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Partial Privatization and Firm Performance

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ABSTRACT

Most privatization programs begin with a period of partial privatization in which only non-controlling shares of firms are sold on the stock market. Since management control is not transferred to private owners it is widely contended that partial privatization has little impact. This perspective ignores the role that the stock market can play in monitoring and rewarding managerial performance even when the government remains the controlling owner. Using data on Indian state-owned enterprises we find that partial privatization has a positive impact on profitability, productivity, and investment.

WIDESPREAD PRIVATIZATION IN RECENT DECADES has generated a large empirical literature concerning the effect of ownership on firm performance. Most studies find that privatization has a positive impact on the profitability and efficiency of firms (see Megginson and Netter (2001) for a recent survey).[1] The firms in these studies have had a majority of their assets privatized and control rights have been transferred from the government to private owners. Surprisingly, little is known about the effect of partial privatization where the government remains the controlling owner. This paper seeks to address this gap in the literature by investigating whether the performance of state-owned enterprises in India is affected by the sale of non-controlling equity stakes on the stock market.

Understanding the impact of partial privatization is important because most privatization transactions of significant size are through partial sales of equity in the stock market. In a sample of share-issue privatizations from 59 countries, Jones et al. (1999) found that just 11.5% of the firms sold all of their capital

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[1] Recent studies that investigate the impact of share issue privatizations with transfer of management control include Boubakri and Cosset (1998), who find significant improvements following privatization in the operating performance of 79 firms from 21 countries. In contrast, using cross-country panel data on 500 large firms, Dewenter and Malatesta (2001) find that earnings improve prior to privatization but decline subsequently.

and less than 30% sold more than half of their capital in the initial public offering. India's privatization program has followed a similar pattern of partial privatization through share offerings but at a particularly slow rate. Between 1991 and 1999 the federal government raised about $9 billion in privatization revenues, compared to nearly $71 billion raised in Brazil and $21 billion in China over the same period (*Global Development Finance* (2001)).

In addition to its practical importance, partial privatization is of theoretical interest because of the insight it offers into the long-standing debate over why state-owned firms perform poorly.[2] The *political* view argues that governments pursue objectives in addition to and in conflict with profit maximization, and that this political interference can distort the objectives and constraints faced by managers (Shleifer and Vishny (1994)). Hence, only the transfer of management control to private owners is likely to address inefficiency in state-owned enterprises. The *managerial* view, based on agency theory, is that state-owned firms have difficulty monitoring managers because there is neither an individual owner with strong incentives to monitor managers nor a public share price to provide information about manager actions as judged by stock market participants (Laffont and Tirole (1993)). Without information from the stock market, managerial incentive contracts are restricted (Holmstrom and Tirole (1993) and Tirole (2001)), managers lack an important public signal of their skills for the executive job market (Fama (1980)), and takeover opportunities are limited (Scharfstein (1988) and Stein (1988)).

Full privatization makes it difficult to distinguish between the political and the managerial perspectives because both ownership and control shift to the private sector at the same time. In contrast, under partial privatization, the shares of the firm are traded on the stock market while the firm remains under government control and subject to political interference. Thus, we are able to test the managerial perspective that inadequate information about managers is an important factor in the inefficiency of state-owned firms. India's experience is useful in this regard because it has a well-established stock market that long predates privatization and, in the period we consider, privatization consists solely of the sale of minority equity stakes.

Because of its intermediate position between public and private ownership, partial privatization also offers insight into the more general question of whether financial markets can alleviate agency problems due to the separation of ownership and control. This literature considers the role of financial markets as information producers and monitors of management (see, for example, Grossman and Stiglitz (1980), Fama (1980), Holmstrom and Tirole (1993) and Tirole (2001)). Stock markets provide incentives to investors to gather information that is reflected in the share price, and this information can improve managerial incentives in a number of ways. Holmstrom and Tirole (1993) and

[2] While we focus on the impact of privatization, there is also a well-developed literature on the political economy of privatization strategies, including partial privatization. For example, Perotti (1995) argues that governments may retain a passive stake in companies in order to signal to investors their commitment to not implement policies adverse to the firm.

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Tirole (2001) show that the share price, which contains unique information that may not be retrieved from accounting data, can be used to design more effective incentive schemes to improve performance. An observable share price can also have a beneficial impact on incentives because it serves as a signal of ability in the managerial labor market (Fama (1980)). Moreover, financial markets facilitate corporate control through takeovers, which can impose managerial discipline (Scharfstein (1988) and Stein (1988)). However, public listings may also have an adverse impact on firm performance in private firms if there is a substantial agency cost associated with the increased dilution of ownership. In most studies of private firms, it is difficult to distinguish between these confounding effects, and the literature has often found evidence of a decline in operating performance after going public (see Jain and Kini (1994), for example).

Studies of partial privatization can investigate the information effect on performance while minimizing the confounding dilution effect of going public. Unlike private firms, state-owned firms are not starting from a position where the owner has strong incentives to maximize efficiency. As a result there is no reason to assume that dilution of state ownership increases agency costs. Partial privatization can also control for other factors that may confound the information effect, such as firms undertaking "window dressing" prior to going public (Sefcik, Malatesta, and DuCharme (2003)), or choosing to issue stock during a time of abnormally good performance (Ritter (1991)). While most studies of private firms cannot control for these effects because they only observe post-listing performance, state-owned firms are subject to stricter reporting requirements and report financial data even if they are not publicly traded.

Our data consist of accounting information on the population of non-financial firms owned by the federal (central) government of India, as well as some manufacturing and non-financial service sector firms owned by regional governments. We observe the pre- and post-privatization performance of 40 firms partially privatized by the federal government and two firms sold by regional governments over the period 1990 to 2000. In all of these firms, only non-controlling shares were sold to financial institutions, foreign institutional investors, and the public through open auctions, public offerings, and global depository receipts in domestic and international stock markets. Since shares of these firms were traded as soon as the government sold equity, we can test the managerial perspective of inefficiency in state-owned enterprises.

Our empirical strategy is to investigate whether the operating performance of firms depends on the share of equity sold, once we control for other factors that can also affect manager incentives and may be changing at the same time. We use several approaches to address the potential endogeneity of privatization. First, to minimize the possibility of simultaneity between privatization and performance, we investigate the impact of the lagged share of private ownership on current performance. This also allows us to take into account that the effects of managers' actions due to privatization are likely to appear with a lag. We estimate a firm fixed effects specification that addresses selection bias that may arise if, for example, more profitable or larger firms are selected for privatization. The specifications include firm-specific controls and

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year dummies to control for contemporaneous macroeconomic shocks. We then relax the assumption of strict exogeneity in the fixed effects model and estimate the dynamic GMM model developed by Arellano and Bond (1991), in which we instrument the privatization variable using instruments from within the panel. This method allows us to control for persistence in the performance measures and to investigate the effect of partial sales on the growth rates of these measures. We also control for potential dynamic selection bias using the method suggested by Frydman et al. (1999) in which the control group is restricted to firms that are likely to share similar unobserved and time-varying characteristics as the partially privatized enterprises. We find no change in the sign or significance of the reported results. We also find no evidence that firms are chosen for privatization because of unusually bad performance in the previous year, as we would then be overestimating the effect of privatization. Nor do we find evidence that the results are driven by a few profitable companies, since the results do not change if we exclude the oil and gas companies, which are considered the most profitable of all the state-owned firms. Finally, we find that the impact of partial privatization remains positive and statistically significant when we control for changes in competitive conditions.

The results suggest that both the levels and the growth rates of profitability, labor productivity, and investment spending improve significantly following partial privatization. In the firm fixed effects regression, we find that a 10-percentage point decrease in government ownership increases annual (log) sales and (log) profit by 13% and 10%, respectively, and the average product of labor and returns to labor by 8% and 5%, respectively. We also find that investment spending on research and development and expenditures on fixed assets rise significantly following an increase in the private share of a firm's equity. Results from estimating the GMM specification indicate that profitability and productivity growth rates increase significantly in response to a decrease in government ownership. Since improvements in operating performance are not accompanied by layoffs, this suggests the continued presence of political interference by the government in these firms. Thus, the results support the hypothesis that partial privatization addresses the managerial rather than the political view of inefficiency in state-owned enterprises.

To investigate how the managerial labor market may affect incentives we examine turnover in the senior management of state-owned firms that sell equity. The results suggest that the performance of partially privatized firms at the time of CEO turnover has a strong effect on the ability of outgoing CEOs to move into the higher-paying private sector. In particular, we find that departing CEOs hired by private firms are likely to have come from overperforming state-owned firms, that departing CEOs hired by other state-owned enterprises are likely to have come from firms with slightly better than average performance, and that departing CEOs who retire are likely to have come from underperforming firms.

Evidence from the privatization literature suggests that the effect of privatization on firm performance is due in part to the role of new human capital (Barberis et al. (1996) and Claessens and Djankov (1999)). This provides an

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additional argument in support of transferring management control because private owners are more likely to emphasize market skills over political connections in the selection of managers. However, better career opportunities and improved incentives under partial privatization can also attract better managers. Consistent with this hypothesis, we find that CEO turnover leads to significant improvements in the performance of partially privatized firms.

Our results also offer insight into the debate on the relative importance of competition versus ownership. Some argue that competition can shape managerial incentives better because it reduces the market share of inefficient firms and facilitates performance comparisons (Vickers and Yarrow (1991)). On the other hand, Shleifer and Vishny (1994) have argued that so long as politicians are in control, public sector firms will be characterized by political interference. India's privatization program is part of a broader set of economic reforms launched in 1991, which includes two competition-enhancing policies that are of significance for state-owned firms: "dereservation," which eliminates restrictions on entry into certain sectors that had been the exclusive domain of government firms; and "liberalization," which eliminates restrictions on foreign equity investment. The added advantage of observing these policy changes is that we can avoid using endogenous market concentration ratios. Our results suggest that privatization and competition are not substitutes in their impact on firm performance. The effect of partial privatization remains similar and statistically significant when we control for changes in the competitive environment.

In the next section we briefly describe the main characteristics of India's economic reforms and its state-owned enterprises. Sections II and III describe the data, results, and potential problems with the estimation strategy that we address. We conclude in Section IV.

I. Background of the Indian Privatization Program

In response to a foreign exchange crisis in 1991, India undertook sweeping economic reforms that included deregulation and privatization. Since the Industrial Policy Resolution of 1991, which outlined the economic reforms, nearly every government's annual budget has declared that the privatization goal is to reduce government ownership to 26% of equity, the minimum equity holding necessary for certain voting powers, in all state-owned firms not in the defense, atomic energy, and railway sectors. In the decade following the launch of the privatization program, the government sold minority shares through a variety of methods including auctions and public offerings in domestic markets, and through global depository receipts in international markets. However, through 1999 the federal government sold an average of just 19.2% of equity in 40 of 258 industrial, financial, and service sector firms and majority stakes in none. Euphemistically referred to as "disinvestment," privatization has proven to be very difficult to implement.

We are particularly interested in the role of an observable stock price in affecting performance. With the exception of two firms, all the partially privatized

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firms are listed on the stock market and their shares have been traded since the month they were privatized. The remaining firms are owned by regional governments, but the results do not change if these are excluded from the sample. We note that none of the partially privatized firms were traded prior to privatization, and none of the firms that have not been partially privatized are publicly traded. Examining the current ownership structure of partially privatized firms, we find that privatized equity is mostly distributed between financial institutions, foreign institutional investors, and the public. From stock market records, it also appears that even when shares were sold to financial institutions, trading in these shares commenced almost immediately on the domestic stock markets. It is worth noting that India has the world's third largest investor base with over 20 million shareholders investing in about 10,000 listed companies.

Large-scale government ownership of firms in India was originally justified by concerns that the private sector would not undertake projects requiring large investments with long gestation periods. Starting in the late 1960s, there was a period of rapid nationalization of firms in all sectors, so that by the mid-1970s the public sector accounted for one-fifth of GDP and two-thirds of the total fixed capital invested in the economy (Goyal (2000)). The Indian public sector consists of departmental enterprises that are run directly by government ministries, such as the railways, the postal service, telecommunications, irrigation, and power, and enterprises that have separate boards of directors. Firms owned by the central government account for nearly 85% of the total assets of all state-owned companies. These firms are also large employers, accounting for 10% of the total workforce in the organized sector. Over half the enterprises owned by the federal government are loss-making and the majority of these companies perform far worse in comparison to private firms in the same industry. Quoting from government sources, one of the primary objectives for privatization is "releasing the large amount of public resources locked up in non-strategic public sector enterprises, for redeployment in areas that are much higher on social priority" (Department of Disinvestment (2001), Chapter 2).

Before 1991 India had an elaborate regulatory framework popularly known as the "License Raj" that involved restrictions on who could invest, how much, in what, and where. Deregulation started in the mid-1970s, but it was not until 1991 that most of these restrictions were removed. The most significant deregulatory measures affecting state-owned firms, dereservation and liberalization, were implemented in this year. Dereservation reduced the number of sectors reserved for the public sector from 17 to 4. Only arms and ammunition, atomic energy production, mining of minerals related to atomic energy, and railway transportation remain closed to the private sector.[3] Since 1991 there have

[3] The industries reserved for the public sector that were opened to private participation include: iron and steel; heavy castings and forgings of iron and steel; heavy plant and machinery for iron and steel; hydraulic and steam turbines; coal and lignite; mineral oils; mining of iron ore, manganese, chrome, gypsum, sulphur, gold and diamonds, copper, lead, zinc, tin, molybdenum, tungsten, wolfram; aircraft; air transportation; ship building; telephones and telephone cables; telegraphs and wireless apparatus; and the generation and distribution of electricity.

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been a number of joint ventures between public sector companies in dereserved sectors and private companies, such as the collaborations between Indian Oil Company and Mobil, IBP and Caltex Petroleum, and Balmer & Lawrie Freight Containers and Tectrans of Germany to name a few. Liberalization allowed for automatic approval of foreign equity up to 74% in certain sectors.[4] Examples of foreign companies that entered Indian markets in response to the liberalization policy are Cogentrix, AES Transpower, Rolls Royce, Powergen, British Telecom, AT&T, Deutsche Telekom, and Nippon Telegraph.

Changes in the rules governing the competitive environment occurred at around the same time that firms were being partially privatized and could also have an effect on manager incentives (Vickers and Yarrow (1991)). We include these two exogenous policy changes in the estimations to identify the effect of partial sales on firm performance and to investigate the relative importance of competition versus ownership.

II. Data

We observe the privatization status, industry, share of government ownership, and a range of accounting data for 339 manufacturing and service sector firms owned by the central and state governments of India. This includes 247 firms that form the population of non-financial companies owned by the central government, and 92 firms that are owned by various state governments. The firm level data is from the Prowess database (1990–2002) collected by the Centre for Monitoring the Indian Economy from company balance sheets and income statements.

From the full sample we observe current sales for an unbalanced panel of 3,008 firm years between 1990 and 2002. Excluding observations with missing information on control variables, the largest available sample is 2,414 firm years. The government undertook partial privatization between 1991 and 1999, hence we observe all the partial privatization transactions. Starting in 2000, the privatization program switched to strategic sales with the sale of majority stakes and the transfer of management control to private owners. We do not use accounting data after 2000, as it would capture the post-privatization performance of firms in which the government has transferred management control. However, we observe all the privatization transactions that are partial. Thus, the largest sample used in the main analysis is 2,230 firm years from 1990 to 2000, which includes 291 firm years of observations on firms owned by regional governments. In order to avoid exacerbating attrition we use an unbalanced panel.

[4] At the 2-digit SIC level the liberalized industries include: food; cotton and other textiles; textile products; basic chemicals except petroleum and coal; rubber, plastic, petroleum, and coal products; metal products; machinery and equipment; transport equipment; mining services; basic metals; medical equipment; construction; and land and water transportation services. We use 2- and 3-digit SIC codes to identify liberalized and dereserved sectors. Government approval is still required in the following industries: coal and lignite; petroleum; alcohol; sugar; tobacco products; defense and aerospace equipment; hazardous chemicals; and drugs and pharmaceutical products.

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We obtain data on privatization transactions from the Department of Public Enterprises Annual Report (2001), the World Bank Privatization Transactions Database (1991–1999), and from news sources. The information includes the fraction of equity sold by a firm, the year of sale, and the method of sale. The World Bank data confirms that the firms sold stock either through public offerings on the domestic stock exchanges and/or through global depository receipts.

Since firms are not required to report employment in their income statements we obtain annual data on the number of workers from the Department of Public Enterprise's *Public Enterprise Survey* published by the government. However, these data are not available for regional government-owned firms.

Our data have a number of advantages over other studies that consider the effects of privatization. We observe the population of non-financial public firms owned by the central government of India, so sample selection is not an issue. Detailed ownership information lets us investigate the effect of variations in ownership shares (for example, Frydman et al. (1999) only observe whether a firm has been privatized). Another advantage, which is an issue of concern in the existing literature, is that the accounting standards remain the same in our data after partial privatization because the firms are still owned by the government and are subject to the same reporting requirements.

We also collect data for the period 1990 to 2000 on senior management and board turnover in 47 firms privatized from the start of the program until 2002, including 14 firms that sell majority stakes between 2000 and 2002. In a given year, we observe whether the CEO of the company has changed from the previous year, the total number of directors, and the number of directors added and removed since the previous year. The data are collected from annual reports and supplemented with information obtained directly from company sources. The panel is unbalanced because not all firms provide annual reports for all years. We also collect data on certain characteristics of the incoming and outgoing CEOs, including whether the new CEO is promoted internally. For 119 of the 392 CEO changes in our data, we also observe whether the departing CEO obtains a new position with a private or state-owned firm, retires, or remains with the same firm in a different position immediately following the turnover.

We observe the incidence of privatization and the average fraction sold in each year between 1991 and 2002, but in the main part of the analysis we investigate the impact of equity sales undertaken up through 1999, which includes all the partial privatizations and none of the majority sales.

Following the privatization literature, we investigate the effect of partial privatization on the following categories of firm performance: profitability, labor productivity, investment expenditures, and employment. We use the annual values of (log) sales and (log) accounting profit as measures of profitability. Sales have also been used as a measure of productivity in other studies. Profit is measured as the income before tax from the main activity of the firm and does not include payments made by the government or by government-owned development institutions to the firm. Our two measures of productivity are the average product of labor (ratio of sales to employment) and returns to labor (ratio of operating income to labor). The first variable is a standard measure of

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labor productivity in the literature, while the second variable is used by LaPorta and Lopez-de-Silanes (1999), among others. We use the following variables to measure investment expenditures: (log) expenditures on research and development, R&D intensity (ratio of R&D expenditures to sales), and the ratio of capital expenditures specific to the purchase of fixed assets, to sales. Finally, we also use (log) annual employment as a dependent variable. The construction of the variables is described further in the Appendix. The explanatory variable we focus on is $PRIV_{it}$, which measures the percentage of equity of firm i that is privately owned in year t. We investigate the effect of lagged *PRIV* on current performance to avoid potential simultaneity problems. Firm-specific controls include lagged values of performance, gross fixed assets to control for firm size, and competition policy changes. Following Bartel and Harrison (2004), we control for potential changes in political interference by the government by including as an explanatory variable the share of government financing (loans and subsidies) in total borrowing.

III. Results

From the summary statistics of the raw data presented in Table I, it appears that relative to state-owned firms that have not sold equity, partially privatized firms are bigger, more profitable and efficient, invest more in R&D, borrow less from the government, and have similar levels of capital expenditures.

Table II presents before-after statistics for selected performance measures for the partially privatized firms. Specifically, using the sample of partially privatized firms, we compare average performance in the years following the first public offering to the average performance of firms in the years before they sell any equity. We find that firms experience a significant increase in profitability, labor productivity, R&D investment and intensity, asset size, and employment after partial privatization. The average share of borrowing from government sources declines significantly following the first tranche of privatization.

The before-after estimator is not reliable if there are changes in the overall state of the economy between these years or if there are changes in the life-cycle position of some of these privatized firms. Below we describe the results of a fixed effects regression with year dummies.

A. Estimating the Effect of Partial Private Ownership

We investigate the average impact of privatization by comparing privatized firms to firms that do not sell any equity between 1990 and 1999 by estimating the following firm fixed effects specification:

$$y_{it} = \alpha_i + \alpha_1 PRIV_{it-1} + \alpha_2 X_{it-1} + \alpha_t Year_t + \varepsilon_{it}, \quad (1)$$

where y_{it} is the performance measure and the X_{it-1} variables are firm-specific factors that explain the outcomes. The specification in (1) includes a firm-specific fixed effect, α_i, which reflects differences across firms that are constant but unobserved over time, year dummies that would capture contemporaneous

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Table I
Summary Statistics by Ownership Category

This table reports annual summary statistics for the population of Indian state-owned enterprises for the period 1990 to 2000, including firms partially privatized between 1991 and 1999 and firms that did not sell equity over this period. *Sales* is revenues received from main activity; *Profit* is excess of income over all costs except tax, depreciation and interest; *Labor* is number of workers; *Assets* are gross fixed assets; *Average Product* is the ratio of *Sales* to *Labor*; *Returns to Labor* is the ratio of operating income to *Labor* where operating income is *Sales* net of input costs; *Govt Loan* is the sum of the total amount of loans and subsidies from the government and government-owned development institutions and *Tot Borr* is the sum of loans from all sources; *R&D Investment* is the sum of the capital and revenue expenses incurred by a company on research and development; *R&D Intensity* is the ratio of *R&D Investment* to *Sales*; and *Capital Expenditures* are revenue expenses on new fixed assets. *N* refers to firm years for each variable and ownership category. Standard deviations are reported in parentheses.

Variable	All Firms	Partially Privatized Firms	Unsold State-Owned Firms
Sales	880.92	3273.61	311.58
	(3903.26)	(8103.77)	(1253.38)
	$N = 2799$	$N = 538$	$N = 2261$
Profit	139.29	476.44	61.38
	(572.82)	(1032.06)	(354.73)
	$N = 2866$	$N = 538$	$N = 2328$
Labor	9583.90	15148.47	8059.74
	(26716.36)	(29183.80)	(25802.29)
	$N = 1772$	$N = 381$	$N = 1391$
Assets	885.30	2608.71	482.77
	(3569.51)	(6805.63)	(2014.94)
	$N = 2852$	$N = 540$	$N = 2312$
Average Product	0.146	0.368	0.084
	(0.334)	(0.554)	(0.199)
	$N = 1684$	$N = 370$	$N = 1314$
Returns to Labor	0.050	0.134	0.027
	(0.152)	(0.251)	(0.096)
	$N = 1684$	$N = 370$	$N = 1314$
Govt Loan/Tot Borr	0.319	0.196	0.349
	(0.364)	(0.276)	(0.377)
	$N = 2686$	$N = 522$	$N = 2164$
R&D Investment	0.998	4.880	0.099
	(5.99)	(13.03)	(0.824)
	$N = 2872$	$N = 540$	$N = 2332$
R&D Intensity	0.001	0.003	0.001
	(0.005)	(0.008)	(0.004)
	$N = 2799$	$N = 538$	$N = 2261$
Capital Expenditures/Sales	0.026	0.024	0.027
	(0.463)	(0.147)	(0.522)
	$N = 2212$	$N = 515$	$N = 1697$

correlation, and a random unobserved component, ε_{it}, that reflects unobserved shocks affecting the performance of firms.

The results from estimating equation (1) are presented in Table III. We find that the share of privately owned equity has a positive and statistically significant impact on next period profitability, labor productivity, R&D

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Table II

Comparing Performance before and after Partial Privatization

This table reports before-after summary statistics for all partially privatized firms for the period 1990 to 2000. Average values are computed for before and after the first tranche of privatization for each firm. Annual *Sales, Profits, Assets, R&D Investment*, and *Labor* are measured in logarithms. *Sales* is revenues received from main activity; *Profit* is excess of income over all costs except tax, depreciation and interest; *Average Product* is the ratio of *Sales* to *Labor*; *Returns to Labor* is the ratio of operating income to *Labor* where operating income is *Sales* net of input costs; *Labor* is the number of workers; *Govt Loan* is the sum of the total amount of loans and subsidies from the government and government-owned development institutions, and *Tot Borr* is the sum of loans from all sources; *Assets* are gross fixed assets; *R&D Investment* is the sum of the capital and revenue expenses incurred by a company on research and development; *R&D Intensity* is the ratio of *R&D Investment* to *Sales*; and *Capital Expenditures* are revenue expenses on new fixed assets. Standard deviations of means are in parentheses.

Variable	Average Before Privatization	Average After Privatization	After-Before *t*-Statistic of Difference in Means
Profitability			
Sales	5.815	7.061	7.577***
	(0.132)	(0.097)	
Profit	6.476	6.792	6.583***
	(0.025)	(0.032)	
Productivity			
Average Product	0.283	0.402	1.859*
	(0.047)	(0.036)	
Returns to Labor	0.106	0.145	1.349
	(0.020)	(0.016)	
Labor	7.963	8.979	6.921***
	(0.128)	(0.078)	
Financing			
Govt Loan/Tot Borr	0.301	0.140	−6.604***
	(0.023)	(0.013)	
Assets and Investment			
Assets	5.417	6.724	7.702***
	(0.141)	(0.098)	
R&D Investment	−0.282	1.464	5.014***
	(0.365)	(0.128)	
R&D Intensity	0.0003	0.004	4.619***
	(0.0001)	(0.001)	
Capital Expenditures/ Sales	0.019	0.017	−0.259
	(0.004)	(0.003)	

*, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

investment and intensity, and employment. For example, from the first two columns of Table III, we observe that a 10-percentage point increase in the level of private equity would increase annual sales and profits by about 13% and 10%, respectively. The results also suggest that partial privatization does not cause the government to abandon the political objective of maintaining surplus employment. Boubakri and Cosset (1998) also document an increase in employment levels following privatization. In the Indian context this result is not too surprising, since company law restricts layoffs in companies, and most

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Table III

The Impact of Private Ownership on Firm Performance Comparing Partially Privatized Firms to Fully State-Owned Firms (Fixed Effects)

This table reports results from firm-level fixed effects (within) regressions that estimate the impact of partial privatization using partially privatized firms as the treatment group and the population of firms that do not sell equity as the control group for the period 1990–2000. *Annual Sales, Profits, Assets, R&D Investment*, and *Labor* are measured in logarithms. The right-hand side firm-specific variables are lagged 1 year. *Sales* is revenues received from main activity; *Profit* is excess of income over all costs except tax, depreciation, and interest; *Average Product* is the ratio of *Sales* to *Labor*; *Returns to Labor* is the ratio of operating income to *Labor* where operating income is *Sales* net of input costs; *R&D Investment* is the sum of the capital and revenue expenses incurred by a company on research and development; *R&D Intensity* is the ratio of *R&D Investment* to *Sales*; *Labor* is the number of workers; *PRIV* is the percent of private equity; *Govt Loan* is the sum of the total amount of loans and subsidies from the government and government-owned development institutions and *Tot Borr* is the sum of loans from all sources; and *Assets* are gross fixed assets. Standard errors are in parentheses.

	Profitability		Productivity		Investment		
	$Sales_{it}$	$Profit_{it}$	*Average Product*$_{it}$	*Returns to Labor*$_{it}$	*R&D Investment*$_{it}$	*R&D Intensity*$_{it}$	$Labor_{it}$
$PRIV_{i,t-1}$	0.013***	0.010***	0.008***	0.005***	0.027***	0.0001***	0.004**
	(0.004)	(0.001)	(0.001)	(0.000)	(0.004)	(0.000)	(0.002)
Govt Loan/*Tot Borr*$_{i,t-1}$	−0.370***	0.006	0.052*	0.033***	−0.080	0.0003	−0.032
	(0.104)	(0.032)	(0.028)	(0.013)	(0.105)	(0.001)	(0.042)
$Assets_{i,t-1}$	0.451***	0.044***	0.084***	0.050**	–	–	0.107***
	(0.042)	(0.012)	(0.012)	(0.006)			(0.019)
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	2228	2272	1564	1564	2280	2230	1615
R^2	0.1042	0.0699	0.1652	0.1849	0.0276	0.0241	0.0828
Pr > F(k, NT-k)[a]	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Pr > F[b]	0.000	0.000	0.000	0.000	0.000	0.000	0.000

[a]Joint significance test for all coefficients.

[b]Joint significance test for firm fixed effects, F-statistic distributed with (N, NT-N-k-1) degrees of freedom, where N equals number of firms, T equals number of years, and k is the number of RHS variables.

*, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

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state-owned enterprise employees belong to well-organized labor unions that are directly affiliated with major political parties. Since overall public sector employment fell during the 1990s, mainly because departing workers were not replaced (Goyal (2000)), it may be the case that partially privatized companies lose fewer workers by attrition because they become more profitable. Alternatively, higher labor productivity may lead these firms to hire more workers. Evidence on the sources of inefficiency in state-owned firms in Majumdar (1998) suggests that it may be possible to obtain some improvements in performance by introducing better management and/or technology. However, reducing surplus employment would clearly lead to further improvement in the allocative efficiency and profitability of Indian state-owned enterprises.

We do not include assets as an explanatory variable in the investment estimations as it may be endogenous. Investment spending may decline in response to partial privatization as politically motivated spending is reduced, or improved monitoring may lead managers to invest in better technology and thus increase productivity. Consistent with the latter hypothesis, from the fifth and sixth columns of Table III, we find that selling more equity leads to a statistically significant increase in R&D investment and R&D intensity, although the economic effect on the latter variable is small. The fraction of privately owned equity, *PRIV*, does not appear to have a statistically significant impact on the ratio of capital expenditures to sales, hence we do not report these results to save space. Lastly, borrowing from the government appears to have a negative impact on revenues. While this result could be interpreted as evidence of political interference, it may also be the case that financial support is directed to poorly performing firms.

Next we relax some of the assumptions of the fixed effects model. First, following Frydman et al. (1999), we account for persistence in the performance variables by including a lagged dependent variable in the specification. We improve on their estimation strategy by accounting for the potential endogeneity of the lagged dependent variable in the fixed effects specification. We use the dynamic GMM model developed by Arellano and Bond (1991) (henceforth AB), and difference equation (1) to remove the fixed effect α_i, and use lagged levels of the dependent and predetermined variables and differences of the strictly exogenous variables as instruments. Second, we treat $PRIV_{it-1}$ and the lagged share of government loans in total borrowing as predetermined variables and instrument them as well. For these instruments to be valid, it should be the case that once we include the predetermined variables in the regression, further lags of these variables do not explain performance growth.[5] Since we have

[5] The model relies on the sequential exogeneity assumption that, conditional on the firm fixed effect, ε_{it} is uncorrelated with current and past values of the right-hand side variables, but may be correlated with future realizations of x_{it}. It is reasonable to question this assumption in the case of $PRIV_{i,t-1}$, since partial privatization in the periods prior to $t-1$ should also have an impact on current performance. Note, however, that *PRIV* in any year measures the cumulative amount of equity sold up to and including that year. We still test the assumption by including both $\Delta PRIV_{i,t-2}$ and $\Delta PRIV_{i,t-1}$ in a fixed effects specification in differences. The coefficient of $\Delta PRIV_{i,t-2}$ is not significant for any of the dependent variables. The same result was obtained for the lagged share of government loans in total borrowing.

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a relatively short panel we restrict the instrument set to a maximum of three lags of the dependent and predetermined variables. Including all the available lags as instruments reduces the sample size but does not significantly change the magnitude or statistical significance of the coefficients.

This approach also minimizes the potential for endogeneity of the privatization variable because it is far less likely that the decision to sell or how much to sell in a given year is based on anticipated changes in performance in the future. However, the main disadvantage has to do with the use of potentially weak instruments that may not be highly correlated with the predetermined variables. In Table IV we report the results from estimating the following AB specification:

$$\Delta y_{it} = \beta_1 \Delta PRIV_{it-1} + \beta_2 \Delta y_{it-1} + \beta_3 \Delta X_{it-1} + \beta_t Year_t + \Delta \varepsilon_{it}, \tag{2}$$

which describes the effect of a change in the level of private equity on the growth rates of the performance variables. From Table IV we observe that a change in the share of private equity has a positive and highly statistically significant impact on the future growth rates of all the profitability and productivity measures. There is a slightly significant impact on R&D investment and on the ratio of capital expenditure to sales (at the 10% level), but no effect on employment growth. Consider the average firm in the sample that sells 3.26% equity between $t-2$ and $t-1$. Based on the results in Table IV, if the firm were to instead sell 5% of equity it would increase the next period growth rate of sales by approximately 4.7-percentage points and increase profit by 6.4-percentage points (from the first two columns of Table IV). The tests for second order autocorrelation in the differenced residuals support the assumption of the AB specification that the residuals in the levels equation are serially uncorrelated. From the p-values of the Sargan test of overidentifying restrictions, we note that we cannot reject the null hypothesis that the instruments are valid (p-values range between 0.31 and 0.99).

From Holmstrom and Tirole (1993) we know that the informativeness of the stock price signal depends on the liquidity of the stock. The testable prediction of their model is that performance should depend on the volume of equity sold, because managers can be monitored more effectively with better information. The results appear to support this hypothesis since we find that performance improvements are positively related to the share of privately owned equity. It would be interesting to see, however, if these results mainly capture the firm's response to being listed on the stock market. To test if the share of equity sold matters once we control for a listing effect, we introduce the dummy variables below that capture the impact of the first and second listing on performance:

$$\begin{aligned} FIRST_{is} &= \begin{cases} 1 \,\forall\, s \geq t & \text{if firm } i \textit{ first} \text{ sells equity in year } t \\ 0 & \text{otherwise} \end{cases} \\ SECOND_{js} &= \begin{cases} 1 \,\forall\, s \geq t & \text{if firm } j \textit{ again} \text{ sells equity in year } t \\ 0 & \text{otherwise} \end{cases} \end{aligned} \tag{3}$$

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Table IV

The Impact of Private Ownership on Firm Performance Comparing Partially Privatized Firms to Fully State-Owned Firms (GMM)

This table reports results from the Arellano and Bond (1991) GMM regressions that estimate the impact of private ownership with partially privatized firms as the treatment group and the population of state-owned firms that do not sell any equity as the control group for the period 1990 to 2000. *Annual Sales, Profits, Assets, R&D Investment*, and *Labor* are measured in logarithms. The right hand side firm-specific variables are 1 year lagged differences. The measures $\Delta y_{i,t-1}$, $\Delta PRIV_{i,t-1}$, and $\Delta Govt\ Loan/Tot\ Borr_{i,t-1}$ are instrumented. Instruments are lagged levels of the dependent and predetermined variables and differences of the strictly exogenous variables, up to a maximum of 3 lags. *Sales* is revenues received from main activity; *Profit* is excess of income over all costs except tax, depreciation, and interest; *Average Product* is the ratio of *Sales* to *Labor; Returns to Labor* is the ratio of operating income to *Labor* where operating income is *Sales* net of input costs; *R&D Investment* is the sum of the capital and revenue expenses incurred by a company on research and development; *R&D Intensity* is the ratio of *R&D Investment* to *Sales*; *Capital Expenditures* are revenue expenses on new fixed assets; *Labor* is the number of workers; *Priv* is the percentage of private equity; *Govt Loan* is the sum of the total amount of loans and subsidies from the government and government-owned development institutions and *Tot Borr* is the sum of loans from all sources; and *Assets* are gross fixed assets. Standard errors are in parentheses.

	Profitability		Productivity		Investment		
	$Sales_{it}$	$Profit_{it}$	*Average* $Product_{it}$	*Returns to* $Labor_{it}$	*R&D* $Investment_{it}$	*Capital Expenditures/* $Sales_{it}$	$Labor_{it}$
$\Delta PRIV_{i,t-1}$	0.027**	0.037***	0.023***	0.006**	0.039*	0.00003*	0.005
	(0.013)	(0.011)	(0.006)	(0.002)	(0.025)	(0.00001)	(0.004)
$\Delta y_{i,t-1}$	0.210	−0.268	0.057	0.720***	0.164**	0.191***	0.307*
	(0.152)	(0.212)	(0.261)	(0.158)	(0.082)	(0.034)	(0.174)
$\Delta Govt\ Loan/Tot\ Borr_{i,t-1}$	0.628	−0.173	0.055	0.026	0.018	−0.052*	0.050
	(0.585)	(0.154)	(0.115)	(0.043)	(0.379)	(0.032)	(0.072)
$\Delta Assets_{i,t-1}$	−0.010	0.014	0.013	0.003	–	–	0.033
	(0.095)	(0.009)	(0.010)	(0.007)			(0.027)
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	1848	1895	984	984	1910	1726	1027
Sargan Test (Pr > χ^2)[a]	0.920	0.985	0.615	0.994	0.988	0.308	0.991
AR(1) (Pr > z)[b]	0.057*	0.567	0.240	0.010***	0.000***	0.011***	0.011***
AR(2) (Pr > z)[c]	0.473	0.238	0.848	0.460	0.214	0.401	0.413

[a]Null hypothesis of the Sargan test is that the over-identifying restrictions are valid. Test statistic is distributed as $\chi^2(87)$.

[b]Null hypothesis of no first order autocorrelation in the differenced residuals (AB is still valid if differenced errors are AR(1)). Test statistic is distributed as standard normal.

[c]Null hypothesis of no second order autocorrelation in the differenced residuals (AB is not valid if differenced errors are AR(2)). Test statistic is distributed as standard normal.

*, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

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In panel A of Table V we report the coefficients of the *PRIV* and listing variables since the control variables are the same as in equation (1). Controlling for the initial and subsequent listings in the fixed effects estimation, we observe that the share of equity owned by private investors continues to have a positive and statistically significant impact on profits and labor productivity. However, the investment measures appear to respond to the initial listing rather than to the share of equity sold.

Since none of the firms transfer management control, the principal change introduced by partial privatization is the impact on managers' incentives from the information contained in an observable share price. State-owned enterprise shares are closely monitored by the large number of business analysts and institutional and individual investors in India's stock markets. Accounts from annual shareholder meetings suggest that private shareholders of partially privatized companies regularly voice concerns about performance. Market monitoring can affect managerial incentives in a number of ways, although in this case we can probably rule out the disciplinary impact of a market for corporate control, since it does not exist for state-owned firms. Stock performance is a valuable signal in the market for managerial skills, and it may also be used by workers and lower level managers to monitor senior managers, since all workers' outside opportunities depend on the performance of the firm. This argument is bolstered by the fact that in the decade following economic liberalization there has been a rapid growth in executive compensation in the private sector. Stock prices may also be used by the government to monitor managers more effectively. For example, if the government is interested in raising more revenues from future equity sales, it may explicitly or implicitly pressure managers to maintain share value.[6] Better information and monitoring might also reduce corrupt practices by managers, such as redirecting output to nonpaying customers (LaPorta and Lopez-de-Silanes (1999)). Thus, improvement in incentives may come about through a combination of the above channels, one of which we investigate further in Section III.C.

It could be that managers respond to other factors that also affect incentives but are not related to better information, such as a bankruptcy threat. We control for a potential change in budget constraints by including financial support from the government as an explanatory variable. However, Indian state-owned enterprises are rarely if ever shut down, and there is no anecdotal evidence to suggest that partially privatized firms are subject to a greater bankruptcy threat. Another potential explanation is that managers respond

[6] This does not imply that the government no longer pursues political objectives. The main criticism of the government owner is that it has other objectives in *addition* to profit maximization. Stock prices allow the government to better monitor manager actions that improve profit performance, but this does not rule out pursuing political objectives as well. The results support this, since employment does not fall and the effect of partial privatization remains significant when we control for government payments to firms. Moreover, it is unclear why objectives would change selectively for the partially privatized firms. A revenue-maximizing government would emphasize profit maximization in all the firms, since they are all future sale candidates.

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Table V

Controlling for the Listing Effect and Changes in the Competitive Environment Comparing Partially Privatized Firms to Fully State-Owned Firms (Fixed Effects)

Panel A reports results from firm-level fixed effects (within) regressions that investigate the effect of listing on the stock market, with partially privatized firms as the treatment group and the population of state-owned firms that do not sell any equity as the control group for the period 1990 to 2000. Panel B reports results from the firm-level fixed effects (within) regressions that control for changes in the competitive environment. All the regressions include lagged government loans over total borrowing, year dummies and, with the exception of the investment measures, lagged assets on the right-hand side. Annual *Sales, Profits, Assets, R&D Investment,* and *Labor* are measured in logarithms. The right-hand side firm-specific variables are lagged 1 year except for the competition dummies. *Sales* is revenues received from main activity; *Profit* is excess of income over all costs except tax, depreciation and interest; *Average Product* is the ratio of *Sales* to *Labor; Returns to Labor* is the ratio of operating income to labor where operating income is *Sales* net of input costs; *R&D Investment* is the sum of the capital and revenue expenses incurred by a company on research and development; *R&D Intensity* is the ratio of *R&D Investment* to *Sales*; *Capital Expenditures* are revenue expenses on new fixed assets; *Labor* is the number of workers; *PRIV* is the percent of private equity; *FIRST* is a dummy variable that equals one in the first year a firm sells equity and thereafter; *SECOND* is a dummy variable that equals one the second time a firm sells equity and thereafter; *DEREST* is a dummy variable (interacted with a time trend) that equals one if the firm is in an industry reserved for state-owned firms that was opened to private entry in 1991; and *LIBT* is a dummy variable (interacted with a time trend) that equals one if the firm is in an industry that removed restrictions on foreign entry in 1991. Standard errors are in parentheses.

	Profitability		Productivity		Investment			
	$Sales_{it}$	$Profit_{it}$	*Average* $Product_{it}$	*Returns to* $Labor_{it}$	*R&D* $Investment_{it}$	*R&D* $Intensity_{it}$	*Capital Expenditures/* $Sales_{it}$	$Labor_{it}$
Panel A: Listing Effect								
$PRIV_{i,t-1}$	0.007	0.009***	0.008***	0.005***	0.008	0.000	−0.001	0.002
	(0.005)	(0.002)	(0.001)	(0.001)	(0.005)	(0.000)	(0.000)	(0.002)
$FIRST_{i,t-1}$	0.173	0.041	−0.001	0.003	0.685***	0.002**	0.020***	0.051
	(0.120)	(0.038)	(0.028)	(0.013)	(0.124)	(0.001)	(0.008)	(0.045)
$SECOND_{i,t-1}$	0.109	−0.067	0.004	−0.070***	−0.026	−0.001	0.006	−0.017
	(0.173)	(0.055)	(0.041)	(0.019)	(0.167)	(0.001)	(0.012)	(0.066)
Panel B: Changes in Competitive Environment								
$PRIV_{i,t-1}$	0.010**	0.010***	0.008***	0.004***	0.025***	0.0001**	−0.0001	0.004**
	(0.004)	(0.001)	(0.001)	(0.000)	(0.004)	(0.000)	(0.000)	(0.002)
$DEREST_{i,t}$	0.029**	0.012***	−0.009***	−0.002	0.025*	0.0003***	−0.003***	−0.009*
	(0.012)	(0.004)	(0.003)	(0.002)	(0.013)	(0.000)	(0.001)	(0.005)
$LIBT_{i,t}$	−0.066***	0.0001	−0.011***	−0.003**	−0.041***	−0.00001	−0.002**	−0.012**
	(0.011)	(0.004)	(0.003)	(0.001)	(0.011)	(0.0001)	(0.001)	(0.005)

*, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

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to the threat of losing their jobs after privatization if profits decline, and not to the share price. It seems unlikely, however, that managers concerned about their future with the firm would not care about maintaining or improving share performance. Moreover, this explanation does not provide an unambiguous prediction, because managers may also understate profits to discourage potential buyers, as was true in many instances of insider privatization in Eastern Europe and Russia. However, a plausible alternative explanation for performance improvement is that manager incentives are affected by a change in competitive conditions rather than partial privatization.

B. Controlling for Changes in the Competitive Environment

We ask if partial privatization continues to matter once we control for changes in the competitive environment of firms. We introduce two variables to capture the effects of dereservation and liberalization: *DEREST* is equal to one if the firm is in an industry that was reserved for state-owned firms and zero if it is an industry that was never reserved, *LIBT* is equal to one if the firm is in an industry that removed restrictions on foreign entry and zero if it is an industry that retained barriers. Both are interacted with a time trend. An advantage of these exogenous policy changes is that they measure potential rather than actual entry and therefore are less likely to suffer from the endogeneity problems associated with measures of market concentration. In panel B of Table V we report the coefficients of *PRIV*, *DEREST*, and *LIBT* from the fixed effects estimations. The control variables are the same as in specification (1) and we do not report them to save space.

From panel B of Table V, we observe that the coefficient of the share of private equity is positive and statistically significant for the profitability, productivity, and investment measures. Dereservation appears to lead to a statistically significant increase in annual sales, profit, R&D investment, and R&D intensity, and a decline in the average product of labor and the share of capital expenditure in sales. In contrast, from the statistically significant negative coefficient of the liberalization dummy, it appears that annual sales and labor productivity decline in response to foreign entry. Liberalization also appears to lead to a statistically significant decline in investment on average (R&D investment and the ratio of capital expenditures to sales). The results also suggest that competitive pressures force firms to undertake labor restructuring, since both variables have a statistically significant negative impact on employment. Including *DEREST* and *LIBT* as additional explanatory variables in specification (2), the results from the GMM regression suggest that a change in the share of privately owned equity continues to have a positive and statistically significant impact on profitability and productivity growth, but not on the growth rates of investment and employment. To save space we do not report these results.

Clearly, the effect of partial privatization on firm performance cannot be attributed to changes in the competitive environment alone. Contrary to Vickers and Yarrow (1991), the evidence suggests that competitive pressures may not

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be sufficient to fully address productive inefficiency. Instead, the effects of competition and privatization may be complementary, so that reducing government ownership is necessary to improve productive efficiency, while competitive pressures increase the allocative efficiency of firms.

C. Investigating Management Turnover in Privatized Firms

Principal-agent theory indicates that partial privatization should lead to stronger managerial incentives by improving information flows. CEOs of partially privatized firms do not receive stock options. This does not rule out other pay-for-performance incentives, but unfortunately we do not observe compensation contracts. Hence, in this section we investigate whether the managerial labor market is one channel through which partial privatization improves incentives. This market may have two effects. First, because information about firm performance is now more public, managers may use success at a partially privatized firm to further their careers. Second, because of the better incentives and opportunities for displaying their talents, partially privatized firms may be able to attract better managers. In this section we investigate both the career paths of departing CEOs and the effects of CEO change on firm performance.

The market for senior executives has expanded considerably in the last decade due to the entry of multinational companies and domestic industrial expansion following liberalization. While the salaries of senior executives and board members employed by state-owned firms are still regulated by the Companies Act of 1956, similar restrictions on the private sector have been eased. For example, in 1994 upper limits on CEO pay were removed for private companies, but not for state-owned firms, with the only restriction being that overall managerial pay and bonuses may not exceed 11% and 1% of net profits, respectively. In contrast, the CEO of a state-owned firm cannot earn more than 10 times the salary of the lowest paid employee of that firm.

Using data on CEO turnover in partially privatized firms and firms that sell majority stakes subsequently, we find that between 1990 and 2000 on average 30.9% of the firms experience a CEO turnover and 67.6% experience a change in board composition each year. Candidates for senior management and board positions in Indian state-owned enterprises are usually selected by a government department, the Public Sector Enterprise Board, and then approved by the governing ministry and the cabinet. Panel A of Table VI describes average CEO turnover for each year between 1990 and 2000, and panel B describes the career paths of departing CEOs. Denis and Denis (1995) find that only 58.1% of U.S. CEOs leave the company after stepping down while nearly 95% of the CEOs in our sample do. The relatively high rate of exit suggests that outside employment opportunities may be an important consideration. We note from panel B of Table VI that about 22% of CEOs who leave the firm move to other state-owned enterprises, while over 25% find employment in the private sector. Thus, of the CEOs who do not retire after stepping down, more than half find employment in the private sector.

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Table VI

Characteristics of CEO Turnover in Partially Privatized Firms

Panel A describes the average annual turnover in the CEO position for the period 1990 to 2000 in partially privatized firms and firms that are selected for privatization. Panel B describes characteristics of departing CEOs for the period 1990 to 2000 of partially privatized SOEs and firms that are selected for privatization. Panel C describes firm characteristics based on the subsequent employment of outgoing CEOs for the period 1990 to 2000 using data on partially privatized firms and firms that are selected for privatization. *Sales* is the average value of annual revenues received from main activity; *Profits* is the average value of annual excess of income over all costs except tax, depreciation, and interest; and Private refers to a privately owned firm. Subsequent employment refers to the departing CEO's new position, which may be with the same firm, with another state-owned firm, with a privately owned firm, or retirement. Standard deviations are in parentheses.

Panel A: CEO Turnover in Partially and Fully Privatized Firms

Year	All Firms	Firms That Sell Equity in Same Year	Firms That Do Not Sell Equity That Year	Number of Observations
1990	1.000	–	1.000	12
	(0.000)		(0.000)	
1991	0.367	0.500	0.333	30
	(0.490)	(0.548)	(0.482)	
1992	0.400	0.400	0.400	35
	(0.497)	(0.503)	(0.507)	
1993	0.324	0.308	0.333	37
	(0.475)	(0.480)	(0.482)	
1994	0.105	0	0.129	38
	(0.311)		(0.341)	
1995	0.333	0.357	0.320	39
	(0.478)	(0.497)	(0.476)	
1996	0.250	0.100	0.300	40
	(0.439)	(0.316)	(0.466)	
1997	0.500	0.500	0.500	42
	(0.506)	(0.707)	(0.506)	
1998	0.225	0	0.231	40
	(0.423)		(0.427)	
1999	0.125	0	0.135	40
	(0.335)		(0.347)	
2000	0.256	0	0.263	39
	(0.442)		(0.446)	

Panel B: CEO Characteristics

Fraction of CEOs that	%
Remain with firm after stepping down	5.04
Leave company after stepping down	94.96
Hired by SOE	21.85
Hired by Private firm	25.21
Retired	47.90

Panel C: Firm Performance and CEO Characteristics

Average Performance in Year of CEO Turnover	Subsequent Employment of CEO: Hired by Private Firm	Subsequent Employment of CEO: Hired by SOE, Same Firm, or Retired	*t*-Test of Difference in Means
Sales	7.371	7.004	1.052
	(0.361)	(0.163)	
Profit	6.452	5.926	2.518***
	(0.210)	(0.098)	
	Hired by SOE	Hired by Private Firm, Same Firm, or Retired	
Sales	7.533	6.975	1.524*
	(0.304)	(0.173)	
Profit	6.127	6.037	0.403
	(0.245)	(0.097)	
	Retired	Hired by Private Firm, Same Firm, or SOE	
Sales	6.738	7.425	2.302**
	(0.197)	(0.221)	
Profit	5.830	6.264	2.401**
	(0.097)	(0.149)	

*, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

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We find that the performance of partially privatized firms at the time of CEO turnover has a strong effect on the career paths of departing CEOs, suggesting that there is a market for successful CEOs of partially privatized companies. In panel C of Table VI we compare the average profits and sales of firms based on the career path of the outgoing CEO for 119 of the 392 turnovers between 1990 and 2000. The results suggest that departing CEOs hired by private firms are likely to have come from significantly more profitable firms, departing CEOs hired by other state-owned enterprises are likely to have come from firms with slightly better than average performance, and that departing CEOs who retire are likely to have come from significantly underperforming firms. For instance, from the second row of panel C of Table VI we observe that in the year of a CEO turnover, profits are significantly higher (at the 1% level) in firms whose outgoing CEO joins the private sector relative to firms whose outgoing CEO either joins another state-owned firm, remains with the same firm in a different position, or retires. And the last two rows of panel C show that firms whose CEOs retire have significantly lower (at the 5% level) average sales and profits in the year of turnover compared to firms whose CEOs find another position either in the private sector or with another state-owned enterprise.

One of the ways in which privatization is said to improve firm performance is by bringing in new human capital, since private owners are more likely to emphasize market skills over political connections in the selection of managers (Barberis et al. (1996) and Claessens and Djankov (1999)). Because of career concerns and other incentives, partially privatized firms should also be able to attract better managers, even though the government remains in control. CEO turnover should therefore be associated with improvements in firm performance in partially privatized firms. Moreover, if the quality of information on manager actions is positively correlated with the volume of shares traded (Holmstrom and Tirole (1993)), this effect should be increasing in the share of private equity held. To investigate the effect of CEO turnover on firm performance, we include two additional variables in specification (1): a dummy variable for CEO turnover, *CEOChange*, and the interaction between the share of equity privatized and *CEOChange*, both lagged 1 year. In panel A of Table VII, we report the results from estimating the specification below:

$$y_{it} = \gamma_i + \gamma_1 PRIV_{it-1} + \gamma_2 CEOChange_{it-1} + \gamma_3 PRIV_{it-1} \times CEOChange_{it-1} + \gamma_4 X_{it} + \gamma_t Year_t + \varepsilon_{it}, \quad (4)$$

where the variables *CEOChange*, *PRIV*, and X_{it} are defined as before, and the specification includes firm fixed effects and year dummies.[7] The control group in each year consists of those firms that have not yet sold equity and firms that

[7] We find that performance does not depend on whether the CEO was internally promoted. In particular, the coefficients of a dummy variable for an insider CEO and its interaction with *PRIV* when entered in equation (4) are not statistically significant.

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Table VII
Effect of CEO Turnover and Partial Privatization on Performance

Panel A reports results from firm-level fixed effects (within) regressions that investigate the effect of CEO turnover and partial privatization, using data for the period 1990 to 2000 with partially privatized firms as the treatment group and firms that are selected for privatization as the control group. Panel B reports results from firm-level instrumental variable regressions with fixed effects for the period 1990 to 2000 with partially privatized firms as the treatment group and firms that are selected for privatization as the control group. The instrumental variables include the first and second lags of the number of directors on the board, lagged assets (not included in the investment regressions), year dummies, and second lags of the following variables: the interaction between *PRIV* and the first *CEOCHANGE*, the dependent variable in the regression, and share of government loans in total borrowing. All the regressions include lagged government loans over total borrowing, year dummies, and with the exception of the investment measures, lagged *Assets* on the right-hand side. Annual *Sales, Profits, Assets*, and *Labor* are measured in logarithms. The right-hand side firm-specific variables are lagged 1 year. *Sales* is revenues received from main activity; *Profit* is excess of income over all costs except tax, depreciation and interest; *Average Product* is the ratio of *Sales* to *Labor*; *Returns to Labor* is the ratio of operating income to *Labor* where operating income is *Sales* net of input costs; *R&D Investment* is the sum of the capital and revenue expenses incurred by a company on research and development; *R&D Intensity* is the ratio of *R&D Investment* to *Sales*; *Labor* is the number of workers; *PRIV* is the percentage of private equity; and *CEOCHANGE* is a dummy variable equal to one in the year in which a company gets a new CEO. Standard errors are in parentheses.

Panel A: Fixed Effects Estimates

	Profitability		Productivity		
	$Sales_{it}$	$Profit_{it}$	*Average* $Product_{it}$	*Returns to* $Labor_{it}$	$Labor_{it}$
$PRIV_{i,t-1}$	0.003	0.009**	0.004*	0.003**	0.004***
	(0.003)	(0.004)	(0.003)	(0.001)	(0.001)
$PRIV_{i,t-1} \times CEOCHANGE_{i,t-1}$	0.006**	0.008*	0.001	0.001	0.001
	(0.003)	(0.004)	(0.002)	(0.001)	(0.001)
$CEOCHANGE_{i,t-1}$	−0.140***	−0.187**	−0.022	−0.047**	−0.015
	(0.055)	(0.075)	(0.044)	(0.022)	(0.017)
Number of observations	339	337	257	257	258

Panel B: Instrumental Variable Estimates

	Profitability		Productivity		Investment		
	$Sales_{it}$	$Profit_{it}$	*Average* $Product_{it}$	*Returns to* $Labor_{it}$	*R&D* $Investment_{it}$	*R&D* $Intensity_{it}$	$Labor_{it}$
$PRIV_{i,t-1}$	0.036**	0.044**	0.006	0.006	0.042	−0.0001	0.013*
	(0.018)	(0.022)	(0.032)	(0.008)	(0.036)	(0.000)	(0.008)
$PRIV_{i,t-1} \times CEOCHANGE_{i,t-1}$	0.059**	0.060*	0.023	0.012*	0.112*	−0.0005	0.010
	(0.026)	(0.034)	(0.042)	(0.007)	(0.059)	(0.001)	(0.011)
$CEOCHANGE_{i,t-1}$	−0.827	−1.195	−0.236	−0.166	−1.421	0.020*	−0.022
	(0.659)	(0.834)	(0.503)	(0.163)	(1.486)	(0.012)	(0.164)
Number of observations	238	236	162	162	238	238	163

*, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

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do not partially privatize but sell majority stakes subsequently. The coefficient of the interaction term captures whether the effect of partial privatization on firm performance is related to turnover in the CEO position. The results reported in panel A of Table VII support the hypothesis that partial privatization both facilitates the selection of better managers and improves incentives for existing and new managers. The first effect is seen from the estimated coefficient of the interaction term in the second row of panel A, which suggests that a CEO change in partially privatized firms leads to significantly higher sales and profits. The second effect is seen from the estimated coefficient of *PRIV* in the first row of panel A, which suggests that the share of privately owned equity continues to have a positive and statistically significant impact on profits, average product, and returns to employment. Since the interaction term does not have a significant impact on the investment measures, we do not report these results to save space.

Because of the potential endogeneity of CEO turnover to performance in equation (4), we also estimate an instrumental variables regression with firm fixed effects treating *PRIV*, the lagged share of government loans, *CEOChange*, and the interaction between *PRIV* and *CEOChange* as endogenous. The results are reported in panel B of Table VII. Instrumental variables include the first and second lags of the number of directors on the board,[8] year dummies, lagged assets, and two-period lags of the following variables: the interaction between *PRIV* and the first CEO turnover in a firm, the dependent variable in the regression, and the share of government loans in total borrowing. The regressions with the investment measures as the dependent variables do not include lagged assets as an instrumental variable. We note from the coefficients of the interaction term in panel B of Table VII that among firms that undertake a CEO change, the greater the share of privately held equity, the greater the increase in sales, profits, returns to employment, and R&D investment. Hence, this result is consistent with the hypothesis that new managerial talent may be responsible for performance improvements in partially privatized firms. We also note that once we control for endogeneity, CEO turnover no longer has a significant effect on the performance of firms that remain fully owned by the government.

D. Addressing Problems in the Estimation Strategy

The fixed effects specifications control for the sort of selection bias that may arise if more shares of better firms are likely to be sold. We have also used lagged values and instrumented potentially endogenous regressors. Below we describe the results from additional robustness checks.

We investigate whether the results overestimate the impact of privatization, because privatized firms experience a decline in performance prior to privatization that other firms do not. Following Bartel and Harrison (2004), we compare the pre-privatization performance measures with those of firms that did not

[8] Yermack's (1996) findings suggest a negative relationship between board size and managerial oversight.

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change ownership and find that privatized firms do not perform differently compared to the control group prior to privatization.

Fixed effects do not address the dynamic selection bias that may arise if the government selects firms for privatization based on time-varying characteristics that are unobservable to the researcher. Frydman et al. (1999) argue that firms that are selected for privatization are likely to share similar characteristics, so comparing privatized firms to a control group of firms that have also been selected for privatization but have not yet been sold should address this potential selection bias. Since privatization is distributed over several years in our data, in any given year, we also observe firms privatized in later years that form the control group. We estimate both specifications (1) and (2) using as a control group only those firms that are selected for privatization. The same sample is used to investigate the impact of CEO turnover in Section III.D. The results are similar to those reported in Tables III and IV and we do not report them to save space.

Since 2000 the Indian government has sold majority stakes and transferred management control in 14 firms. In Table VIII we report the coefficient of *PRIV* for all the specifications, using data from 1990 to 2002. We include both partially privatized firms and firms that transfer management control in the treatment group. The fraction of privately owned equity has a positive and highly statistically significant impact on the profitability and productivity measures in all the specifications, and on R&D investment and employment in specifications (1) and (2).

The results do not change if we exclude the most profitable enterprises, the oil and gas companies that have the highest forecasted profitability among the partially privatized companies. For example, corresponding to the results in the first column of Table III, we find that the coefficient (standard error) of *PRIV* is 0.013(0.005) and is statistically significant at the 1% level, and that it retains its sign, magnitude, and significance for the other specifications as well. Similarly, we also find that the results are not driven by the firms owned by regional governments.

The partial privatization process in India leads us to believe that dynamic selection is not a major problem. The debate in policy circles and in the media emphasizes the absence of a privatization plan. A comment from an editorial in the prominent Indian business newspaper *The Economic Times* (2001) reflected this general perception: "The disinvestment program of the government is completely incoherent and lacks transparency and conviction."

IV. Summary and Concluding Comments

Most governments undertake the transfer of state-owned enterprises to the private sector through partial sales, but this method is largely dismissed as being ineffectual in policy debates and its effects have been overlooked in the literature. Using fixed effects and instrumental variable regressions, we find that partial privatization, in which minority shares of state-owned firms become available on stock markets, has a positive and highly statistically significant impact on the operating performance of firms.

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Table VIII

The Impact of Private Ownership on Firm Performance: Additional Robustness Checks

This table reports results from firm-level fixed effects (within) and GMM regressions that estimate the impact of private ownership with partially privatized firms and firms that sell majority stakes as the treatment group for the period 1990 to 2002. The population of firms that do not sell any equity between 1990 and 2002 is the control group. In the fixed effects estimations the right-hand side firm-specific variables are lagged 1 year. In the GMM estimates, the right-hand side firm-specific variables are 1 year lagged differences, and Δy_{t-1}, $\Delta PRIV_{t-1}$, and $\Delta GOVT\ LOAN/TOT\ BORR_{t-1}$ are instrumented. Instruments are lagged levels of the dependent and predetermined variables and differences of the strictly exogenous variables, up to a maximum of 3 lags. All the regressions include lagged government loans over total borrowing, year dummies, and with the exception of the investment measures, lagged *Assets* on the right hand side. Annual *Sales, Profits, Assets, R&D Investment*, and *Labor* are measured in logarithms. *Sales* is revenues received from main activity; *Profit* is excess of income over all costs except tax, depreciation, and interest; *Average Product* is the ratio of *Sales* to *Labor*; *Returns to Labor* is the ratio of operating income to labor where operating income is *Sales* net of input costs; *R&D Investment* is the sum of the capital and revenue expenses incurred by a company on research and development; *R&D Intensity* is the ratio of *R&D Investment* to *Sales*; *Labor* is the number of workers; and *PRIV* is the percentage of private equity. Standard errors are in parentheses.

	Profitability		Productivity		Investment		
	$Sales_{it}$	$Profit_{it}$	*Average* $Product_{it}$	*Returns to* $Labor_{it}$	*R&D* $Investment_{it}$	*R&D* $Intensity_{it}$	$Labor_{it}$
				Fixed Effects Estimations			
$PRIV_{i,t-1}$	0.010***	0.007***	0.010***	0.005***	0.011***	0.00001	0.005***
	(0.003)	(0.001)	(0.001)	(0.000)	(0.003)	(0.00003)	(0.002)
				GMM Estimations			
$\Delta PRIV_{i,t-1}$	0.025**	0.032***	0.023***	0.006***	0.028*	0.0001	0.005
	(0.010)	(0.009)	(0.006)	(0.002)	(0.016)	(0.0001)	(0.004)
				Control for First and Second Listing			
$PRIV_{i,t-1}$	0.006	0.005***	0.010***	0.005***	−0.007**	0.000	0.005**
	(0.004)	(0.001)	(0.001)	(0.001)	(0.004)	(0.000)	(0.002)
				Control for Changes in the Competitive Environment			
$PRIV_{i,t-1}$	0.003***	0.007***	0.011***	0.005***	0.010***	0.00001	0.004**
	(0.009)	(0.001)	(0.001)	(0.000)	(0.003)	(0.00003)	(0.002)

*, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Previous studies have shown that full privatization improves firm performance but offer little insight into how this occurs. Does privatization improve performance simply by eliminating political interference that forces managers to employ surplus labor and pursue other inefficient policies? Or does it also improve performance by reducing agency problems that impede management efficiency? Because partially privatized firms remain under government control, it is unlikely that the performance gains in our data occur through the former mechanism. Consistent with this interpretation, we find that partial privatization leads to an increase in the productivity of labor and output without layoffs. Hence, our results support the managerial view that improved managerial efficiency is a significant factor in explaining the effect of privatization on performance.

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The principal-agent literature shows how stock price information can alleviate agency problems through a number of different channels. Since a large private sector coexists with the public sector in India and since managers can move between the sectors, an important role of partial privatization is to provide the market for executives with public information on the performance of state-owned firms. To investigate this particular channel, we look at the career paths of departing CEOs and the effects of CEO change on firm performance. We find that managers can use success at a partially privatized firm to further their careers, which suggests that incentives for existing managers improve. We also find that CEO turnover in partially privatized firms leads to a significant improvement in performance, which suggests that partially privatized firms are able to attract better managers.

The majority sales undertaken since 2000 may shed some light on inefficiency due to political interference, since these firms transfer management control to private owners. While there is not yet enough data to draw firm conclusions, we note some preliminary results here. Results from univariate tests suggest that partially privatized firms that subsequently transfer management control experience an improvement in labor productivity and a decline in employment compared to partially privatized firms that remain under government control. However, there does not appear to be a corresponding increase in sales and profits following the transfer of management control. Compared to firms that remain fully state-owned, we find that listing on the stock market has a greater impact on profitability, while transferring management control has a greater impact on labor productivity.[9] However, given that we observe relatively few years of performance after majority sales, these results may not fully capture any longer term gains from restructuring following a transfer of management control.

Appendix

Table AI
Description of Variables

Variables	Description
Sales	Annual sales generated by an enterprise from its main business activity measured by charges to customers for goods supplied and services rendered. Excludes income from activities not related to main business, such as dividends, interest, and rents in the case of non-financial firms, as well as non-recurring income.

(*continued*)

[9] In specification (1), instead of *PRIV*, we include a dummy variable for the first listing (*FIRST*) and a dummy variable for the majority sale. The first listing has a positive and statistically significant effect on profits (at the 1% level), and a majority sale has a significant effect on average product of labor (at the 1% level). The sample is the population of state-owned firms.

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Table AI—*Continued*

Variables	Description
Profit	Annual excess of income over all expenditures except tax, depreciation, interest payments, rent, and extraordinary expenditures. Does not include extraordinary income and income from sources not related to main business activity.
Labor	Total number of employees in a year including managerial staff.
Assets	Annual gross fixed assets that include movable and immovable assets as well as assets that are in the process of being installed.
Average Product	Ratio of sales to labor.
Government loans and subsidies	Annual sum of loans received from the central and state governments and government-owned development institutions, and subsidies given by the government.
Total Borrowing	Annual total borrowings, including loans from banks, institutions, debentures, other companies, tax deferrals, foreign, and other borrowings.
Govt Loan/Tot Borr	Ratio of government loans and subsidies to total borrowing.
Returns to Labor	Ratio of annual operating income to labor. Operating income is measured as sales minus the total cost of raw materials, wages, and energy costs.
R&D Investment	The sum of annual capital and revenue expenses incurred by a company for R&D.
R&D Intensity	Ratio of R&D investment to sales.
Capital Expenditures	Annual revenue expenditures that are incidental and specific to creation of new fixed assets.
DEREST	Dummy variable that is equal to one if the firm is in an industry that was reserved for government-owned firms until 1991, interacted with a time trend.
LIBT	Dummy variable that is equal to one if the firm is in an industry that removed restrictions on foreign ownership after 1991, interacted with a time trend.
PRIV	Variable that lies between 0 and 100, measuring the percentage of equity that is private in a firm in a given year.
FIRST	Dummy variable equal to one if the firm has sold equity in just one tranche, either in that year or prior to that year.
SECOND	Dummy variable equal to one if the firm has sold equity in at least two tranches, either in that year or prior to that year.
CEOCHANGE	Dummy variable equal to one if the firm changes CEOs that year.
Year	Year dummies excluding 1991.

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