differ only in their degree of financial market development. Although such an approach is obviously complex, a feasible alternative would involve testing these conjectures against data obtained from a single country over the period of major financial market liberalization. Moreover, a successful comparison of this type could have serious policy implications. For example, if the model performs better in the liberalized regime, then current practices would be vindicated. On the other hand, if no improvement in model performances were to be found, such efforts might be misdirected and policy makers might be better advised to take necessary steps to correct it.

The Indian experience of the 1990s provides us one such unique opportunity for comparing the allocation patterns across two sharply differing degrees of financial market development. A hallmark of the new economic policy of India has been the gradual liberalization of its financial sector. Until 1992, the Indian corporate sector faced several constraints on its choices regarding sources of funds. Access to the equity market was regulated by the Controller of Capital Issues (CCI), an agency under the Department of Company Affairs, which imposed stringent conditions on firms trying to raise funds through the equity route. Long-term borrowing was largely under the purview of the public sector Development Financial Institutions (DFIs) which, either through direct lending or through

refinancing arrangements, virtually monopolized the supply of debt finance to the corporate sector. In May 1992 (two months into the financial year 1992-93), as part of a sweeping set of reforms relating to the equity market, the CCI was abolished and access to the equity market was made much less restrictive, subject only to meeting certain technical conditions, and not to any formal approval process as had been the case earlier. In the secondary market several steps were undertaken to improve the informational efficiency and liquidity of the Indian stock markets[1].

On the debt front, there were some reforms in the interest rate policy, with the institutions increasingly being given freedom to determine their structure of interest rates. The capital base of the banks was strengthened by recapitalization and public issues. Prudential norms were introduced. Also, identification of non-performing assets, classification of assets, provisions for bad debts and recognition of income were tightened up. The government reduced pre-empting of bank resources through a gradual reduction in reserve requirement ratios. The cash reserve ratio and the statutory liquidity ratio on incremental deposits was also reduced significantly over this period. The interest rate controls were relaxed as well. Finally, in order to encourage competition, new private sector banks were given licenses and branch-licensing restrictions were relaxed. The Government reduced its stake in many financial institutions.

It has been widely discussed and documented that the financial liberalization has been successful in helping the Indian managers to access wide range of funds in the post reform period. Particularly in the early years of the reform (1992-1995), equity market became a major source of funds (Bhaduri, 2000). However, research on the allocation of such funds is limited and practically non-existent for India.

We, therefore, examine the allocation pattern in India during the period 1993-2008 to assess the impact of ongoing financial liberalization on the allocation of capital. The question being addressed is: How the ongoing financial liberalization impacted the capital allocation pattern in India during 1993-2008? More specifically, the paper explores questions such as: Was the total fund available for investment allocated to the more profitable industries and to the better firms within an industry during this sample period (1993-2008)? Can we relate the efficiency of firm to firm specific characteristics such as ownership, stock

[1] See Gokarn et al (2004) for a description and analysis of equity market reforms. A detailed description of specific measure of financial liberalization is available in Sen and Vaidya (1997).

market affiliation, the proportion of bank borrowing, size and age of the firm using a large sample of Indian firms for the period 1994-2008.

However it is important to note that our study focuses on the post reform period. Since the allocation efficiency was severely distorted through strong Governmental interventions and stringent regulations in the pre-reform period we have ignored the pre-reform trends and focused only on the post reform period when the Indian firms were given enough freedom to make rational choices. Finally, it is also important to note that there is a similar strand of literature which examines the relationship between investment and firm growth using the financial constraints hypothesis (Fazarri, Hubbard, and Petersen (1988)). In this literature, whether or not an average firm experiences financial constraint is deduced from the sign and significance of the coefficient of the cash flow variable. However as some attempts have already been made to examine this hypothesis for India, we have pursed the alternative approach for this paper (Bhaduri, 2005).

Apart from its contribution to the sparse literature on whether financial liberalization improves the allocation of capital, the paper is also complementary to a growing body of literature that studies the relationship between finance and economic growth. At the country level, King and Levine (1993), Levine (1998), Levine and Zervos (1998), and Beck, Levine, and Loayza (2000) make an empirical case that financial development causes growth. At the firm level, Demirguc-Kunt and Maksimovic (1998) use a financial planning model to estimate sustainable growth rates in the absence of external finance and find that firms in financially developed countries are able to grow faster than this benchmark. One of the central questions asked by the researchers on this topic is whether better allocation of capital is a reason why financial development is associated with the economic growth. Several authors have inclined to agree with this line of causality including Goldsmith (1969), McKinnon (1973), Shaw (1973), and Greenwood and Jovanovic (1990). Some empirical evidences support this suggestion. Bagehot (1873) cites better capital allocation as a primary reason for England's comparatively faster growth in the mid-to-late 19th century. Further, in their cross-country study, Beck et al. infer that the link between finance and growth is improved allocation efficiency, as suggested by the fact that financial development (specifically, the banking sector) is robustly associated not with higher capital accumulation

but rather with higher productivity growth, which is how an improvement in capital allocation is expressed in their growth accounting framework.

Therefore, the paper also aims to contribute to this sparsely researched issue from the perspective of a developing economy in general and India in particular. The result of this paper stands contrary to the general view that financial liberalization leads to higher economic growth through better resource allocation. The result indicates that liberalization effort in developing countries should be accompanied by concerted effort to strengthen the appropriate markets (market for corporate control) and institutions that create necessary incentive for the private firms to pursue value-maximizing policies. Failing this, financial liberalization can lead to greater misallocation of resources and hence can deter economic growth.

The paper is organized as follows: The next section outlines the empirical framework underlying the study. Data and sample are discussed in section 3. We present and interpret our results in section 4. Finally, section 5 concludes.

2. Empirical Framework:

Wurgler (2000) argues that the capital allocation is improved through at least three mechanisms. First, countries with stock markets that impound more firm-specific information into individual stock prices exhibit a better allocation of capital. This is consistent with the suggestion that larger markets have more informative prices which help investors and managers distinguish between good and bad investments. Second, capital allocation improves as state ownership declines. This is not surprising since, in state-owned firms, resource allocation is guided less by value-maximization than by political motives. Also, soft budget constraints and poor monitoring give managers in state-owned firms few incentives for efficiency. The existing evidence on this supports Shleifer's (1998, p. 144) view that "elimination of politically motivated resource allocation has unquestionably been the principal benefit of privatization around the world." Third, strong minority investor rights, as measured by La Porta et al. (1997), are associated with better capital allocation. The allocation benefit of investor rights seems to come through limiting over-investment in declining firms rather than through improving the supply of finance to growing firms.

Despite this growing body of literature, there has been very little empirical evidence on whether the financial market development improves the allocation of capital. This paper makes an attempt to fill this gap, particularly in the context of a developing economy like India and tries to investigate the issue by using the following empirical methodology.

We investigate the impact of financial liberalization on the efficiency of allocation of resources using two well known approaches: simple efficiency of allocation index and efficiency elasticity.

2.1. Efficiency Index of Allocation:

The paper uses a simple index developed by Galindo, Schiantarelli, Weiss, (2007) to evaluate whether liberalization succeeds in directing resources towards the firms with higher marginal returns. Typically, in estimating the efficiency of the allocation of investment we first need measures of the marginal product of investment. In general, an explicit measure of the marginal product of investment cannot be obtained without knowing the parameters of the production function. To circumvent the problem it is assumed that the marginal product of capital is proportional to particular measures of the average product of capital. The measure of the average product of capital that has been used in this paper is the ratio of operating profits to capital[2]. It is also important to note that this measure is valid only under the assumption that the production function is homogeneous of degree one. We estimate the return to investment for each firm by multiplying investment with the proposed measure of the firm's marginal product of investment. We sum the return to investment for each firm, across all firms, in order to arrive at the total return to investment for the economy in a particular year. Finally, the total return to investment for the economy in a particular year can be obtained by summing up the return across all the firms.

[2] Notably, Galindo, Schiantarelli, Weiss, (2007) in their study involving cross country comparison, had argued for sales based measure over profit based measure to avoid country specific bias due variability in their tax regime. However, in our study we have used profit based measure since we are interested in the trends in the efficiency over the reform period for India.

To obtain a measure of the efficiency of the allocation of investment in a year, this measure of the total return on investment is divided by the total return the same measures would have yielded if investment funds had been allocated to firms in proportion to their share of capital in the economy. In other words, the measure of the efficiency of the allocation of investment is the ratio of estimate of the actual total return on investment to estimate the total return that would have been achieved if investment funds were allocated according to each firm's share of the capital stock. It is noteworthy that the index is invariant to macroeconomic changes that raise the value of the marginal product of capital uniformly for all firms. Using operating profits per unit of capital as a measure of the marginal product of investment proxy, the following measure of the efficiency of the allocation of investment funds is proposed:

Efficiency Index based on operating profit (EI_t^{Π})

$$EI_t^{\Pi} = \frac{\sum_i \frac{\Pi_{i,t+1}}{K_{i,t+1}} I_{i,t}}{\sum_i \frac{\Pi_{i,t+1}}{K_{i,t+1}} \frac{K_{i,t}}{K_t^T} I_t^T}$$

Where $\Pi_{i,t+1}$ operating profits of firm i at t+1 period, $I_{i,t}$ is growth in gross block (fixed investment) at t time period, and $K_{i,t+1}$ capital employed at time period t+1. I_t^T and K_t^T represent, aggregate investment and aggregate capital at time t, respectively. Note that each unit of investment in year t increases the capital stock, and hence generates a return, in year t+1.

2.2 Elasticity of Efficiency of Allocation:

This approach focuses on the very basic definition of an efficient allocation mechanism, which implies higher investment in "growing" firms and lesser investment in the firms that are "declining". The following simple specification captures the idea:

$$\ln(I_{it}/I_{it-1}) = \alpha + \beta_1 \ln(GVA_{it}/GVA_{it-1}) + \beta_2 Z_{it} + \varepsilon_{it} \quad (1)$$

Following Wurgler(2000),the growth in gross value added (GVA) is used as a proxy to measure firm growth. Since the sum of value added across all firms in the economy is GDP, and economic growth is typically measured as growth in GDP, the use of growth in firm value added to capture growth could therefore be justified. The growth in gross fixed asset (GFA) is used as a measure of investment. The slope estimate (β_1) in the above equation is an elasticity and higher its value lesser is the misallocation of capital. Z_{it}s are the control variables used in the model. The component of Z consists of four explanatory variables: Size of the firm captured using the logarithm of total assets, age of the firm (log(age)), proportion of bank loans in total borrowing and a binary variable that takes a value one if the firm is listed in the stock exchange. Size and age are often considered as significant determinants of growth and some recent studies in India (Shanmugam and Bhaduri, 2002) report that smaller and older firms grow faster than their counterparts. Similarly, it is often argued that investment by firms with close bank relationships appears to be less liquidity constrained than investment by firms without close bank ties (Hoshi, Kashyap, and Scharfstein1990_a,1990_b). Finally, we also control for the access to the capital market through listing information. Further, it is important to note that listing information and proportion of bank loan might also have impact on the quality of investment through bank monitoring and market disciplines. The monitoring associated with bank finance is often considered to ameliorate a moral hazard problem between the entrepreneurs and their lenders Diamond (1991).

A few points about the specification (equation 1) warrant discussion. First, the specification is developed on the premise that growth in industry value added captures investment opportunities for firms. Therefore, it is important to verify that value added growth is correlated with more traditional measure of investment opportunity like, Q, the price earning ratio, and sales growth etc. Though there is some evidence for the US on this issue, it is yet to be verified for emerging economies like India. The other alternative would be to use the standard Q model for the analysis. However, in an imperfect capital market, like India, the Q model may be a questionable framework for investment analysis. In the presence of market imperfection, market expectation might not truly reflect the insiders' valuation of investment opportunities. In such an environment, growth in industry value

added would be a better measure of investment opportunities than any measure based on stock prices.

Second, reverse causality might appear to be another concern in the specification as investment can cause a contemporaneous change in value added. However, investment can influence value added contemporaneously if fixed capital become productive immediately – a fact usually refuted by the empirical literature on gestation lags (Mayer, 1960 and Hall, 1977). We have also tried various alternative specifications to accommodate the possibility of gestation lag by introducing lagged values of independent variables (GVA) into the model. Finally, it is important to note that the specification used in this paper is a-theoretic. Ideally, a structural investment equation would have been a better choice. However, low quality data on capital stock, particularly at the aggregate (industry) level, makes it difficult to precisely estimate a structural investment equation based on the production theory. In contrast, methodology used in this paper avoids these problems by focusing on the allocation of capital from directly observing the investment flows.

Next, a common empirical approach has been deployed in the literature to estimate a constant elasticity model (equation (1)) by using ordinary least square method. One key assumption of the constant elasticity specification is the homogeneity of the beta parameters across the sample. The OLS regression estimates the mean effect of the efficiency elasticity and does not take full account of the heterogeneity in the growth of investment across firms. In this study we offer to estimate the efficiency elasticity using quantile regression. The quantile regression developed by Koenker and Bassett (1978) makes it possible to estimate the elasticity at the different points of the growth of investment distributions. The basic quantile regression model specifies the conditional quantile as a linear function of explanatory variables and is given as:

$$Y = X'\beta + \varepsilon$$
$$Q_\theta(Y \mid X = x) = X'\beta(\theta); \quad 0 < \theta < 1$$

where Y is the dependent variable, X is the matrix of exploratory variables, ε is the error term and $Q_\theta(Y \mid X = x)$ denotes the θ^{th} quantile of Y conditional on X=x. The θ^{th} regression quantile estimate, $\hat{\beta}(\theta)$ is obtained by minimizing following equation:

$$Min \sum_{Y \geq X'\beta} \theta \,|\, Y - X'\beta \,| + \sum_{Y \leq X'\beta} (1-\theta) \,|\, Y - X'\beta \,|$$

For θ=0.5, the procedure leads to minimization of the sum of absolute deviation, known as median regression. Therefore, by choosing θ continuously from 0 to 1, one can trace the distribution of Y, conditional on X, and obtain a much more complete view of the effect of the explanatory variable on the dependent variable. This specific feature of quantile regression has been exploited in the paper to estimate the elasticity at the different points of the growth of investment distributions. It is also important to note that segmenting the Y and then running an OLS on the subset is not an appropriate alternative to the quantile regression, due to severe sample selection bias (Koenker and Hallock, 2001).

Finally it is important to note that we exclude the firm specific effect in the quantile regression as the implementation and the interpretation of the firm specific effects are not straightforward in the quantile regression framework (Arias et al 2001, Koenker 2004).

Using a large and unbalanced panel of more than forty thousand firm-time observations over the period, 1994-2008, we employ the quantile regression to estimate and compare efficiency elasticity at different quantiles of the distribution across time. The results show that elasticities are significantly different for firms that are at the opposite tails of the distribution.

3. Sample and Data Description:

The data for this analysis is drawn from the Capita Line database and the sample of the study consists of observations from 1994-2008. The Capita Line database reports accounting information for a large number of firms operating in the Indian manufacturing sector. The database reports the individual level data for each individual firm during a particular year. From this data set we have selected a set of 30 major industries for our analysis and Table 1 lists number of observations in each year.

The variables used in the dataset are capital employed, gross value added, gross fixed asset, operating profit of the firm, total investment, bank loans, ownership group, size and age of the firm. As regard to total capital, it has increased drastically over the years while there is

slight consistent increase in total investment by the firm. However, as these numbers can be influenced by the number of observation in each year we have also looked into the average values of investment, value added (VA) and profitability in Figure 1.

The figure 1 shows on an average there is a consistent relationship between growth in value added (Profitability) and investment. However, as one can note from table 2A and 2B that the over all trend also hides the fact that a large number of negatively growing value added firms in Indian manufacturing industry undertake investment. Further, the trend remains invariant even if we consider the lag values of value added growth. In particular, table 2A and 2B highlights the fact that a growing percentage of Indian firms continue to invest despite having negative value added growth. However, this tale-tell signs of misallocation of resources needs to be further explored through our empirical models.

Table 1: Distribution of firms in the sample

Year	Number of firms
1994	1923
1995	2297
1996	2356
1997	1791
1998	2499
1999	2992
2000	3002
2001	3149
2002	3337
2003	3360
2004	3324
2005	3342
2006	3271
2007	3232
2008	3080

Figure 1: Trend in value added, profitability and investment of the Indian manufacturing

industry.

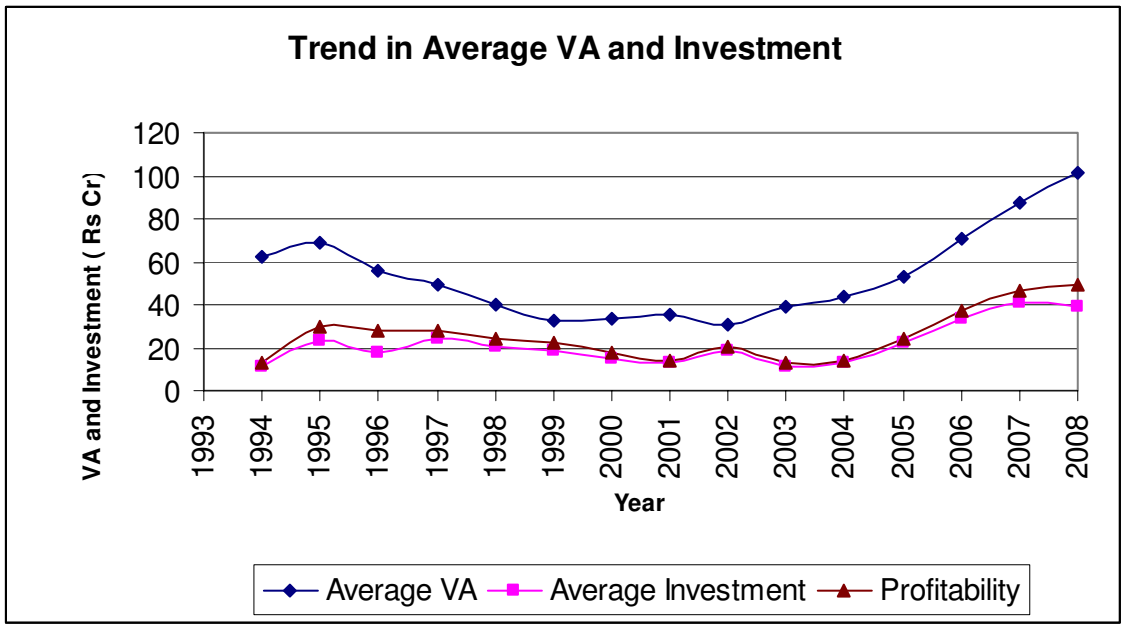


Table 2A: Investment decisions of the negative valued added firms (number in the parenthesis gives the percentage value).

year	Negative gr. In value added	Negative gr. In investment	positive growth in investment
1994	316	22 (0.07)	294 (0.93)
1995	332	23 (0.07)	309 (0.93)
1996	537	34 (0.06)	503 (0.94)
1997	608	48 (0.08)	560 (0.92)
1998	910	85 (0.09)	825 (0.91)
1999	1132	128 (0.11)	1004 (0.89)
2000	1015	126 (0.12)	889 (0.88)
2001	1228	170 (0.14)	1058 (0.86)
2002	1315	158 (0.12)	1157 (0.88)
2003	1119	175 (0.16)	944 (0.84)
2004	971	158 (0.16)	813 (0.84)
2005	896	136 (0.15)	760 (0.85)
2006	774	111 (0.14)	663 (0.86)
2007	743	112 (0.15)	631 (0.85)
2008	758	95 (0.13)	663 (0.87)

Table 2B: Investment Decisions of Negative Valued added firms (number in the parenthesis gives the percentage value).

year	Positive growth in investment	Negative gr. In value added	Positive gr. In value added
1994	1844	317 (0.17)	1527 (0.83)
1995	2216	336 (0.15)	1880 (0.85)
1996	2270	535 (0.24)	1735 (0.76)
1997	1682	574 (0.34)	1108 (0.66)
1998	2292	849 (0.37)	1443 (0.63)
1999	2701	1046 (0.39)	1655 (0.61)
2000	2681	915 (0.34)	1766 (0.66)
2001	2762	1095 (0.4)	1667 (0.6)
2002	2899	1194 (0.41)	1705 (0.59)
2003	2921	980 (0.34)	1941 (0.66)
2004	2868	848 (0.3)	2020 (0.7)
2005	2887	791 (0.27)	2096 (0.73)
2006	2884	681 (0.24)	2203 (0.76)
2007	2885	661 (0.23)	2224 (0.77)
2008	2758	685 (0.25)	2073 (0.75)

4. Empirical Results:

To facilitate the interpretation and avoid short term fluctuations, we report a three years average of simple efficiency index in table 3 and plot the same trend in Figure 2. Though there is a significant variance in the numbers reported in table 1, we can see some trends in the data: A point-to-point comparison shows a declining trend in efficiency for government owned and non listed firms. A similar upward trend is observed for private and listed firms. Consistent with our efficiency hypothesis outlined earlier, private and listed firms tend be more efficient than their counterparts. Though the trends presented so far provides some tell-tale signs of a change in efficiency of the Indian firms after liberalization, we need further investigation using the efficiency elasticity for a robust conclusion.

Table 3: Trend in simple efficiency index 1994-2008

Year	All	Govt.	Pvt.	Listed	Non Listed
1994-96	0.984826	0.9671	1.016305	1.003599	1.09236255
1997-99	1.051971	1.060236	1.04582	1.061724	1.01057691
2000-02	1.284346	1.066201	1.272182	0.985399	1.13476779
2003-05	1.351665	0.942069	1.012267	1.011282	0.83651842
2006-08	1.001211	0.808049	1.098464	1.012626	1.00795921
% Change	2%	-16%	8%	1%	-8%

To facilitate a direct comparison, the model (equation 1) is estimated first by cross section OLS regressions for each year. Column 7 in Table 4 presents the elasticity estimates from the OLS regressions. The cross-section elasticities clearly show a declining trend over the sample period. Next, we have estimated the model for different values of θ that allows an examination of the impact of the explanatory variables at different points of the distribution of investment. The quantile estimates for elasticities are reported in Table 4 (column 1-5). The model is estimated at the 10^{th}, 25^{th}, 50^{th}, 75^{th} and 90^{th} quantiles. We see that there are some pronounced differences across different points in the distribution of investment growth. First, while the elasticities estimates are all statistically significant for OLS regression they are insignificant and small for some of the lower than median quantiles indicating that the elasticities are not constant across the various quantiles of investment decisions.

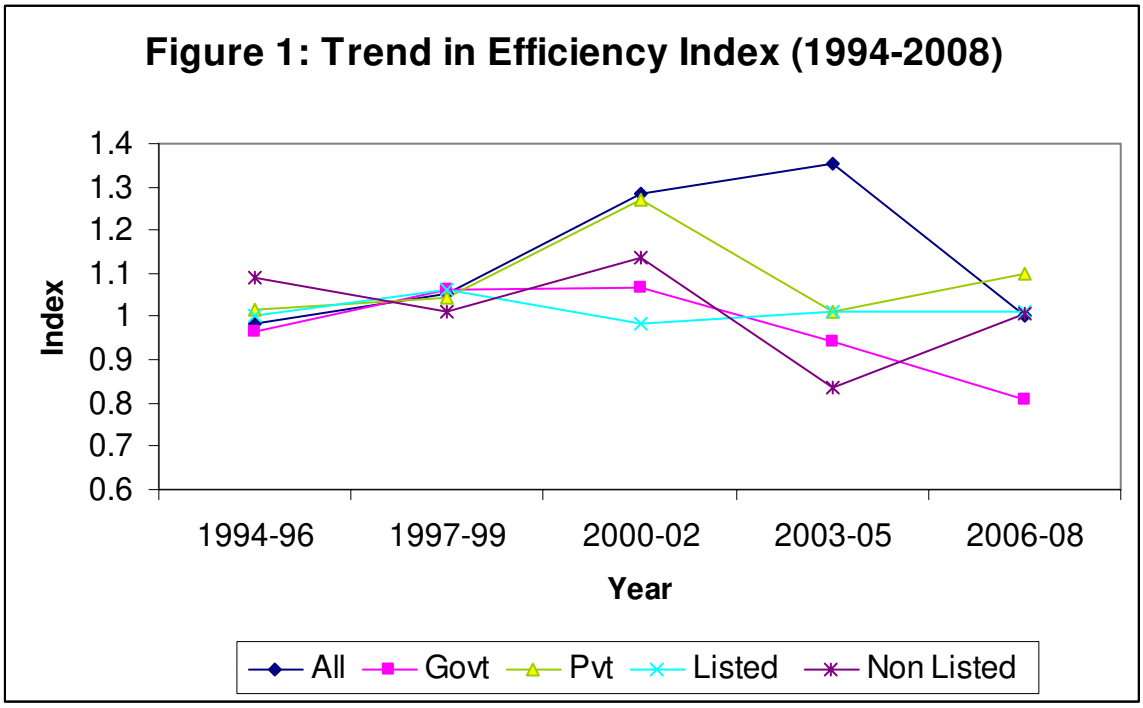


Figure 1: Trend in Efficiency Index (1994-2008)
Index
1.4
1.3
1.2
1.1
1
0.9
0.8
0.7
0.6
1994-96
1997-99
2000-02
2003-05
2006-08
Year
All
Govt
Pvt
Listed
Non Listed

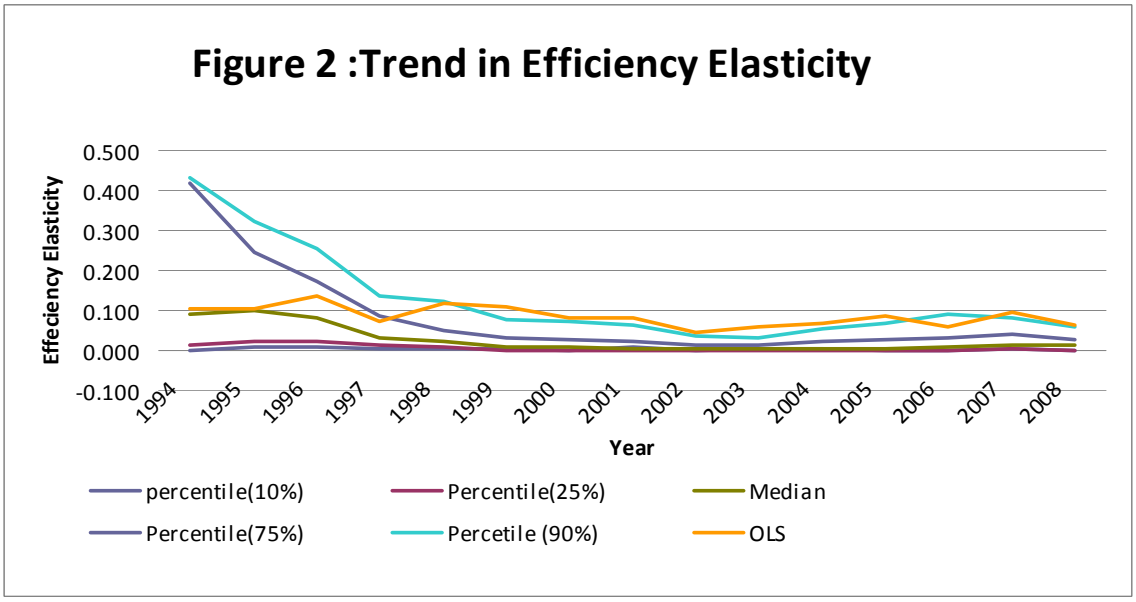


Figure 2 :Trend in Efficiency Elasticity
Effeciency Elasticity
0.500
0.400
0.300
0.200
0.100
0.000
-0.100
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
Year
percentile(10%)
Percentile(25%)
Median
Percentile(75%)
Percetile (90%)
OLS

Table 4: Trend in efficiency elasticity (β_1 of equation 1) **over various quntiles.**

year	Quantile (10%)	Quantile (25%)	Median	Quantile (75%)	Quantile (90%)	OLS
1994	**0.000**	**0.012***	**0.090***	**0.419***	**0.432***	**0.105***
1995	**0.009***	**0.022***	**0.100***	**0.247***	**0.323***	**0.103***
1996	**0.009***	**0.020***	**0.083***	**0.171***	**0.254***	**0.137***
1997	**0.003**	**0.012***	**0.032***	**0.088***	**0.134***	**0.072***
1998	**0.006**	**0.009**	**0.022***	**0.051***	**0.120***	**0.116***
1999	**0.004**	**0.000**	**0.008***	**0.032***	**0.080***	**0.109***
2000	**0.002**	**0.000**	**0.010***	**0.028***	**0.074***	**0.081***
2001	**0.008**	**0.000**	**0.006***	**0.021***	**0.063***	**0.083***
2002	**-0.002**	**0.000**	**0.003***	**0.015***	**0.036***	**0.046***
2003	**0.005**	**0.000**	**0.003***	**0.012***	**0.034***	**0.058***
2004	**0.005**	**0.000**	**0.004***	**0.022***	**0.055***	**0.068***
2005	**-0.002**	**0.000**	**0.005***	**0.025***	**0.066***	**0.087***
2006	**0.002**	**0.001**	**0.007***	**0.031***	**0.089***	**0.061***
2007	**0.006**	**0.003**	**0.013***	**0.042***	**0.083***	**0.093***
2008	**-0.001**	**0.002**	**0.012***	**0.028***	**0.058***	**0.063***

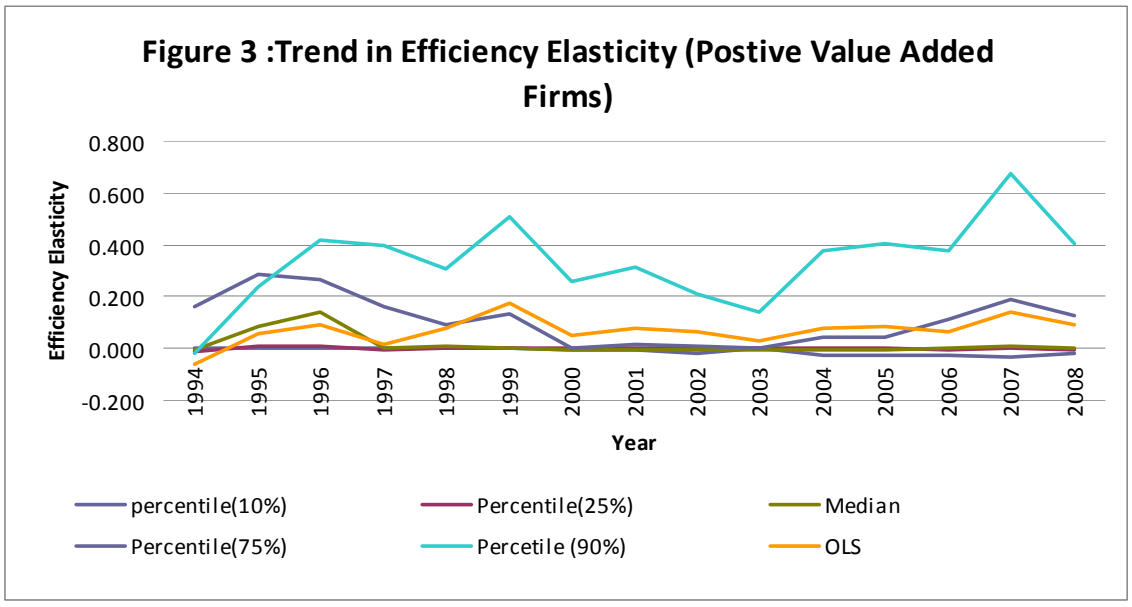
Note: The statistical significance (1%) of the coefficient is indicated by *.

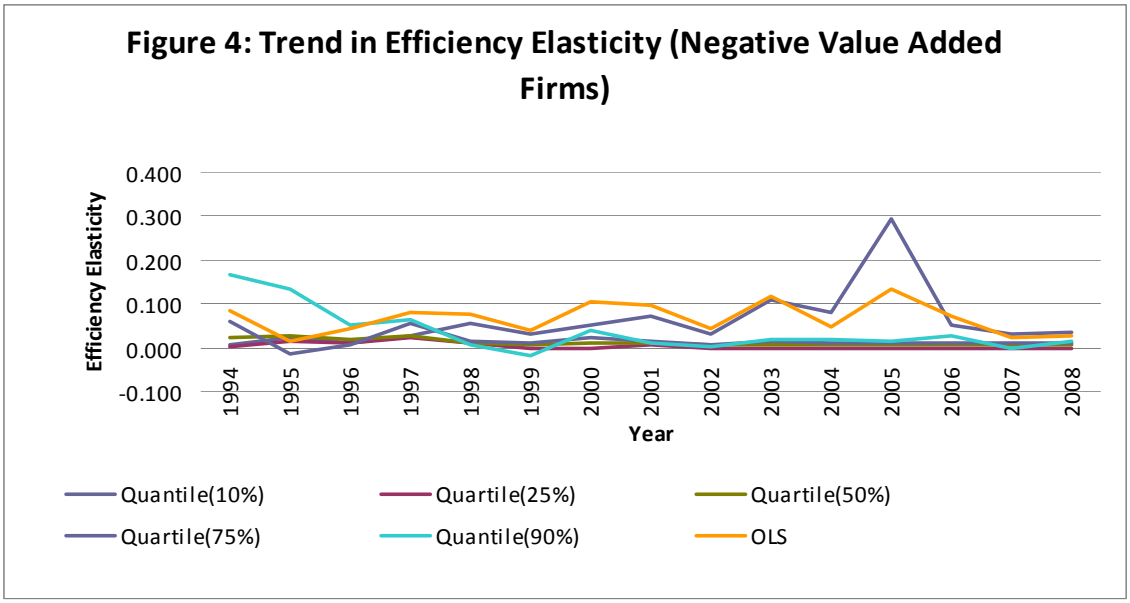
Second, the decline in elasticities is more pronounced for higher quantiles than that of lower quantiles, indicating a higher level of misallocation of resources with a higher investment growth. Third, we see a significant convergence of elasticities across the quantiles over the sample period.

The estimates of control variables also provide certain interesting features of the investment behavior of the Indian firms as reported in the appendix of the paper. The age variable (Table A1) enters the regression with a negative sign at the lower end of the distribution and gradually becomes more pronounced towards the right end of the distribution. Therefore, the impact of age on investment behaviour, particularly the magnitude, is not constant and rises with the investment. The next determinant of the investment behaviour: the coefficient of size (Table A2) is both significant and positive at the higher quantiles. The coefficient on bank proportion (Table A3) is positive and significant at the median indicating that firms with bank links tend to have better access to fund and can undertake higher investment. However, the coefficients tend to become insignificant for the higher quantiles. Finally, Government owned firms (Table A4 and

A5) tend to invest less at the median while we do not see any clear trend for the listed firms.

Further, to investigate the decline in elasticities over the sample period we estimate the equation 1 separately using observations in which firm value added is growing and the observations in which firm value added is declining. Since the fall in elasticity could be due to either underinvestment in growing firms or over investment in declining firms or both, this segmented analysis using the two sets of observation will shed some light on the nature of misallocation. Figure 3 and 4 report the trend in elasticities for firms with positive value added growth and negative value added growth respectively. In contrast to Figure 2, figure 3 and 4 clearly demonstrate that the observed decline in elasticities can be contributed to over investment in declining firms, particularly at the higher quantiles.





Finally to understand the nature and cause of this misallocation we augment our basic equation with three interaction terms: value added interacted with these three variables, such as government ownership dummy, listing dummy and bank proportion of loan in total borrowings. These three additional variables will be able to shed some light on the sources of misallocation across various types of firms. In the spirit of Fama and MacBeth (1973) we use averages of the annual slopes from the augmented equation and time series standard errors of the average to draw inferences. The advantage of this approach is that the year-by-year variation in the slopes, which determines the standard errors of the average slopes, includes estimation error due to the correlation of the residuals across firms. The standard errors are also robust with respect to heteroscedasticity, since there is no heteroscedasticity correction for a sample mean.

Table 5 reports the average estimates for the model augmented with interaction variables. In consistence with these theories, our results show that firms which are subjected to the capital market disciplines are more efficient than their counterparts. Similarly the government owned firms are less efficient than the private counterparts indicating that the government owned firms often have political considerations, and not efficiency as the primary determinant of allocation policy. Therefore, even after liberalization these two factors tend to contribute to the misallocation of capital in a

significant way. However, it is important to note that the decline in efficiency, in the post liberalized period, can not only be attributed to these two groups as misallocation is evenly spread across all segments of firms. The one plausible reason for such misallocation in the post liberalized regime could be due to excessive capacity creation in certain industries, financed by cheap external sources of finance, without any consideration of return or demand conditions (Bhaduri 2000). Finally, though not statistically significant for the interaction term, a negative coefficient on the proportion of bank borrowing indicates a disturbing trend of a higher level of misallocation of resource for firms with bank relation. It is often argued that the monitoring associated with bank finance would tend to ameliorate a moral hazard problem between the entrepreneurs and their lenders. Therefore a failure in the effective monitoring of allocation of fund by banks can have a severe adverse consequence for a predominantly bank based economy such as India.

Table 5: Parameter estimates of the augmented model capturing the interaction effects.

	OLS	SE	t
Growth in value added	0.122	0.023	5.295*
log(age)	-0.109	0.025	-4.385*
log(total Assets)	0.037	0.003	11.541*
Bank loan proportion	0.034	0.003	10.967*
Government firm (Dummy takes 1 for Govt. Firms)	-0.020	0.007	-2.745*
NSE listed firm (Dummy takes 1 for NSE listed firms)	-0.022	0.006	-3.603*
Interaction (growth in value added & NSE)	0.152	0.044	3.470*
Interaction (growth in value added & Bank loan)	-0.044	0.034	-1.271
Interaction (growth in value added & Gov)	-0.077	0.027	-2.888*

Note: The statistical significance (1%) of the coefficient is indicated by *. The table shows means (across years) of the regression intercepts (Int) and slopes, and t-statistics for the means, t(Mn), defined as the mean divided by its standard error [the times-series standard deviation of the regression coefficient divided by (15)1/2]

5. Conclusion:

The paper explores the impact of financial liberalization on the allocation of capital in the context of a developing economy, India. Based on these results, one can infer that in the post liberalization period, there was a strong and harmful tendency in the Indian corporate sector towards misallocation of resources. This stands contrary to the conventional wisdom that financial liberalization leads to better allocation of capital. Our within-year estimates show a decline in the elasticity during the initial phase of reform while some signs of improvement in allocation elasticity are observed during the later phase of reform. The study also highlights the disturbing trend of convergence of efficiencies across various strata of firms towards a lower level during the post liberalization period.

Undoubtedly, the surge in the availability of funds in the stock market, particularly during the early years of liberalization, has encouraged many corporate to adjust their financial structure. Nevertheless, the same factor has also generated a negative aspect due to excessive capacity creation in certain industries, financed by cheap external sources of finance, without any consideration of return or demand conditions (Bhaduri 2000). The phenomenon is a serious detraction from one of the major expected benefits of the removal of financial repression in a developing country and calls for a serious rethinking in the corporate governance policy. Notwithstanding the limitations of generalizing from a restricted context, our findings suggest that a move towards liberalized access to external finance, particularly equity sources of finance, in developing countries, should be accompanied by concerted effort to strengthen the appropriate markets (market for corporate control) and institutions that create necessary incentive for the private firms to pursue value maximizing projects.

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Appendix:

A1: Estimates of Log (Age) to explain the investment behaviour (Equation 1).

year	Percentile (10%)	Median	Percentile (75%)	Percentile (90%)	OLS
1994	0.000	-0.094*	-0.258*	-0.560*	-0.319*
1995	-0.005*	-0.098*	-0.266*	-0.614*	-0.309*
1996	-0.006*	-0.068*	-0.205*	-0.414*	-0.235*
1997	-0.002*	-0.012*	-0.064*	-0.171*	-0.080*
1998	-0.001*	-0.011*	-0.063*	-0.189*	-0.103*
1999	-0.006*	-0.001*	-0.014*	-0.058*	-0.033*
2000	-0.008*	0.000*	-0.011*	-0.042*	-0.041*
2001	-0.013*	-0.004*	-0.020*	-0.099*	-0.063*
2002	-0.019*	-0.003*	-0.018*	-0.065*	-0.056*
2003	-0.010*	-0.004*	-0.024*	-0.068*	-0.042*
2004	-0.009*	-0.005*	-0.030*	-0.088*	-0.084*
2005	-0.027*	-0.009*	-0.035*	-0.101*	-0.105*
2006	-0.019*	-0.011*	-0.052*	-0.125*	-0.097*
2007	-0.008*	-0.012*	-0.049*	-0.113*	-0.075*
2008	-0.007*	-0.011*	-0.046*	-0.093*	-0.028*

A2: Estimates of Log (Total Assets) to explain the investment behaviour (Equation 1).

year	Percentile (10%)	Median	Percentile (75%)	Percentile (90%)	OLS
1994	0.000	0.017*	0.028*	0.036*	0.051*
1995	0.005*	0.024*	0.028*	-0.002	0.039*
1996	0.006*	0.022*	0.018*	-0.009	0.020*
1997	0.003*	0.016*	0.024*	0.027*	0.025*
1998	0.006*	0.014*	0.027*	0.041*	0.034*
1999	0.007*	0.010*	0.022*	0.042*	0.045*
2000	0.005*	0.008*	0.016*	0.027*	0.024*
2001	0.007*	0.005*	0.014*	0.023*	0.030*
2002	0.010*	0.006*	0.016*	0.030*	0.038*
2003	0.008*	0.005*	0.011*	0.012*	0.017*
2004	0.009*	0.005*	0.014*	0.019*	0.030*
2005	0.021*	0.009*	0.022*	0.033*	0.042*
2006	0.012*	0.015*	0.030*	0.038*	0.042*
2007	0.013*	0.018*	0.035*	0.049*	0.058*
2008	0.011*	0.019*	0.042*	0.069*	0.057*

A3: Estimates of bank loan proportion in total borrowings to explain the investment behaviour (Equation 1).

year	Percentile (10%)	Median	Percentile (75%)	Percentile (90%)	OLS
1994	0.000	-0.017	-0.056	-0.047	-0.019
1995	0.002	-0.013	-0.022	0.098	0.024
1996	0.001	0.006	-0.015	-0.043	0.006
1997	0.010*	0.011	0.005	-0.016	0.033*
1998	0.026*	0.002	0.004	-0.047	0.036*
1999	0.035*	0.002	0.006	0.023	0.028*
2000	0.034*	0.002	0.006	-0.020	0.024*
2001	0.037*	0.003*	0.000	-0.005	0.051*
2002	0.032*	0.001*	0.000	-0.002	0.023*
2003	0.041*	0.003*	0.009*	0.011	0.045*
2004	0.051*	0.005*	0.012*	0.017	0.042*
2005	0.047*	0.005*	0.015*	0.030*	0.045*
2006	0.025*	0.006*	0.024*	0.028	0.039*
2007	0.037*	0.012*	0.020*	0.022	0.035*
2008	0.021*	0.008*	0.010*	0.009	0.027*

A5: Estimates of Government ownership dummy to explain the investment behaviour (Equation 1).

year	Percentile (10%)	Median	Percentile (75%)	Percentile (90%)	OLS
1994	0.000	-0.030	-0.064*	-0.139	-0.106*
1995	-0.007	-0.056*	-0.076*	-0.010	-0.038
1996	-0.011*	-0.052*	-0.045*	-0.021	-0.018
1997	-0.002	-0.030*	-0.047*	-0.092	-0.021
1998	0.002	-0.023*	-0.050*	-0.066	-0.026
1999	0.004	-0.014*	-0.026	-0.007	0.009
2000	0.002	-0.009*	-0.017	-0.047	-0.002
2001	0.001	-0.002*	-0.010	-0.001	-0.005
2002	0.002	-0.005*	-0.017*	-0.010	-0.004
2003	0.002	-0.008*	-0.025*	-0.038	-0.014
2004	-0.004	-0.006*	-0.018*	-0.002	-0.019
2005	-0.009	-0.019*	-0.024*	0.012	0.008
2006	-0.001	-0.029*	-0.040*	-0.052	-0.042
2007	-0.003	-0.029*	-0.054*	-0.061	-0.048
2008	-0.004	-0.024*	-0.042*	-0.062	-0.041

A6: Estimates of stock exchange listing dummy to explain the investment behaviour (Equation 1).

year	Percentile (10%)	Median	Percentile (75%)	Percentile (90%)	OLS
1994	0.010	0.007	-0.029	-0.057	-0.037
1995	0.007*	0.002	-0.028	-0.047	-0.033
1996	0.013*	0.023*	0.003	-0.014	0.018
1997	0.007*	0.015*	0.002	-0.034	-0.015
1998	0.012*	0.014*	0.004*	-0.036	-0.001
1999	0.004	0.018*	0.017*	0.006	-0.030*
2000	0.006	0.015*	0.024*	0.017	0.024
2001	0.004	0.020*	0.027*	0.038	0.018
2002	0.000	0.015*	0.022*	0.076*	0.004
2003	0.000	0.011*	0.031*	0.051*	0.020
2004	-0.002	0.016*	0.032*	0.044*	-0.010
2005	-0.001	0.022*	0.020*	-0.002	0.002
2006	-0.006	0.020*	0.020*	0.007	-0.004
2007	0.007	0.005	-0.002	0.003	-0.028
2008	0.004	0.004	-0.035*	-0.091*	-0.052*