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

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The paper investigates the 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 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. This 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. This paper, as a policy recommendation, highlights the importance of creating appropriate institutions prior to pursuing financial liberalization in developing countries like India.

Keywords: allocation; liberalization; India

1. Introduction

The financial sector of an economy plays an important role in allocating capital efficiently, and to this end capital is supposed to be invested in the sectors that are expected to have high returns and to be withdrawn from sectors with poor prospects.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 economic growth. However, there is little factual 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 1980s, Galindo, Schiantarelli, and Weiss (2002) 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 1980s. 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 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 with respect 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 (Beck, Levine, and Loayza 2000; Carlin and Mayer 2003) 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 UK and the USA 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 is strong evidence from a set of cross-sectional studies that the development of financial markets leads to better allocation of capital there are hardly any in-depth country-specific studies 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

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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 with 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 1992–1993), 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.

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 and the statutory liquidity ratios on incremental deposits were 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 licences and branch-licensing restrictions were relaxed. The Government reduced its stake in many financial institutions.

It has been widely discussed and documented that financial liberalization has been successful in helping Indian managers to access a wide range of funds in the post-reform period. Particularly in the early years of the reform (1992–1995), the 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. A simple plot of capital formation and value added by industry as a percentage of GDP below highlights some tell-tale signs of misallocation of resources in the Indian economy. It is evident that there is significant disconnect between these two variables in the post-reform period, indicating a considerable rise in investment without a commensurate rise in industry value added. Moreover, the disconnect between capital formation and industry value added further accentuates as the reform progresses.

We, therefore, examine the allocation pattern in India during the period 1994–2008 to assess the impact of ongoing financial liberalization on the allocation of capital. The question being addressed is: How did ongoing financial liberalization impact capital allocation patterns in India between 1994 and 2008? More specifically, the paper explores questions such as: Was the total fund available for investment allocated to more profitable industries and to better firms within an industry during this sample period (1994–2008)? Can we relate the efficiency of allocation to firm-specific characteristics, such as ownership, stock market affiliation, 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 by 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 (Fazari, 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 pursued 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, this paper also contributes 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, Demirgüç-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 economic growth. Several authors are inclined to agree with this line of causality, including Goldsmith (1969), McKinnon (1973), Shaw (1973) and Greenwood and Jovanovic (1990). Some empirical evidence supports this suggestion. Bagehot (1873) cites improved capital allocation as a primary reason for England’s comparatively faster growth in the mid-to-late nineteenth century. Further, in their cross-country study, Beck, Levine, and Loayza (2000) 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 efforts in developing countries should be accompanied by a concerted attempt to strengthen the appropriate markets (market for corporate control) and institutions that create the necessary incentives for 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 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, 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 attempts to fill this gap, particularly in the context of an emerging economy like India and investigates 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, and 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. 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 up 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.

To obtain a measure of efficiency of 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 been 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 efficiency of allocation of investment is the ratio of the estimate of the actual total return on investment to the estimate of 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 as proxy, the following measure of the efficiency of the allocation of investment funds is proposed:

Efficiency Index based on operating profit (EI)

\[ EI = \frac{\sum_i \left( \Pi_{i,t+1}/K_{i,t+1} \right) I_{i,t}}{\sum_i \left( \Pi_{i,t+1}/K_{i,t+1} \right) K_i^{T}}, \]

where \( \Pi_{i,t+1} \) operating profits of firm \( i \) at time \( t+1 \), \( I_{i,t} \) growth in gross block (fixed investment) at time \( t \), and \( K_{i,t+1}^{T} \) capital employed at time period \( t+1 \). \( I_i^{T} \) and \( K_i^{T} \) 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:

\[ \ln \left( \frac{I_{i,t}}{I_{i,t-1}} \right) = \alpha + \beta_1 \ln \left( \frac{GVA_{it}}{GVA_{it-1}} \right) + \beta_2 Z_i + \varepsilon_{it}. \]  

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 (\( \beta_1 \)) in the above equation is an elasticity and the higher its value the lesser is the misallocation of capital. \( Z \) is 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 are 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 financially constrained than investment by firms without close bank ties (Hoshi, Kashyap, and Scharfstein 1990a, 1990b). Finally, we also control for the access to the capital market through listing information. Further, it is important to note that listing information about the proportion of bank loan might also have an 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 entrepreneurs and their lenders (Diamond 1984).

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 the more traditional measures of investment opportunities like, \( Q \), the price earnings ratio, sales growth, etc. Though there is some evidence for the USA 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 becomes productive immediately – a fact usually refuted by the empirical literature on gestation lags (Mayer 1960; Hall et al. 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 production theory. In contrast, the methodology used in this paper avoids these problems by focusing on the allocation of capital by directly observing the investment flows.

Further, a common empirical approach has been deployed in the literature to estimate a constant elasticity
exploratory variables, $Y$ where by choosing absolute deviation, known as median regression. Therefore, for $\theta = 0.5$, the procedure leads to minimization of the sum of absolute deviation, obtained by minimizing following equation:

$$Y = X^\prime \beta + \varepsilon,$$

$$Q_\theta(Y|X = x) = X^\prime \beta(\theta); \quad 0 < \theta < 1,$$

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

$$\text{Min} \sum_{Y \geq X^\prime \beta} \theta|Y - X^\prime \beta| + \sum_{Y < X^\prime \beta} (1 - \theta)|Y - X^\prime \beta|;$$

For $\theta = 0.5$, the procedure leads to minimization of the sum of absolute deviation, known as median regression. Therefore, by choosing $\theta$ 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 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 (Hallock and Koenker 2001).

Finally, it is important to note that we exclude the firm-specific effect in the quantile regression as the implementation and interpretation of the firm-specific effects are not straightforward in the quantile regression framework (Arias, Hallock, and Sosa-Escudero 2001; Koenker 2004). To circumvent the problem, we estimate the equation for each year separately. Using a large and unbalanced panel of more than 40,000 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, justifying our choice of methodology.

3. Sample and data description

The data for this analysis are drawn from the Capitaline database and the sample of the study consists of observations from 1994 to 2008. The Capitaline database reports contain 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 a number of observations in each year. To minimize the potential impact of outliers, all variables are winsorized at a 5% level at both ends of the distribution.

The variables used in the data-set are capital employed, GVA, GFA, operating profit of the firm, total investment, bank loans, ownership group, and size and age of the firm. To begin with, we have looked at the trends in our three key variables: value added (GVA), profitability and investment in Figure 1. As the aggregate values of these variables are influenced by the number of observations in each year, we have looked at their average values. As Figure 1 shows, on average there is a consistent relationship among value added, profitability and investment. However, as one can note from Table 2 the overall trend also hides the fact that a

| 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.
large number of negative value-added firms in the Indian manufacturing industry undertake investment.\(^3\) Table 3 on the other hand also corroborates the fact that among the investing firms there is a growing number (17–25\%) that continue to invest despite having negative growth in their value added. However, these tell-tale sign of misallocation of resources needs to be further explored through our empirical models.

### 4. Empirical results

To facilitate interpretation and avoid short-term fluctuations, we report a five-year average of simple efficiency index in Table 4 and plot the same 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 an overall declining trend in efficiency during the sample period.\(^4\) Both the government-owned and non-listed firms share the same declining trend during the sample period. However, a moderate upward trend is observed for the listed firms. Though the trends presented so far only provide some preliminary signs of a change in efficiency of the Indian firms after liberalization, we need further investigation using the efficiency elasticity for a robust conclusion.

To facilitate a direct comparison, the model (Equation (1)) is estimated first by cross-sectional OLS regressions for each year. Table 5 reports the result and Figure 3 depicts the trend. Column 7 in Table 5 presents the elasticity estimates from the OLS regressions. The cross-sectional elasticities clearly show a declining trend over the sample period. Next, we estimated the model for different values of \(\theta\) 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 5 (columns 1–5). The model

![Figure 2. Trend in efficiency index based on operating profit (1994–2008).](image-url)
Table 5. Trend in efficiency elasticity ($\beta_1$ of Equation (1)) over various quantiles.

| 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 *.

is estimated at the 10th, 25th, 50th, 75th and 90th quantiles. We see that there are some pronounced differences across different points in the distribution of investment growth. First, while the elasticity estimates are all statistically significant for OLS regression they are insignificantly small for some of the lower than median quantiles, indicating that the elasticities are not constant across the various quantiles of investment decisions.

Second, the decline in elasticities is more pronounced for higher quantiles than for lower quantiles, indicating a higher level of misallocation of resources is associated with 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 Indian firms, as reported in the appendix of this 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 behavior, particularly the magnitude, is not constant and rises with the investment. The next determinant of investment behavior 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 funds and can undertake higher investment. However, the coefficients tend to become insignificant for the higher quantiles. Finally, government-owned firms (Tables 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 Equation (1) separately using observations for both growing and declining value-added firms. Since the fall in elasticity could be due to either under-investment in growing firms or over-investment in declining firms or both, this segmented analysis using the two sets of observations will shed light on the nature of misallocation. Figures 4 and 5 report the trend in elasticities for firms with positive and negative value-added growth.
respectively. In contrast to Figure 3, Figures 4 and 5 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 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. As pointed out by Fama and MacBeth, the advantage of this approach is that the year-by-year variation in the slopes includes estimation errors 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 6 reports the average estimates for the model augmented with interaction variables. Consistently with these theories, our results show that firms which are subjected to the capital market disciplines are more efficient than

Table 6. Parameter estimates of the augmented model capturing the interaction effects.

| Parameter                   | 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 and NSE) | 0.152 | 0.044 | 3.470*|
| Interaction (growth in value added and bank loan) | -0.044 | 0.034 | -1.271|
| Interaction (growth in value added and govt) | -0.077 | 0.027 | -2.888*|

Notes: 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 \(15^{1/2}\)).
their counterparts. Similarly, government-owned firms are less efficient than their 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, cannot be attributed to only 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 resources for firms with bank relations. 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 funds by banks can have a severe adverse consequence for a predominantly bank-based economy, such as India.

5. Conclusion
The paper explores the impact of financial liberalization on the allocation of capital in the context of an emerging 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 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 corporates 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 rethink in corporate governance policy. Notwithstanding the limitations of generalizing from a restricted context, our findings suggest that a move towards a liberalized regime and access to external finance, particularly equity sources of finance, in developing countries, should be accompanied by concerted efforts to strengthen the appropriate markets (market for corporate control) and institutions that create necessary incentives for private firms to pursue value-maximizing projects.

Notes
1. See Gokarn, Sen, and Vaidya (2004) for a description and analysis of equity market reforms. A detailed description of specific measures of financial liberalization is available in Sen, Sarkar, and Vaidya (1997).
2. Notably, Galindo, Schiantarelli, and Weiss (2007) in their study involving cross-country comparisons has argued for sales-based over profit-based measures to avoid country-specific bias due to variability in their tax regime. Though tax distortion is not a concern for single-county estimates, yet to check the robustness of our findings we have used both sales-based and profit-based measures. However, due to space constraint, we have only reported the profit-based measures in this paper. These sales-based estimates can be obtained from the authors on request. More importantly, our main conclusions remain invariant to the choice of our measures of average product of capital.
3. The trend remains invariant even if we consider the lag values of value-added growth.
4. The sales-based efficiency measures also corroborate a similar trend.

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Appendix

Table A1. Estimates of Log(Age) to explain the investment behavior (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* |

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

Table A2. Estimates of Log(Total Assets) to explain the investment behavior (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* |

Note: The statistical significance (1%) of the coefficient is indicated by *.
Table A3. Estimates of bank loan proportion in total borrowings to explain the investment behavior (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 |

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

Table A4. Estimates of government-ownership dummy to explain the investment behavior (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 |

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

Table A5. Estimates of stock-exchange listing dummy to explain the investment behavior (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* |

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