THE IMPACTS OF MANAGERIAL AUTONOMY ON FIRM OUTCOMES

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NBER Working Paper No. 26304
September 2019
JEL No. D2,D23,D73,D92,M12,M38,M51,O38,O53

ABSTRACT

The allocation of decision rights within organizations influences resource allocation, expansion decisions, and ultimately outcomes. Using a newly constructed dataset, I estimate the effects of an earned autonomy program for State Owned Enterprises (SOEs) in India. The program gave managers (the board of directors) of profitable SOEs more autonomy over strategic decisions such as capital expansion and the formation of joint ventures. I find that autonomy allows SOEs to increase their capital stock and form more strategic partnerships which leads to greater sales and profits. I also find that the likelihood that a manager subsequently joins a board of a private firm is greater for managers of those SOEs which were granted autonomy, indicating that career concerns is a consistent explanation for these managerial decisions. Taken together, these results indicate that large gains in SOE performance are possible without privatization (by policies like earned autonomy) and may occur partly through managers' career concerns.

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1   Introduction

The information required for critical decisions is typically dispersed within an organization. As a result, the allocation of decision rights within organizations influences important choices like resource allocation, expansion decisions, and ultimately outcomes. Giving managers autonomy can allow them to make better decisions based on their private information. Alternatively, managers' incentives may not align with those of the organization as a whole: they may prefer to focus on objectives that directly impact their career outcomes (but do not align with the objectives of the firm) or they may inefficiently avoid risk altogether to shield themselves from blame in the case of failures. In this paper, I empirically untangle these effects by using a novel data set to test the effect of an earned autonomy program that granted managers decision rights in Indian State Owned Enterprises (SOEs).

The economic significance and distinctive organizational structure of SOEs make them a particularly relevant setting to study the effect of managerial autonomy. First, they comprise a significant proportion of economic activity in many countries. In 2015, 98 of the Fortune 500 companies were in China, of which only 22 were private firms (Cendrowski, 2015). In 1951, India had 5 SOEs with an investment of about $4 million (2018 USD) - these grew to 260 SOEs with $206 billion in investments in 2012. Second, incentives for managers in SOEs differ from incentives for managers in the private sector. In SOEs, incentives are typically quite low-powered, rent-seeking may prevent optimal decision making (Shleifer, 1998) and, given that SOEs typically have soft budget constraints, managers may be likely to take high-risk decisions knowing that the government will bail out the firm in the event of a disastrous outcome.

Additionally, there is an important policy debate around whether SOEs should be privatized since it is well-established that they are less likely to be profitable and have lower returns to capital than their private-sector counterparts (Dollar and Wei, 2007; Megginson and Netter, 2001). Proponents justify SOEs on the grounds that these firms trade off profits with additional objectives such as generating employment (Azmat et al., 2012; Boycko et al., 1996). It is hence both natural and policy-relevant to ask whether, instead of ownership changes, firms' outcomes (such as productivity) can be improved by improving the allocation of decision rights within the firms' hierarchy.

This paper combines a newly constructed dataset on Indian SOE financial statements with existing data sources to estimate the effects of an earned autonomy program on these firms' decisions and outcomes over an 18-year period. Specifically, the program gave the board of directors (henceforth, referred to as managers) of profitable SOEs more autonomy over strategic decisions such as capital expansion and the formation of joint ventures. Each SOE in India is housed in a particular ministry. Before the program was introduced, such decisions were taken by a committee that included officials from the governing Ministry, and in some cases (depending on the magnitude of the decision) also higher levels of government. This included decisions for which the firm did not need any funds from the government; for instance, if a SOE wanted to use its retained earnings to finance a capital expenditure, it was required to go through the committee nonetheless. Earning autonomy did not explicitly change managerial incentives directly or the set of available options for these decisions; it only meant that the board of directors no longer needed to get committee approval when undertaking decisions that were financed out of retained earnings or private-sector borrowing (and hence did not require government funds).[1]

The program started in 1997 and gave SOEs that earned profits for three continuous years and had a positive net worth the right to apply for autonomous status. I construct a pre-program measure of eligibility to apply for this status: a binary variable that equals 1 if a SOE earned profits for three years continuously and had a positive net worth *before* 1997, the year of the program introduction, and 0 otherwise. I use this measure of program eligibility as a proxy for receiving autonomy, to sidestep the endeogneity concerns around the government picking firms for autonomy that may have the highest potential returns from this program. Using a differences-in-differences framework, I then test whether SOEs that were eligible pre-program performed differentially after 1996 relative to SOEs that were not. I also estimate their performance relative to comparable private firms (that earned profits for three years continuously and had a positive net worth before 1997).

I find that earned autonomy allowed SOEs to increase profitability, productivity, and sales. Treated firms have greater capital expansion and are more likely to form strategic partnerships such as joint ventures or subsidiaries after the program. These effects persist for thirteen years

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[1]The size of capital expansion for a single project was capped depending on the net worth of the SOE - more details are provided in the next section.

after the program was implemented (the entire length of time for which I observe SOE outcomes), indicating that they led to a long-term shift in the way these SOEs were managed. These results indicate that large gains in SOE profitability may be possible without privatization, by giving well-running SOEs more autonomy over their decisions.

Furthermore, I show that managerial autonomy leads to more hiring (though the effects are more imprecisely estimated), indicating that greater profitability does not come at the cost of other objectives such as employment. Put differently, this shows that a better allocation of decision rights can lead to a Pareto improvement of SOE performance along multiple objectives. I also show that this hiring is distributed smoothly over the electoral cycle, in contrast to the average SOE whose hiring increases in the year before an election. Thus, while treated firms have a higher hiring capacity, autonomy ensures that hiring decisions are not co-opted by the government for electoral purposes.

I show that managerial career concerns *outside* the firm (the desire to join the board of a private sector firm) can explain these outcomes. Specifically, I show that the probability I match a SOE director to a private firm board of directors increases after the SOE gets autonomy. By contrast, there is no consistent evidence to suggest that the effects are explained by incentives within the firm. SOE payscales are largely determined by which grade they are allocated to (A, B, C or D, with A having the highest and D the lowest wages). I find that autonomy has a greater impact for higher payscale SOEs, but these effects are no longer present when I control for heterogenous effects (by pre-program sales and profits). Put differently, this evidence indicates that within-firm payscales may have limited ability to explain the relative effects of autonomy.

A potential concern with the baseline empirical strategy I employ is that earning profits for three continuous years may put a firm on a differential growth trajectory (in other words, autonomy itself has no effect). To show that this is not driving the results, I use a second DID framework that includes both the pre-program eligibility measure (the proxy for being treated) interacted with the post-1996 dummy variable and the treatment dummy variable interacted with the post-1996 dummy variable (as well as sector-by-year and firm fixed effects). This is meant to test whether pre-program eligibility has any additional effects on the outcomes of interest after controlling directly for treatment assignment. I find that controlling for the interaction of the treatment dummy variable interacted with the post-1996 dummy variable causes the effects on the interaction be-

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tween pre-program eligibility and the post-1996 dummy variable to be statistically insignificant and much smaller. This indicates that pre-program eligibility is a plausible proxy for treatment, and does not have independent effects on firm outcomes conditional on the controls included in the regression.

I conduct several other robustness checks. I rule out that the effects are driven by strategic reporting of profits, or by spillovers on ineligible SOEs. I also show that the results are robust to considering only SOEs that reported positive profits at least once during the sample period, the inclusion of more stringent sector-by-year fixed effects, and estimating the effects relative to comparable private firms. Finally, I show that government ownership does not change on average during the sample period, indicating that the results are not driven by privatizing firms that received autonomy.

Related Literature

This paper builds on two literatures. The first studies the impact of within-firm decentralization and managerial autonomy on firm decisions and outcomes.[2] Decentralization within private firms has been shown to increase firm's ability to withstand negative shocks (Aghion et al., 2017; Nagar, 2002).[3] However, given that SOE managers face different career concerns and incentives than private firm managers, and target multiple objectives in addition to profit maximization, managerial autonomy may have very different effects in SOEs. Xu (2000) studies a combination of reforms in China in the 1980s[4], and Groves et al. (1994) find that autonomy and incentives together increased SOE productivity in China also in the 1980s, when SOEs produced the bulk of industrial output in China. This paper has several differences that make it complementary to this prior work. First, it uses a natural experiment to estimate the causal effects of managerial autonomy. Second, it considers a program that provided autonomy around strategic decisions but did not explicitly change

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[2]I use the terms autonomy and firm decentralization interchangeably throughout the paper.

[3]The literature on the determinants of firm decentralization is also quite related to this paper. For instance, Acemoglu et al. (2007) show that private firms closer to the technological frontier and younger firms are more likely to decentralize decision rights. (Vázquez, 2004) studies the determinants of delegation to shop-floor managers in the Spanish electronics industry. Huang et al. (2017) show that greater distance to the central government in China predicts allocation of the SOE's oversight to a more local level of government. For an excellent overview of this literature, see Colombo and Delmastro (2008).

[4]These were focused around increasing competition to SOEs, allowing them to sell part of their output in the open market, and giving SOE managers discretion around wage-setting for workers along with autonomy over input sourcing and several production decisions

within-firm incentives of SOE managers. Third, I provide additional evidence showing that SOE managers' career concerns around seeking board memberships in private firms may explain why they respond to autonomy.

Autonomy programs exist in many countries and aim to promote efficiency and accountability in publicly owned organizations across a wide variety of settings including the health sector, school reforms, and public procurement.[5] A prominent example of earned autonomy of the kind this paper studies is the UK's earned autonomy program for the National Health Service (NHS) (Goddard and Mannion, 2006). I am able to causally estimate the effects of earned autonomy as well as test whether the impacts last in the longer-term.

The second literature concerns the determinants of SOE profitability. The main focus in this literature is the effects of changes in ownership on SOE profitability and productivity (Barberis et al., 1996; Bartel and Harrison, 1999,?; Berkowitz et al., 2017; Gupta, 2005; Hsieh and Song, 2015; Megginson and Netter, 2001; Musacchio and Lazzarini, 2014). This includes studies on the impacts of the reform of Chinese SOEs in the 1990s known as "Grasp the Large, Let Go of the Small" that focused on privatizing smaller SOEs while corporatizing larger SOEs (Berkowitz et al., 2017; Hsieh and Song, 2015). There is much less work studying the effects of changes to organizational structure (rather than ownership), with the exceptions of Xu (2000) and Groves et al. (1994) discussed above.

Finally, the context of this paper is SOEs in India, which have co-existed with the private sector since about 1950. Barring some exceptions (Alfaro and Chari, 2009; Choudhury and Khanna, 2014; Gupta, 2005), SOEs in India are not well-studied as in other settings, such as China. However, despite India's substantial private-sector reforms in the 1980s and early 1990s, SOEs dominate market shares in the sectors they operate in (Alfaro and Chari, 2009) and employ tens of millions of people. Thus, policies that impact their profitability and expansion decisions have potentially large aggregate effects.

The rest of the paper is organized as follows. Section 2 details the earned autonomy program that is the subject of this paper. Section 3 presents the data and summary statistics, and Section 4

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[5]A related though distinct literature estimates the effects of autonomy across diverse settings such as schools and public procurement. Clark (2009) finds positive effects of school autonomy on educational achievement in the UK, though Hanushek et al. (2013) document that the returns to school autonomy are negative in developing countries, and positive in developed countries. Baltrunaite et al. (2018) find that giving procurement agents more discretion increases share of contracts awarded to politically connected firms, and possibly increases misallocation.

details the empirical strategy. Section 5 presents the results, Section 6 presents robustness checks and additional outcomes, and Section 7 concludes.

2   Earned Autonomy Program

The earned autonomy policy was instituted in 1997, and allowed SOE directors autonomy over several significant strategic decisions conditional on fulfilling certain criteria. There were three levels of autonomy in the period I study, each conditional on increasingly stringent criteria. The least level of autonomy (called "Miniratna category-II") was given to firms that had earned positive profits for three consecutive years, and had positive net worth. The next level of autonomy (called "Miniratna category-I") was given to firms that fulfilled all criteria for Miniratna category-II, and also earned a profit of at least Rs.300 million in one of the three years. The final level of autonomy (called "Navratna") was conditional on more stringent criteria which changed over time, including finally requiring that an SOE have stayed at a a lower level of autonomy for a certain number of years.

Once the SOEs fulfilled these criteria, they could apply to their governing Ministry for this status – once granted, in principle, they had to include at least 3 independent directors on their board before exercising autonomy. In practice, several of these board seats remain vacant for long periods of time. If at any point they preferred to exchange this autonomous status for governmental support once again, they could do so (so the moral hazard of taking a risky decision, knowing that the government would bail out the firm in case of a failure was therefore a distinct possibility).[6] The criteria for autonomy for the Mini-ratna categories is outlined in Table 1.

Once the firms were granted autonomy, the board of directors could exercise autonomy over the following decisions:

1. Capital Expenditure: the board of directors could undertake capital expenditures (upgrading capital or purchasing new capital) in any location, up to a cap which was an increasing function of firm's net worth - this would be financed out of retained earnings and commercial borrowing (the commercial borrowing was to be debt-based, since SOEs could not give

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[6]If a firm gave up its autonomy status, they would have to become eligible once again to apply for and renew their status in the future if they wanted to do so - in practice, I do not find firms giving up their status.

Table 1

	Mini-Ratna Cat-II	Mini-Ratna Cat-I
Positive net profits for each of the last 3 Years	✓	✓
Positive net worth	✓	✓
Do not require budgetary support from the government	✓	✓
Pre-Tax Profit of at least 30 crore in one year		✓

away equity to finance capital expenditure).

2. Labour training and retirement schemes: The SOE board could introduce human resource management initiatives, training, voluntary or compulsory retirement schemes. Given that SOEs are large employers, and laying off workers in these firms can be politically sensitive, this may have given them more flexibility to restructure their labor force.

3. Ability to float joint ventures and subsidiaries: these were also subject to a value cap, about 5% of the net worth of the SOE.

Instead of requesting the government for permission on any of these decisions, the SOE board was only required to notify the government of their decision. For SOEs not granted this autonomy status, the process of approval for undertaking any of these decisions was the same as before, as discussed in Section 1. This included requesting approval from the governing Ministry, and the decision was taken by a committee comprising Ministry officials. In cases of projects that required large amounts of government funds, the decision could be subject to a parliamentary vote. The full details of the benefits conferred on firms with different types of autonomy are detailed in Appendix B.

3 Data

The paper combines data from several volumes of the Public Enterprise Survey Reports with existing data sources.[7] These reports are published annually by the Department of Public Enterprises in India, which is responsible for reporting information on SOE financial performance, expenditures, and labor composition. I was able to access these volumes from 1994 to 2009. Since some data is available for the past two years in a given report, for certain variables, such as those available in financial statements, the data covers the years 1992-2009. The universe of all SOEs in which the Central Government of India has a majority stake are included in the data- in an average year, data is available for about 220 firms.

3.1 Firm Returns, Inputs, Borrowing and Profit Division

The annual financial statements of the SOEs cover the period from 1992 to 2009. These include information available in the profit & loss accounts and balance sheets for each SOE. To ensure that the results I estimate are not driven by entry or exit, I restrict the sample to SOEs that report data for at least 5 years before (starting in 1992) and at least 5 years after (until 2002) the program (this gives a sample of about 190 firms per year).[8] I have three measures of firm returns - profits, value added, and sales, as well as two measures of productivity- sales per employee and value added per employee.[9]

   The statements also include information on capital assets (the sum of fixed assets, capital works in progress, and other long-term investments), the number of employees, and the wage bill. These variables, along with whether a SOE participates in a joint venture or subsidiary, are intermediate outcomes of interest via which autonomy might impact firm returns and productivity (I detail the data collection for participation in a joint venture or subsidiary in Section 3.4). I digitize information on total loans, as well as interest payments. For the years 1994-2009, I have information on the level of borrowing separately by government and non-government sources.

   To test whether autonomy changes the allocation of surplus generated by a SOE, I use infor-

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[7]The data appendix presents all variables used in the analysis, the level of measurement (e.g. whether the data are available at the firm-year level, firm-level, etc.), temporal coverage, and source.

[8]In Appendix table A6, I present results including all firms, including those that began reporting after 1992 or stopped reporting before 2002, to show that results are consistent with the main results.

[9]I calculate value added by subtracting expenditures on raw material, as well as power and fuel, from sales.

mation on the distribution of profits into dividends and retained earnings. I use these to test how much the government benefits from autonomy via receiving greater dividends, and how much of their profits do SOEs are able to retain.

3.2 Autonomy Status, Compensation Grade, Labor Composition, and Spatial Presence

The reports include information on the autonomy status of each SOE since when the program began in 1997. This includes whether a SOE has autonomy, and if so, which category of autonomy it has (whether it is a mini-ratna category I, mini-ratna category II, and so on). In addition, I digitize data available from 1994-2007 on the labor composition of the SOEs. For all years except 1999, this is available as the number of managers, supervisors, workers, and casual workers. In 1999, only information on the number of managers and non-managers is available. Accordingly, I combine data from the rest of the years into these two categories only. This will allow me to test whether SOEs respond to autonomy by changing the labor composition of their workforce. Thirdly, from 1999, data on each SOE's state-level employment and capital presence is available. This allows me to test for electoral cycles in hiring decisions by SOEs, and how autonomy impacts these decisions.

Finally, I collect cross-sectional data on the compensation grade - defined as A, B, C, or D - of each SOE. As mentioned in Section 1, SOEs with grade A have the highest wages for each position, and SOEs with grade D have the lowest. SOE grades are determined by a variety of factors by the government, including sales, profits, the strategic importance of a SOE etc. In practice, the grades are quite static over time - each year, the Department of Public Enterprises reports include mentions of the number of grade changes, and usually only 1-2 SOEs at most change their grade in a year, indicating that this is unlikely to be heavily affected by the program. The data on SOE grades is only available in 2005 and later - I use each SOE's 2005 grade as their grade throughout the program.

3.3 Sectoral Codes, Board of Director Names, and Private Sector Firm Data

I combine the digitized data with the Prowess database, collected by the Centre for Monitoring the Indian Economy (CMIE). The database includes financial statements data for about 50,000 firms (including SOEs and private firms), as well as information on the board of directors of about 41,500 firms. I match SOEs to the Prowess database first to get information on their 5-digit National Industrial Classification (NIC) product codes.[10]

Additionally, I use information on the names of the board of directors in SOEs and private firms to test whether SOE managers that run firms which receive autonomy are differentially more likely to get private sector board seats after autonomy is granted. Data on SOE board members is available only for a fraction of the SOEs - 100 SOEs report data consistently after 2002 on the names of the Board of Directors. Coverage in the Prowess database on the board of directors improves markedly in 2003, which is why I consider 2003-2010 for this part of the analysis. I construct a director-year panel, that includes a binary variable that takes the value 1 if I am able to find a match for a SOE director name amongst the director names of private firms in a given year, and 0 otherwise. I can also test whether the propensity of the director to be present on private sector boards varies by whether the SOE director was on the SOE board before the firm received autonomy.

The Prowess data also includes data on firm profits, sales, and value added for private firms at an annual level, which allow me to estimate the effects of the autonomy program relative to private firms.[11] To ensure that I'm comparing firms that operate in similar conditions, I only include private firms that are in the same 5-digit NIC codes as SOEs, that were in operation before 1997 and report data for at least five years after 1997 (similar to the SOE main sample).

3.4 Participation in a Subsidiary or Joint Venture Project

To construct a measure of whether a SOE had a subsidiary or participated in a joint venture, I combine the CMIE database with the reports from the Department of Public Enterprises. The CMIE

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[10]Of about 230 SOEs operating before 1997, I was unable to find sector codes for only about 10 SOEs in the database. While the Prowess database includes reliable cross-sectional information on these SOEs in the 1990s, consistent annual financial information is not available across years, hence the need to digitize annual financial statements of these SOEs separately.

[11]The database does not report employment for most of the sample, so I cannot estimate the effects on productivity (sales per employee and value added per employee).

database reports whether a SOE had a subsidiary. While it also reports the assets reported by a firm in a joint venture project, the data on joint ventures is more sparse and begins only in 2000. The annual reports from the Department of Public Enterprises include a paragraph summarizing each SOE's activities over the course of the year. I searched all years of the report for mentions of new joint venture projects, and construct a binary variable that equals 1 if a SOE reported a new joint venture, and 0 otherwise. This variable is likely measured with some error, since a SOE may not choose to report a joint venture for some reason, and it does not have a good measure of when a joint venture ends.[12] With this information, I construct a binary variable that takes the value 1 if a SOE either reported a subsidiary (from the CMIE database) or a joint venture in either of the two data sources, and is 0 otherwise.

3.5 State Assembly Election Timing

To test for electoral cycles in SOE hiring, I collected data on the timing of the assembly elections (to elect representatives to the state legislature) in each state between 1999-2009. This data is available from the website of the Election Commission of India, and lists the state and year for each state's assembly election.

3.6 Summary Statistics

The main sample comprises of data from 193 firms. 95 firms were eligible before 1997 to apply for autonomy, of which 65 received it at some point between 1997 and 2009. In total, 73 unique firms received autonomy during the sample period.[13] Table 2 presents the summary statistics for SOE inputs and outcomes, as well as outcomes for the private firms used in the analysis. These summary statistics are over the entire sample period. In addition, for all outcome variables, the regression tables report the mean for each outcome variable.

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[12]In case the SOE only reported the number of joint ventures, this variable is 1 in a given year in case the number of joint ventures in that year exceed the number of joint ventures in previous years.

[13]19 firms received Navratna status between 1997-2009, 50 firms received Mini-ratna category-I status, and 17 firms Mini-ratna category-II status. These numbers include 13 firms that graduated to a higher level of autonomy during the sample period.

4 Empirical Strategy

4.1 Direct Effects of Autonomy on SOEs

4.1.1 Main Specification

To identify the effects of the autonomy program on SOE decisions and outcomes, I use a difference-in-differences (DID) framework. To sidestep the endogeneity of the timing of when a SOE gets autonomy, I evaluate all firms post-1996, the year before the policy was first implemented.[14] The DID framework allows me to test for parallel trends in the outcomes of interest. However, it is possible that (time-varying) factors that are observed by SOE managers or the government but not by the econometrician are correlated with the decision to apply for or grant autonomy. Therefore, I use the profitability and net worth criteria to generate a pre-program eligibility measure. I construct a variable that takes the value 1 if a firm earned profits for 3 consecutive years and had positive net worth before 1997, the year of the program implementation, and is zero otherwise. I use this eligibility measure as a proxy for the treatment, and thus estimate:

$$y_{ijt} = \alpha + \alpha_i + \gamma_t \phi_j + \beta \left(\mathbb{1}(\text{post } 1996)_t * \mathbb{1}(\text{eligible})_{ij} \right) + \mu \left(\mathbb{1}(\text{pre } 1996)_t * \mathbb{1}(\text{eligible})_{ij} \right) + \epsilon_{ijt}$$

(1)

where y_{ijt} = outcome for firm i in sector j in year t (such as sales or profits), α_i = firm fixed effect (FE), $\gamma_t \phi_j$=2-digit sector by year FE, and $\mathbb{1}(\text{eligible})_{ij}$= 1 if firm i was eligible pre-program, and 0 otherwise. β is the parameter of interest, and μ tests for pre-trends in the outcomes of interest. I omit interactions of $\mathbb{1}(\text{eligible})_{ij}$ with the year 1996, to estimate effects relative to the year before the program was implemented. Standard errors are clustered at the firm-level. I additionally present event study estimates with year by year interactions of pre-program eligibility, showing impacts for 5 years before (when the data begins) and 10 years after 1997 (these analogously omit the interaction of pre-program eligibility with the dummy variable that is 1 for the year 1996, the year before program introduction, and 0 otherwise).

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[14]In Table A5, I present generalized difference in differences results, which evaluate the effects of the program after a firm actually receives autonomy, and show that they are consistent with the main results.

4.1.2 Effects on Volatility of Firm Returns

In addition to estimating the average effects of autonomy, I test whether volatility of firm returns (profitability, sales, and value added) change over time. To do so, I estimate the firm-level standard deviation of each of these outcomes over three 5-year periods- 1992-1996 (before the program), 1997-2001 (shortly after the program), and 2002-2006 (longer term after the program). This gives a firm-year panel of the standard deviation over the last 5 years of these variables (comprising three data points for each firm covering the years 1996, 2001, and 2006). Using this panel, I estimate:

$$SD_{ijt} = \alpha + \alpha_i + \gamma_t\phi_j + \beta_1\left(\mathbb{1}(\text{Year=2001})_t * \mathbb{1}(\text{eligible})_{ij}\right) + \beta_2\left(\mathbb{1}(\text{Year=2006})_t * \mathbb{1}(\text{eligible})_{ij}\right) + \epsilon_{ijt}$$

(2)

where SD_{ijt} is the standard deviation of an outcome (profits, sales, and value added) for firm i in sector j in year t, α_i = firm fixed effect (FE), $\gamma_t\phi_j$=2-digit sector by year FE, and $\mathbb{1}(\text{eligible})$= 1 if a firm was eligible pre-program, and 0 otherwise. β_1 tests whether the volatility of firm outcomes changed in the short-term relative to before the program, and β_2 tests whether the volatility of firm outcomes changed in the longer-term.

4.2 Direct Effects of Autonomy Relative to Comparable Private Firms

While SOEs may increase profitability relative to other SOEs with autonomy, it is possible that they are still significantly less profitable or have lower sales than comparable private sector firms. To test how SOE performance compares to private sector firms, I use a triple difference regression:

$$\begin{aligned}y_{ijt} =&\alpha + \alpha_i + \gamma_t\phi_j + \psi\left(\mathbb{1}(\text{post-1996})_t * \mathbb{1}(\text{eligible})_{ij} * \mathbb{1}(\text{SOE})_{ij}\right) + \nu\left(\mathbb{1}(\text{pre-1996})_t * \mathbb{1}(\text{eligible})_{ij} * \mathbb{1}(\text{SOE})_{ij}\right) \\&+ \theta\left(\mathbb{1}(\text{post-1996})_t * \mathbb{1}(\text{eligible})_{ij}\right) + \kappa\left(\mathbb{1}(\text{pre-1996})_t * \mathbb{1}(\text{eligible})_{ij}\right) + \zeta\left(\mathbb{1}(\text{post-1996})_t * \mathbb{1}(\text{SOE})_{ij}\right) \\&+ \tau\left(\mathbb{1}(\text{pre-1996})_t * \mathbb{1}(\text{SOE})_{ij}\right) + \epsilon_{ijt}\end{aligned}$$

(3)

where α_i = a firm fixed effect (FE), $\gamma_t\phi_j$=2-digit sector by year FE, and $\mathbb{1}(\text{eligible})_{jt}$= a firm that

earned positive profits for 3 years and has a positive net worth pre-1997. As in Section 4.1.1, 1996 is the omitted year in all interaction terms. ψ compares pre-program eligible SOEs with comparable private firms after 1996, and ν tests for pre-trends. Standard errors are clustered at the firm-level.

4.3 SOE Board of Directors

To test whether career concerns around getting a board seat in the private sector may be a mechanism driving manager behavior, I use information on the names of SOE board members between 2003 and 2010. (As mentioned in Section 3.3, data coverage is very sparse before 2003). In 2003, about 55% of SOEs in the main sample report board members, and from 2004, about 66-74% of SOEs report board members.

I create a cross-sectional director-level dataset that includes a SOE director's name, whether they are on a SOE board that received autonomy, and if so, the year in which their SOE received autonomy. Using this information, I create a director-year level binary variable that takes the value 1 if I am able to merge a director's name with names of the board of directors of a private firm in a particular year. Since this data only begins after the program was announced, I estimate two separate specifications. The first specification, which includes all the data, is as follows:

$$\mathbb{1}(\text{SOE director matched to private board})_{it} = \alpha + \alpha_i + \beta\left(\mathbb{1}(\text{SOE has autonomy})_{it}\right) + \delta_t + \epsilon_{it}$$

(4)

where the variable $\mathbb{1}$(SOE has autonomy) is 1 if the director's firm has autonomy and 0 otherwise - for firms that received autonomy before 2003, it is always 1.[15] α_i is the director name fixed effect, and δ_t is a year fixed effect. Standard errors are clustered at the director name level. While this specification uses all the data, its limitation is that I cannot test for pre-trends. I therefore additionally estimate the following specification, which drops firms that received autonomy prior to 2005:

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[15]In case a director name shows up on both treated and untreated SOEs, I consider them to be treated directors.

$$\mathbb{1}(\text{SOE director Matched to Private Firm Board})_{it} = \alpha + \alpha_i + \beta \left(\mathbb{1}(\text{post autonomy})_t * \mathbb{1}(\text{treatment})_i \right)$$

$$+ \mu \left(\mathbb{1}(\text{pre autonomy}) * \mathbb{1}(\text{treatment})_i \right) + \beta_2 \left(\mathbb{1}(\text{post autonomy})_t \right) + \mu_2 \left(\mathbb{1}(\text{pre autonomy})_t \right) + \delta_t + \epsilon_{it}$$

$$(5)$$

where $\mathbb{1}(\text{treatment})=1$ if a firm was ever granted autonomy status in 2005 or later and 0 otherwise, α_i is the director name fixed effect, and δ_t is a year fixed effect. β tests whether SOE directors are more likely to be matched to a private sector board after autonomy, and μ tests for pre-trends. I estimate both specifications on two different samples - all SOE directors between 2003 and 2010, and only those who were present on SOE boards before 2005 (incumbent directors).

4.4 Electoral Cycles in Hiring

The autonomy program increases average employment by SOEs. However, it is possible that this increased hiring capacity is co-opted by the government to coincide with electoral cycles. To examine whether this is the case, I first test for the presence of electoral cycles by estimating the following equation:

$$\mathbb{1}(\text{SOE reports positive employment})_{ijkt} = \alpha + \alpha_i + \beta \mathbb{1} \left(\text{Year before a state assembly election} \right)_{kt}$$

$$+ \gamma_t \phi_j + \psi_k + \epsilon_{ijkt}$$

$$(6)$$

where the dependent variable is 1 if SOE i in sector j reports positive employment in state k in year t, and 0 otherwise. The coefficient of interest is β, and tests whether SOEs are more likely to hire in a state in the year before that state's assembly election. Since I have state-level estimates of employment for each SOE each year, I can also estimate a version of this equation including firm by year fixed effects. Furthermore, I can look at whether the year after an assembly election has any differential employment effects, in addition to the year before.

After showing the presence of electoral cycles in SOE hiring, I use two specifications analogous to those in Section 4.3, to test whether autonomy further exacerbates the electoral cycle in hiring.

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The first specification (as in Section 4.3), uses all the data, and is as follows:

$$
\begin{aligned}
\mathbb{1}(\text{SOE reports positive employment})_{ijkt} &= \alpha + \alpha_i + \beta_1 \mathbb{1}\,(\text{Year before a state assembly election})_{kt} \\
&+ \beta_2 \mathbb{1}(\text{SOE has autonomy})_{ij} + \beta_3 \left(\mathbb{1}\,(\text{Year before a state assembly election})_{kt}\, b * \mathbb{1}(\text{SOE has autonomy})_{ij} \right) \\
&\gamma_t \phi_j + \psi_k + \epsilon_{ijkt}
\end{aligned}
\tag{7}
$$

where the notation is similar to Equation 6, and β_3 tests whether the autonomy program exacerbates electoral cycles in employment. As in the previous specification, I can additionally include firm by year fixed effects as an additional robustness check.

I also estimate the following specification, which drops firms that received autonomy prior to 2005, and allows me to test for pre-trends:

$$
\begin{aligned}
\mathbb{1}(\text{SOE reports positive employment})_{ijkt} &= \alpha + \alpha_i + \beta_1 \mathbb{1}\,(\text{Year before a state assembly election})_{kt} \\
&+ \beta_2 \left(\mathbb{1}(\text{Treatment})_{ij} * \mathbb{1}\,(\text{Year before a state assembly election})_{kt} * \mathbb{1}\,(\text{Pre-autonomy})_t \right) \\
&+ \beta_3 \left(\mathbb{1}(\text{Treatment})_{ij} * \mathbb{1}\,(\text{Year before a state assembly election})_{kt} * \mathbb{1}\,(\text{Post-autonomy})_t \right) \\
&+ \beta_4 \left(\mathbb{1}\,(\text{Year before a state assembly election})_{kt} * \mathbb{1}\,(\text{Pre-autonomy})_t \right) \\
&+ \beta_5 \left(\mathbb{1}\,(\text{Year before a state assembly election})_{kt} * \mathbb{1}\,(\text{Post-autonomy})_t \right) \\
&+ \beta_6 \left(\mathbb{1}(\text{Treatment})_{ij} * \mathbb{1}\,(\text{Pre-autonomy})_t \right) + \beta_7 \left(\mathbb{1}(\text{Treatment})_{ij} * \mathbb{1}\,(\text{Post-autonomy})_t \right) \\
&+ \beta_8 \mathbb{1}\,(\text{Pre-autonomy})_t + \beta_9 \left(\text{Post-autonomy}_t \right)_t + \gamma_t \phi_j + \psi_k + \epsilon_{ijkt}
\end{aligned}
\tag{8}
$$

β_3 tests whether autonomy worsens hiring during the electoral cycle, and β_2 tests for pre-trends. In addition to all relevant double interaction terms, the equation includes firm fixed effects α_i, sector by year fixed effects $\gamma_t \phi_j$, and state fixed effects ψ_k. As in the previous equations in this subsection, I also show results with the inclusion of firm fixed effects, $\gamma_t \phi_j$.

4.5 Heterogeneous Effects by Compensation Grade

To test whether autonomy has heterogeneous effects on profitability by the compensation grade of the SOE, I estimate the following equation:

$$\pi_{ijt} = \alpha + \alpha_i + \gamma_t \phi_j + \beta_1 \left(\mathbb{1}(\text{post 1996})_t * \mathbb{1}(\text{eligible})_{ij} \right) + \mu_1 \left(\mathbb{1}(\text{pre 1996})_t * \mathbb{1}(\text{eligible})_{ij} \right) +$$

$$\beta_2 \left(\text{compensation grade}_{ij} * \mathbb{1}(\text{post 1996})_t * \mathbb{1}(\text{eligible})_{ij} \right) + \beta_3 \left(\text{compensation grade}_{ij} * \mathbb{1}(\text{post 1996})_t \right)$$

$$+ \mu_2 \left(\text{compensation grade}_{ij} * \mathbb{1}(\text{pre 1996})_t * \mathbb{1}(\text{eligible})_{ij} \right) + \mu_3 \left(\text{compensation grade}_{ij} * \mathbb{1}(\text{pre 1996})_t \right) + \epsilon_{ijt}$$

$$(9)$$

where π_{ijt} is profits in firm i in sector j in year t, and the compensation grade variable takes the value 1,2,3, or 4, with 1 denoting grade A (higest wages), 2 denoting B grade, 3 denoting C grade, and 4 denoting D grade (lowest wages). $\beta_2 < 0$ would indicate that autonomy has a lower effect for SOEs on the lower scale of wages, and μ_2 tests for pre-trends. To ensure that I adequately control for the heterogenous effects of pre-program sales and profitability that might be correlated with compensation scales, I also report a specification where I control for the double interactions of pre-program mean sales with $\mathbb{1}(\text{post 1996})_t$, of pre-program mean sales with $\mathbb{1}(\text{pre 1996})_t$, as well as the triple interaction of $\mathbb{1}(\text{eligible})_{ij}$, pre-program sales, and $\mathbb{1}(\text{post 1996})_t$, and the triple interaction of $\mathbb{1}(\text{eligible})_{ij}$, pre-program sales and $\mathbb{1}(\text{pre 1996})_t$.

Finally, I report another specification that additionally controls for pre-program profits i.e. the double interactions of pre-program mean profit with $\mathbb{1}(\text{post 1996})_t$, of pre-program mean profit with $\mathbb{1}(\text{post 1996})_t$, as well as the triple interaction of $\mathbb{1}(\text{eligible})_{ij}$, mean pre-program profit and $\mathbb{1}(\text{post 1996})_t$, and the triple interaction of $\mathbb{1}(\text{eligible})_{ij}$, pre-program profit and $\mathbb{1}(\text{pre 1996})_t$.

5 Results

5.1 Direct Impacts on Firm Inputs and Outcomes

5.1.1 Profitability, Sales, and Productivity

Tables 3 presents the results for the three measures of firm returns- annual sales, value added, and profits. Column 1 of Table 3 shows that firms that were eligible to apply for the program before 1997 have greater sales by about Rs. 8.82 billion after the program, a large effect in magnitude relative to mean sales of about Rs. 28 billion. The effect before 1996 is less than 5% of that magnitude, negative and not statistically significant. Furthermore, firms that were eligible for autonomy before the program was announced have higher value added by about Rs. 4.2 billion after the program is implemented, about a 41% increase over mean value added. They also have higher profits by about Rs. 1.05 billion, a 58% increase relative to mean profits. Pre-trends are not significantly different from zero for any of the outcome variables.

Table 4 presents results for both measures of labor productivity- sales per employee and value added per employee. For both measures, I find large increases in labor productivity after the program for pre-program eligible firms - an increase in Rs. 4.5 million for sales per worker and an increase in Rs. 1.086 million for value added per worker. I do not find any evidence of pre-trends in either of the measures. The results in Tables 3 and 4 indicate that the autonomy, proxied for by pre-program eligibility, has large positive effects on profitability and sales, as well as productivity.

5.1.2 Inputs and Strategic Ventures

Table 5 presents the results on firms strategic decisions- this includes capital assets, employment levels and wages, as well as engagement in joint ventures and subsidiaries. Capital assets are the sum of the book value of fixed assets, capital works in progress, and investments. I find a substantial increase in capital assets for pre-program eligible firms post-1996 - the effect size is about Rs. 6.4 billion higher borrowing, relative to mean capital assets of Rs. 273 billion. The wage bill also increases significantly, by about Rs. 0.9 billion. The effects on employment are very similar in terms of magnitude relative to the mean, but are noisier (the p-value on the interaction between the pre-program eligibility dummy-variable and the post-treatment dummy variable is

about 0.16). The fourth column indicates the probability that a firm reports a subsidiary or participates in a joint venture also increases with autonomy by nearly 7 percentage points, an effect that is about 35% relative to mean participation in such ventures. Thus, SOEs use most levers of autonomy granted to them to increase the scale of their production and are more likely engage in strategic partnerships such as joint ventures and subsidiaries.

The results in Table 3 show a large increase in sales, profits, and value added. However, it is possible that firms increase only prices, and not output, which would be consistent with this pattern. Unfortunately, I do not have data on output prices and quantities separately, which would allow me to test how much of the effect on sales and productivity is a function of higher prices relative to higher quantities. While the results in Table 4 contradict the hypothesis that firms do not increase output (by showing an expansion in capital and labor use), I can more definitively rule this out by showing that total costs of production increase (which, if all firms did was increase output prices with no change in output or quality, should be unchanged). Column 1 of Table 14 shows that costs of production (computed as the sum of purchase of finished goods, raw materials, wage bill, power and fuel expenses, depreciation, interest payments, and miscellaneous expenses), increase substantially after the program. Though the effects are slightly noisily estimated (the double interaction of pre-program eligibility with the post-1996 dummy has a pvalue of 0.13), the magnitude of the effect is substantial- the average increase is about Rs.6.2 billion, 25% relative to mean costs. This, in conjunction with increased capital and labor use shown in Table 4, indicates that the changes in profitability and productivity are not driven by increases in output prices without any corresponding increase in output quantity or quality (where quality is defined as a higher marginal cost).

It is also possible that firms achieved higher sales and profits by increasing both prices and quantity, while either keeping quality constant or lowering quality. [16] Under the stronger assumption of a constant returns to scale (CRS) production function, I can test whether the data are consistent with higher prices with no change in quality. The ratio of net profits to sales is given by $\frac{(pQ - bQ)}{pQ} = \frac{(p - b)}{p}$, where p is the output price, Q is the output quantity, and b is the average cost per unit (and in the case of a CRS production function, also the marginal cost). If I do not find any changes to the profit to sales ratio as a result of the program, I can rule out that p increased but

---

[16]Note that in order for this to be the case, the demand curve facing these firms must be inelastic.

b either did not change or decreased (quality stayed constant or deteriorated). Column 2 of Table 14 shows that while profit to sales did increase as a result of the program, the results are quite imprecisely estimated. These results indicate that the large and statistically significant increase in profitability and productivity shown in Tables 3 and 4 are unlikely to be completely driven by higher prices without any change or a reduction in quality.

5.1.3 Borrowing and Surplus Division with the Government

SOEs, like private firms, retain part of their earnings and distribute the rest as dividends (which are largely received by the government, since it is the majority shareholder). Dividend outlays are usually heavily influenced by the government, and it is possible that they increase their surplus allocation with increased profitability. Conversely, since retained earnings are one way to finance capital expansion with autonomy (other than private borrowing), firms would like to retain as much of their earnings under autonomy as possible. Table 6 tests how the allocation of profits into retained earnings vs. dividends changes due to the program. Both dividends and retained earnings increase- the increase in dividends is about 54% relative to the mean, and the increase in retained earnings is about 55% relative to the mean. This indicates that the government, as the majority shareholder in these firms, gets a substantial increase in the revenue it receives. However, there is no substantial change in the relative allocations between the government and the SOE.

Panel B of Table 6 presents the results for the amount and composition of borrowing- these are available only from 1994-2009. Pre-program eligible firms increase borrowing by about Rs. 2.94 billion, about 18% relative to the mean, though the effect is not statistically significant. Government loans (defined as loans extended by the Central government), fall substantially, by Rs. 3.3 billion (mean government borrowing is Rs. 24.95 billion), an effect that is statistically significant at the 5% level. Non-government loans increase by Rs. 6.3 billion, though the effect is not statistically significant. Overall, the results in Panel B indicate that SOEs re-allocate borrowing away from the government and into non-governmental sources, which is consistent with the conditions for capital expansion under the autonomy program (that the expansion be financed out of non-governmental sources). The third column of Panel A indicates that interest payments do not change as a result of the autonomy program - the effect is commensurate to the change in

total borrowing as a percent relative to the mean, indicating that firms did not use autonomy to increase their high-interest borrowing.[17]

5.2 Within and Outside Firm Incentives for SOE Managers

A possible mechanism for why SOE managers use the autonomy program to increase firm returns is that their career concerns include the possibility of private sector board memberships. Both the information contained in receiving the autonomy status, as well as the freedom associated with it, may thus allow them to signal their quality to the private sector. To test whether this is the case, I use data on SOE board member names from the Prowess database, and estimate Equations 4 and 5. Results are presented in Table 7. Columns 1 and 2 present the results from estimating Equation 4 - Column 1 includes all SOE directors, and Column 2 only incumbent directors (those individuals who are on SOE boards before 2005). I find that the probability I match a SOE director to a private firm board is higher by about 3-4 percentage points for firms with autonomy. Columns 3 through 6 present results after dropping firms that received autonomy before 2005, which allows me to test for pre-trends. Columns 3 and 4 include all SOE directors, and Columns 5 and 6 only incumbent SOE directors. Results are similar across specifications, and indicate that SOE directors are more likely to be matched to private firm boards after receiving autonomy. They are no more likely to be matched to private firm boards before receiving autonomy (there are no statistically significant pre-trend effects). The magnitude of the effects is about 6-8 percentage points, about 10-13 percent relative to the mean probability of a matched name. Given these results, it seems plausible that managers of autonomous SOEs are better able to signal their quality to the private sector, and are rewarded with private sector board positions, which may be a mechanism for the effects of autonomy of SOE outcomes.

I next discuss results testing whether SOEs with higher payscales have a higher effect of autonomy, presented in Table 11. Column 1 presents only the results from Equation 9. Column 2 additionally controls for the double interactions of pre-program mean sales with $\mathbb{1}(\text{post } 1996)_t$ and pre-program mean sales with $\mathbb{1}(\text{pre } 1996)_t$, as well as the triple interaction of $\mathbb{1}(\text{eligible})_{ij}$, pre-program sales, and $\mathbb{1}(\text{post } 1996)_t$, and the triple interaction of $\mathbb{1}(\text{eligible})_{ij}$, pre-program sales

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[17]I also test whether interest payments per Rs. of borrowing change, by using the ratio of interest payments to total borrowing as an outcome variable- I find similar results that this does not change. Results are omitted for brevity, and are available upon request.

and $\mathbb{1}(\text{pre } 1996)_t$. Column 3 estimates the same regression as in Column 2, and adds controls for the double interactions of pre-program mean profit with $\mathbb{1}(\text{post } 1996)_t$ and the interaction of pre-program mean profit with $\mathbb{1}(\text{post } 1996)_t$, as well as the triple interaction of $\mathbb{1}(\text{eligible})_{ij}$, mean pre-program profit and $\mathbb{1}(\text{post } 1996)_t$, and the triple interaction of $\mathbb{1}(\text{eligible})_{ij}$, pre-program profit and $\mathbb{1}(\text{pre } 1996)_t$. While Column 1 shows that lower compensation schedules have lower effects of autonomy on profitability (SOEs with higher wage schedules have higher effects), the results are not statistically significant once the additional control variables are added. This indicates that the results on wage schedules in Column 1 are either driven by the correlation of the compensation grade with pre-program sales and profits, or that there is not enough independent variation in compensation grades to identify heterogeneous effects.

5.3   Electoral Cycles in Hiring

In this section, I first document electoral cycles in hiring i.e. that SOEs are more likely to employ workers in a state in the year before a state assembly election. To do so, I use data on annual state-level employment presence for each SOE (available between 1999-2009), and estimate Equation 6. Results are presented in Table 9, and show that a SOE is 0.004 percentage points more likely to report positive employment in a state, about 2% higher relative to the mean probability. These results, while small on average, show that the average SOE adjusts its hiring every 5 years or so to respond to electoral concerns. In contrast, there are no effects in the year after an election.

Table 5 shows that autonomy increases SOE employment levels. A natural question is whether the government is able to use the increased hiring capacity of SOEs for electoral purposes. To test this, I estimate Equations 7 and 8. Results are presented in Table 10. Columns 1 and 2 use the entire sample and show results from estimating Equation 7. I find that while having autonomy shows a positive and statistically significant effect on the probability a SOE reports positive employment in a state, the effect is not statistically significantly different from 0 for firms with autonomy in the year before an election (the coefficient on the double interaction of whether a firm has autonomy with whether it is a year before an election is not statistically significantly different from 0). Columns 3 and 4 drop firms that received autonomy before 2005, and allows me to test for pre-trends. The results are consistent with those in columns 1 and 2, and show that the hiring capacity

of SOEs with autonomy is not co-opted by the government for electoral purposes, as the coefficient on the triple interaction between $\mathbb{1}(\text{Treatment})_{ij}$, $\mathbb{1}\,(\text{Year before a state assembly election})_{kt}$, and $\mathbb{1}\,(\text{Post-autonomy})_t$ is not statistically significantly different from 0.

5.4 Direct Impacts on SOE Outcomes Relative to the Private Sector

The results in Table 3 indicate that the autonomy program increases sales, value added, and profitability relative to other SOEs. How does autonomy affect SOE performance to the private sector? I test this using the estimation Equation 3, and the results are presented in Table 8. Before 1996, pre-program eligible SOEs are not statistically different relative to comparable private sector firms, and if anything, perform worse than these private firms. However, post-1996, the eligibility criteria that conferred autonomy on some SOEs led to higher profits, value added, and sales. The effects are substantial relative to mean sales and profits - an increase of about 3.5 times higher sales relative to the mean, and an increase in profits over twelve years of about 45% relative to the mean. These effects imply that not only did autonomy allow SOEs to increase profitability and expand output relative to other SOEs, but also allowed them to perform effectively relative to the private sector.

6 Robustness Checks and Additional Outcomes

In this section, I report robustness checks, and additional outcomes, namely, employment composition and the volatility of firm returns. A concern with the main empirical strategy is that the process of becoming eligible (earning profits for three years continuously and a positive net worth) has a direct impact on firm outcomes, and the results I find are independent of whether the firm actually received autonomy or not. To test whether this is the case, I estimate the following equation:

$$
y_{ijt} = \alpha + \alpha_i + \gamma_t \phi_j + \beta_1 \left(\mathbb{1}(\text{post 1996})_t * \mathbb{1}(\text{eligible})_{ij} \right) + \mu_1 \left(\mathbb{1}(\text{pre 1996})_t * \mathbb{1}(\text{eligible})_{ij} \right) +
$$
$$
\beta_2 \left(\mathbb{1}(\text{post 1996})_t * \mathbb{1}(\text{received autonomy})_{ij} \right) + \mu_2 \left(\mathbb{1}(\text{pre 1996})_t * \mathbb{1}(\text{received autonomy})_{ij} \right) + \epsilon_{ijt}
$$
$$
(10)
$$

Table A1 reports the results. Once autonomy status is controlled for, pre-program eligibility has no marginal effect on firm returns or productivity - all the effects are driven by actually receiving autonomy. These results show that just the process of becoming eligible does not have effects in absence of receiving autonomy.

To ensure that the results are not driven by negative spillover effects on ineligible firms, Table A2 reports results from five-digit sectors in which either all or none of the firms were eligible for autonomy before 1997. This halves the sample size, but the results, while nosier due to the smaller sample size, are very similar to those reported in Tables 3 and 4.[18]

It is possible that firms which are due to report small losses are able to manipulate their profits to report small positive profits instead to increase their eligibility probability. Considering firms that were already eligible before the program as treated ensures that the results are not driven by this behavior (if it exists). To further test that results do not change if firms around the zero profits threshold are removed, Table 12 presents the results from a "donut" estimator - Panel A reports results removing 10 firms around the zero profits threshold in each year (as well as all firms reporting exactly zero profits), and Panel B reports results removing 15 firms around the zero profits threshold in each year (as well as all firms reporting zero profits). The results are quite similar to the results from Tables 3 and 4, and consistent across both panels.

The main sample I consider in the paper are SOEs that were reporting data five years before and at least five years after the program. In Table A6, I show results including all firms (as well as entry and exit results). Results are once again similar to those reported in Tables 3 and 4, both in statistical significance and magnitude.

Table A5 presents results from a generalized difference in difference estimation that tests whether firms that received autonomy performed differently after receiving autonomy. The results are positive, statistically significant, and similar to those in Tables 3 and 4, though larger in magnitude. This is to be expected, since I am directly testing for the effects of autonomy rather than proxying for treatment status with pre-program eligibility, and estimating effects after the firm actually receives autonomy, rather than post-1996, when the program was first implemented.

Table 3 shows that average firms returns are higher after the program - however, it is possi-

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[18]I residualize sector by year and firm fixed effects in the whole sample before running regressions on this sample to ensure that I'm controlling for similar sectoral-year effects as in the whole sample. Results are the same if I simply estimate Equation 1 on this restricted sample.

ble that higher mean profitability is accompanied by more volatile profits. To test whether this is the case, I estimate Equation 2, that tests whether the firm-level standard deviation of profits, sales and value added changed in the short term (in the 5 year period immediately after the program, between 1997 and 2001), and in the longer term (in the 5 year period between 2002 and 2006), relative to 5 years before the program (1992-1996). Results are presented in Table 13. I find no difference in volatility in the short-term, but a much higher volatility across outcomes in the longer-term. This shows these firms' returns, while higher on average, were also accompanied by greater volatility.

As an additional robustness check, I show that government ownership does not seem to have been affected by the autonomy program. I estimate Equation 1 using the proportion of central government's equity holdings as the outcome variable, which is available between 1994 and 2009. I also show that the results are robust to including state government holdings in the definition of government holdings (though state government holdings in these centrally owned SOEs is very small, on average less than 2% of equity). Results are presented in Table A7, and show that government equity was not changed as a result of the program.

Table A8 reports results for three types of employees separately (available between 1994 and 2009) - managerial and supervisory, non-managerial and non-supervisory, and non-permanent employees (which measures the propensity of the firm to outsource work, possibly to less well-paid workers with fewer protections under labor laws). Similar to the results for overall employment, I find positive, but noisy effects on all three categories of employment. The results indicate that both managerial and non-managerial employment increased by about 13% relative to mean employment levels (an increase of about 239 managers on average and about 1500 non-managers on average).

Finally, I present event study estimates for 10 years after the program in Figures 1 through 8 and Appendix figures A1 through A11, which are consistent with the regression tables.

7   Conclusion

Autonomy may allow managers to leverage their private information better, by empowering them to act on their knowledge to their firm's benefit. When incentives are low-powered, however,

or the objective function of the firm multi-dimensional, how autonomy impacts firm outcomes if at all is unclear. Autonomy may also backfire if it encourages managers to undertake high-risk projects believing that the government will bail out the firm in the event of failure. The existence of earned autonomy programs across a range of organizational settings indicates that this is a common model governments employ in devolving autonomy. However, it is not clear that giving autonomy to well-running organizations has positive effects, since these firms may be less constrained overall, and so the gains to autonomy may be low for such firms.

I test how an earned autonomy program for SOEs in India impacts managerial decisions and firm outcomes. I find that autonomy increases profit, sales, and productivity significantly, and that these outcomes may be driven partly by SOE managers' incentives to receive board seats in the private sector. I also find that in the long-run, the volatility of firm returns increases, which indicates that managers may be engaging in higher return and higher risk projects. Overall, the results show that large gains in SOE performance are possible without any changes to the firms ownership structure. These results hold for about 13 years after the program, the entire length of the sample period.

These results contribute to understanding how autonomy affects organizational outcomes. However, this work has some limitations. First, I am unable to separately test the impact of quasi-randomly or randomly giving autonomy to all firms - it is possible that consistently loss-making SOEs lack the organizational or managerial capacity to avail of the benefits of autonomy. Second, since the autonomy was over several important strategic decisions for the firm, I cannot separately estimate the effects of autonomy over each decision. Third, I do not test to what extent this program encourages SOEs that were not eligible in 1997 to work towards earning autonomy i.e. whether it has a motivation effect on SOE managers. These and related questions, including whether similar programs generate positive impacts in other settings, remain important questions for future work.

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Table 2: Summary Statistics

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Whole Sample			*Firms With Autononomy*			*Pre-Program Eligible*		
Number of SOEs	193			73			95		
	N	Mean	SD	N	Mean	SD	N	Mean	SD
Total Loans (00,000 Rs.)	3,342	16,963.45	89,298.44	1,303	29,953.92	130,059.30	1,679	23,575.83	117,448.70
Interest Payments (00,000 Rs.)	3,342	11,994.68	37,691.79	1,303	17,645.75	46,497.23	1,679	15,324.83	44,196.68
Net Profit (00,000 Rs.)	3,342	18,090.33	101,533.20	1,303	50,643.46	150,170.00	1,679	37,285.52	134,685.00
Gross Sales (00,000 Rs.)	3,342	282,763.90	1,432,490.00	1,303	621,153.40	2,206,133.00	1,679	487,473.30	1,960,220.00
Value Added (00,000 Rs.)	3,342	99,627.92	375,939.40	1,303	218,157.40	570,131.20	1,679	171,327.10	511,355.80
Sales Per Employee (00,000 Rs.)	3,301	58.56	202.67	1,291	102.98	263.85	1,641	95.54	261.24
Value Added Per Employee (00,000 Rs.)	3,264	17.47	48.71	1,277	31.16	64.75	1,619	28.98	64.53
Retained Profit (00,000 Rs.)	3,341	10,934.56	65,708.59	1,302	32,936.25	90,620.45	1,678	24,134.37	83,105.16
Dividend Paid (00,000 Rs.)	3,341	6,312.73	36,057.27	1,302	15,675.13	56,421.10	1,678	11,597.86	49,349.76
Capital Assets (00,000 Rs.)	3,338	273,303.10	1,066,236.00	1,300	573,913.00	1,614,447.00	1,675	458,874.00	1,455,359.00
Number of Employees (000's)	3,338	8,459.91	21,106.89	1,301	12,936.53	25,096.83	1,676	9,353.59	21,747.74
Wage Bill (00,000 Rs.)	3,342	17,986.60	51,863.87	1,303	32,053.38	70,353.95	1,679	24,486.10	63,692.94
	Private Sector Firms						*Pre-Program Eligible Private Firms*		
Number of Private Firms in the Same 5-digit Sectors as SOEs	1,426						993		
	N	Mean	SD				N	Mean	SD
Net Profit (00,000 Rs.)	23,208	1,776.96	26,045.53				17,550	2,324.84	29,890.11
Gross Sales (00,000 Rs.)	20,555	25,468.16	258,928.60				15,878	31,015.50	294,084.20
Value Added (00,000 Rs.)	15,928	14,733.21	102,882.00				12,550	17,641.54	115,601.50

Notes: Pre-program eligible firms are those that earned positive profits for three consecutive years and had a positive net worth before 1997.

Table 3: Sales, Value Added, and Profit

	(1)	(2)	(3)
	Sales (Rs. 00,000)	Value Added (Rs. 00,000)	Profit (Rs, 00,000)
1(Eligible Pre-Program)*1(Year<1996)	-4,118	-5,193	-2,358
	(14,353)	(5,543)	(2,035)
1(Eligible Pre-Program)*1(Year>1996)	88,115**	42,017***	10,561**
	(44,400)	(15,812)	(5,320)
Controls	Firm FE, NIC 2-digit X Year FE		
Observations	3,342	3,342	3,342
R-Squared	0.863	0.832	0.726
Mean of Dependent Variable	282,764	99,628	18,090

Notes: Standard errors clustered at the firm level in parentheses (*** p<0.01, ** p<0.05, * p<0.1). 1(Eligible Pre-Program)*1(Year=1996) is the omitted category.

Table 4: Labor Productivity

	(1)	(2)
	Sales Per Employee (Rs. 00,000)	Value Added Per Employee (Rs. 00,000)
1(Eligible Pre-Program)*1(Year<1996)	1.622	-2.444*
	(5.570)	(1.457)
1(Eligible Pre-Program)*1(Year>1996)	45.20	10.86*
	(28.22)	(5.724)
Controls	Firm FE, NIC 2-digit X Year FE	
Observations	3,301	3,264
R-Squared	0.678	0.767
Mean of Dependent Variable	58.56	17.47

Notes: Standard errors clustered at the firm level in parentheses (*** p<0.01, ** p<0.05, * p<0.1). 1(Eligible Pre-Program)*1(Year=1996) is the omitted category. Sales per employee and profit per employee are trimmed at the 1st and 99th percentile.

Table 5: Capital, Labor and Participation in Joint Ventures/Subsidiaries

	(1)	(2)	(3)	(4)
	Capital Assets (Rs. 00,000)	Wage Bill (Rs. 00,000)	Number of Employees	1(SOE Reported a Subsidiary or a Joint Venture)
1(Eligible Pre-Program)*1(Year<1996)	-15,999	-917.1	-368.5	-0.0130
	(13,250)	(1,157)	(364.2)	(0.0435)
1(Eligible Pre-Program)*1(Year>1996)	64,001**	9,119*	1,554	0.0686*
	(28,878)	(4,727)	(1,109)	(0.0401)
Controls	Firm FE, NIC 2-digit X Year FE			
Observations	3,338	3,342	3,338	3,342
R-Squared	0.849	0.834	0.976	0.717
Mean of Dependent Variable	273303	17,987	8,460	0.193

Notes: Standard errors clustered at the firm level in parentheses (*** p<0.01, ** p<0.05, * p<0.1). 1(Eligible Pre-Program)*1(Year=1996) is the omitted category. Capital assets include the book value of fixed assets, investments, and capital works in progress.

Table 6: Borrowings and Profit Utilization

	(1)	(2)	(3)
Panel A	Retained Profits (Rs. 00,000)	Dividends (Rs. 00,000)	Interest Payments (Rs. 00,000)
1(Eligible Pre-Program)*1(Year<1996)	-1,497	-957.0**	52.44
	(1,753)	(468.6)	(1,468)
1(Eligible Pre-Program)*1(Year>1996)	6,118	3,592**	2,191
	(3,874)	(1,587)	(4,432)
Controls		Firm FE, NIC 2-digit X Year FE	
Observations	3,341	3,341	3,342
R-Squared	0.698	0.690	0.807
Mean of Dependent Variable	10,935	6,313	11,995
Panel B	Total Loans (Rs. 00,000)	Government Loans (Rs. 00,000)	Non-Government Loans (Rs. 00,000)
1(Eligible Pre-Program)*1(Year<1996)	-9,226	-2,759	-6,467
	(6,587)	(2,639)	(5,825)
1(Eligible Pre-Program)*1(Year>1996)	29,462	-33,142**	62,604
	(70,737)	(16,794)	(75,060)
Controls		Firm FE, NIC 2-digit X Year FE	
Observations	2,685	2,685	2,685
R-Squared	0.765	0.718	0.734
Mean of Dependent Variable	166,295	24,946	141,350

Notes: Standard errors clustered at the firm level in parentheses (*** p<0.01, ** p<0.05, * p<0.1). 1(Eligible Pre-Program)*1(Year=1996) is the omitted category. Variables in Panel B are available only from 1994-2009.

Table 7: SOE Board of Directors Matched to Private Firm Boards

	(1)	(2)	(3)	(4)	(5)	(6)
			1(Matched to a Private Firm Board of Directors)			
1(Firm Has Autonomy)	0.0425***	0.0336**				
	(0.0142)	(0.0156)				
1(Treatment)*1(Year<Year Before which Autonomy Received)			-0.0106	-0.00327	-0.000404	0.00253
			(0.0122)	(0.0139)	(0.0161)	(0.0198)
1(Treatment)*1(Year>=Year in which Autonomy Received)			0.0794***	0.0655***	0.0657***	0.0619***
			(0.0153)	(0.0168)	(0.0173)	(0.0221)
Controls			Director Name FE			
	Year FE		1(Pre-autonomy), 1(Post-autonomy)	1(Pre-autonomy), 1(Post-autonomy), Year FE	1(Pre-autonomy), 1(Post-autonomy)	1(Pre-autonomy), 1(Post-autonomy), Year FE
Sample	Full		Dropping Firms that received autonomy before 2005			
Sample	All SOE Directors	Only SOE Directors Before 2005	All SOE Directors		Only SOE Directors Before 2005	
Observations	56,709	34,437	25,516	25,516	16,397	16,397
R-Squared	0.78	0.811	0.781	0.787	0.81	0.811
Mean of Dependent Variable	0.681	0.683	0.576	0.576	0.594	0.594

Notes: Standard errors clustered at the director name level in parentheses (*** p<0.01, ** p<0.05, * p<0.1). 1(Treatment)*1(Year=One Year Before Autonomy Received) is the omitted category in columns 3 and 4. For the control group, the omitted year is 2005. The data for whether a SOE director is matched to a private firm board is available from 2003-2010.

Table 8: Sales and Profits Effects Relative to the Private Sector

	(1)	(2)	(3)
	Sales (Rs. 00,000)	Value Added (Rs. 00,000)	Net Profit (Rs. 00,000)
1(SOE)*1(Eligible Pre-Program)*1(Year<1996)	-41,720	-10,819	-3,449*
	(32,249)	(7,317)	(1,833)
1(SOE)*1(Eligible Pre-Program)*1(Year>1996)	222,436**	59,100*	17,146*
	(96,771)	(30,730)	(8,853)
1(SOE)*1(Year<1996)	-19,908*	-5,850	-142.2
	(10,993)	(3,702)	(1,018)
1(SOE)*1(Year<1996)	39,135	143.6	3,135
	(25,060)	(8,461)	(3,162)
1(Eligible Pre-Program)*1(Year<1996)	-7,123***	-4,323***	-337.2
	(2,599)	(1,165)	(364.6)
1(Eligible Pre-Program)*1(Year>1996)	5,217	7,300**	1,889**
	(8,912)	(3,390)	(950.2)
Controls	Firm FE		
	NIC 2-digit X Year FE		
Observations	23,785	19,158	26,438
R-Squared	0.729	0.753	0.591
Mean of Dependent Variable	59173	29624	3843

Notes: Standard errors clustered at the firm level in parentheses (*** p<0.01, ** p<0.05, * p<0.1). 1(SOE)*1(Eligible Pre-Program)*1(Year=1996), 1(SOE)*1(Year=1996), and 1(Eligible Pre-Program)*1(Year=1996) are the omitted categories.

Table 9: Electoral Cycles in Hiring Decisions

	(1)	(2)	(3)	(4)
	1(SOE reports positive employment in a state)			
1(Year Before A State Assembly Election)	0.00438***	0.00438***	0.00448***	0.00448***
	(0.00154)	(0.00156)	(0.00150)	(0.00152)
1(Year After A State Assembly Election)			0.000425	0.000425
			(0.00136)	(0.00137)
Controls	Firm FE, State FE	State FE	Firm FE, State FE	State FE
	NIC 2-digit X Year FE	Firm X Year FE	NIC 2-digit X Year FE	Firm X Year FE
Observations	61,149	61,149	61,149	61,149
R-Squared	0.428	0.455	0.428	0.455
Mean of Dependent Variable	0.238	0.238	0.238	0.238

Notes: Standard errors clustered at the firm level in parentheses (*** $p<0.01$, ** $p<0.05$, * $p<0.1$). The data on SOE employment presence in a state each year available from 1999-2009.

Table 10: Autonomy Effects on Electoral Cycles in Hiring Decisions

	(1)	(2)	(3)	(4)
	1(SOE reports positive employment in a state)			
1(Firm Has Autonomy)	0.0772**			
	(0.0350)			
1(Year Before An Election)	0.00497***	0.00487***	-0.00992	-0.00990
	(0.00176)	(0.00178)	(0.00961)	(0.00971)
1(Firm Has Autonomy)*1(Year Before An Election)	-0.00200	-0.00165		
	(0.00447)	(0.00454)		
1(Treatment)*1(Year<Year Before which Autonomy Received)*1(Year Before An Election)			-0.0123	-0.0152
			(0.0417)	(0.0433)
1(Treatment)*1(Year>Year in which Autonomy Received)*1(Year Before An Election)			0.00690	-0.0135
			(0.0528)	(0.0569)
1(Year<Year Before which Autonomy Received)*1(Year Before An Election)			0.0152	0.0147
			(0.0105)	(0.0105)
1(Year>Year Before which Autonomy Received)*1(Year Before An Election)			0.0139	0.0149
			(0.0108)	(0.0110)
1(Treatment)*1(Year Before An Election)			0.0154	0.0203
			(0.0400)	(0.0418)
1(Treatment)*1(Year<Year Before which Autonomy Received)			-0.120***	
			(0.0452)	
1(Treatment)*1(Year>Year Before which Autonomy Received)			0.00233	
			(0.0183)	
Controls	Firm FE, State FE	State FE	Firm FE, State FE	State FE
	NIC 2-digit X Year FE	Firm X Year FE	NIC 2-digit X Year FE	Firm X Year FE
Sample	Full		Dropping Firms that received autonomy before 2005	
Observations	61,149	61,149	43,491	43,491
R-Squared	0.428	0.455	0.37	0.402
Mean of Dependent Variable	0.238	0.238	0.188	0.188

Notes: Standard errors clustered at the director name level in parentheses (*** p<0.01, ** p<0.05, * p<0.1). Interactions with 1(Year=One Year Before Autonomy Received) is the omitted category in columns 3 and 4. For the control group, interactions with a dummy variable that is 1 if year is 2005 and 0 otherwise are the omitted categories. The data on SOE employment presence in a state each year available from 1999-2009. Columns 3 and 4 additionally include the control variables 1(Year<Year Before which Autonomy Received), 1(Year>Year Before which Autonomy Received).

Table 11: Heterogeneous Effects by Compensation Schedule

	(1)	(2)	(3)
	Net Profit (Rs. 00,000)		
1(Eligible Pre-Program)*1(Year<1996)	-6,543	-10,829	2,834
	(7,571)	(8,091)	(11,208)
1(Eligible Pre-Program)*1(Year>1996)	55,235**	58,489***	54,047
	(23,193)	(21,474)	(36,696)
Compensation Schedule*1(Year<1996)	1,315	4,672*	4,000*
	(2,197)	(2,739)	(2,054)
Compensation Schedule*1(Year>1996)	-9,031	-6,646	-5,799
	(5,809)	(5,335)	(4,447)
1(Eligible Pre-Program)*1(Year<1996)*Compensation Schedule	1,980	-3,590	-3,570
	(2,755)	(3,609)	(3,214)
1(Eligible Pre-Program)*1(Year<1996)*Compensation Schedule	-23,897**	611.4	2,314
	(10,408)	(13,435)	(14,173)
		Firm FE, NIC 2-digit X Year FE	
		Double interactions of i) pre-program sales with pre 1996, and ii) pre-program sales with post 1996, Triple interactions of i) pre-program sales with pre 1996 and pre-program eligibility, and ii) interactions of pre-program sales with post 1996 and pre-program eligibility	
Controls			Double interactions of i) pre-program profits with pre 1996, and ii) pre-program profits with post 1996, Triple interactions of i) pre-program profits with pre 1996 and pre-program eligibility, and ii) interactions of pre-program profits with post 1996 and pre-program eligibility
Observations	3,000	2,701	2,701
R-Squared	0.738	0.756	0.76
Mean of Dependent Variable	19,629	15685	15,685

Notes: Standard errors clustered at the firm level in parentheses (*** p<0.01, ** p<0.05, * p<0.1). Interactions with 1(Eligible Pre-Program)*1(Year=1996) and 1(Eligible Pre-Program)*1(Year=1996) are the omitted categories.

Table 12: Firm Returns and Productivity Using a "Donut" Estimator

	(1)	(2)	(3)	(4)	(5)
Panel A	Sales (Rs. 00,000)	Value Added (Rs. 00,000)	Profits (Rs. 00,000)	Sales Per Employee (Rs. 00,000)	Value Added Per Employee (Rs. 00,000)
1(Eligible Pre-Program)*1(Year<1996)	9,783	-8,510	-2,673	2.443	-2.061
	(25,881)	(5,752)	(2,666)	(6.661)	(1.389)
1(Eligible Pre-Program)*1(Year>1996)	105,764***	45,924***	11,786**	53.49**	13.04**
	(36,216)	(17,080)	(5,904)	(26.30)	(6.085)
Controls			Firm FE, NIC 2-digit X Year FE		
Sample Restriction			Dropping 10 Firms Each Around Zero Profits and Firms With Zero Profits		
Observations	2,935	2,935	2,935	2,894	2,858
R-Squared	0.864	0.839	0.729	0.719	0.781
Mean of Dependent Variable	305686	110,331	20602	64.69	19.32
Panel B	Sales (Rs. 00,000)	Value Added (Rs. 00,000)	Profits (Rs. 00,000)	Sales Per Employee (Rs. 00,000)	Value Added Per Employee (Rs. 00,000)
1(Eligible Pre-Program)*1(Year<1996)	5,624	-8,096	-2,467	10.40	-1.740
	(20,581)	(6,814)	(3,025)	(11.73)	(1.534)
1(Eligible Pre-Program)*1(Year>1996)	110,028***	48,419***	12,595**	60.40**	13.47**
	(36,853)	(17,076)	(5,988)	(27.86)	(6.506)
Controls			Firm FE, NIC 2-digit X Year FE		
Sample Restriction			Dropping 15 Firms Each Around Zero Profits and Firms With Zero Profits		
Observations	2,756	2,756	2,935	2,715	2,679
R-Squared	0.865	0.840	0.729	0.741	0.787
Mean of Dependent Variable	324,373	117208	20,602	67.52	20.34

Notes: Standard errors clustered at the firm level in parentheses (*** p<0.01, ** p<0.05, * p<0.1). 1(Eligible Pre-Program)*1(Year=1996) is the omitted category. Value added per employee and sales per employee are trimmed at the 1st and 99th percentile.

Table 13: Variability of Firm Returns Over Time

|	(1)	(2)	(3)
	Standard Deviation of Sales (Rs.,00,000)	Standard Deviation of Value Added (Rs.,00,000)	Standard Deviation of Profits (Rs.,00,000)
1(Eligible Pre-Program)*1(Year=2001)	2,429	3,453	-2,626
	(4,762)	(3,756)	(2,008)
1(Eligible Pre-Program)*1(Year=2006)	40,159**	15,037*	5,289
	(19,880)	(9,049)	(5,388)
Controls		Firm FE, NIC 2-digit X Year FE	
Sample Restriction		None	
Observations	554	554	554
R-Squared	0.914	0.849	0.781
Mean of Dependent Variable	56,684	20370	8,171

Notes: Standard errors clustered at the firm level in parentheses (*** p<0.01, ** p<0.05, * p<0.1). There are three data points per firm. Standard deviation of sales for a firm comprises the standard deviation of sales between 1992-1996, 1997-2001, and 2002-2007. Similarly, the standard deviation of profits comprises the standard deviation of profits between 1992-1996, 1997-2001, and 2002-2007. Standard deviation of value added comprises the standard deviation of value added between 1992-1996, 1997-2001, and 2002-2007. 1(Eligible Pre-Program)*1(Year=1996) is the omitted category.

Table 14: Costs of Production and Net Profit Over Sales

|	(1)	(2)
	Costs of Production	Net Profit/Total Sales
1(Eligible Pre-Program)*1(Year=2001)	-1,326	-0.345
	(12,393)	(0.397)
1(Eligible Pre-Program)*1(Year=2006)	61,865	0.666
	(41,274)	(0.633)
Controls	Firm FE, NIC 2-digit X Year FE	
Sample Restriction	None	
Observations	3,342	3,206
R-Squared	0.869	0.628
Mean of Dependent Variable	239,817	-0.788

Notes: Standard errors clustered at the firm level in parentheses (*** $p<0.01$, ** $p<0.05$, * $p<0.1$). Net Profit/Total Sales is trimmed at the 1st and 99th percentile. 1(Eligible Pre-Program)*1(Year=1996) is the omitted category. Cost of Production is the sum of purchase of finished goods, raw materials, wage bill, power and fuel expenses, depreciation, interest payments, and miscellaneous expenses.

Figure 1: Sales (Rs. 00,000)
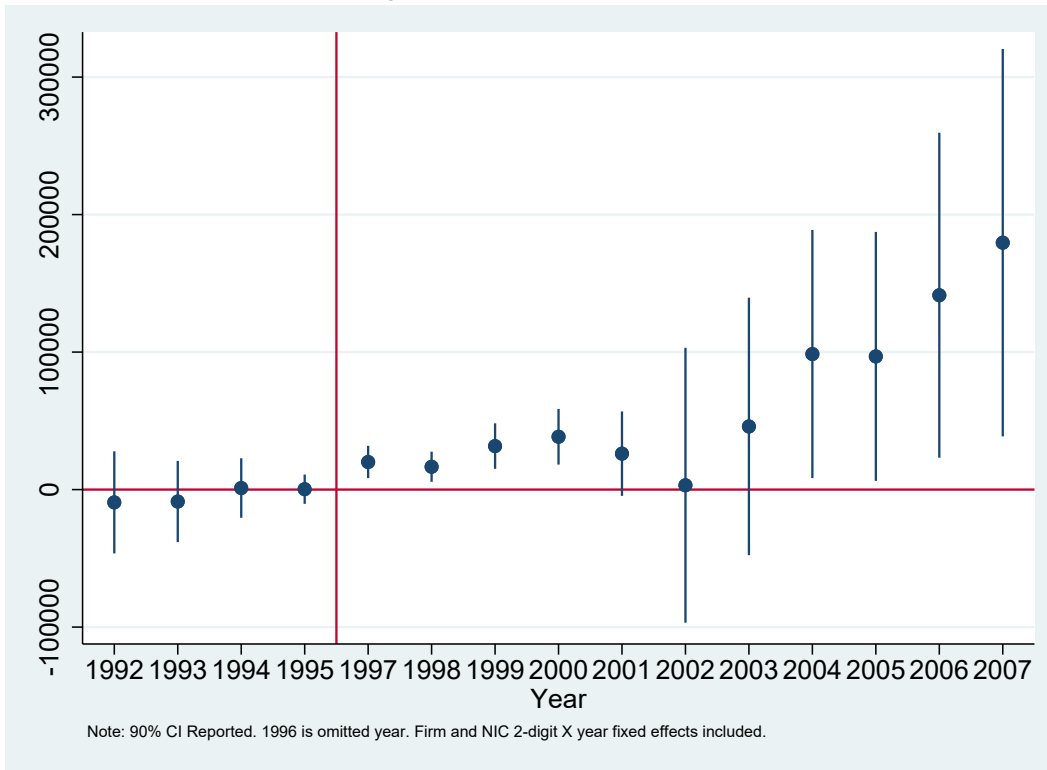
Note: 90% CI Reported. 1996 is omitted year. Firm and NIC 2-digit X year fixed effects included.

This figure plots the interaction coefficients of the pre-program eligibility dummy variable with year dummy variables. The interaction of pre-program eligibility with the 1996 year dummy variable is omitted.

Figure 2: Value Added (Rs. 00,000)
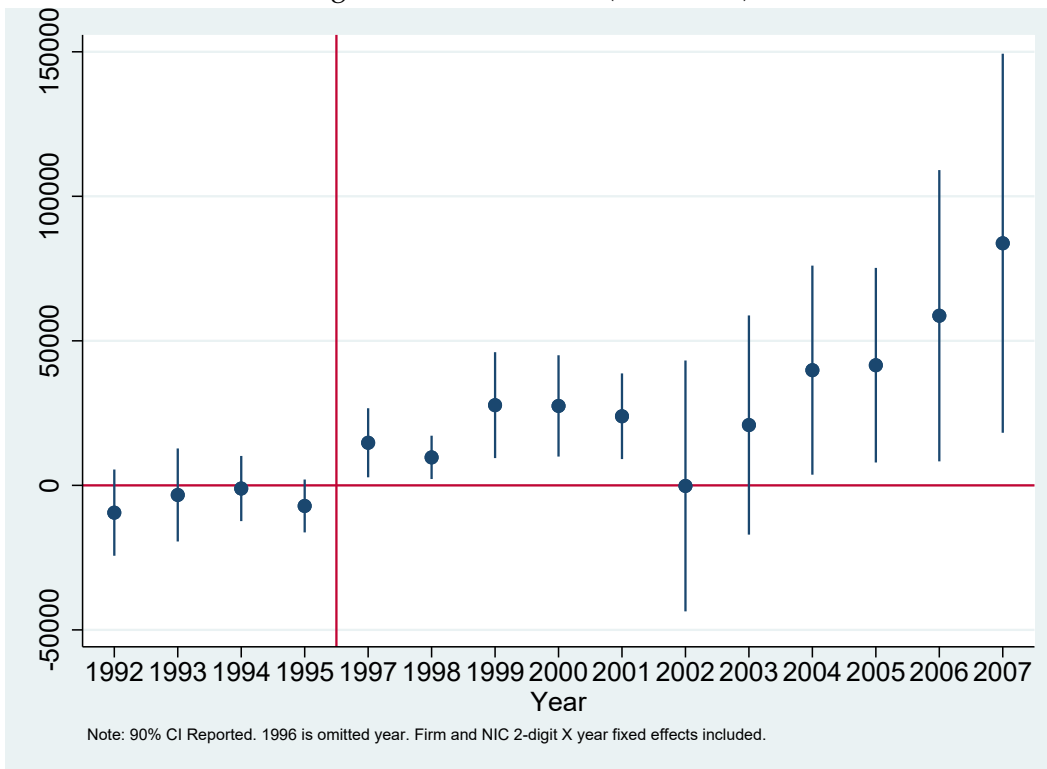
Note: 90% CI Reported. 1996 is omitted year. Firm and NIC 2-digit X year fixed effects included.
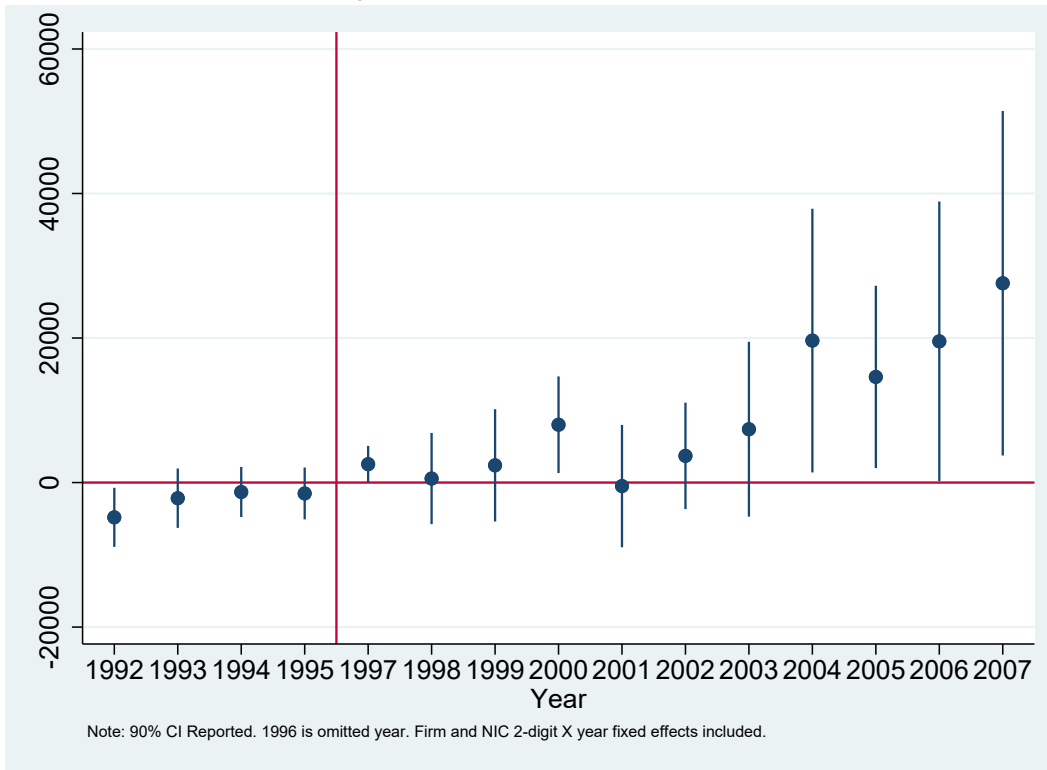
This figure plots the interaction coefficients of the pre-program eligibility dummy variable with year dummy variables. The interaction of pre-program eligibility with the 1996 year dummy variable is omitted.

Figure 3: Net Profit (Rs. 00,000)

Note: 90% CI Reported. 1996 is omitted year. Firm and NIC 2-digit X year fixed effects included.

This figure plots the interaction coefficients of the pre-program eligibility dummy variable with year dummy variables. The interaction of pre-program eligibility with the 1996 year dummy variable is omitted.

Figure 4: Sales Per Employee (Rs. 00,000)

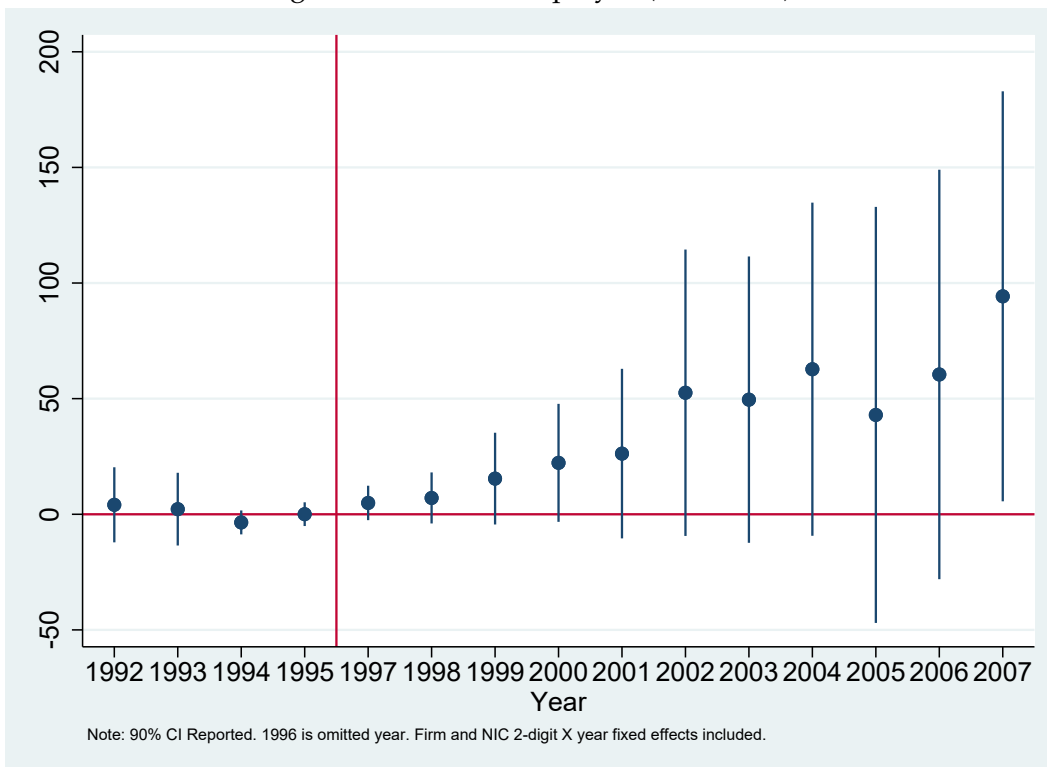Note: 90% CI Reported. 1996 is omitted year. Firm and NIC 2-digit X year fixed effects included.

This figure plots the interaction coefficients of the pre-program eligibility dummy variable with year dummy variables. The interaction of pre-program eligibility with the 1996 year dummy variable is omitted.

Figure 5: Value Added Per Employee (Rs. 00,000)

Note: 90% CI Reported. 1996 is omitted year. Firm and NIC 2-digit X year fixed effects included.
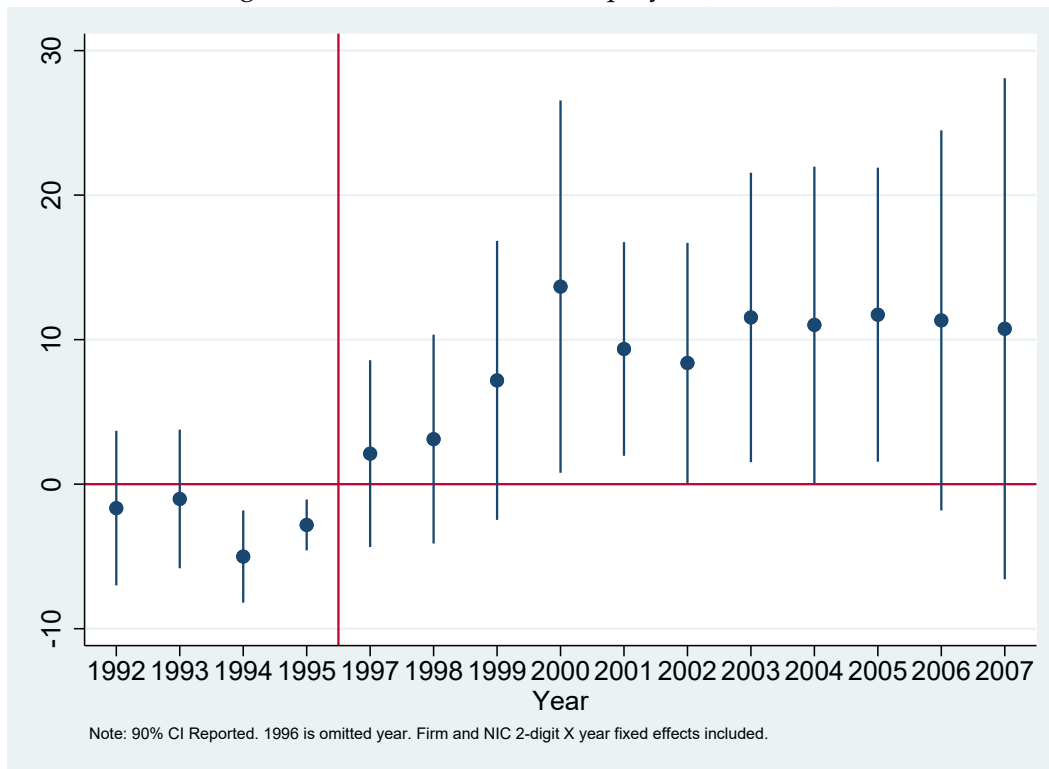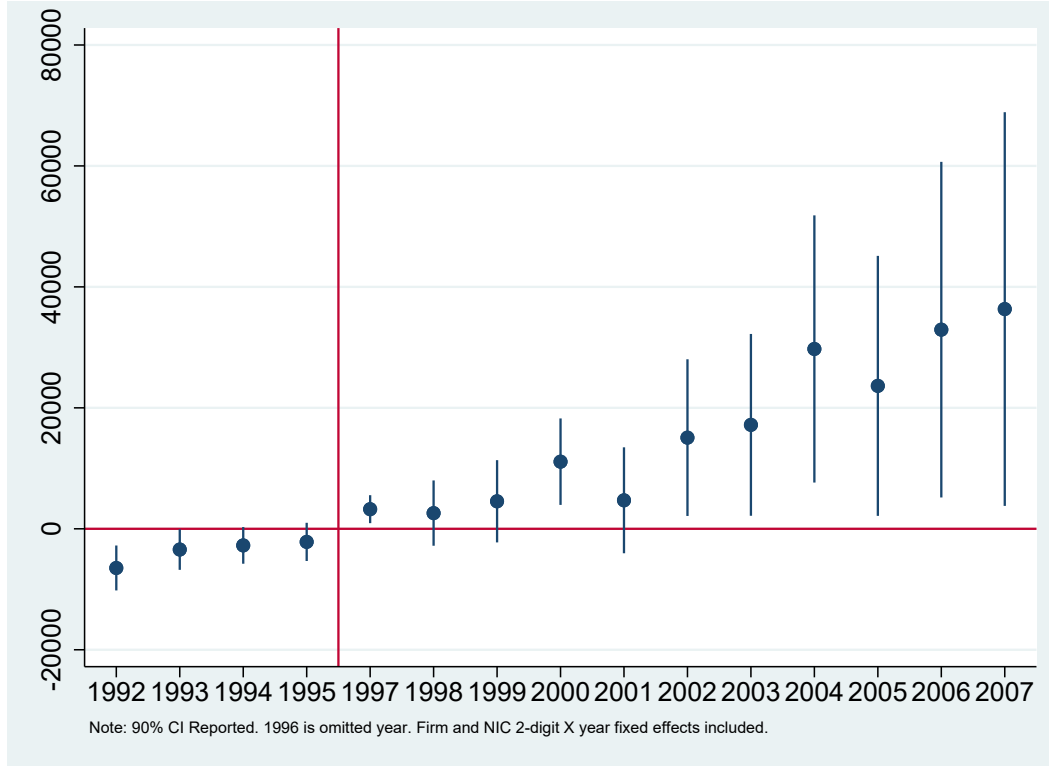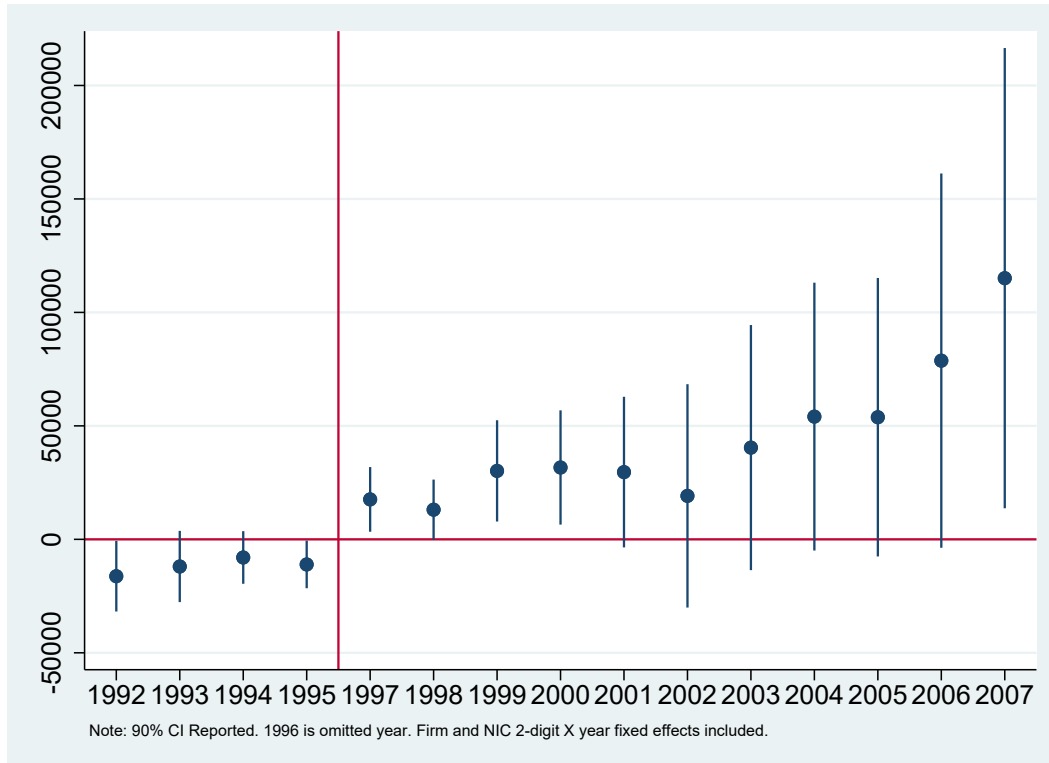
This figure plots the interaction coefficients of the pre-program eligibility dummy variable with year dummy variables. The interaction of pre-program eligibility with the 1996 year dummy variable is omitted.

Figure 6: Sales (Rs. 00,000) for Eligible SOEs Relative to Comparable Private Firms

Note: 90% CI Reported. 1996 is omitted year. Firm and NIC 2-digit X year fixed effects included.

This figure plots the interaction coefficients of the pre-program eligibility dummy variable with year dummy variables and whether the firm is a SOE. The interaction of pre-program eligibility, whether the firm is a SOE, and the 1996 year dummy variable is omitted.

Figure 7: Value Added (Rs. 00,000) for Eligible SOEs Relative to Comparable Private Firms

Note: 90% CI Reported. 1996 is omitted year. Firm and NIC 2-digit X year fixed effects included.

This figure plots the interaction coefficients of the pre-program eligibility dummy variable with year dummy variables and whether the firm is a SOE. The interaction of pre-program eligibility, whether the firm is a SOE, and the 1996 year dummy variable is omitted.

Figure 8: Profits (Rs. 00,000) for Eligible SOEs Relative to Comparable Private Firms

Note: 90% CI Reported. 1996 is omitted year. Firm and NIC 2-digit X year fixed effects included.
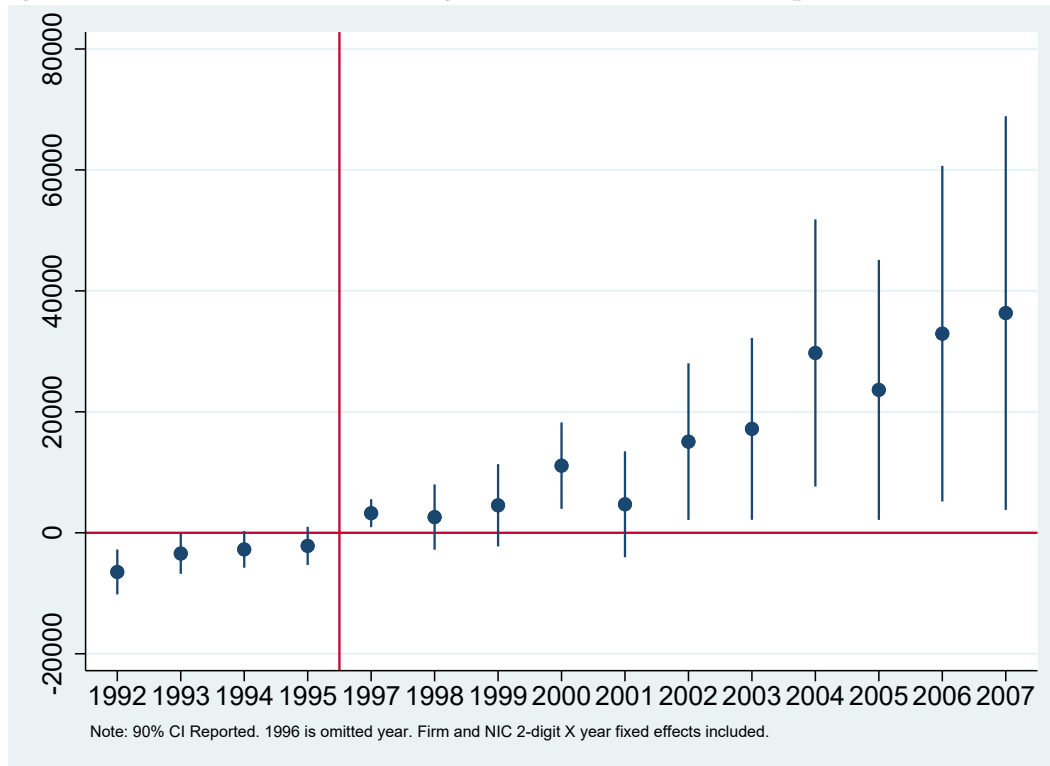
This figure plots the interaction coefficients of the pre-program eligibility dummy variable with year dummy variables and whether the firm is a SOE. The interaction of pre-program eligibility, whether the firm is a SOE, and the 1996 year dummy variable is omitted.

Appendix A

Table A1: Testing Whether Pre-Program Eligibility Affected SOE Outcomes Independent of Autonomy

	(1)	(2)	(3)	(4)	(5)
	Sales (Rs. 00,000)	Value Added (Rs. 00,000)	Net Profits (Rs. 00,000)	Sales Per Employee (Rs. 00,000)	Value Added Per Employee (Rs. 00,000)
1(Eligible Pre-Program)*1(Year<1996)	24,996	6,849	3,083	0.763	-2.025
	(23,161)	(6,966)	(2,685)	(4.577)	(1.471)
1(Eligible Pre-Program)*1(Year>1996)	-35,409	-19,157	-15,463	8.771	0.593
	(58,177)	(28,337)	(10,441)	(22.60)	(6.010)
1(SOE Received Autonomy)*1(Year<1996)	-49,824	-20,610***	-9,311***	0.786	-0.897
	(30,926)	(7,738)	(3,001)	(6.332)	(1.797)
1(SOE Received Autonomy)*1(Year>1996)	210,306***	104,165**	44,310***	61.37*	17.29**
	(78,837)	(42,767)	(15,906)	(32.72)	(7.756)
Controls	Firm FE, NIC 2-digit X Year FE				
Observations	3,342	3,342	3,342	3,301	3,264
R-Squared	0.864	0.834	0.732	0.68	0.77
Mean of Dependent Variable	282,764	99,628	18,090	58.56	17.47

Notes: Standard errors clustered at the firm level in parentheses (*** p<0.01, ** p<0.05, * p<0.1). 1(SOE Received Autonomy)*1(Year=1996) and 1(Eligible Pre-Program)*1(Year=1996) are the omitted categories. Sales per employee and profit per employee are trimmed at the 1st and 99th percentile.

Table A2: SOEs in Five-Digit Sectors Where All Firms or No Firms Were Eligible Pre-Program

	(1)	(2)	(3)	(4)	(5)
	Sales (Rs.,00,000)	Value Added (Rs.,00,000)	Profits (Rs.,00,000)	Sales Per Employee (Rs. 00,000)	Value Added Per Employee (Rs. 00,000)
1(Eligible Pre-Program)*1(Year<1996)	3,813	-3,794	0.378	-3.039	-3.812*
	(31,390)	(10,870)	(2,657)	(2.648)	(1.975)
1(Eligible Pre-Program)*1(Year>1996)	82,204	39,755*	13,776	49.25	10.36***
	(81,550)	(20,128)	(8,306)	(40.15)	(3.668)
Controls	Firm FE, NIC 2-digit X Year FE				
Sample Restriction	Only sectors with all or no eligible firms				
Observations	1,781	1,781	1,781	1,766	1,755
Mean of Dependent Variable	406,144	121,622	28,423	59.75	15.81

Notes: Standard errors clustered at the firm level in parentheses (*** p<0.01, ** p<0.05, * p<0.1). 1(Eligible Pre-Program)*1(Year=1996) is the omitted category. Value added per employee and sales per employee are trimmed at the 1st and 99th percentile.

Table A3: Including Three-Digit Sector by Year Fixed Effects

	(1)	(2)	(3)	(4)	(5)
	Sales (Rs.,00,000)	Value Added (Rs.,00,000)	Profits (Rs.,00,000)	Sales Per Employee (Rs. 00,000)	Value Added Per Employee (Rs. 00,000)
1(Eligible Pre-Program)*1(Year<1996)	-12,685	-7,788	-3,522	3.442	-1.322
	(8,442)	(4,803)	(2,445)	(6.843)	(1.523)
1(Eligible Pre-Program)*1(Year>1996)	104,337***	41,469**	9,019	53.21*	10.47
	(34,541)	(16,676)	(5,586)	(28.51)	(7.114)
Controls	Firm FE, NIC 3-digit X Year FE				
Observations	3,342	3,342	3,342	3,301	3,264
R-Squared	0.867	0.840	0.74	0.75	0.787
Mean of Dependent Variable	282,764	99628	18,090	58.56	17.47

Notes: Standard errors clustered at the firm level in parentheses (*** $p<0.01$, ** $p<0.05$, * $p<0.1$). 1(Eligible Pre-Program)*1(Year=1996) is the omitted category. Value added per employee and sales per employee are trimmed at the 1st and 99th percentile.

Table A4: Sample of Firms That Earned Positive Profits At Least Once Between 1992-2009

	(1)	(2)	(3)	(4)	(5)
	Sales (Rs.,00,000)	Value Added (Rs.,00,000)	Profits (Rs.,00,000)	Sales Per Employee (Rs. 00,000)	Value Added Per Employee (Rs. 00,000)
1(Eligible Pre-Program)*1(Year<1996)	-2,129	-4,929	-2,360	1.122	0.205
	(16,149)	(6,133)	(2,219)	(4.956)	(0.942)
1(Eligible Pre-Program)*1(Year>1996)	82,705*	42,091**	9,239*	36.75	3.521
	(48,092)	(16,497)	(5,555)	(27.44)	(2.674)
Controls	Firm FE, NIC 2-digit X Year FE				
Sample Restriction	Only Firms That Earned Positive Profits At Least Once Between 1992-2009				
Observations	3,064	3,064	3,064	3,023	3,000
R-Squared	0.863	0.831	0.727	0.683	0.747
Mean of Dependent Variable	308,175	108601	20,314	63.55	4.352

Notes: Standard errors clustered at the firm level in parentheses (*** p<0.01, ** p<0.05, * p<0.1). 1(Eligible Pre-Program)*1(Year=1996) is the omitted category. Value added per employee and sales per employee are trimmed at the 1st and 99th percentile.

Table A5: Generalized Difference-in-Difference Results

	(1)	(2)	(3)	(4)	(5)
Panel A	Sales (Rs. 00,000)	Value Added (Rs. 00,000)	Net Profits (Rs. 00,000)	Sales Per Employee (Rs. 00,000)	Value Added Per Employee (Rs. 00,000)
1(SOE Received Autonomy)*1(Year<Year Before Autonomy Received)	-10,769	-10,178	-6,415	10.000	-5.390
	(27,773)	(13,380)	(6,522)	(12.41)	(3.460)
1(SOE Received Autonomy)*1(Year>Year Before Autonomy Received)	242,890***	113,436***	38,974***	88.41**	20.54**
	(80,340)	(40,118)	(14,463)	(42.16)	(9.045)
Controls	Firm FE, NIC 2-digit X Year FE, 1(Year<Year Before Autonomy Received), 1(Year>Year Before Autonomy Received)				
Observations	3,342	3,342	3,342	3,301	3,264
R-Squared	0.864	0.834	0.731	0.681	0.774
Mean of Dependent Variable	282,764	99628	18090	58.56	17.47
Panel B	Sales (Rs. 00,000)	Value Added (Rs. 00,000)	Net Profits (Rs. 00,000)	Sales Per Employee (Rs. 00,000)	Value Added Per Employee (Rs. 00,000)
1(SOE Received Autonomy)*1(Year<Year Before Autonomy Received)	-10,769	-10,178	-6,415	10.000	-5.390
	(27,773)	(13,380)	(6,522)	(12.41)	(3.460)
1(SOE Received Autonomy)*1(Year>Year Before Autonomy Received)	242,890***	113,436***	38,974***	88.41**	20.54**
	(80,340)	(40,118)	(14,463)	(42.16)	(9.045)
Controls	Firm FE, NIC 3-digit X Year FE, 1(Year<Year Before Autonomy Received), 1(Year>Year Before Autonomy Received)				
Observations	3,342	3,342	3,342	3,301	3,264
R-Squared	0.864	0.834	0.731	0.681	0.774
Mean of Dependent Variable	282,764	99,628	18,090	58.56	17.47

Notes: Standard errors clustered at the firm level in parentheses (*** p<0.01, ** p<0.05, * p<0.1).1(SOE Received Autonomy)*1(Year=Year Before Autonomy Received) and 1(Year=Year Before Autonomy Received) are the omitted categories. Sales per employee and profit per employee are trimmed at the 1st and 99th percentile.

Table A6: All Firms, Including Those That Began Reporting Data After 1992 or Stopped Before 2002

	(1)	(2)	(3)	(4)
	Sales (Rs.,00,000)	Value Added (Rs.,00,000)	Profits (Rs.,00,000)	Sales Per Employee (Rs. 00,000)
1(Eligible Pre-Program)*1(Year<1996)	-12,221	-7,073	-3,065*	1.701
	(16,894)	(4,837)	(1,637)	(4.980)
1(Eligible Pre-Program)*1(Year>1996)	79,725**	37,125***	8,601*	41.14
	(40,005)	(14,079)	(4,917)	(25.20)
Controls		Firm FE, NIC 2-digit X Year FE		
Observations	3,728	3,728	3,728	3,686
R-Squared	0.863	0.832	0.723	0.674
Mean of Dependent Variable	257,092	91545	16,447	54.56
	Value Added Per Employee (Rs. 00,000)	1(Entry)	1(Exit)	1(Entry or Exit)
1(Eligible Pre-Program)*1(Year<1996)	-2.709*	0.00440	0.0135	0.0179
	(1.453)	(0.00862)	(0.0142)	(0.0167)
1(Eligible Pre-Program)*1(Year>1996)	9.355*	0.00890	-0.00874	0.000157
	(5.289)	(0.00948)	(0.0171)	(0.0196)
Controls		Firm FE, NIC 2-digit X Year FE		
Observations	3,650	3,728	3,728	3,728
R-Squared	0.76	0.209	0.392	0.382
Mean of Dependent Variable	16.59	0.000805	0.02	0.02

Notes: Standard errors clustered at the firm level in parentheses (*** p<0.01, ** p<0.05, * p<0.1). 1(Eligible Pre-Program)*1(Year=1996) is the omitted category. Value added per employee and sales per employee are trimmed at the 1st and 99th percentile. Entry is a binary variable that takes the value 1 if the firm started reporting data that year (it is 0 for all firms in the first year of data). Exit is a binary variable that takes the value 1 if the firm stopped reporting data that year (it is 0 for all firms in the last year of data). 1(Entry or Exit) is a binary variable that takes the value 1 if the firm started or stopped reporting data that year.

Table A7: Impact on Government Ownership

|	(1)	(2)
	Proportion of Government Equity (Excluding State Government Holdings)	Proportion of Government Equity (Including State Government Holdings)
1(Eligible Pre-Program)*1(Year<1996)	0.00740*	0.00697
	(0.00430)	(0.00423)
1(Eligible Pre-Program)*1(Year>1996)	-0.00900	-0.00764
	(0.00866)	(0.00938)
Controls	Firm FE, NIC 2-digit X Year FE	
Observations	2,871	2,871
R-Squared	0.855	0.887
Mean of Dependent Variable	0.91	0.93

Notes: Standard errors clustered at the firm level in parentheses (*** p<0.01, ** p<0.05, * p<0.1). 1(Eligible Pre-Program)*1(Year=1996) is the omitted category.

Table A8: Effects on Employment Composition

|	(1)	(2)	(3)
	Number of Manageral and Supervisory Employees	Number of Non-Managerial and Supervisory Employees	Number of Non-Permanent Employees
1(Eligible Pre-Program)*1(Year<1996)	-47.58	-160.1	-183.5
	(137.1)	(196.1)	(234.4)
1(Eligible Pre-Program)*1(Year>1996)	239.0	1,516	271.3
	(283.2)	(1,107)	(349.8)
Controls	Firm FE, NIC 2-digit X Year FE		
Observations	2,872	2,872	2,685
R-Squared	0.845	0.959	0.379
Mean of Dependent Variable	1,853	7,105	543

Notes: Standard errors clustered at the firm level in parentheses (*** p<0.01, ** p<0.05, * p<0.1). 1(Eligible Pre-Program)*1(Year=1996) is the omitted category.

Figure A1: Capital Assets (Rs. 00,000)
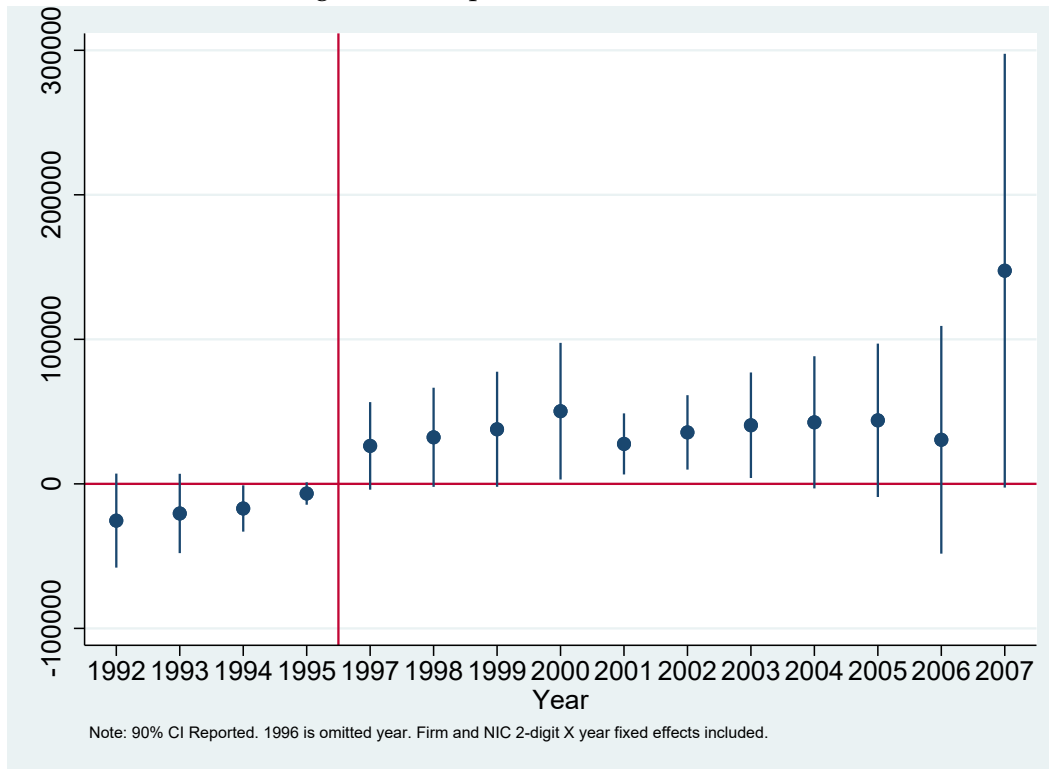
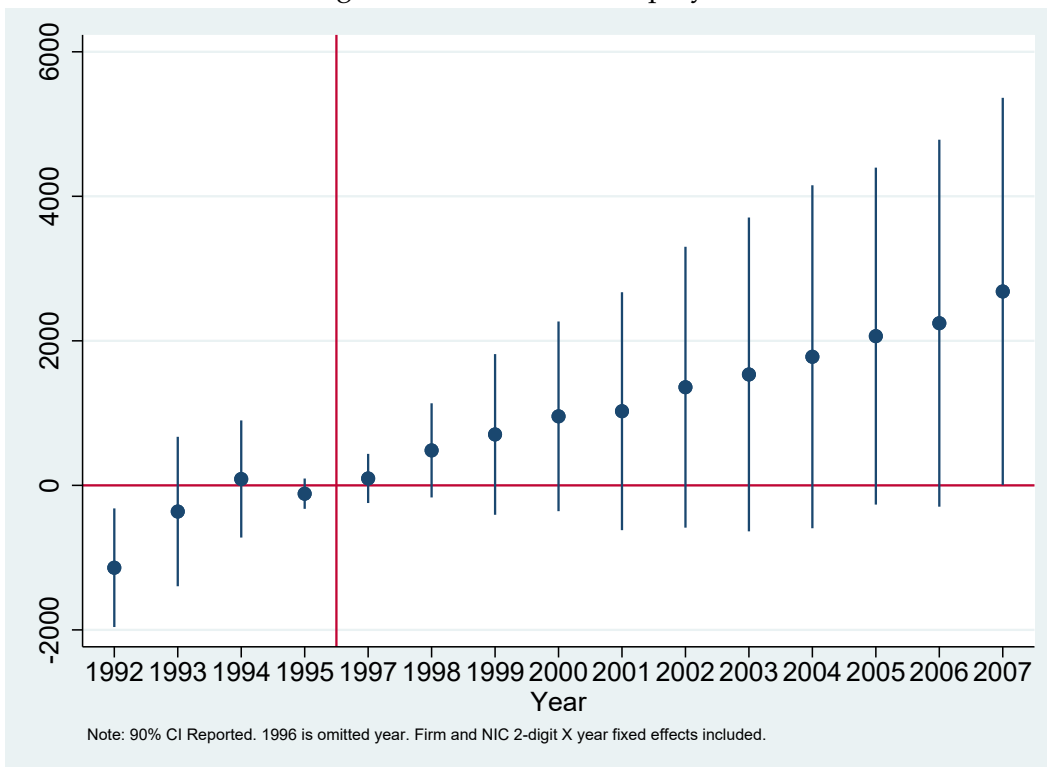Note: 90% CI Reported. 1996 is omitted year. Firm and NIC 2-digit X year fixed effects included.

This figure plots the interaction coefficients of the pre-program eligibility dummy variable with year dummy variables. The interaction of pre-program eligibility with the 1996 year dummy variable is omitted.

Figure A2: Wage Bill (Rs. 00,000)
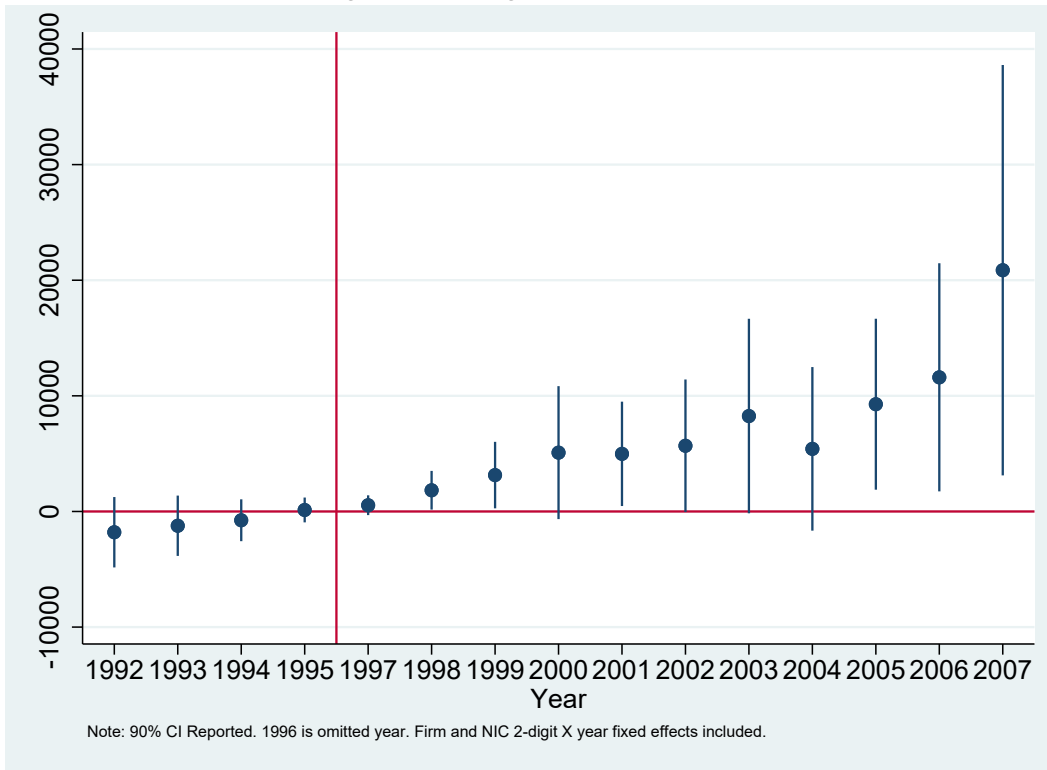
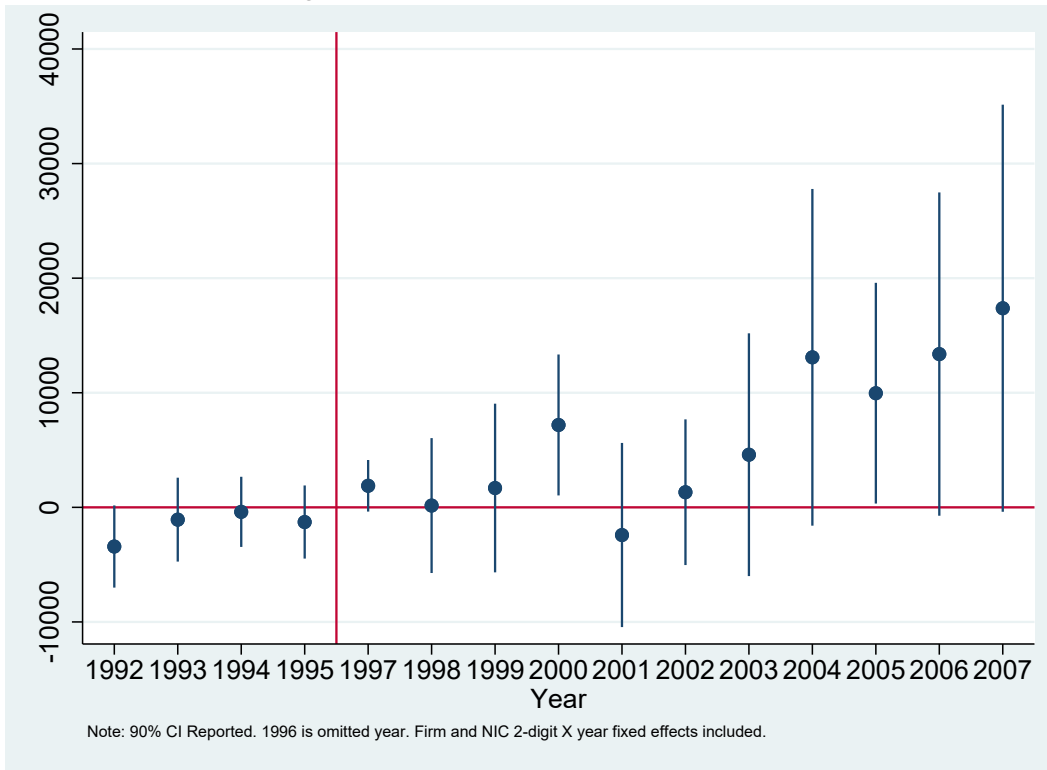Note: 90% CI Reported. 1996 is omitted year. Firm and NIC 2-digit X year fixed effects included.

This figure plots the interaction coefficients of the pre-program eligibility dummy variable with year dummy variables. The interaction of pre-program eligibility with the 1996 year dummy variable is omitted.

Figure A3: Number of Employees

Note: 90% CI Reported. 1996 is omitted year. Firm and NIC 2-digit X year fixed effects included.
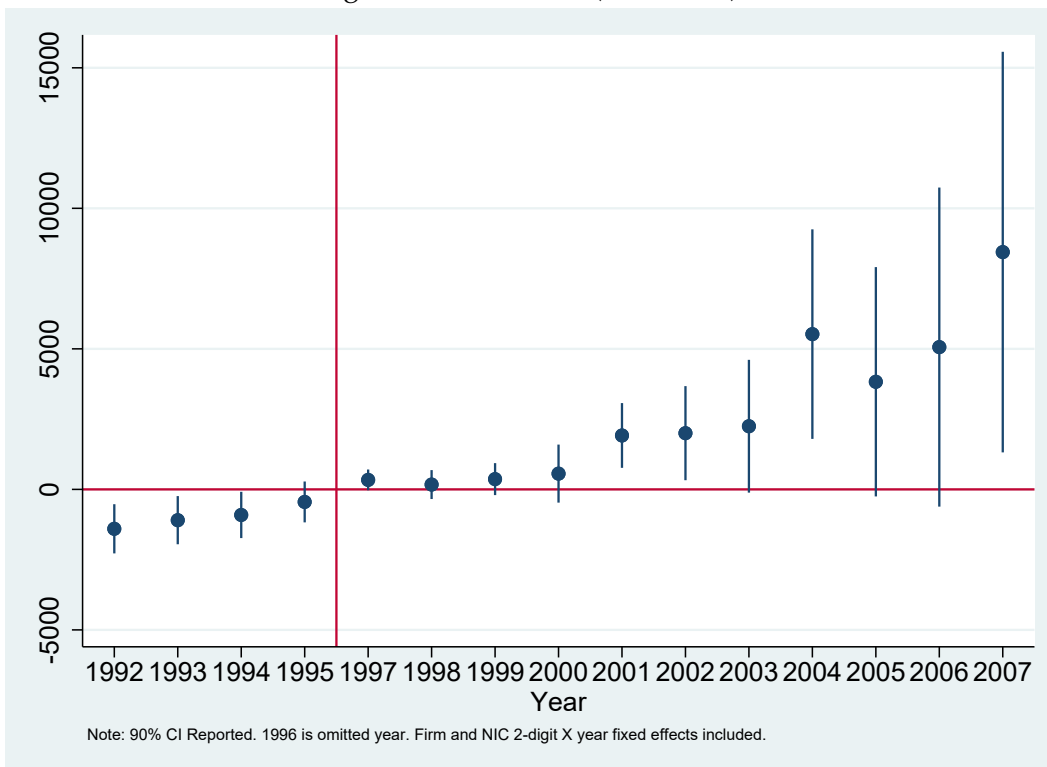
This figure plots the interaction coefficients of the pre-program eligibility dummy variable with year dummy variables. The interaction of pre-program eligibility with the 1996 year dummy variable is omitted.

Figure A4: Retained Profits (Rs. 00,000)

Note: 90% CI Reported. 1996 is omitted year. Firm and NIC 2-digit X year fixed effects included.
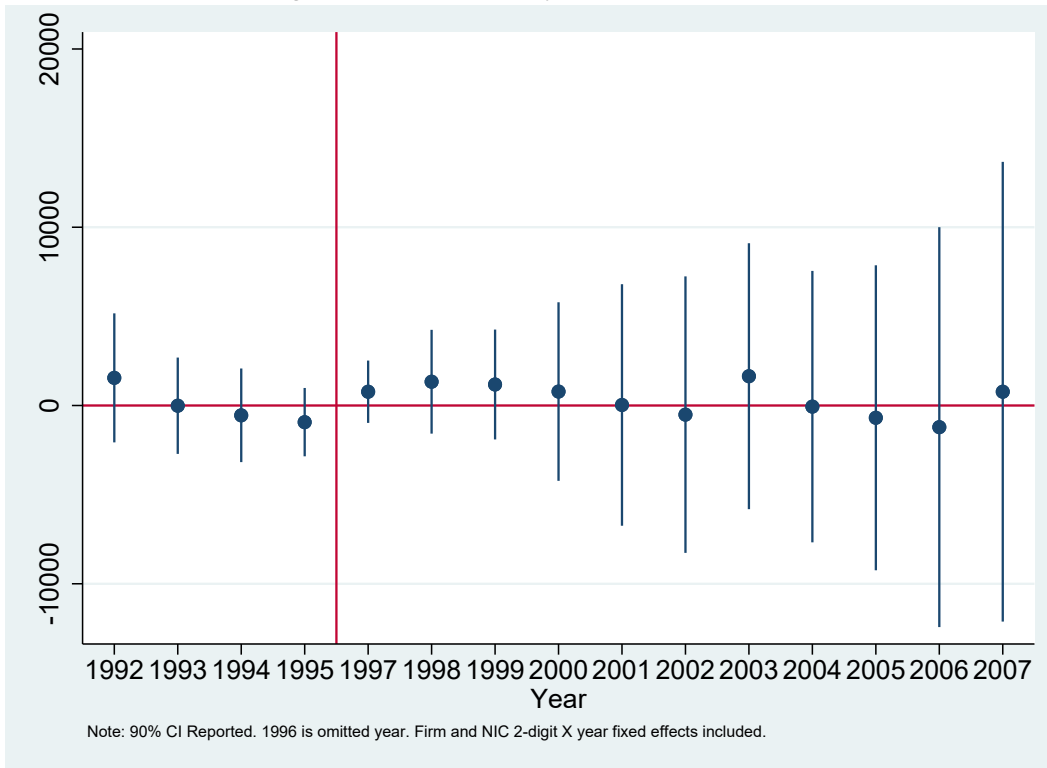
This figure plots the interaction coefficients of the pre-program eligibility dummy variable with year dummy variables. The interaction of pre-program eligibility with the 1996 year dummy variable is omitted.

Figure A5: Dividend (Rs. 00,000)

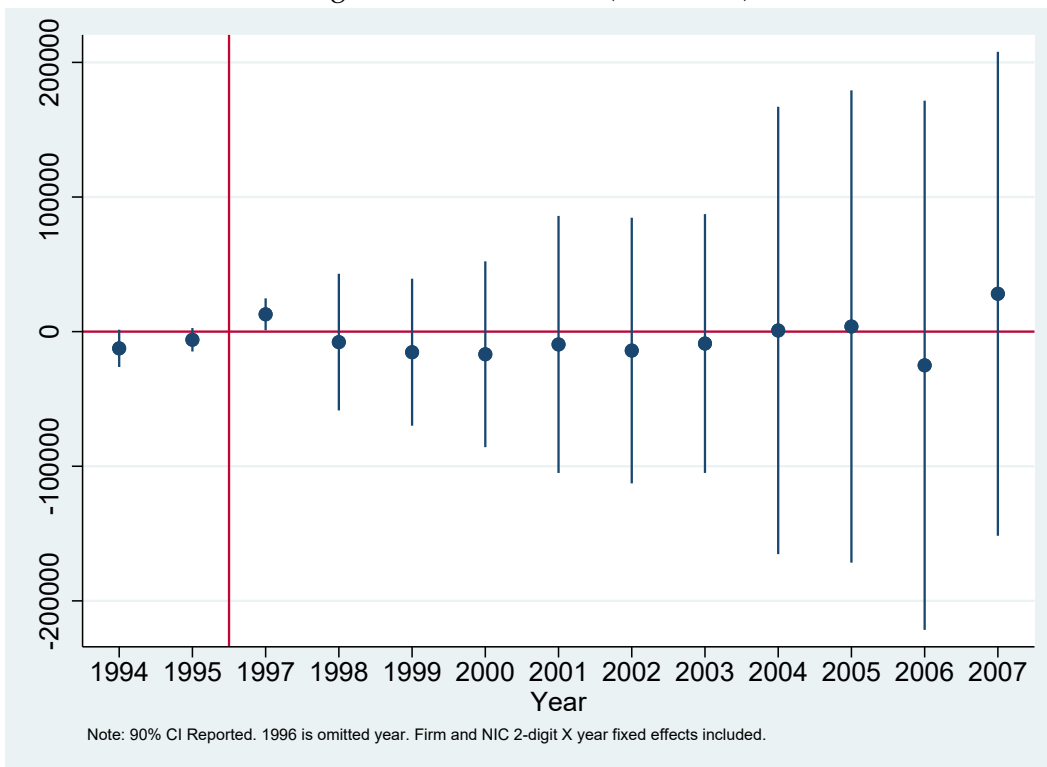Note: 90% CI Reported. 1996 is omitted year. Firm and NIC 2-digit X year fixed effects included.

This figure plots the interaction coefficients of the pre-program eligibility dummy variable with year dummy variables. The interaction of pre-program eligibility with the 1996 year dummy variable is omitted.

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Figure A6: Interest Payments (Rs. 00,000)

Note: 90% CI Reported. 1996 is omitted year. Firm and NIC 2-digit X year fixed effects included.

This figure plots the interaction coefficients of the pre-program eligibility dummy variable with year dummy variables. The interaction of pre-program eligibility with the 1996 year dummy variable is omitted.

Figure A7: Total Loans (Rs. 00,000)

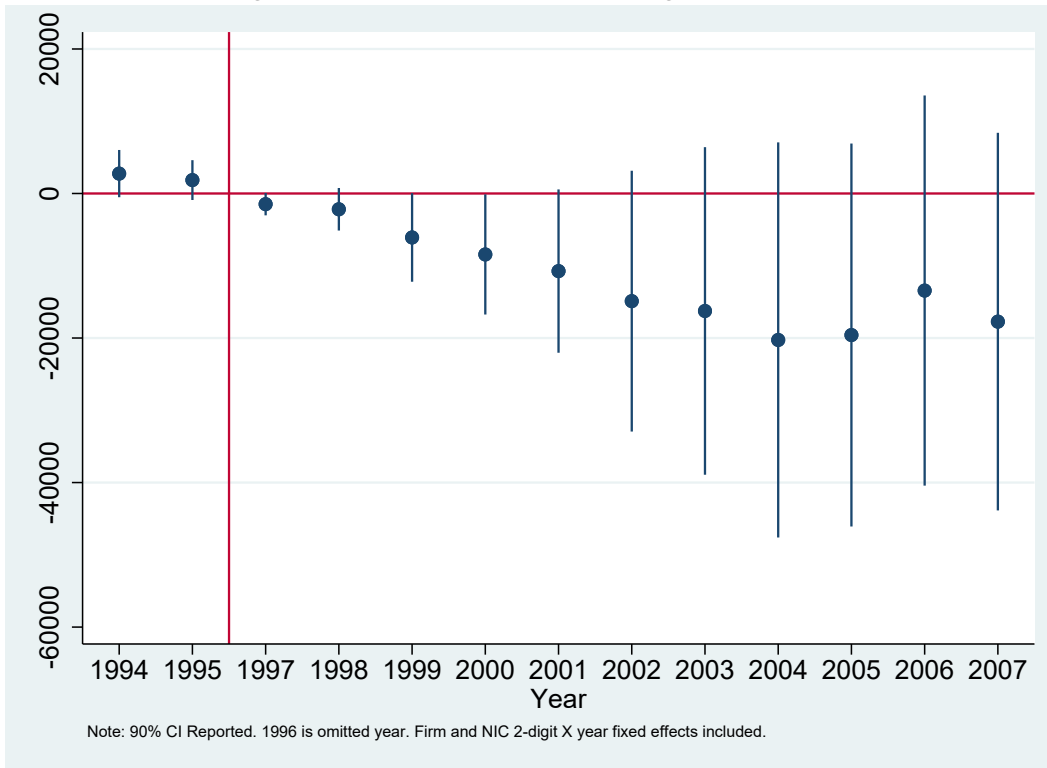Note: 90% CI Reported. 1996 is omitted year. Firm and NIC 2-digit X year fixed effects included.

This figure plots the interaction coefficients of the pre-program eligibility dummy variable with year dummy variables. The interaction of pre-program eligibility with the 1996 year dummy variable is omitted.

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Figure A8: Government Borrowing (Rs. 00,000)

Note: 90% CI Reported. 1996 is omitted year. Firm and NIC 2-digit X year fixed effects included.
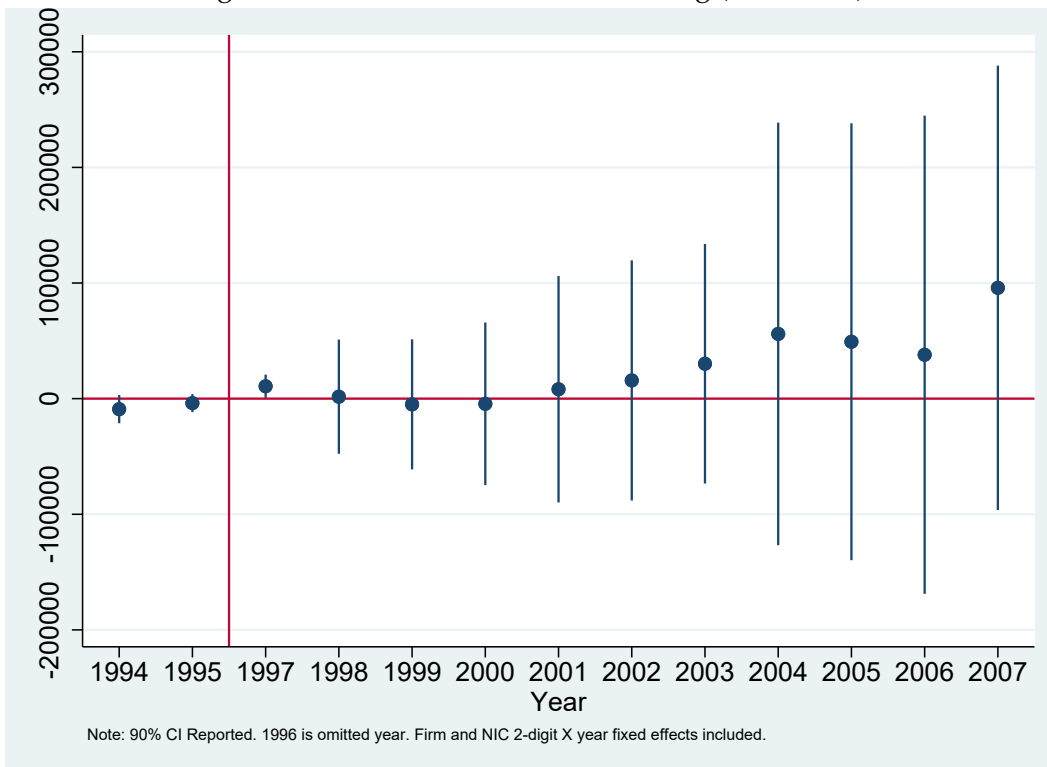
This figure plots the interaction coefficients of the pre-program eligibility dummy variable with year dummy variables. The interaction of pre-program eligibility with the 1996 year dummy variable is omitted.

Figure A9: Non-Government Borrowing (Rs. 00,000)

Note: 90% CI Reported. 1996 is omitted year. Firm and NIC 2-digit X year fixed effects included.

This figure plots the interaction coefficients of the pre-program eligibility dummy variable with year dummy variables. The interaction of pre-program eligibility with the 1996 year dummy variable is omitted.

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Appendix B: Details of the Autonomy Program Benefits Between 1997-2009

1. *Capital Expenditure*: Between 1997-2005, Mini-Ratna category-I enterprises could undertake capital expenditure on new projects, modernization or purchase of equipment without government approval up to Rs. 3 billion, or equal to their net worth, whichever was lower. This expenditure was for each project, not each year (so a firm could undertake multiple projects each year). For Mini-Ratna category-II enterprises, this amount was Rs. 1.5 billion, or up to 50% of their net worth. In 2005, these amounts were revised upward. Between 2005-2009, Mini-Ratna category-I enterprises could spend up to Rs. 5 billion per project, or up to their net worth, whichever was lower. Mini-Ratna category-II enterprises could spend up to Rs. 2.5 billion per project, or up to 50% of their net worth, whichever was lower. Throughout this period, Navratna enterprises could undertake capital expenditure without any ceiling. They could also (unlike the Mini-ratna enterprises) establish offices abroad without the government's permission.

2. *Labor Restructuring*: All firms with autonomy could implement initiatives around personnel training, and voluntary or compulsory retirement schemes to restructure their labor force. Navratna enteprises could additionally create and fill vacancies in the firm without any government involvement, up to the level of the board of directors (not including the directors themselves).

3. *Joint Ventures and Subsidiaries*: Between 1997-2005, Mini-Ratna category-I enterprises could establish joint ventures and subsidiaries (in India) as long as the equity investment of the firm was capped at Rs. 1 billion or 5% of the firms net worth , whichever was lower. For Mini-Ratna category-II enterprises, this amount was Rs. 0.5 billion, or up to 5% of the firms net worth per project, whichever was lower. For Navratna enterprises, this amount was Rs. 2 billion, or up to 5% of the firms net worth per project, whichever was lower. The total equity investment could not exceed 15% of the firms net worth across all joint ventures or subsidiaries in any firm with autonomy (regardless of the type of autonomy).

   In 2005, the cap on the value of these projects was increased - Mini-Ratna category-I enterprises could now invest equity up to Rs. 5 billion or 15% of the firms net worth per project,

Mini-Ratna category-II enterprises could now invest equity up to Rs. 2.5 billion or 15% of the firms net worth per project, and Navratna enterprises could now invest equity up to Rs. 10 billion or 15% of the firms net worth per project. Across all types of autonomy, total investment in such ventures was capped at 30% of the firms net worth. In 2005, all firms with autonomy were also allowed to enter into mergers and acquisitions subject to the same value caps, and subject to these activties being in the SOE's core area of functioning.

4. All firms with autonomy were encouraged into strategic alliances such as technology joint ventures, though there were no specific guidelines around this.

Appendix C: Online Data Appendix

Variable	Years Available	Frequency	Source
Net Profit	1992-2009	Firm-year	Financial Statements, Dept. of Public Enterprises (DPE)
Sales	1992-2009	Firm-year	Financial Statements, DPE
Value Added	1992-2009	Firm-year	Financial Statements, DPE
Sales Per Employee	1992-2009	Firm-year	Financial Statements, DPE
Value Added Per Employee	1992-2009	Firm-year	Financial Statements, DPE
Capital Assets	1992-2009	Firm-year	Financial Statements, DPE
Wage Bill	1992-2009	Firm-year	Financial Statements, DPE
Number of (Permanent) Employees	1992-2009	Firm-year	Financial Statements, DPE
Retained Profit	1992-2009	Firm-year	Financial Statements, DPE
Dividends	1992-2009	Firm-year	Financial Statements, DPE
Interest Payments	1992-2009	Firm-year	Financial Statements, DPE
Total Loans	1992-2009	Firm-year	Financial Statements, DPE
Government Loans	1994-2009	Firm-year	DPE Annual Report
Non-Government Loans	1994-2009	Firm-year	DPE Annual Report
Number of Managerial and Supervisory Employees	1994-2009	Firm-year	DPE Annual Report
Number of non-Managerial and Supervisory Employees	1994-2009	Firm-year	DPE Annual Report
No. of Non-Permanent Workers	1994-2009	Firm-year	DPE Annual Report
Pre-Program Eligibility	1992-2009	Firm	Constructed from Financial Statements
Autonomy Status	1992-2009	Firm-year	DPE Annual Report
Government Equity Holdings	1994-2009	Firm-year	DPE Annual Report

Variable	Years Available	Frequency	Source
Participation in Joint Venture/Subsidiary	1992-2009	Firm-year	Center for Monitoring the Indian Economy/ DPE Annual Report
Sector Codes	1992-2009	Firm-year	CMIE
Private Sector Profit	1992-2009	Firm-year	CMIE
Private Sector Value Added	1992-2009	Firm-year	CMIE
Private Sector Sales	1992-2009	Firm	CMIE
SOE Board of Director Names	2003-2010	Director-level	CMIE
Private Firm Board of Director Names	2003-2010	Director-level	CMIE
SOE State-level Employment	1999-2009	Firm-state-year	DPE Annual Report
Compensation Schedule	2005	Firm	DPE Annual Report
Costs of Production	1992-2009	Firm-year	Financial Statements, DPE
Standard Deviation of Profits, Sales, and Value Added	1996, 2001, 2006	Firm-year	Calculated from Financial Statements, DPE
State Election Timing	1992-2009	State-Year	Election Commission of India