

Does Autonomy Matter in State Owned Enterprises? - Evidence from Performance Contracts in India

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**Indira Gandhi Institute of Development Research, Mumbai
August 2014**

<http://www.igidr.ac.in/pdf/publication/WP-2014-034.pdf>

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Keywords: state-owned enterprises, autonomy, performance contracts, partial privatization, performance, India

JEL Code: D2, D73, L23, L33, P31

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Abstract

The empirical effect of enterprise autonomy on the performance of state-owned enterprises is surprisingly scant despite autonomy being a preferred reform instrument in many countries, and often chosen over privatization. Using longitudinal data on performance contracts for state-owned enterprises in India, this paper empirically examines whether granting increased autonomy to state-owned enterprises through such contracts positively impacts enterprise profitability. Further, using the unique reform experience of India as a natural experiment, whereby enterprise autonomy has been simultaneously pursued with partial privatization for a sub-set of enterprises, a unique contribution of the study lies in investigating whether ownership divestiture through partial privatization has any effect once enterprises are imparted managerial autonomy, or whether ownership *per se* matters. Classifying state owned enterprises into three types, namely those that have been granted autonomy, those with autonomy and partially divested ownership, and those with neither, the study finds robust evidence of a positive impact of managerial autonomy on enterprise profitability. Additionally, once autonomy is controlled for, the study finds at best a weak effect of partial privatization. These results raise doubt on earlier findings of a robust positive effect of partial privatization in India in studies that did not explicitly control for enterprise autonomy thereby raising the possibility that the positive privatization effect that showed up was in actuality, an autonomy effect.

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1. Introduction

One of the sources of inefficiency of state owned enterprises (SOEs) that has been widely recognized across both developed and developing countries is the lack of managerial autonomy in decision making. This is on account of excessive intervention and control exerted in most operational matters by the *de facto* caretakers of SOEs, namely the politicians and bureaucrats (Bolton, 1995; Lioukaset *al.*, 1993; OECD, 2005). Inefficiencies on account of political intervention are said to arise as the objectives of the politicians are driven by their desire to seek rents and their need to cater to the demands of various interest groups that constitute their vote banks (Shleifer and Vishny, 1994; Gupta, 2008). Control by politicians, by distorting pricing, investment, location, production and resource allocation decisions lead to excessive labor employment and wages (Bolton, 1995; Shleifer and Vishny, 1994), and are found to adversely affect allocative and dynamic efficiency in general. As suggested by theories of decentralization, agency theory, and incentive contracts, imparting greater decision making control to SOE managers can generate efficiency gains through better use of local information on operational factors such as costs, technology and demand, and through alleviating agency costs arising from asymmetric information between the government and the SOE management (Bolton, 1993; Li and Wu, 2002; Shirley and Xu, 1998).

The objective of this paper is to empirically examine the impact of granting increased autonomy to SOE managers on enterprise performance using longitudinal data on performance contracts for SOEs in India, spanning a period of thirty years. A performance contract is essentially a negotiated incentive contract between the government and SOE management designed to create appropriate incentives and greater autonomy for SOE managers. Such autonomy is expected to reduce information asymmetry between the government and SOE managers, to bring clarity to multiple SOE objectives by setting specific targets for the management to achieve, and to link the targets set in the contract with high-powered incentives and meaningful penalties for managers and employees, along with ensuring commitment of both parties, namely the government and SOE management to the contract (Shirley and Xu, 1998; 2001). As noted by Mishra and Rishi (2013), in the last twenty five years or so, more than thirty developing countries have introduced the performance contract system to impart greater operational autonomy in order to improve SOE performance². Performance contracts have also been introduced in developed countries but their use has been largely restricted to government owned utilities in natural monopoly settings³. Significantly, contracts in developing countries have been implemented in the initial years of SOE reforms, in lieu of

²The World Bank (1995) in a survey of 32 developing countries in 1994, found evidence of over 565 performance contracts and in China alone they found over 103,000 such contracts.

³ Developed countries include United Kingdom, United States, Canada, Denmark, Finland, and most importantly France where the system originated.

outright privatization as the latter faced a host of political and institutional constraints⁴, with few governments in practice being able to relinquish completely the ownership and control of SOEs to private owners (Bortolotti et al.,2001)⁵. Keeping the ownership and control structures of SOEs largely unchanged, the weight of reforms shifted to implementing organizational changes, including imparting greater autonomy to managers and strengthening their incentives, in order to positively impact the environment in which SOEs operated (see for example, Djankov and Murrell, 2002). For instance in the case of Chinese SOEs, Naughton (1994) observed that formulating policies that granted autonomy and incentives were so “fundamental” to the SOE reform process that these could be viewed as “privatization from below.”

Notwithstanding the theoretical arguments favoring enterprise autonomy as well as its wide adoption as an SOE reform measure, empirical evidence on the impact of autonomy on performance is surprisingly scant and far between. This we think is a serious lacuna in the literature on SOE reforms despite autonomy being a preferred reform instrument in many countries for improving SOE performance. Barring a few empirical studies with respect to China, questions regarding the effectiveness of enterprise autonomy as a reform measure have largely gone unanswered and unaccounted for despite being an integral part of the SOE reform package. Additionally, among the existing studies, the results on the impact of autonomy are mixed (Xu et al., 2005). The limited number of studies and the lack of robust evidence in the literature pertaining to the long term effects of autonomy and incentives on enterprise performance are particularly stark in comparison with the innumerable and ongoing studies on privatization across countries⁶. From a policy perspective, it is important to contribute to the body of evidence on how enterprise level autonomy can impact SOE performance, in view of the continuing constraints on privatization particularly in developing and emerging economies that have a substantial presence of SOEs on the one hand, and the persistent tendency of politicians to intervene in SOE activities on the other.

The choice of India as a setting to examine the impact of autonomy on SOE performance is dictated by the availability of a unique and comprehensive longitudinal data set that enables us to evaluate the effect

⁴ These conditions have included political factors (Biais and Perotti, 2002; Gupta ,2005)), budgetary constraints (Roland, 2000; Guislain, 1997), legal origins and level of financial sector development (Boubakri et al., 1998) and the absence of important pre-conditions for privatization (World Bank, 1995).

⁵ In the reported public offerings between 1977 and 1999, the majority of stock was sold in only 30% of the 617 companies being considered, and it never happened in 11 out of 76 countries.

⁶ The large number of privatization studies is most evident from the numerous comprehensive surveys of empirical studies till date with respect to developed, developing and transition economies, among these being Megginson and Netter (2001), Parker and Kirckpatrick (2005), Megginson and Sutter (2006), Nellis (2007) and Estrin et al. (2009).

of autonomy in the medium to long run. The scant evidence on autonomy and performance in the existing literature, in our opinion, has to do with the scarcity of appropriate large sample data needed for empirically evaluating its effects on different metrics of SOE performance. In the case of India, however, the introduction of the performance contract system in the late eighties and the continuation of the system till date make available relevant data on Indian SOEs for a period spanning more than twenty years. This together with the availability of pre-reforms data starting in 1982 enables us to choose a sample period of thirty years, 1982 – 2011, by far the longest duration study on autonomy, with 5500 firm year observations over 214 SOEs in the non-financial sector that are owned and controlled by the Government of India. With three decades of information, roughly one decade prior to the introduction of autonomy through the performance contract system in the country and two decades since the introduction of the system, the data set of our study thus has both sufficient across time and across firm variation.

Along with the long panel, the value of an Indian case study lies in the reliability and exhaustive coverage of the data on SOEs. Most of the existing empirical studies on SOE reforms including that with respect to autonomy, and predominantly focusing on Chinese SOEs are based on sample survey data rather than on mandated self-disclosures as is the best-practice in developed countries like the US. This in turn leads to problems of selection bias and omitted variables (Megginson and Netter, 2001). This is not the case with India where all operating SOEs owned and controlled by the Government of India (centrally owned SOEs) have to make mandatory annual disclosures in a prescribed format to the Government, which are then publicly available in officially published reports. Our dataset is based on these reports and cover almost all centrally owned SOEs in the non-financial sector.

The richness of the longitudinal data on Indian SOEs allows us capture with greater precision and robustness the long run impact of performance contracts on SOE performance relative to existing studies. As several researchers have argued (Willner, 2001; Brown *et al.*, 2005) in the context of privatization studies, the dearth of longitudinal data works against estimating with reasonable precision, post-reform effects on firm performance due to sparse pre and post reform observations. Estimated effects in such cases are predominantly derived from cross-section variations in the data rather than from comparisons of pre- and post-reform performance for a panel of firms. For instance, studies evaluating the impact of performance contracts in Chinese enterprises do not go beyond a decade of post-autonomy observations, as China's experiment with enterprise autonomy lasted for approximately a period of ten years up to the late nineties. The absence of any definitive evidence on performance contracts in the empirical literature to date could very well be due to the fact that the post-autonomy effects have been studied over too short a period for the performance effects to unravel and be captured. In contrast, in the case of India, the

performance contract system has been in vogue since 1988 when it was put in place to impart increasing autonomy and flexibility to SOEs, and is in existence since then, with an increasing number of SOEs coming under the system over the years. With an average of around 25 observations per enterprise, and with an almost equal split of pre- and post-performance contract observations, the Indian experience thus makes available longitudinal data that allows us to not only exploit the cross-section variation in performance across SOEs with and without autonomy, but also allows us to capture the before and after effects of autonomy on a balanced panel of SOEs.

Along with the availability of suitable data, a second and equally important consideration for focusing on Indian SOEs is that the Indian public sector reform experience over the period of our study enables one to evaluate not only the marginal effect of autonomy *per se* but also to compare it vis-à-vis the effect of ownership changes through privatisation. Such an exercise has seldom been undertaken in the context of examining the impact of autonomy, nor has it been done in the context of privatization studies. Yet as several researchers point out (Djankov and Murrell, 2002; Nellis, 2007) points out, SOE reforms like autonomy and privatization seldom are “stand alone” policy interventions and it is important to separate out their effects and establish possible complementarities and substitutabilities between different types of interventions⁷. The Indian SOE reform experience since the nineties provides us with such an opportunity to identify autonomy effects and their implications if any for the benefits that can be further accrued through privatisation. This is on account of the fact that since the 1990s, India has followed a ‘dual track’ policy of imparting increasing managerial autonomy through performance contracts on the one hand, and effecting ownership changes through partial privatization, on the other. The objective of partial privatization in India as in many other countries has been to divest government ownership to private owners so as to subject SOEs to greater capital market discipline without relinquishing state control and upsetting the voter banks, and to buy time to build political consensus about full privatization in future (Jones, 1999; Qian, 2003; Gupta, 2005, 2011). However, what is different in the case of India is that such privatization has proceeded hand in hand with organizational autonomy where several SOEs which have been under performance contracts have also been partially privatized while continuing to remain under such contracts. The moot question that can therefore be addressed in light of the Indian experience is, does autonomy matter, or does ownership matter, or is it both?

⁷ Arguing in the context of privatization, Nellis (2007) argues that in the presence of other accompanying reforms that increase competitive pressures for SOEs, it is challenging to isolate the effects of privatization from other effects.

The motivation underlying this question lies in the still unresolved debate of whether, as argued by the property rights and public choice theorists⁸, it is the ownership structure of the public sector that is *per se* primarily responsible for its underperformance relative to private sector entities, or whether, as other researchers argue, it is the environmental imperfections and distortions in which SOEs operate, such as the lack of autonomy and non-competitive environment, that are responsible for the relative inefficiency of SOEs so that ownership does not matter⁹. Applying the latter argument, if performance contracts are effective in removing political interference and giving managers the autonomy and incentives to take decisions that seek to maximize SOE performance, further ownership changes through privatization may be redundant. Empirical studies on organizational autonomy have largely bypassed testing this hypothesis even in contexts where both policies were pursued, as in the case of China. In China both autonomy and partial privatization were pursued, but performance contracts and privatization were pursued in phases with such contracts being prevalent for only ten years in the first phase, from 1984-93, and the second phase of corporatization and privatization from 1993 onwards (Aivazian et al., 2005). Existing studies of autonomy in China largely concentrated on the first phase with little overlap with the second phase. This has been less by choice than by design, as data sets used for empirical estimation seldom captured both kinds of reforms over an extended period of time (Groves et al., 1994; Shirley and Xu, 2001).

In contrast, the Indian reform experience is unique in terms of both autonomy and partial privatization being pursued side by side for perhaps the longest duration. This is reflected in our longitudinal data set where we can identify essentially three types of SOEs, *Type-1* that did not undergo either autonomy or privatization throughout the period of study, 1982-2011, *Type-2* which were granted autonomy under the performance contract system since the late eighties, and *Type-3*, which were granted both autonomy and were also partially privatized at some point of time starting early nineties. As is clear from this typology, the Indian data set is naturally suited to measuring the marginal effect not only of autonomy vis-à-vis no reform, but also the marginal effect of partial privatization vis-à-vis that of autonomy. Earlier work on India which has looked at partial privatization effects seem to suggest that ownership indeed matters (Gupta, 2005; 2011). However, the study overlooked the fact that partial privatization in India was not a “stand alone” reform in the sense that apart from changes in the competitive environment, those SOEs that were partially privatized, were also under performance contracts and continued to remain so post-disinvestment. While the results of Gupta’s (2005; 2011) studies suggest that partial privatization is beneficial, the fact that the studies do not control for the autonomy effect in partially privatized

⁸ See for example, Alchian (1977), De Alessi(1987), Levy (1987), Niskanen(1975) and Linet *et al.*, (1998).

⁹ See for example, Vickers and Yarrow (1991), Shirley and Xu (1998), Anderson *et al.*(2000), Djankov and Murrell (2002); Holz, 2002).

enterprises, could have confounded the effects of partial privatization to the extent that the positive privatization effect that showed up was in actuality, an autonomy effect.

Our empirical strategy of measuring the impact of performance contracts and partial privatization on SOE performance closely mirrors that of Brown et al. (2005) in their longitudinal study of estimating the productivity effects of privatization in four transition economies. Like Brown et al. (2005), we follow a “difference-in-difference approach” to estimate the ‘treatment effects’ of autonomy and partial privatization, by comparing the outcomes of the treated group of SOEs that have been subject to a particular policy reform to that of the untreated group that has not been subjected to similar reform measures. Additionally, we also undertake a “before-after analysis” by exploiting the long time series data in our sample to compare the outcomes of the treated group before and after the treatment to identify policy impacts. However, the measurement issues in our study are somewhat more complex than those in Brown et al. as we have to separate out the marginal effects of two types of treatments pursued sequentially over time, namely, autonomy and partial privatization while in Brown et al., the focus is only on privatization. We disentangle the marginal effects of these two types of reforms by exploiting the significant cross-sectional variation across the three types of SOEs that we have in our sample and which we have outlined earlier.

One empirical issue that is of particular concern for our study and indeed that of all impact evaluation studies is that of selection bias, namely the random assignment of units to the treatment group. The random assignment assumption ensures that the estimated differential effect between the control and treatment groups can be unconditionally attributed to the stimulus rather than been driven by the specific characteristics of the treatment group. While random assignments are easier to implement for experiments in medical sciences, it is difficult to do so in social sciences like Economics where the treatment units are chosen with an eye towards the success of intervention. Given the large number of observations of different types of enterprises in the cross section as well as before and after the policy intervention that we have in our sample, we address the issue of selection bias by carefully selecting alternative sub-samples rather than by employing the usual econometric technique of instrumental variable which is a preferred choice in a situation of sparse data. In other words, there are many control and treatment groups in our study. If the differences in the behavior of the treatment and control groups remain robust for various alternative choices of the control and treatment groups, then the inference that the observed difference is due to the stimulus becomes stronger. We elaborate our empirical strategy in greater detail in the empirical section.

The key finding of our study is that enterprise autonomy through performance contracts matter in SOE performance. Specifically, enhanced autonomy has a statistically significant positive effect on SOE profitability. Further, when the impact of partial privatization is estimated after controlling for the impact of autonomy, in most cases, partial privatization has no independent impact on profitability while autonomy continues to have a positive impact. At best, partial privatization is found to have a positive impact only when the extent of share disinvested is substantial in comparison to the median level of disinvestment. In effect, one major finding of our study with important policy implications for SOE restructuring is that while deregulation and hard budget constraints could have important complementarities with enterprise autonomy, partial privatization, post enterprise autonomy, does not lead to enhanced SOE profitability.

The paper is organized as follows. Section 1 being this introduction, Section 2 discusses the evolution and practice of performance contract system in India keeping in background, the relevant theoretical and empirical literature. The data, variables and estimation methodology are outlined in Section 3, while the empirical results are presented in Section 4. Concluding comments are made in Section 5.

2. Background Literature

The granting of autonomy through performance contracts (PCs) has been a preferred mode in reforming SOEs over privatization through ownership divestiture due to a host of factors ranging from strategic considerations requiring government ownership, to political constraints that render privatization infeasible, to being a less radical but potentially an equally effective policy option as compared to privatization. Theoretically, performance benefits associated with PCs can arise from combination of factors that include reducing agency problems arising from asymmetric information and managerial shirking, eliminating multiple principals with multiple goals, and improving accountability of SOE managers through pre-set performance targets (see Shirley and Xu, 2001 and Trivedi, 1990 for a detailed discussion).

Applying a principal-agent framework (Shirley and Xu, 2001), a PC can be viewed as a negotiated incentive contract in the form of a written agreement between the government (the principal) and SOE managers (the agent) that specifies pledges by management to achieve key performance targets within a time period, in return for which the government makes some fixed commitments in the form of autonomy and incentives. The benefit of such a contract is that, it can solve the moral hazard problem arising from asymmetric information and unobservable managerial effort by revealing information and motivating

managers to exert effort that maximize SOE performance (Ghosh, 1997; Jones, 1991; Shirley and Xu, 1998; Trivedi, 1990). Further, negotiated contracts can clarify the multiplicity of objectives that the SOE manager faces from the various governing bodies (like different ministers, legislatures, bureaucrats etc.) by setting specific targets for the management to achieve, thus encouraging governments to reduce control *ex ante* and through the delegation of decision making authority, giving managers more freedom and motivation to improve SOE performance (Jones, 1991; Ghosh, 1997). Benefits also arise from linking targets set in the performance contract with high-powered incentives and meaningful penalties for managers and employees, along with ensuring commitment of both parties (government and management of SOEs) to the contract that would ensure the success of these contracts in improving the SOE performance (Shirley and Xu, 1998). Finally, the enhanced delegation of formal authority to SOE managers as envisaged to some extent under performance contracts can effectively increase their real authority and improve the quality of their decision making and thereby organizational performance (Aghion and Tirole, 1997)¹⁰.

While, theory predicts that greater autonomy in decision through policy instruments such as performance contracts should translate into better SOE performance as managers have greater incentives to acquire information valuable for the efficient functioning of the enterprise, as well as cut down on political agency costs, these benefits may at the margin be neutralized if increased managerial independence (and less government oversight) gives rise to the typical managerial agency that arise on account of moral hazard in manager-controlled corporations (Xu et al., 2005). In fact, by eliminating political control and thereby government oversight from the day to day operations of SOEs, such agency problems are likely to become more acute in SOEs as the disciplining effect of different markets such as the takeover market and the managerial market that are considered effective in the case of private sector enterprises (Manne, 1965; Fama, 1980), and virtually absent in public enterprises due to the attenuation of property rights in public enterprises whereby their shares are non-transferable and cannot be traded in the markets. This can therefore leave public management that has more autonomy, with even far more discretion to pursue its own objectives at the expense of that of the shareholders (Lindsay, 1976, Kay and Silbertson, 1984, Millward and Parker, 1983). Adding to this is the possibility that measures through which managerial autonomy are granted may be more cosmetic in nature that does little to transfer real decision making control to managers so that ‘formal authority’ does not necessarily transfer into ‘real authority’ (Aghion and Tirole, 1997). Given the opposing effects of autonomy on managerial incentives and agency, and the possibility that meaningful autonomy may be difficult to implement in practice, the resultant impact of

¹⁰ A similar point is made by Xu et al. (2005)

managerial autonomy on SOE performance is not *a priori* evident and is therefore an open empirical question (Xu et al., 2005).

Although PCs are known by different names in different countries (like contract plan in Senegal, performance monitoring and evaluation system in Philippines, memorandum of understanding in India, contract responsibility system in China), they all share the common feature of being written agreements between the government and the managers of SOEs, that specify targets that management pledge to achieve in a given time frame along with defining the criteria for measuring the performance, and the benefits that managers earn in return for meeting the set targets. PCs in Indian SOEs are known as the Memorandum of Understanding (MOU) and were introduced for the first time in 1988-89 on the recommendation of the Arjun Sengupta Committee which was set up in 1984 as a first step towards reviewing extant policy of SOEs and suggesting policy measures to improve SOE performance. The committee in its report, Report of the Committee to Review Policy for Public Enterprises, 1986 (Arjun Sengupta Committee) (CMIE, 1986), recommended the introduction of MOUs that would provide management of SOEs with more operational autonomy and distance the government from the day-to-day operations of the enterprises¹¹.

As in the case of other countries, the MOU system in India was adopted in light of the inefficiency of the public sector vis-à-vis its private sector counterparts that was perceived to arise from the presence of multiple principals for any SOE, with multiple and often conflicting objectives, the fuzziness of SOE objectives and the resultant lack of accountability of management, and in general, the absence of functional autonomy for SOE managers (Rajya Sabha, 2011; LBSIM, 2013)¹².

An MOU has typically entailed SOEs signing performance contracts on an annual basis between the Government, the *de facto* owner of SOEs, and the senior management of the SOE. The objectives underlining the signing of the MOU have been to enhance SOE performance by empowering them through reducing formal and informal government interference without necessarily impairing the Government's right to control the SOEs, increase autonomy and accountability of its management, strengthen the performance of SOEs in an increasingly competitive environment post the liberalization of the Indian economy in 1991, and to ensure a level playing field for SOEs vis-à-vis their private sector

¹¹ Specifically, the Arjun Sengupta Committee noted that "(A)utonomy of a public enterprise consists in the ability

¹² For instance, the report on Public Sector Enterprises and Memorandum of Understanding: Charting New Frontiers (LBSIM, 2013) note that the lack of autonomy of SOEs has "stifled their growth" and there was a need to limit the involvement of the government in the activities of SOEs in lines with the "principles of an independent professional organization."

counterparts¹³. In general, the MOU system has tried to remove the fuzziness in the goals and objectives that the SOE pursued by clearly laying down performance targets along with stating the intentions, obligations and mutual responsibility of both the parties involved in the contract (GOI and SOE management). The MOU contracts thus made an attempt to move the management of SOEs from management by controls and procedures to management by results and objectives.

As far as the government's obligations to the SOE are concerned, conditional on the signing of the MOU and the attainment of the pre-specified targets, financial and administrative autonomy is granted to concerned SOEs broadly in the areas of capital expenditure, setting up joint ventures and subsidiaries, organizational restructuring and human resource management, resource mobilization through debt issuance, undertaking mergers and acquisitions, wage revision, incentive schemes for employees, and in utilization of foreign exchange (KPMG, 2011; PES, several issues). However, the particular structure of MOUs and the specific heads under which autonomy given to individual enterprises have varied. Over the years, as increasing number of SOEs have come under the MOU, the system along with being a vehicle for delegating autonomy to SOEs, has also become a major incentive-based compensation mechanism in the sense that MOU performance in terms of the achievement of targets, has become one of the major criteria for rewarding SOE managers through Performance Related Pay (PRP)/variable pay of SOE managers. Finally, as a non-pecuniary incentive associated with MOUs, the GOI instituted the MOU Excellence Award, where the top performers under the system are publicly recognized¹⁴.

As in the case of many transition and emerging economies that have been pursuing SOE reforms, the move towards greater managerial autonomy through performance-linked contracts was accompanied by a host of other reforms at the level of the enterprise, as well as in the operating environment of the SOEs. In India, following the structural reforms since 1991, SOEs have been operating in an increasingly competitive environment. This has been primarily accomplished through the deregulation and liberalization of SOE activities in the form of de-reservation and deregulation of most productive activities that were the sole domain of SOEs, partial disinvestment of SOEs, and by seeking to implement hard budget constraints by restricting the free flow of funds to these enterprises and forcing SOEs to live within their budgets. With regard to the de-reservation of SOE activities, the GOI decided to withdraw the monopoly status of SOEs in most of the sectors, except those in the areas where security and strategic

¹³ These objectives have been highlighted from time to time in the various committees/reports that have examined the workings of the MOU system, which include NCAER (2004), GOI (2008), Rajya Sabha (2011), and GOI(2012).

¹⁴From the perspective of the GOI, the MOU Excellence awards are seen as “an expression of the commitment of the policy makers to the CPSEs and the MoU system” (GOI, 2009).

concerns predominated¹⁵. Along with de-reservation, the government also undertook deregulation of industries, particularly deregulating progressively the pricing of several products that enjoyed some form of subsidy or price support, like cement, iron and steel, electronic products, aluminum among others, since 1991¹⁶. Notwithstanding these measures, the importance accorded to internal restructuring through the MOU system continued unabated. In fact the potential complementarity between external market pressures and internal restructuring is most evident in the ‘Statement on Industrial Policy’ issued by the GOI in 1991 in the wake of the adoption of the structural reforms programme, which specifically called for a “greater thrust” on improving the performance of SOEs through the Memorandum of Understanding, and for making the MOU system more effective (Rajya Sabha, 2011).

Finally, as stated in the introduction, the move towards granting autonomy to an increasing number of SOEs was accompanied by limited ownership changes through partial privatization. As in the case of subjecting SOEs to increased competitive pressures, policy makers perceived a complementarity between the MOU system and partial privatization in the sense that both these policy interventions were pursued almost simultaneously. Implicit in this is that notwithstanding enterprise autonomy, ownership still matters. Several of the SOEs that were MOU signatories were partially privatized but continued to remain under the MOU system post equity divestiture. Among the objectives listed by the GOI in disinvesting SOE shares were those that were similar in motivation to those underlying the MOU system, of the need for the government to move away from “controlling, managing and running” SOEs that were in non-strategic sectors¹⁷. The additional consideration for partial privatization, in line with the theoretical arguments for divestiture of government ownership was that such divestiture, albeit limited, will be instrumental in exposing SOEs to greater market discipline, improve their governance, and increase their efficiency (GOI, 2001). Starting in 1991-92, till 2010-11, the government divested its equity stakes in 63 SOEs through open auction, strategic sales, public offering, global depository receipt in the domestic and the international stock markets¹⁸. Of these, a large majority, 57, were partially divested in the sense that the government continued to have majority ownership and control. Only in 6 enterprises were majority

¹⁵Of the seventeen areas reserved for investment by the public sector since 1956, the government under the Industrial Policy Resolution of 1991, decided to de-reserve over time 13 industries, leaving only four strategic sectors exclusively for the public sector (Handbook of Industrial Policy and Statistics, 1992, 1993 and GOI, 2001).

¹⁶While most of the 22 cognate industry groups were deregulated in the years following 1991 liberalization, some firms/ products manufactured by SOEs under cognate groups like Coal and Lignite, Petroleum (Refining and Marketing) and Fertilizers remain under administered pricing system (PES, 2010-11).

¹⁷The other important objectives were to release the large amount of public resources locked up in non-strategic SOEs for redeployment in areas that were much higher on the social priority, such as, basic health, family welfare, primary education and social and essential infrastructure. Divestment was also seen as means to reduce the public debt that had catalysed the financial crisis in 1991 (GOI, 2001)

¹⁸www.bsepsu.com “Master Table of all Past CPSE Disinvestments in India till date.”

control transferred to private sector management. With the exception of one, all SOEs that were partially privatized came under the MOU system at some point of time preceding partial privatization.

Table 1 presents for the period 1987-88 to 2010-11, the total number of SOEs owned by the central government (also termed as centrally owned public sector enterprises, CPSE), the total number of SOEs signing MOUs in any given year, the total number of partial disinvestments made in a year, and the average percentage of equity divested. As can be seen from the table, an increasingly large number of SOEs came under MOU since its introduction. While there have been some marginal fall in the number of signatories in some years, the predominant picture emerging from the data presented is that starting from only 4 out of 238 enterprises in 1987-88, an increasing number of SOEs became signatories of the performance contracts, accounting for 40-50 per cent of total enterprises for the larger part of the study period and touching around 90 per cent at the close of the period. Compared to the scope of the MOU system, the coverage and scale of the partial privatization programme was relatively limited. While the total number of partial disinvestment transactions during the twenty year period was 129 involving 57 distinct enterprises, the average percentage of government equity divested was at a maximum around 20 per cent, and mostly in the range of less than 10 per cent during the period under study.

Turning to the existing empirical evidence across countries on the impact of enterprise autonomy through performance contracts, much of the evidence has come by way of evaluating the impact of performance contracts on the profitability or productivity of Chinese SOEs. Additionally, apart from a handful of large sample studies with respect to China (Shirley and Xu, 2001; Xu et al., 2005; Li and Wu, 2002), existing evidence is based on case studies of a small number of PCs, either with respect to a country, with a relatively small number of observations (see Trivedi, 2007)¹⁹. Whatever the case, the evidence is far from conclusive. On the one hand are studies that do not find that performance contracts improved the productivity or profitability of SOEs (Shirley and Xu, 1998; Shirley, 1999; Li and Wu, 2002). On the other hand, however, Song (1991) in the context of Korea, Ahmed (1999) in the context of Bangladesh, Trivedi (2006) in the context of Kenya, find case-study based evidence supporting the effectiveness of performance contract in increasing SOE performance.

The few large-sample econometric studies on PCs in a multivariate framework that do exist, have all been based on survey data pertaining to a select sample of Chinese SOEs located in four provinces in China.

¹⁹ As a case in point, Shirley and Xu (1998) examined twelve PCs across six countries including two from India, Ghosh (1997) analyzed twelve SOEs from India, and Trivedi (1990) examined the success of PCs for 16 commercial corporations over a period of one year.

The first among these is the study by Shirley and Xu (2001) that examined a panel data set of about 500 Chinese SOEs between 1987 and 1994, a period which marked the peak of implementation of PCs as a reform measure. The same data set was later used by Li and Wu (2002) who analysed for the period 1980-94, the relative importance of production autonomy and managerial incentives vis-à-vis partial privatization, without however, directly focusing on PCs as was the case in the study by Shirley and Xu (2001). As stated earlier, Shirley and Xu (2001) do not in general find empirical evidence of the beneficial effects of PCs on SOE productivity, although they find that PCs become more effective in impacting productivity in competitive environments, and that better PCs were designed in SOEs that were administered by local governments, were relatively small and were better performers in the past. Li and Wu (2002) similarly do not find any statistically significant effect of increased autonomy and stronger incentives on SOE profitability and productivity. Finally, Xu et al. (2005), in their study of autonomy and ownership reform for a cross-section of Chinese enterprises find significant negative effects of managerial autonomy on ROA as well as for ROA changes, suggesting that the benefits at the margin of greater independence in managerial decision-making due to lower political control, are outweighed by the agency costs arising from reduced oversight by the State following increased autonomy.

In contrast to a sizeable number of large-sample empirical studies with respect to Chinese SOEs, in the case of India, existing evidence is largely based on case studies and on studies conducted periodically by various working groups under the auspices of the GOI. Ghosh (1997) for instance, in his analysis covering six years of twelve Indian SOEs that signed the MOU contracts with the central government in 1988-89, finds positive effect of PCs on SOE profitability²⁰. On the other hand, the Eleventh Five Year Plan documented that the MOU system “has proved to be ineffective and dysfunctional” as the autonomy and financial delegations granted under the MOU by the GOI have been largely marginal (GOI, 2007-12).

Finally, turning to the evidence on whether ownership reforms through partial privatization still matter in SOE performance post- managerial autonomy, most of the studies examine the effect of one to the exclusion of the other. Thus, while Shirley and Xu (2001) focus on managerial autonomy through PCs in the case of China, Gupta (2005; 2011) examines the impact of partial privatization in India without controlling for the fact that many of the SOEs undergoing disinvestment were also under the MOU. As discussed in the introduction, the MOU effect if not controlled for suitably, the finding of a positive partial privatization effect in Gupta (2005; 2011) could very well be the impact of MOU rather than of

²⁰ Similar favourable views are found in (Rajya Sabha Secretariat, 2011) where the Working group based on the survey of the MOU system found that the system has developed into a “robust mechanism” to ensure autonomy and accountability of Indian SOEs and that most of the enterprises under the MOU system were of the view that MOUs have made a positive impact on SOE operations.

ownership changes. The only study that examined the relative efficacies of autonomy and ownership, to the best of our knowledge, is the aforementioned study by Li and Wu (2002) that estimated a pooled fixed effects regression to find out the relative effects of managerial reforms and ownership reforms. The key finding of this study based on data in the eighties and nineties is that while ownership divestment through partial privatization improved both performance and productivity, managerial autonomy and incentives did not have any significant impact. Apart from the fact that the findings are rather dated, the empirical methodology to estimate the effects of ownership and autonomy suffer from the type of measurement problems that have been discussed in the introduction.

3. Data, Variables and Estimation Methodology

3.1 Data

The data for our analysis, spanning the thirty year period 1981-2011, are compiled from the Public Enterprises Survey (PES, several years) published by the Department of Public Enterprises (DPE) under the Ministry of Heavy Industry, GOI. This document is officially published annually and covers all Centrally Owned Public Sector Enterprises (CPSEs) in India. The PES publishes data that are collected through an Annual Survey conducted by the DPE across all SOEs. Survey forms are sent to each SOE soliciting detailed information under the following heads, namely (i) Balance Sheet Data (ii) Profit and Loss Accounts Data (iii) Other Financial Details (iv) State-wise fixed assets and employment (v) salary and wages (vi) employment and social overheads, and (vii) miscellaneous information. The data on MOU is also collated, year-wise from the PES which shows for each SOE, whether it has entered into an MOU with the GOI in a particular year. As reported in the PES, the number of SOEs signing MOUs increased from 4 out of a total of 230 SOEs in 1988 to 202 of a total of 220 SOEs in the year 2011. In the first five years of the inception of the MOU system, the number of SOE signatories sharply increased to 100.

Our sample covers all centrally owned SOEs operating in the non-financial sector owned by the GOI operating across different industry groups, except for those that were being constructed at the time of data collection²¹. Of the SOEs in the 19 industry groups that constitute the sample, there is however some year to year variation in the number of SOEs. This is due to the setting up of new SOEs during the study period or due to the exclusion of SOEs in a particular year. The latter was on account of one of the

²¹ Centrally owned state owned enterprises are owned by the Government of India and these are distinct from public sector undertakings that are owned by individual State Governments.

following three reasons, namely that an SOE did not submit the completed survey form on time, due to full privatization of an SOE, or due to its winding up.

The final sample for our analysis consists of an unbalanced panel of 214 SOEs with data for at least one year, accounting on an average for more than 95 per cent of the number of SOEs and of total SOE assets in any year. Of these 214 SOEs, 133 have come under the MOU system at different points of time, and 81 have not. Of those under MOU, 39 SOEs in our sample have been partially privatized at least once during the period of study. Thus the sample data based on the type of reform that the SOEs have undergone, can be classified into three distinct categories, namely *Type-1*, *Type-2* and *Type-3*. *Type-1* firms, 81 in number, are the ‘no-reform’ SOEs, i.e., those that neither signed the MOU contract nor underwent partial privatization at any point of time during the sample period. *Type-2* SOEs, 94 in number in our sample, are those that have been subjected to *only* enterprise reform through the MOU system. This is the group that includes firms that were MOU signatories at some point in the sample period, but were not subjected to partial privatization at any point during the period under consideration. Typically, once an SOE has entered into an MOU contract, it has signed such contracts in all subsequent years.

The third category of SOEs, the *Type-3* SOEs, is those which have been partially privatized during the sample period. This type comprises of SOEs that have been under the MOU system as well as were partially privatized at some point of time. There are 39 such firms in our sample, for which, on an average, the government’s equity holding declined by around 15 percent. Of the 39 partially privatized SOEs included in the present study, 29 of them had undergone the first tranche of partial privatization by 1992-93, very close to the time when performance contracts were also introduced. Further, in 37 of the 39 SOEs partial privatization have followed autonomy, whereas in the remaining two, the opposite has happened with partial privatization preceding the signing of MOU by a year or two. Finally, the average gap between the first signing of MOU and first tranche of partial privatization in *Type-3* firms is around 1.5 years, with no gap between the two interventions for 13 firms.

The cross-section variation in our sample in terms of the three types of SOEs, along with over time variation where the first ten years of the data set are the no-reform years and the latter twenty mark both autonomy reforms and ownership changes pursued predominantly in a sequential fashion, yield sufficient firm-year observations to allow us to conduct a rigorous empirical analysis to measure the marginal impact of both reforms with a reasonable degree of precision by allowing us to select appropriate control and treatment groups and also in dealing with the problem of selection bias. We discuss these in greater detail below while outlining the empirical methodology of the study.

3.2 Variables

Turning to the key model variables, we measure the dependent variable Y_{it} , denoting SOE performance in terms of the return on assets (ROA), which captures the ability of management to convert a firm's capital into profits. The use of profitability as a yardstick for measuring SOE performance has gained importance over the years when governments world over started to feel the burden of loss- making SOEs on their budget deficits²². Accordingly, a large number of empirical studies examining the impact of reforms on SOE performance have adopted ROA as a measure of performance (Boardman and Vining, 1989; Boubakri and Cosset, 1998; Aivazian et al., 2005). The choice of ROA in examining the performance effect of autonomy on Indian SOEs is particularly relevant in view of the importance given to financial performance ratios in MOU contracts from the very beginning of the MOU program. Financial ratio as target criteria has been mandatory in the MOU contract, and by 1993-94, 50 percent weight was given to financial profitability in the composite score evaluation of targets set under the MOU contract, with almost 20 percent weight given to ROA by almost all SOEs signing the MOU contracts. The importance of profitability in defining performance targets in MOU is also borne by the fact that the profit earned by an SOE is one of the core criteria for the selection of SOEs for MOU Excellence Awards and Certificates.

In our study, ROA is defined as the ratio of profit before taxes to total assets. A similar definition of ROA has been adopted by most SOEs since 1993-94 as targets in their MOU contracts.

Our main variable of interest is the performance contract or memorandum of understanding, which we denote by *MOU* which captures the effect of enterprise reform on SOE performance. Under an MOU contract, individual enterprises sign the contract with their respective administrative ministries under the GOI at the beginning of a financial year. The enterprises are then evaluated at the end of the financial year against the targets set in the MOU contract. With the signing of an MOU contract, the signatory firm is expected to start striving towards fulfilling its targets set in the MOU. Thus, in our analysis, signing of the MOU contract is taken as the differentiating factor between firms that have not undergone enterprise reforms and those that have.

²²Some studies have used multi factor productivity (MFP) as a measure of performance of state owned enterprises. While this is an encompassing measure that captures the technical side of the operation of an enterprise, it does not capture the behavioral practice of an enterprise in terms of cost minimization and revenue maximization. Also, MFP estimation requires data on raw materials as inputs which is missing in many studies. This is an important issue as the relative importance of materials may vary substantially across industries and within an industry, over time.

With respect to the MOU signatories, it is expected that MOU will have an impact on the performance of the enterprise, but with a lag. The study captures this with a dummy variable *MOU* as has been the approach in existing studies on autonomy (see for example, Shirley and Xu, 2001; Xu et al., 2005). In our case, to take account of the time difference between the signing of the MOU and its evaluation, *MOU* takes the value 1 in period '*t*' if the enterprise had signed a MOU contract in the period '*t-1*'. Given the opposing theoretical predictions on the effect of performance contracts as discussed in the previous section, with the positive effect on the one hand of delegation of greater functional and operational autonomy to the top management to facilitate the firm in achieving targets, and the negative impact of increased managerial agency problems due to the reduction of government oversight, the net direction of the impact of MOU is *a priori* indeterminate. Though the first MOU contract was signed on an experimental basis by four SOEs in the year 1988, the system was re-cast a year later in 1989, with the core structure remaining the same since then²³.

While *MOU* is our key variable of interest, we consider an additional explanatory variable, namely partial privatization, *PPVT_SHR*, in order to evaluate whether ownership changes has an independent effect on performance notwithstanding enterprise autonomy through *MOU.PPVT_SHR* is measured by share of private equity in total equity of an SOE. Any positive value of *PPVT_SHR* measures the extent to which government ownership has been disinvested in an SOE.

To capture the impact of the two variables of interest, *MOU* and *PPVT_SHR* accurately and to avoid any spurious relationship between these variables and performance, the present study controls for other firm characteristics and environmental factors that may also affect SOE performance. A description of these and their possible effects is given next.

Given that most SOE activities were de-reserved at some point of time during our period of study, we define an indicator variable *DEREG* that controls for the effect on profitability of exposing an SOE to private sector competition. The dummy variable takes the value 1 for a firm for period '*t*' and all subsequent periods if the SOE belongs to the industry that was de-reserved in period '*t*' by the government. As much of the industrial organization literature predicts, increased competition through entry of firms is likely to put pressure on monopoly profits and reduce profit margins. Thus, de-reservation, *DEREG*, is expected to reduce a firm's profit ratio.

²³ The original system introduced in 1988 was modeled after the French system of performance contracts, but was restructured in 1989 in line with the signaling system introduced in Pakistan and S. Korea (Trivedi, 1990).

Another control variable widely regarded to be relevant for SOE performance is the soft-budget constraint. As Kornai (1989, 2003) argues, an SOE under state ownership is seldom allowed to fail even with consistent losses as the state typically acts as the universal insurance company compensating for every loss. A crucial feature of such a soft-budget constraint syndrome is that the bailouts are not completely unexpected, nor are they limited to one-off interventions. They include prolonged support by the state of SOEs suffering from persistent financial problems. Hence, in the presence of soft budget constraints, SOE managers feel little pressure to ensure SOE profitability. The impact of a soft-budget constraint, *SOFTLN*, is captured in terms of the ratio of loans borrowed by individual enterprises from the central government to total loans borrowed, lagged by one year, and is expected to have a negative impact on SOE profitability.

The other control variables that we include in our estimation are (i) export intensity, *EXPINT* which controls for the effects of exposure to international competition and measured as the proportion of exports to total sales (ii) depreciation intensity, *DEPINT*, proxying for capital intensity of the company's technological process and measured as the ratio of depreciation expenditure to sales (iii) size of the SOE proxied by log value of firm assets, *LNAST*, to reflect the effect of unobserved factors related to size²⁴ (iv) the effect of economy wide structural reforms, measured in terms of a dummy variable *LIB* that takes the value 1 for the financial year 1990-91 and all subsequent years and zero otherwise, seeks to capture the impact of industrial and trade liberalization initiated in India since 1991, wherein licensing requirements were abolished for all except 18 industries²⁵, and finally (v) year dummies, *YEAR*, to capture other economy wide shocks which might have an impact on SOE performance, but have not been fully accounted for by the other variables. The list of variables used in the study along with their descriptions is presented in Table 2.

3.3 Estimation Methodology

Our empirical methodology is closest in conception to the approach adopted by Brown et al.(2005) for measuring the effect of privatization for a large panel of firms in four transition economies. In applying the treatment-control framework to measure the effect of performance contracts on SOEs and subsequent ownership changes through disinvestment, we deal with two estimation problems that arise in measuring

²⁴As pointed out in the literature (Majumdar, 1998 and Sarkar and Sarkar, 2000), in the product market, size reflects possible entry barriers that might result from economies of scale. Size also reflects the extent of market power of a company. It is postulated to have positive impact on firm performance.

²⁵These industries were exempted because of their strategic and environmentally sensitive nature or their exceptionally high import content.

impacts of policy interventions. The first is the choice of appropriate benchmarks or control groups relative to which performance effects of a policy reform needs to be measured, and second is that of selection bias.

At the conceptual level, the effect of stimulus or treatment can be uncovered by contrasting the behavior of the treatment group with that of a control group with similar characteristics that did not receive the treatment. The challenge in most empirical work is to find a proper control group with respect to which the effect of the stimulus is to be measured. In many studies the control group is the treatment group itself prior to the application of the stimulus. These studies, known as “before-and-after” studies exploit the difference in behavior of the sample units before and after the application of the stimulus to quantify its effects. These studies perforce require long time series data to ensure adequate number of observations to get statistically meaningful estimates. This ensures that the estimated before and after difference reflects the permanent effect of the stimulus and not some transitory effects which may be difficult to disentangle when the after-treatment period is short. However, the disadvantage of these studies is that effect of the stimulus can be confounded by effects of other time varying factors which can operate in the post-treatment period.

Studies using the “difference-in-difference” (DID) approach try to handle the effect of confounding time varying factors by selecting a control group, similar in characteristics to the treatment group, and then studying the difference in their behavior before and after the application of the stimulus. The assumption is that since the control and treatment groups are similar in characteristics, the effect of confounding time varying factors are likely to be the same, and hence any difference in the difference of group behavior after the stimulus must be on account of the stimulus only. However, while in medical sciences the control group can be chosen to have the same characteristics as that of the treatment group so that the assumption of similarity of effect of confounding time varying factors after the application of the stimulus is satisfied, it is not easy to accomplish this in social sciences and therefore the differing characteristics of the control and treatment group need to be controlled. The usual assumption in empirical work is that the effect of each of these factors can be parameterized via a known functional form and therefore can be netted out using a regression framework.

However, both the before-and-after as well as the DID studies assume that the selection of the units in the treatment group and the control group is random so that the effect of the stimulus measured based on the sample units are applicable to the population as a whole. This is the issue of selection bias. Specifically in context of our study, a potential source of selection bias that better performing SOEs can be

systematically picked up by the government to prove the success of the reforms when faced with opposition from certain interest groups (Frydman et al., 1999). Such ‘cherry-picking’ (Chang et al., 2003), is likely to overestimate the effect of the reforms compared to that what would be obtained if the SOE’s were selected without regard to their success probability. The main issue here is the random assignment of units into the treatment group so that unconditional inferences may be made. A sample consisting of large cross section increases the probability that there could be potentially many sample units that could be subjected to the stimulus and accordingly the problem of selection bias can be relatively low compared to those in samples which have few cross sections and large time series observations. Coupled with such a large cross section sample, a long time series data ensures that the measured effects are permanent. Thus, a longitudinal dataset with both a large number of cross sections as well as long time series data provide a great opportunity to measure the effect of a treatment that is both unconditional and permanent.

In our estimation methodology we address the issue of an appropriate control group by undertaking both before-and-after analyses as well as a difference-in-difference analysis. Our longitudinal data of 214 cross sections (firms) which comprise of nearly 95% of the total SOEs in India, with an average of 26 years of time series observations per SOEs enable us to carry out both these analyses with large amount of precision. The long time series data per SOE has at least 10 years of data, on an average, each for the pre and post reform periods which ensure that the estimated effects are not transitory in nature. However, with such a long time series, confounding effects can be caused by unobserved factors that change over time. We account for these factors by including time specific fixed effects in our empirical models. Recognizing that time specific effects themselves may not be uniform across all cross sections, we also include industry level fixed effects in our empirical specification.

With respect to selection bias we handle the problem in two ways. First, we address the problem of cherry-picking by including group specific fixed effects for the different types of SOEs in our empirical models. The group specific fixed effects ensure that any improvement in post reform performance is measured relative to the pre reform performance of the same selected group. Second, exploiting the advantage that we have in terms of a large number of observations of different types of enterprises with varying types of reform experience over time, we address the issue of selection bias by carefully selecting alternate sub-samples to estimate reform effects rather than by the usual econometric way of undertaking instrumental variable estimation. In many empirical studies, the instrumental variable method is adopted due to limited number of observations. However, the challenge of finding the correct instruments sometimes makes the estimation results sensitive to the choice of the instruments. As outlined earlier, the SOEs in our sample can be split into three types namely, those with no reform (*Type-I*), those with only

autonomy (*Type-2*), and those with autonomy and partial privatization (*Type-3*). Thus the effect of autonomy can be uncovered by contrasting the performance of the *Type-1* SOEs with that of *Type-2* and *Type-3* SOEs or alternatively by contrasting the performance of the *Type-1* SOEs with that of *Type-2* SOEs or *Type-1* SOEs with that of *Type-3* SOEs. In other words, there are many control and treatment groups in our study. If the difference in the behavior of the treatment and control group remains significant for various alternate choices of the control and treatment group, then the inference that the differential effect is due to the stimulus only becomes stronger.

Finally, in estimating the effect of SOE reforms via performance contracts and partial privatization, we allow for the possibility that enterprises may be “prepared for reforms” through preemptive changes in organization structure and modes of operation before the actual reform is implemented. We term such possible run-up as the ‘preparation effect’ and estimate for each relevant sample, two specifications, one without, and one with such preparation to illustrate the point. Evidence of such preparation effects has been well documented in studies focusing on measurement of policy changes (Brown et al., 2005; Malani and Reif, 2011).

To incorporate preparation effects we create three dummy variables, *mou_prep₁* and *mou_prep₂* and *mou_prep₃*, each of which represents a particular year before the enterprise signed the MOU contract. Thus, the dummy variable *mou_prep₁* represents one year prior to the year the enterprise signed the MOU contract, *mou_prep₂* represents two years prior to the year the enterprise signed the MOU contract, and *mou_prep₃* represents three years prior to the year the enterprise signed the MOU contract. These dummy variables are expected to capture preparation effects one to three years prior to the year of signing the MOU contract. In addition, we also include a dummy variable *mou_prep₀*, to capture possible preparation effects in the year of signing the MOU as there is generally a lag between the signing of the MOU and the actual operation of the enterprise under the MOU contract. For capturing preparation effects for disinvestment, we similarly create three dummy variables *ppvt_prep₁*, *ppvt_prep₂*, and *ppvt_prep₃* which represent the first, second and third year respectively, prior to the year the enterprise was disinvested. We do not include the corresponding dummy *ppvt_prep₀* since there is no lag between disinvestment and actual operation of the enterprise under partial private ownership.

Given the above discussion, our empirical model for estimating the effect of autonomy and partial privatization on SOE performance takes the form:

$$Y_{it} = \alpha_G + \lambda_t + \eta_I + \beta'X_{it} + \eta'W_{it} + \gamma'Z_{it} + \varepsilon_{it} \quad (1)$$

Where,

- Y_{it} - represents the performance variable, *ROA*, for firm 'i' at time 't,'
- α_G - represents the group specific effects for *Type-1*, *Type-2* and *Type-3* SOEs
- λ_t - represents the time fixed effects
- η_I - represents the industry fixed effects
- X_{it} - represents the variables of interest, *MOU* and *PPVT_SHR*
- W_{it} - represents the preparation effects
- Z_{it} - represents the control variables
- ε_{it} - represents the error term

Given the general specification of the empirical model in Equation (1), we now elaborate our choice of the appropriate sub-sample and hence the control group against which the marginal effect of MOU and that of partial privatization on firm performance is estimated. Table 3 and Table 4 highlight the sample details and the variations in the cohort groups that one can construct from our full sample. As can be seen from Table 3, there are a total of 5500 firm year observations during the period of our study of which 1851 observations belong to 81 SOEs that have not been subjected to either MOUs or partial privatization, i.e., *Type-1* SOEs, 2569 observations to enterprises that have been under the MOU system at some point during the period of our study, i.e., *Type-2* SOEs, and finally 1080 observations across enterprises subject to partial ownership divestiture at some point during the sample period, and also by and large being under the performance contract system, i.e., *Type-3* SOEs.

For the 94 *Type-2* SOEs, the number of pre-MOU observations per SOE, on an average is 16.85 and the corresponding number of post-MOU observations is 10.48. For the 39 *Type-3* SOEs, 31 were subjected first to MOU and then partially privatized, and eight were first partially privatized and then subsequently brought under the MOU system. In both cases, the lag between partial privatization and autonomy was on an average less than a year, as is evident for example from the few firm year observations (31) pertaining to *Type-3* firms that have been granted autonomy, but have not yet been partially privatized. For *Type-3*

SOEs we have substantial pre- and post-partial privatization observations on an average, around 10²⁶ and 17, respectively.

The importance of segregating the sample observations by Types of SOEs to estimate the effect of the reforms under question is brought home by the fact that if we pool observations across types of SOEs and consider all the three types together to estimate the effect of either autonomy or partial privatization, we automatically find that there is a striking imbalance between per unit pre-reform observations and post-reform observations, both with respect to MOU and partial privatization; the average number of pre-reform observations being 17.74 and the average number of post-reform observations pertaining to MOU and partial privatization being 4.74 and 3.21, respectively. As Brown et al. (2005) have pointed out, such sparse post-reform observations stand in the way of reliably identifying a reform effect and of controlling for possible selection bias in the reforms process. Based on the estimates provided in Table 3, one can make the limited observation that our sample has substantial variation in terms of the status of reforms undergone by the SOEs over a thirty year period, as well as sufficient number of pre- and post-reform observations allowing us to identify both a post-autonomy effect and a post-partial privatization effect by exploiting not only cross-section variation but also by estimating before and after effects using long time series observations. If one considers comparable studies estimating the impact of autonomy and other organizational reforms such as corporatization and partial privatization on SOEs (see for example Shirley and Xu, 2001; Xu et al, 2005; Aizabian et al., 2005) predominantly all of which are with respect to Chinese SOEs between the eighties and nineties with limited pre-reform and post-reform observations, much of the results in these studies are driven by cross-section variation of a sample of SOEs that have undergone a reform initiative during the period of study²⁷.

Finally, as seen in Table 4, our sample with both cross-section and longitudinal data allows us to estimate Equation (1) to capture the effect of MOU and partial privatization on SOE performance on a variety of sub-samples (SS1 – SS6). Each estimation is distinct in terms of measuring the impact of a reform measure against a different cohort of SOEs. As we discuss below in Sections 3.3.1 and 3.3.2, we measure the MOU and partial privatization effect using different combinations of SOE types, ranging from including only one type at a time such as in Sub-Sample SS3 and SS6, to including a combination of types such as SS1, SS2 and SS5, to pooling all types as in Model SS4.

²⁶ If we club the pre-privatisation observations (including those pertaining to MOU) with the no-reform observations for Type-3 SOEs, the average number of pre-reform observations is 10.07.

²⁷ For instance, Shirley and Xu (2001) analyzes the impact of performance contracts on 769 SOEs over a ten year period, 1980-89, considering only SOEs that had come under the performance contract system. Hence, both the pre- and post-reform observations were limited and the results were primarily drawn by cross-section variation. Similarly, Xu et al. (2005) considered annual data on 442 SOEs for only a ten year period, between 1990-99.

3.3.1 Measuring the MOU Effect

Since our primary focus is on the effect of enterprise autonomy, our estimation strategy is to first measure as cleanly as possible the impact of MOU on SOE performance. For this purpose, we estimate three variations of Equation (1) over sub-samples SS1—SS3, each with a different cohort of SOEs against which the impact of MOU is measured.

In SS1, we consider a sub-sample consisting of all SOE observations in our sample *excluding* those pertaining to post-partial privatization (Table 3). That is, the sub-sample comprises of all observations related to *Type-1* and *Type-2* SOEs, and in the case of *Type-3* SOEs, all observations prior to their share divestment. By excluding the post-partial privatization observations, we focus solely on the performance of SOEs that have signed MOUs vis-à-vis firms that have not. Thus the cohort against which the MOU effect is measured is *Type-1* comprising only of the ‘no-reform’ SOEs. The model to be estimated is given by Equation (1) above, but excluding a truncated set of observations for *Type-3* firms. Both cherry-picking dummies are included as the sample includes *Type-2* and *Type-3* SOEs. Equation (1), estimated for SS1 is therefore specified as:

$$Y_{it} = \alpha_2 + \alpha_3 + \lambda_t + \eta_l + \beta_1 MOU_{it} + \gamma'Z_{it} + \eta'W_{it} + \varepsilon_{it} \quad (1-SS1)$$

Compared to the number of firm year observations of 5500 over the entire sample as given in Equation (1), Equation (1-SS1) is estimated over 4813 observations excluding those pertaining to partial privatization. Thus, the coefficient of *MOU* in Model (1-SS1), i.e., β_1 captures the effect of enterprise autonomy on SOE performance relative to all SOEs that have not been under the MOU system.

The second estimation is based on sub-sample SS2, which excludes *Type-1* SOEs, and focuses only on SOEs that came under the MOU contract. The sample in this case comprises of all pre- and post- MOU observations of *Type-2* firms and pre-privatization observations (like SS1) of *Type-3* firms. Thus, the effect of MOU is measured in SS2 against the pre-MOU performance of MOU signatories. This eliminates the need to control for the first source of selection bias of better SOEs self-selecting to becoming more autonomous and as discussed earlier, is expected to lend more precision to the estimates.

$$Y_{it} = \alpha_3 + \lambda_t + \eta_l + \beta_1 MOU_{it} + \gamma'Z_{it} + \eta'W_{it} + \varepsilon_{it} \quad (1-SS2)$$

Finally, while both the samples SS1 and SS2 enable us to control for self-selection by incorporating the cherry-picking dummies, these could albeit be imperfect, and our best case scenario would be to choose a

sample that do not suffer from potential self-selection bias. This is done through a before and after estimation of only *Type-2* firms, i.e., comparing performance levels of *Type-2* firms before and after signing MOU. In this case, the control group is identical in all other respects except for the policy intervention, so that specification errors that may arise from time-variant statistical differences in the inherent characteristics of the ‘treated,’ and the cohort used for benchmarking, are eliminated. As stated earlier, with a sufficiently long panel of pre- and post MOU observations on *Type-2* firms, such estimation is possible in our case and is carried out over sample SS3. Equation (1) can then be re-written as follows (1-SS3) where, as compared to Equations (1-SS1) and (1-SS2), we drop the unobserved group specific effects α_m as we consider the same set of SOEs before and after coming under the MOU contract.

$$Y_{it} = \lambda_t + \eta_l + \beta_2 MOU_{it} + \gamma'Z_{it} + \eta'W_{it} + \varepsilon_{it} \quad (1-SS3)$$

3.3.2 Measuring the Partial Privatization Effect

As discussed in the introduction, an on-going debate on the desirability of enterprise autonomy vis-à-vis privatization, apart from the question of whether the former is necessary, is whether it is sufficient for increasing SOE performance, or whether ownership still matters. The Indian experience, where some SOEs have been partially privatized, post enterprise autonomy, allows us to address this question.

The methodology measuring the effect of partial privatization on SOE performance is guided by the same rationale underlying measuring the MOU effect, of controlling for unobservable firm fixed effects and for increasing the precision of estimates through choosing different cohorts to take care of selection bias problems that can arise from time-variant unobservable firm-specific characteristics.

As in the case of MOU, the estimation of the effect of partial privatization measured in terms of *PPVT_SHR* for the different sub-samples is based on Equation (1), with specifications differing across sub-samples in terms of the inclusion of firm-specific fixed effects in the models. In particular, we estimate the partial privatization effect over three sub-samples, SS4-SS6, each model distinguished by a different cohort against whom the partial privatization effect is measured. However, before estimating these three models, we run a similar partial privatization model ignoring the fact that some of these enterprises had been given autonomy prior to partial privatization. We run this regression to illustrate the point that studies which ignore autonomy aspects may mistakenly pick up the autonomy effect as the partial privatization effect.

Starting off with SS4, we estimate the impact of partial privatization on the entire sample of firm-year observations comprising of *Type-1*, *Type-2* and *Type-3* firms. That is, for the entire sample, we estimate, Equation (1). Given that all partially privatized SOEs were also under MOU, the coefficient of the partial privatization variable in this case captures its incremental effect over and above that of MOU. The regression incorporates the two group effect variables α_2 and α_3 as all SOE types are included. So the relevant equation to estimate on SS4 is given by:

$$Y_{it} = \alpha_2 + \alpha_3 + \eta_t + \lambda_t + \beta_1 MOU_{it} + \beta_2 PVT_SHR + \gamma'Z_{it} + \eta'W_{it} + \varepsilon_{it} \quad (1-SS4)$$

With regard to SS5, we exclude the *Type-1* firms and estimate Equation (1) for all observations pertaining to *Type-2* and *Type-3* firms. Thus, sample observations include pre-MOU observations of *Type-2* and *Type-3* firms, post-MOU observations of *Type-2* firms, and pre-and post MOU and partial privatization observations of *Type-3* firms. However, given that *Type-1* firms are excluded from the sample observations, the fixed effect α_2 is dropped from Equation (1), as we have to deal with only one source of selection bias, that of the better SOEs under MOU being potentially chosen for partial privatization. Given that selection bias is never perfectly controlled for, one would expect a greater precision in estimates using SS5, as compared to SS4.

$$Y_{it} = \alpha_3 + \lambda_t + \beta_1 MOU_{it} + \beta_2 PVT_SHR + \gamma'Z_{it} + \eta'W_{it} + \varepsilon_{it} \quad (1-SS5)$$

Finally, similar to SS3 in the context of MOU, we use sub-sample SS6 to conduct a before and after study on only *Type-3* SOEs, those that have undergone both autonomy and partial privatization and compare their performance before and after partial privatization. Given that in SS6, the sample observations are restricted only to *Type-3* firms, we do not need to deal with measurement issues related to time variant factors that can lead to differential effect of MOU on *Type-2* and *Type-3* firms which can otherwise be picked up by the partial privatization variable in Equations (1-SS4) and (1-SS5). Hence with SS6, Equation (1) assumes the following specification:

$$Y_{it} = \lambda_t + \eta_t + \beta_1 PVT_SHR + \gamma'Z_{it} + \eta'W_{it} + \varepsilon_{it} \quad (1-SS6)$$

Like the case of autonomy, in estimating all these models we allow for the possibility that enterprises may get ready to be partially privatized subsequently, and therefore estimate two specifications for each sub-

sample, SS4-SS6 one without and one controlling for such partial privatization preparation effects, along with controlling for the corresponding MOU effects wherever relevant.

4. Regression Results

4.1 Descriptive Statistics

All regressions are estimated after taking care of the presence of influential observations by truncating the distribution of the dependent variable at 1 percent low and 1 percent high ends of the distribution.

The mean and standard deviations for our performance measure, ROA, along with the main control variables, for the three categories of SOEs, *Type-1*, *Type-2* and *Type-3*, are given in Table 5 (a). Further, the null hypothesis of equal means for various sub-groups is tested using paired *t-test*²⁸, results of which are given in Table 5(b). As is evident from Table 5 (b), for most variables, the null hypothesis of equal means was rejected. Specifically, with respect to ROA across all categories, it is found that as compared to the no-reform SOEs (*Type-1*), the profitability of SOEs under MOU (*Type-2*) as well as those which were partially privatized (*Type-3*), is on the average, higher. Similarly, when one compares *Type-2* with *Type-3*, one finds that the profitability of SOEs which have been granted autonomy as well as been partially divested of government ownership, perform significantly better (at 1 per cent level of significance) than those with only enterprise autonomy (11 per cent as compared to around 4 per cent).

Given that the profitability measures for SOEs undergoing reforms show a higher average for *Type-3* SOEs as compared to *Type-2* SOEs, which have higher averages compared to *Type-1* SOEs, there is a possibility of cherry-picking, of better performing SOEs being systematically selected for policy interventions. The other possibility is that present or absent selection bias, reforms have had a positive impact on SOE profitability. Among the other firm characteristics, what is notable is that *Type-3* SOEs are seen to be significantly larger in size, followed by *Type-2* SOEs and *Type-1* SOEs. *Type-3* SOEs as compared to the other categories of SOEs are found to borrow significantly lower (at 1 % level of significance) than both *Type-2* and *Type-1* SOEs. Export intensity is the highest for *Type-3* SOEs and depreciation intensity for *Type-2* SOEs the lowest.

²⁸The Satterthwaite method was used to test the means.

4.2 Estimation Results

4.2.1 The MOU Effect

Column (i) of Table 6 shows the regression results run on sub-sample SS1, without controlling for MOU preparation. The variable *MOU* is positive and highly significant in the regression implying that granting of autonomy to SOEs significantly increases their profitability performance. The associated coefficient implies a 6.0 percent increase in average return on assets per year.

The effect of the control variables are along expected lines. Availability of soft loans, *SOFTLN*, has a negative effect on enterprise performance while liberalization of the industry in which the enterprise operates, has a positive effect. While there could be a potential reverse causality issue with respect to soft loans, to some extent this endogeneity is broken by measuring this variable with lags. We re-estimated the model by using a one-year lagged measure of *SOFTLN* and we do not find any substantive change in the sign, size or significance of the coefficients of interest. Larger enterprises as proxied by the variable *LASSET*, experience lower rates of return possibly due to diminishing returns while enterprises with higher export intensity, *EXINT* exhibit higher performance possibly due to exposure to foreign competition. Finally, enterprises with higher capital intensity, as proxied by *DEPINT*, experience lower rates of return.

The coefficients on the variables, α_1 and α_2 that control for group effects and potential selection bias are suggestive. Both coefficients are positive and highly significant, confirming that there is indeed selection bias in the choice of enterprises that are subjected to reforms. Noticeably, the coefficient on α_2 is significantly larger in magnitude than that on α_1 implying that the enterprises that were selected for partial privatization following the grant of autonomy under MOU were better-performing than those selected only for MOU. We have more to say about this selection bias while discussing the regression results that follow.

Column (ii) of Table 6 presents the regression results, again run on sub-sample SS1, but now with control for possible preparation for MOU. As argued earlier, enterprises might be "prepared" for the granting of autonomy so that the devolution of autonomy does not lead to any unexpected results. The coefficient on all the four dummy variables *mou_prep0*, *mou_prep1*, *mou_prep2* and *mou_prep3* that allow for enterprise performance to differ in the year and up to three years prior to granting of autonomy²⁹ are all positive and highly significant. Controlling for such preparation, the coefficient on the variable *MOU* continues to be positive and highly statistically significant. Noticeably, the magnitude of this

²⁹The dummy variables that allow performance to differ in years beyond three are not significant in the regression.

coefficient is higher than those associated with the preparation variables suggesting that the actual grant of autonomy increases performance beyond those observed in the preparation years. The *F-test* with the null hypothesis that all the coefficients associated with the preparation variables and the *MOU* are same vis-a-vis the alternative hypothesis that the coefficient on *MOU* is higher than that associated with the preparation variables (confirmed to be equal), returns an *F* value of 40.71 which is significant at one percent. It is also instructive to note that the magnitude of the *MOU* variable in Column (ii) is higher than that associated with it in Column (i), implying that once the preparation effect is controlled for, the effect of granting autonomy is significantly higher at 7.6 percent compared to 6.0 percent as reported in Column (i). The coefficients on all the control variables in Column (ii), retain their sign and significance as observed in Column (i). In Columns (i) and (ii) of Table 4, the dummy variables α_1 and α_2 represent the difference in average performance of the *Type-2* and *Type-3* enterprises from the *Type-1* enterprises, i.e., those which were neither granted any autonomy nor were subject to partial privatization. As outlined earlier, an implicit assumption in the above two specifications is that the difference in performance between the *Type-1* and the *Type-2* enterprises, as also the difference between the *Type-3* and *Type-1* enterprises, remains constant over time. This assumption, as we have argued earlier may be suspect, because the performance of *Type-1* firms may deteriorate over time. Indeed declining performance may be the reasons why these enterprises have not been given autonomy or subjected to partial privatization. If this is indeed a possibility, then α_1 and α_2 will not be able to control for this time variant effect and accordingly the large magnitude of the coefficient associated with *MOU* may be picking up the deteriorating performance of the *Type-1* enterprises rather than the improved performance of the *Type-2* and *Type-3* counterparts. As we have argued earlier, one way to handle this time variant effect with respect to the *Type-1* firms is to drop them from the sample and re-run the models with only the *Type-2* and *Type-3* enterprises i.e., with SS2 as the relevant sample.

Columns (iii) and (iv) report the regression results of without and with preparation for *MOU* when the regression is run on the SS2. In both Columns (iii) and (iv), *MOU* remains positive and highly significant, and with very high magnitude. The results in Column (iii) show that granting autonomy increases ROA by 6.3 percent. In Column (iv), which controls for the preparation for autonomy, the effect is significantly higher, estimated at 8.1 percent. Thus, our earlier finding of a positive and significant effect of autonomy on performance is not caused by the deteriorating performance of the *Type-1* enterprises which provide the base for the measurement of effect. Omitting *Type-1* enterprises from the estimation in fact leads to a higher estimated value of the coefficient associated with the *MOU* variable. These results provide strong evidence that granting autonomy to SOEs significantly improves their profitability.

In Columns (iii) and (iv) of Table 6, we again observe that the coefficient associated with α_2 is positive and highly significant. Carrying forward our earlier argument that the coefficient which captures the difference in average performance of the *Type-3* enterprises from the *Type-2* enterprises, may not be able to perfectly control for time-variant factors. In particular, if there is preparation for privatization then any corresponding positive effect would be picked up by the *MOU* variable. Alternatively, the effect of granting autonomy may itself be different for the *Type-3* enterprises. While it is possible to control for these factors by including additional dummy variables and interaction effects in the above models itself, another way to account for these effects is to drop the *Type-3* enterprises altogether and estimate the models only with the *Type-2* enterprises which were granted only autonomy with no subsequent partial privatization. This obviously leads to a loss in the degree of freedom but the large number of observations that we have for the *Type-2* enterprises allows us to adopt this relatively cleaner approach compared to the inclusion of dummy variables and interaction effects which themselves require an assumption of time invariance.

Accordingly in Columns (v) and (vi) of Table 6, we re-estimate the two models, without and with *MOU* preparation, by considering only the *Type-2* enterprises, i.e., sub-sample SS3. Accordingly, the results of these two regressions can be looked at as a pure "before-and-after" study. We observe that in both these models, the variable *MOU* retains its high statistical significance, is positive and of similar magnitude. In the Model without controlling for preparation for autonomy, granting of autonomy leads to 6.2 percent increase in *ROA* while in the model that controls for the preparation for autonomy, the effect is again higher and estimated at 8.0 percent. Both coefficients are comparable to those found using sub-sample SS2. In summary, the results presented in Table 6 provide very strong evidence that granting of autonomy to SOEs in India improves their profitability performance. The effects are large and robust and are not due to selection bias or due to lack of proper control for time variant factors.

4.2.2 Interaction Effects

An important research question with regard to SOE restructuring through various policy initiatives is to examine the possible complementarities or substitutability among different reform measures. As Djankov and Murrell (2002) point out in their survey of the literature on restructuring of SOEs in transition countries, while the answer to this question is important from the view of policy making, neither existing theoretical nor empirical literature have unambiguously resolved it.

In the context of our study, bringing SOEs under the performance contract system over time in India has been accompanied by the deregulation of many of the industries in which SOEs have traditionally

operated. Estimation results in Table 6 consistently show that deregulation does not have an independent impact on SOE profitability, whereas MOU does have a strong positive effect. However, given that deregulation can potentially increase competitive pressures, an open empirical question in this regard that we examine is whether the impact of *MOU* would be greater in SOEs that were opened up to competition from private sector entities relative to those that were not, i.e., the reforms are complementary, or whether the two have had substituting effect on performance. In a similar vein, one of the major concerns for SOEs worldwide have been the absence of hard budget constraints for weakly performing SOEs, a point that we made earlier while discussing the inclusion of *SFTLN* as a control variable. The earlier results show that the availability of soft loans, in general, has a negative effect on enterprise performance, whereas MOU has a positive effect. The relevant question here is whether a relaxation of the soft budget constraint at the margin reduces the incentives of managers to meet their performance targets under the MOU system, or conversely, whether a hardening of the soft budget constraint motivates the managers to exploit more the potential performance benefits to be realized through increased autonomy.

We examine the impact of deregulation and soft loans on the marginal impact of autonomy on SOE performance by interacting *MOU* each with *DEREG* and *SFTLN* to create two interaction terms respectively, *DEREG x MOU* and *SFTLN x MOU*. Using these variables, we re-estimate the regressions on the SS1, SS2 and SS3 samples. In all these models we control for the preparation for the *MOU* effect for which we have earlier found strong evidence. The results of these three regressions are presented in Columns (i), (ii) and (iii) of Table 7.

The coefficient estimates show that the interaction effects are significant in all but one case. With regard to deregulation, coefficient estimates of *DEREG x MOU* in columns (i) and (ii) of Table 7 show that the coefficient of the interaction term is positive and significant at the 5 per cent and 10 per cent levels in sub-samples SS1 and SS2 respectively. As in the previous estimations, MOU continues to have a positive and significant effect at the 1 per cent level, and the coefficient of *DEREG* insignificant, for all three sub-samples. The positive and significant effect of *DEREG x MOU* suggests that while deregulation is not found to have an independent effect on profitability, it complements the impact of autonomy on SOE performance as the effect of MOU is stronger in SOEs that were deregulated compared to those that were not. We do not find such a significant complementary effect in SS3 that considers only *Type-2* firms. The weakening of this coefficient is possibly due to the fall in discriminatory power of this variable in this sample which does not contain the *Type-3* firms for whom the complementary effect of deregulation on MOU is likely to be higher.

Turning to the interaction between soft loans and autonomy, the coefficient estimates of *SFTLN x MOU* does indicate that the availability of soft loans weakens the effect of autonomy on enterprise performance. The coefficient on the interaction variable *SFTLN x MOU* is negative and statistically significant in all the three sub-samples. In Column (i) the positive effect of granting autonomy is weakened by 4.2 percent in the SS1 sample. The corresponding estimates in sub-samples SS2 and SS3 are higher and estimated at 6.4 percent and 6.2 percent, respectively. However, in all the three samples, the estimated coefficient on the interaction variable is similar in magnitude to that on the *MOU* variable suggesting the effect of granting of autonomy is almost neutralized by the availability of soft loans to SOEs. A statistical test fails to reject the null hypotheses that the total effect of *MOU* (which is the sum of the coefficient on the *MOU* variable and the interaction term) is zero at the one percent level in all the three models. These results show that the autonomy effect is weaker in enterprises with higher availability of fall back options in the form of soft loans. This is to be expected as managerial incentives to improve performance through exploiting greater autonomy in decision making is likely to be weakened if managers do not face hard budget constraints³⁰.

Our findings on the effect of *MOU* on profitability of Indian SOEs strongly suggest that delegation of autonomy to SOE managers under the performance contract system in India has had a statistically significant positive effect on the return on assets. Our findings are robust after controlling for selection bias and across a variety of sub-samples and control groups that include the three types of SOEs, excluding SOEs that have not undergone any reforms (*Type-1*) as well as focusing only on SOEs that have been only reformed through performance contracts (*Type-2*).

The positive effect of performance contracts that we find in our study are in contrast to the findings of studies examining the effect of autonomy and incentives on profitability and total factor productivity with respect to Chinese SOEs. While Xu et al. (2005) find that increased autonomy leads to both a decrease in the return on assets as well as changes in ROA, Li and Wu (2002) find mixed evidence of autonomy on total factor productivity. The findings by Shirley and Xu (2001) on the productivity effects of performance contracts in China are inconclusive too. However, similar to our finding, the study does find that the effect of performance contracts is stronger in competitive environments.

The positive impact of performance contracts through the memorandum of understanding that we find in the case of Indian SOEs suggest that the beneficial effect of increased managerial autonomy outweighs

³⁰ As in the case of the estimates in Table 4, we re-estimated the models in Table 6 using a lagged value of soft loans. All our results go through with the lagged specification.

the increased managerial agency costs that may arise due to less political monitoring. In the Indian scenario, managerial agency costs on account of increased autonomy are unlikely to be exacerbated as the appointment and tenure of chief executive officers of SOEs are under the control of the government so that, as Xu et al. (2005) argue, SOE managers would have to be accountable to the government and therefore less likely to abuse the power that comes with autonomy.

4.2.2 The Partial Privatization Effect

We now turn to the measuring of effect of partial privatization on enterprise performance conditional on the fact that partially privatized SOEs were also under performance contracts prior to or coinciding with partial privatization, and continuing to be under MOU, post privatization. The key point of inquiry in this exercise is to find out whether ownership matters notwithstanding enterprise autonomy.

The empirical literature on measuring the effect of partial privatization as opposed to full privatization has been rather scant. Existing studies have typically measured the impact of partial disinvestment by contrasting the performance of enterprises post-partial privatization, with their performance prior to partial privatization as well as with the performance of enterprises that were never partially privatized (see Gupta, 2005, 2011; Chen et al., 2006; Li and Yamada, 2013)³¹. However, partially privatized enterprises may have been granted autonomy prior to partial privatization, and this autonomy effect can potentially influence the measurement of the partial privatization effect. Our earlier results in Tables 4 and 5 point to this possibility. Many empirical studies have been unable to address this issue either because autonomy and partial privatization may not have been implemented together in the settings in which these studies are set (Nahadi and Suzuki, 2012), or even if both were implemented as in China, were not reflected in the relevant datasets (Shirley and Xu, 2001; Li and Yamada, 2013). The only exception in this regard is the study by Li and Wu (2002) which examined the relative efficacy of managerial autonomy versus ownership reforms over a fourteen year period 1980-94 using a panel data of 680 firms. In this case, the underlying methodology was a fixed-effects pooled cross-section time series analysis rather than a before and after study with respect to each type of reform. After accounting for both reforms, the main finding of the study was that while autonomy had mixed effects on productivity, ownership changes positively impacted it.

In the case of Indian SOEs, as mentioned earlier, while the impact of partial privatization has been estimated by Gupta (2005; 2011), the studies do not control for the effect of enterprise autonomy in order

³¹ This is the case for privatization studies too as observed by Megginsson and Netter (2000).

to find the marginal effects of partial privatization. Since autonomy through MOU and partial privatization have been adopted sequentially since the early 1990s, our submission is that not accounting for the former while evaluating the partial privatization effect may bias the findings³². This is all the more so in light of our findings of a robust positive impact of MOU across samples, which begs the question of whether the positive partial privatization effect that is found in earlier studies that do not control for the MOU effect is actually the autonomy effect.

To find out the ownership effect after taking into account enterprise autonomy, our estimation strategy, as in the case of MOU, is to consider three distinct sub-samples discussed above, namely SS4, SS5 and SS6, comprising of different combinations of SOE types, and estimate respectively two versions of Equations (1-SS4), (1-SS5) and (1-SS6), one without and one with the preparation for partial privatization effects. As and where applicable, we control for possible selection bias through the introduction of the two group dummies namely α_1 and α_2 . The results of the estimations are presented in Table 8. Columns (i) and (ii) of Table 8 report the results of the regression on the SS4 sample which uses all three SOE types, namely *Type-1*, *Type-2* and *Type-3*, and all the observations from Regimes 1, 2 and 3. We observe from the estimates in column (i) of Table 8 that while the variable *MOU* and the associated preparation variables all retain their sign and significance as found earlier in Tables 6, the partial privatization variable *PPVT_DUMMY*, is negative and significant in the regression. However, once we control for the preparation for partial privatization for the duration of three years prior to the event, we do not find any partial privatization effect. With control for preparation for partial privatization, the partial privatization variable *PPVT_DUMMY* itself loses its statistical significance with the P-value reducing from around 3 percent to 16.2 percent. Estimates of the partial privatization preparation variables, *ppvt_prep1*, *ppvt_prep2*, and *ppvt_prep3* also show the absence of any preparation for partial privatization, which is consistent with the findings with respect to *PPVT_DUMMY*.

In contrast to the partial privatization effect, the autonomy variable *MOU* continues to remain significant and positive with a large magnitude comparable to the results found earlier. Note that the SS4 sample contains all observations from all three regimes compared to only Regime 1 and Regime 2, and part of Regime 3 used in the analysis of autonomy in Tables 6. This suggests that the effect of autonomy found earlier in a smaller time series sample holds up in the extended sample. These results show that once we

³² Both of Gupta's studies, in estimating the impact of partial privatization, have controlled for firm-fixed effects, which one may argue would take care of the autonomy effect. However, as has been the case with partial privatization, Indian SOEs have come under the MOU system at different points of time since 1989, and hence its effect on firm performance cannot be taken as unobservable fixed firm level characteristics that can be accounted for with firm-level fixed effects.

control for autonomy, its preparation effects and partial privatization preparation effects, there is no incremental improvement in enterprise performance following partial privatization over and above that which result from the granting of autonomy.

We seek to confirm these results by re-estimating the above two models, one without and one with preparation for partial privatization, by first dropping the *Type-1* enterprises from the sample (i.e. using the Sample SS5) and second by further dropping the *Type-2* enterprises from the sample (i.e., using Sample SS6). We do this in keeping with our earlier argument that the fixed group effects captured by the variables α_1 and α_2 may not be able to control for time-variant effects which could then show up in the partial privatization variable. We discussed earlier that the time variant effect could be present due to deteriorating performance of *Type-1* enterprises and the differential effects of autonomy on *Type-2* and *Type-3* enterprises. Columns (iii) and (iv) of Table 8 show the regression results when the models are estimated using sub-sample SS5, while Columns (v) and (vi) of Table 8 show the results when the models are estimated as a before-and after analysis using sub-sample SS6. The latter is analogous to the use of sub-sample SS3 to undertake a before and after analysis of MOU.

In Columns (iii) and (iv) of Table 8, we observe that the partial privatization variable, along with partial privatization preparation variables continue to remain statistically insignificant while the *MOU* continues to remain positive and highly significant in the regression under both specifications. Thus omitting the *Type-1* enterprises does not influence the estimation of the partial privatization effect. Similarly, in Columns (vi) of Table 8, that report the before and after estimation results on only *Type-3* SOEs, we observe that the partial privatization variable is statistically insignificant while the autonomy variable retains its sign and magnitude. The results obtained in Columns (ii), (iv) and (vi) of Table 8 thus provide us with strong evidence of absence of any effect from partial privatization while the effect of autonomy continues to be positive and robust in all the regressions. Further, comparing the P-values associated with both autonomy and partial privatization across the three sub-samples, SS4-SS6, we find that considering the more general models with both MOU and partial privatization preparations, while the level of statistical significance of the MOU variable remains unchanged at one per cent, that with respect to *PPVT_DUMMY*, dips from around 16 per cent in column (ii) to 57 per cent in column (iv) to 60 per cent in column (vi) (not reported)³³.

³³In unreported results, we also estimated the regressions reported in Columns 3 to 6 by the dropping the Regime 1 observations pertaining to the Type-2 and Type-3 enterprises to take into account the presence of possible time variant effects in the performance of these enterprises. All our results remain robust both qualitatively and quantitatively.

In the estimations presented in Table 8, the effect of partial privatization is measured in form of a dummy variable. A dummy variable measures the average effect of all partial privatization events without taking into account the level effect. However, the effect of partial privatization can depend critically on the level of ownership that is disinvested. In particular the sale of very low amount of equity stakes may not generate enough incentive for the buyer to exert much effort for enterprise gains. In particular, devolution of too little stakes may not give the buyer the minimum threshold of control that is required to effect changes in the organization structure as well as the operation of the enterprise so that the government remains the *de facto* owner and the manager. It is only when a sufficient amount of equity stakes is privatized can one expect to see results from partial privatization.

To address this argument, and to take into account possible level effects in the partial privatization variable as has been done in many privatization studies, we re-estimate our partial privatization regression with these three alternative level specifications for the three samples SS4-SS6 by introducing instead of the dummy variable, the percentage share of equity held by private entities, *PPVT_SHR* through a simple linear specification. We estimate this regression with control for preparation for partial privatization effects to conserve space. Our results remain robust if we omit the preparation variables.

Columns (i), (ii) and (iii) of Table 9 report the results using the SS4, SS5 and SS6 subsamples respectively. In Column (i) we find that *PPVT_SHR* is statistically insignificant with a very high P-value. With regard to SS5 too, we find *PPVT_SHR* lacking statistical significance at the conventional levels. Finally, with regard to SS6 which estimates the effect of partial privatization for all *Type-3* SOEs in a before and after set up, we find, in departure with the earlier results, both with the privatization dummy as well as with respect to privatization levels, the coefficient of *PPVT_SHR* is positive and significant at the 5 per cent level.

In an attempt to reconcile the apparent conflicting results obtained with regard to *Type-3* SOEs when we use two different indicators of partial privatization, namely the dummy *PPVT_DUMMY* and the level variable, *PPVT_SHR*, we specify a piece-wise linear spline specification that allows for the marginal effect of the private shareholding to change at different threshold points known as spline nodes. The rationale underlying the spline specification is that only when private shareholding crosses a certain threshold would capital market discipline be an effective channel through which private shareholders can influence SOE performance. This is all the more relevant for partial privatization where it is argued that so long as the government controls an SOE, no amount of disinvestment would be effective in impacting performance. To examine whether the marginal impact of partial privatization depends on a threshold

level of such disinvestment, we adopt the spline specification. We set our threshold at the median value of disinvestment of 10 per cent. Any disinvestment above 10 per cent, we can dub as substantial partial disinvestment, the highest in our data set being 47 per cent. The results of the spline estimation, with the node set at 10 per cent reveal that the coefficient of *PPVT_SHR* is insignificant for the shareholding below 10 per cent, and positive and significant for shareholding equal to and above 10 per cent is positive and statistically significant with a P-value of 0.02.

Our inconclusive results on the impact of partial privatization, statistically insignificant in two sub-samples and positive impact beyond a threshold of 10 per cent are in line with the mixed evidence emerging from the limited number of empirical evidence on partial privatization and SOE performance. On the one hand, Chen et al., (2006) find that partial privatization in China did not lead to an improvement in economic performance; in fact it led to a deterioration of performance. The authors argue that while shares of SOEs are partially divested, the control of the enterprises continued to remain in the hands of the government with most decisions dictated by government objectives rather than by market considerations. On the other hand, the findings of a positive effect that we find with regard to sub-sample S6 seem to be consistent with the findings of Gupta (2005; 2011) who evaluated the impact on disinvestment on a host of performance variables, namely SOE profitability, productivity and investment. These findings are explained in terms of the disciplining role that capital market exerts in reducing managerial agency costs. While the results of Gupta's (2005; 2011) studies cannot be exactly comparable given that both the sample and period of study are somewhat different³⁴, we cannot rule out the possibility that the positive partial privatization effect that Gupta (2005) finds in the first twelve years of disinvestment, could have reflected the positive impact of the organizational changes that were taking place on account of many of the SOEs simultaneously coming under the MOU system. A similar argument can be made with respect to her more recent study (Gupta, 2011). We illustrate this point using our sub-samples SS4 and SS5 for which we find no effect of partial privatization using either the dummy or the level indicator of disinvestment. Specifically, we re-estimate samples SS4 and SS5 to find the impact of partial privatization, *PPVT_SHR*, without controlling for MOU, which in turn means re-estimating columns (i) and (ii) of Table 9 without the MOU variables. The estimates are presented in Table 10.

³⁴ The period of study in Gupta(2005) is 1990-2002, with the sample comprising of both centrally owned public sector enterprises as well as enterprises under the ownership and control of state governments. Our sample includes not only the pre-reform period, but also covers a decade more of partial privatization and autonomy.

As is evident from the estimates in Table 10, partial privatization, *PPVT_SHR* is positive and statistically significant both for sub-sample SS4 and SS5, at 5 per cent level in the former and at 10 per cent for the latter. Moreover, while in Table 9, while most of the privatization preparation variables were statistically insignificant consistent with the insignificant effect of *PPVT_SHR*, in Table 10, all these variables are positive and statistically significant at the 5 per cent level.

The presence of a positive partial privatization effect when we do not control for autonomy and the disappearance of this effect once autonomy is controlled for together with a positive and statistically significant effect of autonomy raise an important question. Can enterprise autonomy be considered as a substitute for partial privatization? Both performance contracts and partial privatization are policies aimed at incentivizing and disciplining managers accompanied by lesser political control. In case of autonomy, the government partially divests decision making control that is tied to the performance of the SOE, and in the case of partial privatization, the government partially divests control to private entities, which through the capital markets exert pressures on managers to perform. Our estimates of the marginal effects of performance contracts and partial privatization (when not controlling for autonomy) on ROA in fact indicate that the former ranges from 6 to 8 per cent depending on the sample considered, whereas the partial privatization effect is less than one per cent. Based on our findings, it is safe to conclude that if ownership changes in SOEs are effected through partial privatization, there is little to gain in terms of performance effects especially at low levels of disinvestment if the enterprises are already under the performance contract system. It is only when the extent of share divested is substantial can capital market discipline be functional.

5.0 Conclusion

The objective of this paper has been to examine the impact of managerial autonomy on SOE performance in the context of India. Using a longitudinal data set on Indian SOEs spanning thirty years with more than 5000 firm year observations, we focus on estimating the effect of performance contracts, dubbed as Memorandum of Understanding in the Indian context, on the return on assets of SOEs. Additionally, we use the Indian SOE reforms experience of pursuing both autonomy and partial privatization concomitantly as a natural setting to examine whether enterprise autonomy is both necessary and sufficient for SOE performance or whether private ownership, albeit partial, still matters. Our study contributes to the sparse evidence on enterprise autonomy and performance and on how the effects of autonomy match up with those with respect to partial privatization. Such an analysis is particularly important in view of the fact that state owned enterprises continue to play an important role in both

developed and developing countries and the relative benefits of various reform measures continue to be debated in view of the inconclusive evidence emerging from existing empirical studies.

We acknowledge that being restricted to one country, our results however become specific to those countries that share the same institutional structure as India. A similar observation can be made with respect to other country-specific studies such as those with respect to China. This is a tradeoff we face between measurement and applicability. We reason that India is representative of many emerging market economies that have both public and private sector enterprises operating in their industrial landscape and as such our results are applicable to these economies. Our longitudinal panel is restricted to only one country and hence avoids country specific issues that arise in many cross-country regressions. Pertinent to our case, in a cross-country setting the effect of autonomy/partial privatization may itself depend on the institutional setting in which the state-owned enterprises operate in the pre- autonomy/partial privatization era. For example in Brown et al. (2005) that uses longitudinal data from Hungary, Romania, Russia and Ukraine and looks at the effect of privatization (rather than partial privatization), starts from a base scenario where 36.1 percent of the firms in Hungary are already privatized, compared to 20 percent in Romania, while none of the firms are privatized in Russia and Ukraine. Accordingly, the benchmark and the competitive environment from which the effect of privatization is measured are different for different countries. A single country study bypasses such problems.

Our findings with respect to India strongly suggest that enterprise autonomy through performance contracts has a positive and statistically significant effect on SOE performance as measured by the return on assets. This finding is robust after controlling for selection bias and across different control and treatment groups that our sample allows us to define. These results by and large contrast with the largely negative findings of several empirical studies with respect to Chinese SOEs, as well as that of case studies on select developing countries including India.

In view of the policy discussion on the possible complementarities between different types of SOE reforms, we also examine in terms of our empirical exercise, the impact of deregulation and hard budget constraints on the marginal effect of autonomy. Our findings suggest such complementarities with competitive pressures through deregulation found to strengthen the autonomy effect on ROA, and softer budget constraints to weaken the effect.

One of the major findings of this study has been with regard to the effect of partial privatization on SOE performance conditional on the fact that the partially privatized SOEs continue to remain under the

performance contracting system. Reform experiences in other countries typically entail autonomy to the exclusion of ownership reforms and vice-versa. This has not been the case with respect to India and hence the findings of our study on the relative impacts of both in an integrated framework are of value. By and large, we find that partial privatization has no independent effect on ROA once we control for performance contracts, whereas the positive and significant effect of performance contracts persists even after taking into account partial privatization. At best, we find that partial privatization matters when private shareholding exceeds 10 per cent, with the result holding only when we consider *Type-3* SOEs in the sample. Given our findings, the only rationale for partial privatization to be undertaken in contexts like India is revenue generation for the government with no expectation of any real effect on performance.

Overall our study highlights the sizeable effects of enterprise autonomy which have not been reported in most other empirical studies using a data set that has much more cross-sectional and over-time variation than any of the existing studies, allowing us to estimate the impacts using various combinations of control and treatment groups. In that sense, the findings of the study, that enterprise autonomy through performance contracts is necessary, and is sufficient in relation to partial privatization, can be considered to be robust with respect to the performance parameter under consideration, namely profitability.

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Table 1: Performance Contracts (Memorandum of Understanding) and Partial Privatisation of State Owned Enterprises (Central Public Sector Enterprises) in India, 1988-2011

Year	Total Number of CPSEs	Number of MOUs Signed	Number of CPSEs disinvested	Average percentage of disinvestment
1987-88	238	4	NA	NA
1988-89	238	11	NA	NA
1989-90	238	18	NA	NA
1990-91	238	23	NA	NA
1991-92	238	72	30	13.75
1992-93	241	98	15	4.43
1993-94	241	101	0	0
1994-95	241	100	16	5.87
1995-96	236	104	4	2.00
1996-97	236	110	1	2.94
1997-98	236	108	1	7.13
1998-99	234	108	6	9.98
1999-2000	234	108	4	5.05
2000-01	234	107	0	0
2001-02	231	104	2	13.42
2002-03	226	100	5	16.37
2003-04	230	96	9	19.64
2004-05	227	99	2	4.91
2005-06	226	102	2	4.00
2006-07	217	113	0	0
2007-08	214	144	3	7.97
2008-09	213	147	0	0
2009-10	217	197	5	6.46
2010-11	220	202	6	11.37

Notes: NA: Not Applicable. Data on partial privatization pertains to all disinvestment less than majority private control.

Source: MOU data sourced from Annual Report 2010-2011, Department of Public Enterprises, Ministry of Heavy Enterprises and Public Enterprises, Government of India. Partial Privatisation data sourced and computed from www.bsepsu.com "Master Table of all Past CPSE Disinvestments in India till date.

Table 2: Description of Variables used in the Analysis

This Table presents the description of all the variables used in our study. The first column gives the variable name as defined in the study and the next column gives the description of the variable.

Variable	Description
Performance Measure:	
ROA	Ratio of profit before taxes to total assets
Independent Variables:	
Performance Contract Variables:	
MOU	Dummy variable that takes the value 1 in period ' $t+1$ ' if the enterprise had signed a MOU contract in year ' t '; = 0 otherwise.
mou_prep0	Dummy variable that takes value 1 for the year SOE signed MOU and zero otherwise
mou_prep1	Dummy variable that takes the value 1 for year ' $t-1$ ' if the enterprise signed MOU in year ' t ' and zero otherwise.
mou_prep2	Dummy variable that takes the value 1 for year ' $t-2$ ' if the enterprise signed MOU in year ' t ' and zero otherwise.
mou_prep3	Dummy variable that takes the value 1 for year ' $t-3$ ' if the enterprise signed MOU in year ' t ' and zero otherwise.
Partial Privatization Variables:	
PPVT_DUMMY	Dummy variable that equals 1 for an SOE in time ' t ' and thereafter if the firm was partially privatized in year ' t ', and zero otherwise
PPVT_SHR	Share of private equity in total SOE equity
ppvt_prep1	Dummy variable that takes the value 1 for year ' $t-1$ ' if the SOE underwent partial privatization in year ' t ' and zero otherwise.
ppvt_prep2	Dummy variable that takes the value 1 for year ' $t-2$ ' if the SOE underwent partial privatization in year ' t ' and zero otherwise.
ppvt_prep3	Dummy variable that takes the value 1 for year ' $t-3$ ' if the SOE underwent partial privatization in year ' t ' and zero otherwise.
post_ppvt1	Dummy variable that takes the value 1 for year ' $t+1$ ' if the SOE underwent partial privatization in year ' t ' and zero otherwise.
post_ppvt2	Dummy variable that takes the value 1 for year ' $t+2$ ' if the SOE underwent partial privatization in year ' t ' and zero otherwise.
post_ppvt3	Dummy variable that takes the value 1 for year ' $t+3$ ' if the SOE underwent partial privatization in year ' t ' and zero otherwise.
Control Variables:	
SOFTLN	Ratio of loans borrowed by SOE from the central government to total loans borrowed, lagged by one year.
DEREG	Dummy variable that takes the value 1 for a firm for year ' t ' and all subsequent years if the SOE belongs to the industry that was de-reserved in year ' t ' by the government; equal to 0 otherwise.
LIB	dummy variable that takes the value 1 for the financial year 1990-91 and all subsequent years and zero otherwise
LASSET	Log of total assets
EXINT	The ratio of exports to total sales
DEPINT	The ratio of depreciation expenditure to total sales
Industry effects	Industry dummies, one dummy for each of the 19 industry groups, taking the value 1 for a particular industry and zero otherwise.
Time effects	Year dummies, one dummy for each of the 30 years; Dummy equals 1 for a particular year and zero otherwise.
Group Dummies	
α_2	Dummy variable that takes value 1 for Type-2 SOEs and zero otherwise
α_3	Dummy variable that takes value 1 for Type-3 SOEs and zero otherwise

Table 3: Sample Size by Type of Enterprises

This Table presents the number of SOEs and sample observations classified by *Type* and *Regime* for the sample of 214 SOEs analyzed in our study over the study period 1982-2011. The SOEs are classified here based on the two major policy reforms that is analyzed in this study, namely., the performance contract policy reform (*MOU*) and the partial privatization reform. While *Type-1* here refers to SOEs that have not been subjected to either of these reforms, *Type-2* refers to SOEs that were subjected to the *MOU* system at some point during the study period and *Type-3* indicates the SOEs that were under the *MOU* system and also underwent partial ownership divestment at some point during the study period. Panel A gives the total number of SOEs under each reform type along with the sample observations for the three different regimes described in the leftmost column. *Regime 1* represents the no-reform sample observation of all SOEs analyzed. *Regime 2* indicates only the post-*MOU* sample observations; *Regime 3* represents the sample observation for post partial privatization. Panel B presents the average number of SOE observations under each regime being analyzed in this study.

Panel A				
	<i>Type-1</i>	<i>Type-2</i>	<i>Type-3</i>	All types
Number of enterprises ¹	81	94	39	214
No-Reform observations(<i>Regime 1</i>)	1851	1584	362	3797
Post- <i>MOU</i> - Pre-Partial Privatization observations(<i>Regime 2</i>)	-	985	31	1016
Post-Partial Privatization observations(<i>Regime 3</i>)	-	-	687	687
Total number of observations	1851	2569	1080	5500
Panel B				
Average ² number of No-Reform observations(<i>Regime 1</i>)	22.85	16.85	9.28	17.74
Average number of Post- <i>MOU</i> -Pre-Partial Privatization observations(<i>Regime 2</i>)	-	10.47	0.79	7.64
Average number of Post-Partial Privatization observations(<i>Regime 3</i>)	-	-	17.61	17.61

¹: firms appearing at least once in the sample.

²: The average for each type in Panel B is computed by dividing the total number of relevant observations by the number of enterprises shown in each column in Panel A.

Table 4: Description of Samples Used in the Analysis by Type of SOEs and Policy Regime

This table presents the sample description for the different sub-samples used in our analysis to study the differential impact of the two policy interventions that SOEs have undergone over the study period. There are 5500 observations for 214 SOEs studies over the period 1982-2011. While *Type-1* SOEs are those that have not been subjected to either of the two policy interventions, *Type-2* SOEs were subjected to MOU treatment at some point in our analysis and *Type-3* SOEs were subjected to both MOU reform and partial disinvestment at some point of time during the study period. Thus each SOE classified as *Type-2* or *Type-3* also have pre-treatment observations which are described in the table under the Regime type. *Regime 1* indicates observations relating to no treatment period, *Regime 2* relates to observations for SOEs under MOU treatment and *Regime 3* refers to observations for SOEs subjected to partial privatization reform. Sample ID (SS1—SS6) indicate the different sub-samples used in the analysis. The tick mark in each cell denotes observations belong to a particular Type and Regime. While Sample SS4 covers the entire sample observations for all SOEs, all other sub-samples are different sub-sets of SS4.

Sample Type	Sample Observations					
	<i>Type-1</i>	<i>Type-2</i>		<i>Type-3</i>		
	No Reform <i>Regime 1</i>	Pre-MOU <i>Regime 1</i>	Post-MOU <i>Regime 2</i>	Pre-MOU <i>Regime 1</i>	Post MOU- Pre-PPVT <i>Regime 2</i>	Post-PPVT <i>Regime 3</i>
SS1	√	√	√	√	√	-
SS2	-	√	√	√	√	-
SS3	-	√	√	-	-	-
SS4	√	√	√	√	√	√
SS5	-	√	√	√	√	√
SS6	-	-	-	√	√	√

Table 5a: Descriptive Statistics by Type of SOE

The Table presents the mean and standard deviation of key variables used in the analysis. The means are presented separately for different Types of SOEs. The SOEs are classified based on the Type of policy intervention that they were subjected to over the study period. The sample consists of 214 SOEs studies over the period of 1982-2011. While *Type-2* includes 94 SOEs that were subjected to MOU performance- contract reform, *Type-3* include 39 SOEs that were subjected to both MOU and partial disinvestment reforms. *Type-1* SOEs are those that were not subjected to either of these reforms, which are 81 in our data set.

Variables	Type-1		Type-2		Type-3		ALL	
	Mean	Stddev	Mean	Stddev	Mean	Stddev	Mean	Stddev
ROA	-0.08	0.24	0.04	0.23	0.11	0.29	0.02	0.25
LASSET	8.49	2.12	9.75	2.19	11.64	1.58	9.70	2.34
SOFTLN	0.61	0.43	0.47	0.58	0.26	0.36	0.48	0.51
EXINT	0.04	0.17	0.03	0.14	0.10	0.22	0.050	0.17
DEPINT	0.40	4.80	0.70	0.23	0.19	2.15	0.20	2.95
MOU	N.A.	N.A.	0.41	0.49	0.63	0.48	0.31	0.46
PPVT_SHR (%)	N.A.	N.A.	N.A.	N.A.	9.77	13.09	1.94	7.00
No of firm-year observations	1851		2569		1080		5500	

N.A.: Not Applicable

Table 5b: Paired t-tests between Different Types of SOEs

This Table presents the P-values for the paired t-test comparisons of means for key variables described in Table 3a across the three Types of SOEs. The null hypothesis tested is that the means across the two types of SOEs compared is equal. The SOEs classified based on the type of policy reform that these SOEs underwent during the study period. The sample consists of 214 SOEs studies over the period of 1982-2011. Of the total, 94 SOEs classified as *Type-2*, were subjected to MOU reform and 39 classified here as *Type-3* SOEs, underwent both the MOU reform and partial disinvestment and the remaining 81 SOEs classified as *Type-1* were not subjected to either of these reforms in the entire study period.

Variables	<i>Type-1 and Type-2</i>	<i>Type-2 and Type-3</i>	<i>Type-1 and Type-3</i>
	P-value	P-value	P-value
ROA	0.0349**	<.0001***	<.0001***
LASSET	<.0001***	<.0001***	<.0001***
SOFTLN	<.0001***	<.0001***	<.0001***
EXINT	0.0441**	<.0001***	<.0001***
DEPINT	0.0028**	0.0661*	0.0985*

Table 6: Regression of Return on Assets on Memorandum of Understanding and other Firm Characteristics across Sub-Samples

This Table presents the regression results for return on assets on memorandum of understanding and other firm characteristics. Column (i) - (vi) are regression estimates for alternate sample specifications. Column (i) and (ii) present the results for sub-sample SS1, which includes the SOEs under *Type-1*, *Type-2* and *Type-3* with sample observations for Regimes 1 and 2. While *Regime 1* includes the no-reform sample observations for all SOEs analyzed, *Regime 2* indicates only the post-MOU sample observations and *Regime 3* represents the sample observations for post partial privatization. *Regime 3* sample observations are excluded in sub-sample SS1. Column (iii) and (iv) present the regression results for sub-sample SS2, which is a sub-set of SS1 and includes SOE observations under *Regime 1* and *Regime 2* for *Type-2* and *Type-3* SOEs. Column (v) and (vi) present results analyzed for sub-sample SS3, which is a subset of SS2 and includes only *Type-2* SOEs with firm observations under *Regime 1* and *Regime 2*. For each sub-sample specification two regressions are estimated, one without including the MOU preparation variables (columns (i), (iii) and (v)) and the other including the MOU preparation dummies (columns (ii), (iv) and (vi)). NA indicates not applicable. *** significant at 1%, ** significant at 5% and * significant at 10%.

Variables	Sub-Sample SS1		Sub-Sample SS2		Sub-Sample SS3	
	(i)	(ii)	(iii)	(iv)	(v)	(vi)
Intercept	0.15237***	0.16196***	0.22314***	0.22357***	0.23266***	0.2283***
mou_prep0		0.06153***		0.06200***		0.05597**
mou_prep1		0.0607***		0.06280***		0.06229**
mou_prep2		0.05522***		0.06098***		0.07423***
mou_prep3		0.05311***		0.04479**		0.05554**
MOU	0.06033***	0.07616***	0.06318***	0.08125***	0.06204***	0.07994***
SOFTLN	-0.05010**	-0.0458**	-0.04736**	-0.04331**	-0.04672**	-0.04293*
DEREG	-0.02097	-0.03028	-0.01556	-0.02968	0.00523	-0.011
LIB	0.06657**	0.06166**	0.06918**	0.05858*	0.06589*	0.0607
LASSET	-0.01643***	-0.01688***	-0.01758***	-0.01800***	-0.0196***	-0.01977***
EXINT	0.04369**	0.04335**	0.01627	0.014950	-0.00071	-0.00268
DEPINT	-0.00295**	-0.00294***	-0.07411***	-0.07065***	-0.07129***	-0.0675***
α_2	0.07546***	0.06251***	NA	NA	NA	NA
α_3	0.12909***	0.10909***	0.06363***	0.05542***	NA	NA
Industry effects	<i>Included</i>	<i>Included</i>	<i>Included</i>	<i>included</i>	<i>included</i>	<i>Included</i>
Time effects	<i>Included</i>	<i>included</i>	<i>Included</i>	<i>included</i>	<i>included</i>	<i>Included</i>
Adj. R ²	0.32	0.33	0.25	0.26	0.25	0.27
No. of observations	1803	1803	0	0	0	0
<i>Type-1</i>	2503	2503	2498	2498	2519	2519
<i>Type-2</i>	391	391	391	391	0	0
<i>Type-3</i>	4703	4703	2889	2889	2519	2519
Total						

Table 7: Regression of Return on Assets on Memorandum of Understanding (MOU) across Sub-Samples – Interaction Effects of MOU with Soft Loans and Deregulation

This Table presents the regression results for the interaction effects of MOU with soft loan and deregulation along with MOU reform impact on the return on assets performance of SOEs. The relationship is estimated for three different sub-samples SS1, SS2 and SS3, results of which are presented in column (i), (ii) and (iii) respectively. Sample SS-1 includes the SOEs under *Type-1*, *Type-2* and *Type-3* with sample observations for Regimes 1 and 2. *Type-1* SOEs are those that were not subjected to either the MOU reform or the partial disinvestment reform. *Type-2* SOEs are those that were subjected to MOU reform at some point in the study period. *Type-3* SOEs include firms that have undergone both the MOU and partial privatization reforms at various time points in the study period. While *Regime 1* includes the no-reform sample observations for all SOEs analyzed, *Regime 2* indicates only the post-MOU sample observations and *Regime 3* represents the sample observations for post partial privatization. *Regime 3* sample observations are excluded in sub-sample SS1. Sample SS2 and SS3 are subsets of SS1 where SS2 includes SOE observations under *Regime 1* and *Regime 2* for *Type-2* and *Type-3* and SS3 includes only sample observations for *Type-2* SOEs with firm observations under *Regime 1* and *Regime 2*. NA indicates not applicable. ***significant at 1%, ** significant at 5% and * significant at 10%.

Variables	Sub-Sample SS1	Sub-Sample SS2	Sub-Sample SS3
	(i)	(ii)	(iii)
Intercept	0.15992***	0.21483***	0.22092***
mou_prep0	0.06218***	0.06297***	0.05674**
mou_prep1	0.06184***	0.06501***	0.06589***
mou_prep2	0.05624***	0.06305***	0.07725***
mou_prep3	0.05438***	0.04738**	0.05867**
MOU	0.05378	0.0698*	0.07231
DEREG	-0.03063	-0.02822	-0.00748
SOFTLN	-0.04123***	-0.0344***	-0.03408***
DEREG x MOU	0.03681**	0.03413*	0.02921
SOFTLN x MOU	-0.04234**	-0.06454**	-0.06182*
LIB	0.06014**	0.05223*	0.05183
LASSET	-0.0171***	-0.01804***	-0.0199***
EXINT	0.04382**	0.01503	-0.00513
DEPINT	-0.00298**	-0.07107***	-0.06811***
α_2	0.06243***	NA	NA
α_3	0.11123***	0.05805***	NA
Industry effects	<i>Included</i>	<i>Included</i>	<i>Included</i>
Time effects	<i>Included</i>	<i>Included</i>	<i>Included</i>
Adj. R ²	0.33	0.27	0.27
No. of observations			
<i>Type-1</i>	1803	0	0
<i>Type-2</i>	2503	2498	2519
<i>Type-3</i>	391	391	0
Total	4703	2889	2519

Table 8: Regression of Return on Assets on Memorandum of Understanding and Partial Privatisation across Sub-Samples

This Table presents the regression results for the impact of MOU and partial privatization on the SOEs return on assets performance for alternate sample specifications. Column (i) and (ii) present the results for sub-sample SS4, which includes all the 214 SOEs studied for the period 1982-2011. Column (iii) and (iv) present the regression results for sub-sample SS5, which is a sub-set of SS4 and excludes SOE observations for *Type-1* SOEs, while including sample observations for *Type-2* and *Type-3* SOEs. Column (v) and (vi) present results analyzed for sub-sample SS6, which is a subset of SS-5 and excludes *Type-2* SOEs from the analysis, thus including only *Type-3* SOEs. For each sub-sample specification two regressions are estimated, one without including the pre-privatization preparation variables (columns (i), (iii) and (v)) and the other including the pre-privatization preparation dummy variables (columns (ii), (iv) and (vi)). NA indicates not applicable. *** significant at 1%, ** significant at 5% and * significant at 10%.

Variables	Sub-Sample SS4		Sub-Sample SS5		Sub-Sample SS6	
	(i)	(ii)	(iii)	(iv)	(v)	(vi)
Intercept	0.11986***	0.12012***	0.20358***	0.20458***	0.37527***	0.37371***
mou_prep0	0.0495**	0.04768**	0.05972***	0.05783***	0.05827**	0.05937**
mou_prep1	0.05559***	0.05326***	0.06211***	0.06006***	0.05741**	0.05826**
mou_prep2	0.04663**	0.04495**	0.05508***	0.05397***	0.03611*	0.03819
mou_prep3	0.04742**	0.0465**	0.04255**	0.04258**	0.01808	0.01902
MOU	0.07638***	0.07554***	0.08686***	0.08592***	0.08502***	0.08608***
ppvt_prep1		0.01601		0.02622		0.02497
ppvt_prep2		0.01487		0.01808		-0.0072
ppvt_prep3		0.02003		0.01733		0.04458
PPVT_DUMMY	-0.01767*	-0.01267	-0.01139	-0.00523	-0.03538*	-0.01442
SOFTLN	-0.04961***	-0.04949***	-0.04429***	-0.04411***	-0.03552**	-0.03491**
DEREG	-0.01812	-0.01708	-0.01216	-0.01094	-0.0003	0.00427
LIB	0.06748**	0.06682**	0.06061**	0.06021**	0.03583	0.00769
LASSET	-0.01703***	-0.01709***	-0.01807***	-0.01817***	-0.01767***	-0.01751***
EXINT	0.04546**	0.04517**	0.02454*	0.02404*	0.04906**	0.04981**
DEPINT	-0.00354***	-0.00354***	-0.00793***	-0.00792***	-0.00519**	-0.00518**
α_2	0.06905***	0.06962***	NA	NA	NA	NA
α_3	0.11476***	0.11071***	0.04902***	0.04342***	NA	NA
Industry effects	<i>Included</i>	<i>included</i>	<i>Included</i>	<i>included</i>	<i>Included</i>	<i>included</i>
Time effects	<i>Included</i>	<i>included</i>	<i>Included</i>	<i>included</i>	<i>Included</i>	<i>included</i>
Adj. R ²	0.35	0.35	0.26	0.26	0.28	0.28
No. of observations						
<i>Type-1</i>	1800	1800	0	0	0	0
<i>Type-2</i>	2519	2519	2516	2516	0	0
<i>Type-3</i>	1071	1071	1072	1072	1059	1059
Total	5390	5390	3588	3588	1059	1059

Table 9: Regression of Return on Assets on Partial Privatisation Across Sub-Samples

This Table presents the regression results for the impact of partial privatization on SOEs return on assets performance, where partial privatisation is measured in terms of the percentage of equity divested, PPVT_SHR. All estimations are run taking preparations for partial privatisation into account. Column (i) – (iii) present the results for three alternate sample specifications- SS4, SS5 and SS6. Sample SS4 includes all the 214 SOEs studied for the period 1982-2011. Sample SS-5 and SS-6 are subsets of sample SS4, where SS5 includes sample observations for *Type-2* and *Type-3* SOEs and SS6 includes sample observations for only *Type-3* SOEs. *Type-2* SOEs are those that were subjected to MOU reform at some point in the study period. *Type-3* SOEs include firms that have undergone both the MOU and partial privatization reforms at various time points in the study period. NA indicates NA indicates not applicable. *** significant at 1%, ** significant at 5% and * significant at 10%.

	Sub-Sample SS4	Sub-Sample SS5	Sub-Sample SS6
	(i)	(ii)	(iii)
Intercept	0.12184***	0.20701***	0.36327***
mou_prep0	0.04759***	0.05834***	0.05808**
mou_prep1	0.05375***	0.06076***	0.05712**
mou_prep2	0.04549**	0.05443***	0.03561**
mou_prep3	0.04752***	0.04331**	0.01796
MOU	0.07276***	0.08498***	0.08470***
ppvt_prep1	0.02601	0.03198*	0.04199**
ppvt_prep2	0.02446	0.02342	0.00389
ppvt_prep3	0.02979*	0.02311	0.05824**
PPVT_SHR	0.00031	0.00031	0.00129**
DEREG	-0.01679	-0.01092	0.00430
SFTLN	-0.04918**	-0.04390**	-0.03191**
LIB	0.06525**	0.05862**	-0.02324
LASSET	-0.01721***	-0.01828***	-0.01739***
EXINT	0.04495**	0.02417*	0.05328**
DEPINT	-0.00353***	-0.00787**	-0.00479**
α_2	0.07072***	N.A.	N.A.
α_3	0.10068***	0.03690***	N.A.
Industry effects	<i>Included</i>	<i>Included</i>	<i>Included</i>
Time effects	<i>Included</i>	<i>Included</i>	<i>Included</i>
Adj. R ²	0.34	0.26	0.29
No. of observations			
<i>Type-1</i>	1800	0	0
<i>Type-2</i>	2519	2516	0
<i>Type-3</i>	1071	1072	1059
Total	5390	3588	1059

Table 10: Regression of Return on Assets on Partial Privatisation on Pooled Sample without controlling for the Autonomy (MOU) Effect

This Table presents the results for the impact of partial privatization on SOEs return on assets performance without controlling for the MOU effect. Column (i) and (ii) are results for sub-samples SS4 and SS5 that were used for estimation in Table 9. Column (i) presents the results for regression estimated for sub-sample SS4 while, column (ii) shows the results for SS5. SS4 includes all the 214 SOEs across Regimes 1, 2 and 3 and for all three types of SOEs- *Type-1*, *Type-2* and *Type-3*, whereas SS5 comprises of *Type-2* and *Type-3* across Regimes 1, 2 and 3. *** significant at 1%, ** significant at 5% and * significant at 10%.

	Sub-Sample S4 (i)	Sub-Sample S5 (ii)
Intercept	0.07950***	0.22556***
ppvt_prep1	0.04214**	0.04516**
ppvt_prep2	0.04034**	0.04397**
ppvt_prep3	0.04070**	0.03348**
PPVT_SHR	0.00064**	0.00054*
DEREG	-0.00384	-0.01362
SOFTLN	-0.06653**	-0.05448**
LIB	0.07759**	0.04516**
LASSET	-0.00957***	-0.01665***
EXINT	0.04083**	0.03089**
DEPINT	-0.00456**	-0.00855**
α_3	0.06260***	0.04576***
Industry effects	<i>Included</i>	<i>Included</i>
Time effects	<i>Included</i>	<i>Included</i>
Adj. R ²	0.28	0.23
No. of observations		
<i>Type-1</i>	1800	0
<i>Type-2</i>	2519	2516
<i>Type-3</i>	1071	1072
Total	5390	3588