State as Investor and State as Owner: Consequences for Firm Performance in India*

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A common assumption is that firms owned by the state perform poorly compared with firms in the private sector. Most studies that make such claims are problematic, because they are based on analysis of public-sector firms operating as either monopolies or duopolies. This makes it difficult to disentangle the effects of ownership and monopoly on firm performance. In this article, we argue that state ownership influences firm performance, measured as RETURN ON ASSETS and RETURN ON SALES, only when property rights devolve fully to the state. Data from 1,100 firms listed on the Bombay Stock Exchange are analyzed, and a spline regression model is advocated for cross-sectional data where linearity exists within but not across categories. Controlling for a number of firm- and environment-specific factors, we conclude that firms in which the state does not have majority shareholding indeed outperform firms in which the state has a majority of shares, though the former, too, do not yield positive returns on either assets or sales.

Introduction

In its heyday, state intervention in the economy of developing countries took two broad forms. The state regulated the private sector, provided subsidies, and offered incentives to some sectors over others. State-owned firms also produced industrial, consumer, and agricultural goods. Critics of these roles of the state argued that state regulations introduced distortions in the economy and generated welfare losses.[1] Relying on property-rights theories of the firm, some scholars also claimed that private firms outperformed state-owned firms.[2] Reporting the results of more than 90 studies on firm performance, A. R. Vining and A. E. Boardman note that "ownership does matter and there is strong evidence of superior PC [private corporations] performance."[3]

Numerous analyses of the performance of state-owned enterprises

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have addressed the relationship between state ownership and performance but have focused their analysis solely on state enterprises that are either natural monopolies or regulated duopolies.[4] Because the research on SOEs (state-owned enterprises) "involve[s] contiguous, spatial (usually national) monopoly SOEs, e.g., post offices . . . obviously, these studies cannot tell us much about ownership effects as there is no variation in ownership."[5] These studies also do not "address whether public firms will be as efficient as private firms in competitive environments."[6] As such, it is difficult to assess whether the poor performance of these SOEs is due to the absence of competition or to ownership by the state.[7]

Most analyses of the influence of state ownership on firm performance also do not take into account the institutional framework in which these firms operate. It is not clear a priori what level of ownership will allow an owner control over strategic decisions concerning a firm. In this article, we argue that the institutional framework translates shareholding to property rights.[8] Insofar as the poor performance of state-owned firms is attributable to an attenuation of property rights, it is important to be able to demarcate property rights clearly. This, as D. North has argued forcefully, cannot be done outside an institutional framework.[9]

Like most developing countries, India has a long history of state intervention in the economy. In 1944 the "Bombay Plan," drawn up by the leading industrialists of India, advocated an activist and leading role for the state in industrial development, in view of limited private and corporate savings in India. Soon after independence, in 1956, India adopted a "command-and-control"–oriented, mixed-economy regime. This regime had distinct characteristics: a private economy functioning within an extensive set of government regulations and a number of SOEs operating in key sectors of the economy. The nationalization of banks and the insurance industry in the late 1960s and early 1970s increased the extent of state intervention in the economy. The supply of long-term debt capital, too, became the exclusive province of the state, because most of the financial institutions that supplied capital were state owned. Although efforts to liberalize the economy were first made in the early 1980s, it was only the reforms initiated in 1991 that finally led to a reduced role for the state in the Indian economy. Since then, there has been a move toward a market-based economy in which private and foreign capital is expected to play a significant role. There have been standard criticisms of the state ownership of firms in India—that it has lead to inefficient, bloated, and loss-making enterprises.[10]

State ownership of firms in India, however, also extends to mixed enterprises operating in competitive industries. Shares of these firms are traded on the Bombay Stock Exchange. This article, drawing on a large sample (1,100) of Indian firms firms listed on the Bombay Stock Exchange will demonstrate that, even for mixed enterprises, the proportion of shares owned by the state does indeed influence the performance of

the enterprises. Mixed enterprises perform poorly when property rights devolve to the state, because the state has the capability to make strategic decisions about the allocation of resources within these firms. These findings suggest that state ownership could be a key problem even for mixed enterprises in developing countries. In the following section, current theories on the impact of state ownership on firm performance are discussed. We argue that the translation of shareholding to control over a firm is determined by the institutional framework within which firms operate. In Section III, a spline regression model, which takes account of institutional differences, is specified, and various firm- and environment-specific controls are also introduced into the model.

II. Theory and Institutional Issues

A form of state intervention that has been criticized is government ownership of firms. State-owned firms do not perform as well as private firms do largely because property rights are more attenuated in an SOE than in a privately held firm.[11] Nontransferable ownership of state firms also "rules out specialization in their ownership" and "inhibits the capitalization of future consequences into current transfer prices and reduces owners' incentives to monitor managerial behavior."[12] Attenuation of property rights can also be a problem for private firms, although some of it may be obviated by the takeover market, which reduces managers' incentives to free ride through increased monitoring by owners.

Empirical support for the poorer performance of state firms relative to private firms, however, is relatively limited, especially for developing nations. Most research addresses the "relationship between performance and ownership in certain limited contexts" and does not concern itself with whether state firms "will be as efficient as private firms in *competitive* environments."[13] The issue that is important to determine is, if state firms perform poorly in areas where they are monopolies, how much of the reduced performance of state firms is the result of ownership compared with operation as monopolies? This is an especially salient question because there is evidence that, "given sufficient competition between public and private producers (and no discriminative regulations and subsidies), the difference in unit cost turns out to be insignificant."[14] Insofar as most studies have also not been able to disentangle the interactive effects of regulation and ownership, claims about the influence of ownership on performance have to be qualified.[15]

Studies that examine the relative performance of government and private firms exist.[16] Examining the performance of government and private firms in Indonesia and Tanzania, R. Funkhouser and P. W. MacAvoy, and K. S. Kim argue that private firms outperform government firms.[17] However, both studies are based on very small samples. Kim examined 35 firms (23 in the private sector and 12 in the public sector) and Funkhouser and MacAvoy collected data on 64 public-sector

companies and between "30 [and] 40 observations" in the private sector.[18] Boardman and Vining used a larger sample, 500 of the largest non-U.S. industrial firms, firms that could be either state-owned, mixed (state and private ownership), or private corporations.[19] Boardman and Vining conclude that, "after controlling for a wide variety of factors, large industrial MEs [mixed enterprises] and SOEs perform substantially worse than similar PCs [private corporations]."[20]

tivities. We could expect mixed enterprises, in which the state can exercise some control, to perform poorly. The poor performance can be attributed to the fact that in mixed enterprises in which the state owns either a majority of the shares or can block special resolutions, the disposal of resources and capital assets is not an issue, and since neither is takeover, the pressures to monitor are absent and managers can free ride.[28] In firms in which the state is merely a passive investor and does not exercise strategic control, firm resources and capital assets can be

provided initial data. Thereafter, details on ownership and some aspects of firm behavior and performance were collected from the Bombay Stock Exchange and the office of the Registrar of Companies in the Department of Company of the Ministry of Law, Justice and Company Affairs of the Government of India. The principal limiting factor was the availability of data on ownership, as these data were not readily available for all firms. In conjunction with the guidance provided to us by officials of the Department of Statistical Analysis and Computer Services of the Reserve Bank of India, we were able to collect ownership data for the firms.

The data collected are cross-sectional and not time-series in nature, largely because of difficulties with obtaining ownership patterns. Ideally, data collected on changing patterns of ownership and firm performance over a long time period are likely to yield richer findings. The large and heterogeneous cross-section of firms in the dataset, however, allows us to control for firm-level, industry-wide, and institutional effects. This is especially important, because the lack of efficient controls has been a lacuna of past studies.[30] The variables used in the study are listed in table 1.

B. Measures of Firm Performance

As with similar work studying the impact of ownership on firm performance, two different variables are used: RETURN ON ASSETS and RETURN ON SALES.[31] As in the West, these measures are used by the stock market to appraise firm performance. Apart from profitability, another key measure of firm-level performance is productive efficiency, or the ability of firms to convert resource inputs into outputs. To compute productive efficiency indices, it is necessary to have data available not only on the value of outputs but also data on the different inputs used by firms. Since our data base did not include any information on the number of employees, we do not have a key variable required to undertake traditional productive efficiency calculations.

C. Independent Variables

Institutional constraints imposed by the Indian government imply that the influence of state ownership on firm performance has to be assessed at three levels: first, for firms with less than 26% state shareholding; second, for firms with 26% or more of shares owned by the state; and, third, for companies in which the state is a majority shareholder. The data that we acquired on shareholding report the percentage of each firm's shares that is owned by the state, with information that allows us to classify firms according to the three levels of state shareholding.

D. Controls

A key methodological weakness of much of the earlier literature, especially that assessing the performance of state-owned firms in India, is

TABLE 1

DESCRIPTION OF VARIABLES

Variable	Description
Dependent variables:	
RETURN ON ASSETS	Profit after taxes as a ratio of total assets
RETURN ON SALES	Profit after taxes as a ratio of net sales
Independent variables:	
GOVERNMENT	Government shareholding
GOVERNMENT—MID	Government shareholding between 26% and 50%
GOVERNMENT—HIGH	Government shareholding of 50% or more
SIZE	Log of sales
AGE	Number of years since incorporation until the date for which data are reported
DIVERSITY	Index taking on the values between 0 and 2 to denote the extent of diversification of each firm into different business areas (0 = single-product firms; 1 = multiple activities in related areas; 2 = widely diversified firms)
EXPORT SALES	Ratio of exports to total sales of each company
IMPORTS	Ratio of imports to total operating expenses
NET FIXED ASSETS	Ratio of net fixed assets to total assets
QUICK RATIO	Ratio of cash and other short-term realizable assets to total current liabilities
INVENTORY	Ratio of inventory investment to investments in total assets
SALES GROWTH	Ratio of current year's to previous year's sales
ADVERTISING	Ratio of advertising expenses to total operating expenses
WAGES AND SALARIES	Ratio of wages and salaries paid to total operating expenses
MARKETING	Ratio of marketing expenses to total operating expenses
DISTRIBUTION	Ratio of distribution expenses to total operating expenses
DEBT EQUITY	Ratio of total debt to total equity
FOREIGN OWNERSHIP	Dummy variable, taking the value of 1 if the firm is
EXCISE	Ratio of excise duties paid to total sales
TIME	Dummy variable, taking the value 0 for the years preceding 1991 and 1 thereafter

that the analyses were based either on case studies or on a simple, often nonparametric, comparison of the performance of a private subsample versus a state subsample, without controlling for other relevant factors. In addition, earlier work in this area compares the relative impact of state and private ownership by basing findings on analyses of industry-level or plant-level data, to make the case that a private firm may turn out to

with either plant-level or industry-level analysis, in that neither unit of analysis permits control for a number of firm-specific factors that have to be taken into account in explanations of performance. The approach used in this article is different because the focus is at a relevant unit of analysis, the firm.[33]

In addition to focusing on the firm, this study controls for a variety of industry- and environment-specific factors. We introduce a number of controls, all of which can influence either positively or negatively a firm's ability to generate above-average levels of performance. Because there is no fully developed theory or a standard model that explains differences in firm performance, we have chosen a wide a set of variables that have been identified as important in influencing firm performance.

The size of a firm is known to affect a firm's performance in many ways. Key features of a large firm are its diverse capabilities, the ability to exploit economies of scale, and the formalization of procedures. These characteristics make the implementation of operations more effective and allow larger firms not only to generate greater returns on assets and sales but also to capture more value as a proportion of the value of production than is possible for smaller firms. Alternatively, larger firms could be less efficient than smaller firms because of the loss of control by top managers over strategic and operational activities within the firm.[34]

SIZE is an important control variable for another reason. While our data are cross-sectionally extensive, we do not have the ability to measure a firm's market power or the level of concentration in the industries in which the firms in our sample operate. This is a major limitation of the data, and we cannot include controls for market-structure factors that are important determinants of economic performance. SIZE reflects the ability of firms to attain economies of scale as well as market power.[35] Finally, the inclusion of SIZE allows us to avoid the criticism directed against much empirical work in this area. H. Short notes that "a major criticism that can be levied at the majority of the empirical studies is that they tend to concentrate on large firm samples, rather than taking a broad cross-section of firms of different sizes."[36]

The age of a firm is an important determinant of performance. The industrial organization literature suggests that older firms are more experienced, enjoy the benefits of learning, and can, therefore, be relatively superior performers compared with newer firms. On the other hand, early economic literature and current sociological writing suggest that older firms are prone to inertia, and bureaucratic ossification that goes along with AGE makes older firms less flexible.[37] As with SIZE, there is no consensus on the impact of AGE on a firm's performance, though there is agreement that AGE is a critical variable.

The quantum of diversification of business activities by a firm also affects its performance.[38] Related diversification is one way of exploiting a firm's excess capacities and may lead to better performance for the firm

as a whole.[39] On the other hand, unrelated diversification away from the core activities of the firm can lead to lower than average performance because it leads to a dissipation of energies and resources into areas that demand more than necessary attention.[40] In some cases, unrelated diver-

INVENTORY and SALES GROWTH are variables that capture aspects of industry-level characteristics as well as general business-cycle–related conditions that influence individual firms. In addition, the overall economic environment may be such that during one period inventory holdings may be higher than they are in others, and SALES GROWTH may also be negative. These business-cycle influences affect all firms, and the two variables simultaneously help to control for industry-level as well as business-cycle factors.

ADVERTISING, MARKETING, and DISTRIBUTION help to control for operational aspects that can affect firm performance. A large literature has shown advertising and firm-level performance to be positively related; in addition, state-owned firms relative to private firms show a strong predilection for undertaking less advertising.[49] In the Indian context, weak marketing and distribution skills have been attributed to state-owned firms. Another control variable introduced is the wages and salaries paid by a firm. In general, we can expect higher wages and salaries to result in lower returns on assets and sales.

A number of institutionally related variables have to be introduced in order to control for their effects on performance. First, in India high leverage, or debt-equity, ratios are the norm, since the state has stepped in as a provider of long-term capital for large industrial projects because equity markets were underdeveloped and the quantum of personal savings inadequate.[50] In theory, principal-agent reasoning suggests that the greater the level of debt, the greater the amount of lender monitoring and, therefore, the better will be the firms' performance.[51] In India, such principal-agent concepts have been reversed, in spite of the presence of

to outperform domestic firms and because many of the firms in our dataset had some foreign shareholding, FOREIGN OWNERSHIP was introduced as a dummy variable.

E. Model Estimation

In India, as we noted, there are three critical levels of state shareholding: less than 26%, between 26% and 50%; and greater than 50%. These ownership levels give state shareholders different levels of control over the firm. A general problem arises as a result. There cannot be a linear function that best represents the data; rather, the ownership-performance relationship is likely to be nonlinear. Although linearity is theoretically attractive, in view of institutional considerations underlying the ownership-performance nexus, linearity is empirically untenable.

One way to determine the influence of these different categories or levels of state ownership is to estimate the independent impact of the various categories of state ownership through a series of separate estimations or through a series of dummy variables, which is tantamount to estimating separate regressions for each ownership category.[53] These approaches, however, rule out any continuous movement from one ownership category to another and also do not use all the information contained in the data for model estimation.[54] An alternative approach builds a relationship between the various categories through a series of linear segments but forces them to meet at the end points of each category of ownership. This approach is captured by a class of models called "spline" or "kinked-regression" models.[55]

Spline regression was originally used for time-series regression models, in which the dependent variable could have time-varying relationships with the independent variables.[56] A spline model is equally appropriate for cross-sectional analysis, especially when the key independent variable is continuous with very definite breaks or kinks, and there have been a number of uses of spline-regression models for cross-sectional data.[57] Spline models may also be appropriate for variables such as education, for example, in which clear breaks may be identified between the influence of a high-school and college education on income but in which within each category (for example, individuals with only a high-school education) the relationship of the independent variable to income may be linear. W. H. Greene, whose formulation we follow below, uses another sociological variable, AGE, as an appropriate example for spline regression.[58]

The general function to be estimated is

$$\text{PERFORMANCE} = \alpha^0 + \beta^0 \text{STATE} + \boldsymbol{\beta} X - \epsilon \quad \text{if STATE} < 26. \tag{1}$$

$$\text{PERFORMANCE} = \alpha^1 + \beta^1 \text{STATE} + \boldsymbol{\beta} X - \epsilon \quad \text{if STATE} \geq 26 \text{ and} \leq 50. \tag{2}$$

$$\text{PERFORMANCE} = \alpha^2 + \beta^2 \text{STATE} + \boldsymbol{\beta} X - \epsilon \quad \text{if STATE} > 50. \tag{3}$$

where STATE is the level of state shareholding or ownership and represents the control variables.

The values for the various categories of ownership, or the threshold levels of ownership, are called "knots." The knots are determined on the basis of the discussion, with natural kinks in the data being provided by the government regulations. As a result, we have two knots at 26% and a greater than 50% state shareholding.

The function can be specified with dummy variables:

$$d_1 = 1 \quad \text{if STATE} \geq t_1, \tag{4}$$

$$d_2 = 1 \quad \text{if STATE} > t_2, \tag{5}$$

where $t_1 = 26$ and $t_2 = 50$. Combining all three equations yields

$$\begin{aligned} \text{PERFORMANCE} = {} & \beta_1 + \beta_2 \text{STATE} + \gamma_1 d_1 + \delta_1 d_1 \text{STATE} \\ & + \gamma_2 d_2 + \delta_2 d_2 \text{STATE} + \boldsymbol{\beta} X + \epsilon. \end{aligned} \tag{6}$$

To ensure continuity, the segments should be joined at the knots, or

$$\beta_1 + \beta_2 t_1 = (\beta_1 + \gamma_1) + (\beta_2 + \delta_1) t_1 \tag{7}$$

and

$$(\beta_1 + \gamma_1) + (\beta_2 + \delta_1) t_2 = (\beta_1 + \gamma_1 + \gamma_2) + (\beta_2 + \delta_1 + \delta_2) t_2. \tag{8}$$

These represent linear restrictions on the coefficients. Collecting terms in (7) and (8), we obtain

$$\gamma_1 = -\delta_1 t_1 \tag{9}$$

and

$$\gamma_2 = -\delta_2 t_2. \tag{10}$$

Inserting (9) and (10) in (6), we obtain

$$\begin{aligned} \text{PERFORMANCE} = {} & \beta_1 + \beta_2 \text{STATE} + \delta_1 d_1 (\text{STATE} - t_1) \\ & + \delta_2 d_2 (\text{STATE} - t_2) + \boldsymbol{\beta} X + \epsilon. \end{aligned} \tag{11}$$

Introducing these constraints adjusts the intercepts so that slopes for the various categories join at the knots. The variables used in the analysis are listed in table 1.

TABLE 2

WEIGHTED LEAST SQUARES REGRESSION RESULTS

	DEPENDENT VARIABLE: RETURN ON ASSETS	
	Coefficient Estimate	Standard Error
Constant	5.334	2.111
GOVERNMENT	−.053	.043
GOVERNMENT—MID	−.071	.059
GOVERNMENT—HIGH	−.569**	.099
SIZE	2.076**	.322
AGE	−.056**	.016
DIVERSITY	.199	.607
EXPORT SALES	.039*	.020
IMPORTS	1.234	2.303
NET FIXED ASSETS	−.064**	.022
QUICK RATIO	.354	1.219
INVENTORY	−.112**	.031
SALES GROWTH	−.001	.001
ADVERTISING	.118	.251
MARKETING	.099	.105
DISTRIBUTION	−.257**	.127
DEBT EQUITY	−.453**	.113
FOREIGN OWNERSHIP	−.933	1.004
EXCISE	−.1029**	.038
TIME	−.834	1.081
R^2	.127	
F	8.21 (19, 1016)	

* $P < .10$ (two-tailed).
** $P < .05$ (two-tailed).

IV. Results and Implications

The estimation results are reported in tables 2 and 3.[59] As the results show, state ownership does affect firm performance, but different categories of ownership differ sequentially from one another regarding their influence on RETURN ON ASSETS and RETURN ON SALES.[60] With respect to returns on assets, which we believe is critical insofar as it measures whether an investment yields adequate returns or not, state ownership below 26%, which we classify as GOVERNMENT, and government ownership greater than 26% but less than 50%, which we classify as GOVERNMENT—MID, do not have a significant impact (where significance is at least at the 5% level using a two-tailed test) on firms' returns on assets. When levels of state ownership exceed 50%, classified as GOVERNMENT—HIGH, thus permitting the state to exercise control, the relationship between the level of state ownership and returns on assets turns negative and significant at the 5% level using a two-tailed test. The results for returns on sales, which are more a measure of the firm's performance in the market place, are not different. Government

TABLE 3

WEIGHTED LEAST SQUARES REGRESSION RESULTS

	DEPENDENT VARIABLE: RETURN ON SALES	
	Coefficient Estimate	Standard Error
Constant	2.906	2.976
GOVERNMENT	−.078	.062
GOVERNMENT—MID	−.056	.084
GOVERNMENT—HIGH	−1.141**	.168
SIZE	2.993**	.459
AGE	−.060**	.020
DIVERSITY	−.857	.866
EXPORT SALES	.078**	.029
IMPORTS	1.458	3.334
NET FIXED ASSETS	−.046	.031
QUICK RATIO	7.682**	1.808
INVENTORY	−.129**	.044
SALES GROWTH	−.005**	.001
ADVERTISING	.188	.356
MARKETING	.099	.105
DISTRIBUTION	−.484**	.181
DEBT EQUITY	−.573**	.162
FOREIGN OWNERSHIP	−1.543	1.512
EXCISE	−.164**	.052
TIME	−1.495	1.513
R^2	.163	
F	10.88 (19, 1009)	

* $P < .10$ (two-tailed).
** $P < .05$ (two-tailed).

control, when the state has a majority of the shares, also generates a negative and significant impact on returns on sales.

What these results suggest is that increasing levels of state ownership indeed do have a clear negative and significant influence on various dimensions of firm performance, especially when state investment crosses a certain threshold. This threshold is defined by the property-rights regime, when the state is a majority shareholder. It is interesting to note that, even when property rights do not devolve clearly to state shareholders or in firms in which the state is merely a passive investor and where there is less likely to be an attenuation of property rights, there are fewer monitoring problems, and managers are not inclined to freeride, firms are not necessarily profitable. Conversely, when property rights and control over resources do devolve to the state, there is a clear attenuation of property rights, and these mixed enterprises do not perform as well as private enterprises do.[61]

V. Conclusions

The results of the study, based on an analysis of data for more than 1,000 Indian firms, support the view that, after controlling for a number of crit-

ical firm- and environment-specific factors, state ownership has either no or a negative impact on the performance of a mixed-enterprise firm that operates in a competitive environment, as far as returns on assets and on sales are concerned. Firms in which property rights devolve clearly and unambiguously to the state shareholders are definitely poorer performers than firms in which the state cannot exercise effective control. In addition, the results suggest that firms in which control does not fully devolve to the state also do not perform as well. With state control comes a clear attenuation of property rights that does not occur at lower levels of state shareholding.

For the policy maker, these results indicate clearly that the role of mixed enterprises in economic development has to be reconsidered. Mixed enterprises, instead of state-owned enterprises, are advocated by some to be the appropriate engines for economic development. P. Evans's discussion of the success of the Korean information technology industry points to the key role that the state played by not intervening in the operation of firms.[62] In Korea, the state invested in information technology firms but allowed control over key aspects of the firms to be retained by the private partners. Our results, which are not based on a single industry case study but instead rely on a cross-section of firms and industries, suggest that this is not the case. Mixed enterprises in India do not yield positive returns to the investments made by the state and, in fact, such enterprises have a negative impact if the state can exercise some control. If the Indian state as a passive investor does not receive positive returns on investments, the rationale for resting economic development on mixed enterprises is not justified. This, of course, raises another question. What is the opportunity cost for the state of investing in mixed enterprise firms from which it cannot draw positive yields? Although our research does not enable us to answer the question fully, it does provide evidence that even when the state is a passive investor there is no clear evidence that the investment will generate sufficient returns. Therefore, we must conclude that the idea of mixed enterprises should be reconsidered and, if necessary, abandoned.

Notes

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1. G. J. Stigler, "The Theory of Economic Regulation," *Bell Journal of Economics and Management Science* 2 (1971): 137–46; S. Peltzman, "Towards a More General Theory of Regulation?" *Journal of Law and Economics* 19 (1976): 211–40; L. Shepherd, "Licensing Restrictions and the Cost of Dental

Care." *Journal of Law and Economics* 21 (1978): 187–201; James Buchanan, R. D. Tollison, and G. Tullock, *Toward a Theory of the Rent Seeking Society* (College Station: Texas A&M Press, 1981).

2. Louis De Alessi, "The Economics of Property Rights: A Review of the Evidence," in *Research in Law and Economics*, 2d ed., ed. Richard O. Zerbe (Greenwich, Conn.: JAI, 1980), pp. 1–47; James T. Bennett and Manuel H. Johnson, "Public versus Private Provision of Collective Goods and Services: Garbage Collection Revisited," *Public Choice* 34 (1979): 55–63.

3. Aidan R. Vining and Anthony E. Boardman, "Ownership versus Competition: Efficiency in Public Enterprise," *Public Choice* 73 (1992): 205–39, esp. 218.

4. A. E. Boardman and A. R. Vining, "The Behavior of Mixed Enterprises," *Research in Law and Economics* 14 (1991): 223–50.

5. Vining and Boardman, p. 218.

6. A. E. Boardman and A. R. Vining, "Ownership and Performance in Competitive Environments: A Comparison of the Performance of Private, Mixed, and State-Owned Enterprises," *Journal of Law & Economics* 32 (1989): 1–33, esp. 7.

7. Moreover, the studies also focus on large public undertakings that are either monopolies or controlled duopolies. Hence, it is difficult to sort out the effects of ownership on firm performance from performance attributes related to the firm that operates as a monopoly.

8. Indeed, owning more than 50% of the shares does provide control over key aspects of a firm's operations, and in most cases ownership at that level does lead to control. Two issues still remain to be addressed. First, if a state owns less than 50% of the shares, at what level of ownership is it able to exercise control over key decisions (in India the state has less than 50% shares in many firms). Second, it is also conceivable that minority owners with less than 50% of the shares but with more than some institutionally determined limit can prevent majority owners from exercising unfettered control.

9. Douglass North, *Structure and Change in Economic History* (New York: Norton, 1981).

10. P. K. Bardhan, *The Political Economy of Development in India* (Oxford: Basil Blackwell, 1984); J. N. Bhagwati, *India in Transition: Freeing the Economy* (Oxford: Oxford University Press, 1993); Baldev Raj Nayar, *The Political Economy of India's Public Sector: Policy and Performance* (Bombay: Popular Prakashan, 1990); Prajapati Trivedi, *A Critique of Public Enterprises Policy* (New Delhi: International Management, 1992).

11. A. A. Alchian, "Some Economics of Property Rights," *Il Politico* (De-

provided is based on an aggregation of plant-level data, however, and hence it is not possible to reach any firm-level conclusions.

17. Richard Funkhouser and Paul W. MacAvoy, "A Sample of Observations on Comparative Prices in Public and Private Enterprises," *Journal of Public Economics* 11 (1979): 353–68; Kwan S. Kim, "Enterprise Performance in the Public and Private Sectors: Tanzanian Experience, 1970–75," *Journal of Developing Areas* 15 (1981): 471–84.

18. Funkhouser and MacAvoy, p. 357.

19. It has been suggested that focusing only on large firms biases the result. See Helen Short, "Ownership, Control, Financial Structure and the Performance of Firms," *Journal of Economic Surveys* 8, no. 3 (1994): 203–49.

20. See Boardman and Vining, "Ownership and Performance" (n. 6 above), esp. p. 26.

21. Defining ownership may be especially problematic in many developing countries, such as India, where the state is an investor of varying proportions in many firms.

22. A number of studies have picked 10%, 15%, or 20% shares as sufficient to permit control. See, e.g., R. Monsen, J. S. Chiu, and D. E. Cooley, "The Effect of Separation of Ownership and Control on the Performance of the Large Firm," *Quarterly Journal of Economics* (June 1968), pp. 435–51; K. J. Boudreaux, "Managerialism and Risk-Return Performance," *Southern Economics Journal* (January 1973), pp. 366–72; and H. K. Radice, "Control Type, Profitability and Growth in Large Firms," *Economic Journal* 87 (September 1971): 547–62. However, the theoretical rationale for picking these percentages is not clear. We believe that the institutional environment provides us with a clear and definable framework for converting ownership to control.

23. For an overview of the theory of state-owned enterprises in market economies and distinctions between ownership and control and the financial performance of firms, see Short; also see Colin Lawson, "The Theory of State Owned Enterprises in Market Economies," *Journal of Economic Surveys* 8 (1994): 283–309.

24. See Boardman and Vining, "The Behavior of Mixed Enterprises" (n. 4 above), p. 228.

25. While Boardman and Vining's arguments on mixed enterprises are provocative, they are based largely on evidence drawn on the experiences of individual firms. Our analysis seeks to build on that line of reasoning in two ways. First, we use the ideas developed in the new institutional economics to delineate clearly the possible effects of various levels of ownership. Second, we offer a quantitative analysis, based on a large number of mixed enterprises, to test the influence of different levels of mixed ownership on firm performance.

26. Property rights associated with levels of ownership influence firm performance in a number of ways. First, they determine which shareholders will exercise operational or strategic control over a firm. Second, they clarify who will monitor the performance of managers (or who is the principal in a principal-agent model). Third, property rights include the right to the sale or disposal of resources and capital assets, which is a sine qua non of ownership. See H. Demsetz, *Ownership, Control and the Firm* (Oxford: Basil Blackwell, 1988). If this particular right, which is the ultimate expression of an investor's ability to exercise strategic control, is precluded or becomes difficult, shareholder monitoring suffers.

27. See North (n. 9 above).

28. State-owned firms may not be able to dispose of resources and capital assets for a number of political reasons, including pressure from unions and employees, ideological considerations, or the fact that state firms may simply not

be saleable any more. For our purposes, the reason why state firms cannot dispose of assets is not as important as the fact that they are unable to do so.

29. In our sample, 355 firms had state investments of less than 10%; in 289 firms, state shareholding was between 10% and 26%; in 252 firms, state shares were greater than 26% but less than 50%; finally, 51 firms had majority state ownership. A list of the firms is available from us on request.

30. P. Athukorala, S. Jayasuriya, and E. Oczkowski, "Multinational Firms and Export Performance in Developing Countries: Some Analytical Issues and New Empirical Evidence," *Journal of Development Economics* 48 (1995): 109–22.

31. Boardman and Vining, "Ownership and Performance" (n. 6 above); S. K. Majumdar, "The Impact of Size and Age on Firm Level Performance: Some Evidence from India," *Review of Industrial Organization* 12 (1997): 231–41; S. K. Majumdar and P. K. Chhibber, "Capital Structure and Performance: Evidence from a Transition Economy on an Aspect of Corporate Governance," *Public Choice* (in press).

32. Of course, ownership does have an impact on plant-level performance as well.

33. Moreover, this is perhaps one of the largest cross-sectional data sets on firms collected to study the impact of state ownership on firm performance for any developing nation and especially for India, where the last similar comprehensive study of Indian industry was conducted by R. K. Hazari, who investigated the ownership structure of Indian industry. The purpose of that study was more limited, as it was more concerned with identifying broad ownership patterns than with assessing the influence of ownership, per se, on firm performance. See R. K. Hazari, *The Structure of the Corporate Private Sector: A Study of Concentration Ownership and Control* (London: Asia Publishing, 1966).

34. See O. E. Williamson, "Hierarchical Control and Optimal Firm Size," *Journal of Political Economy* (April 1967), pp. 123–35.

35. Boardman and Vining, "Ownership and Performance." In India, the concentration of economic power has been a contentious issue, and since the late 1960s the enforcement of monopolies legislation has attempted to reduce industrial concentration, but implementation has left much to be desired. See Bardhan (n. 10 above); Bhagwati (n. 10 above); S. S. Marathe, *Regulation and Development: India's Policy Experience of Controls Over Industry* (New Delhi: Sage, 1989). The Monopolies and Restrictive Practices Act was promulgated in 1969 to prevent industrial concentration.

36. See Short (n. 19 above), esp. p. 226.

37. A. Marshall, *Principles of Economics*, 8th ed. (London: Macmillan, 1920); M. Hannan and J. Freeman, *Organizational Ecology* (Cambridge, Mass.: MIT Press, 1989).

38. V. Ramanujan and P. Varadarajan, "Research in Corporate Diversification: A Synthesis," *Strategic Management Journal* 10 (1989): 523–51.

39. On excess capacity, see E. T. Penrose, *The Theory of the Growth of the Firm* (Oxford: Basil Blackwell, 1959); on firm performance, see R. P. Rumelt, *Strategy, Structure, and Economic Performance* (Boston: Harvard Business School Press, 1974).

40. R. A. Bettis and C. K. Prahalad, "The Dominant Logic: A New Linkage between Diversity and Performance," *Strategic Management Journal* 7 (1986): 485–501.

41. Marathe.

42. A degree of endogeneity between diversity and firm performance is possible because profitable firms are likely to have more incentives to diversify. In India, however, diversification was policy induced. The scope of a firm's op-

erations was limited by capacity controls introduced by a restrictive industrial policy regime. Because expansion of activities in the primary business area was not feasible, firms sought other opportunities for reasons that are not associated with superior performance.

43. See A. O. Krueger, *Trade and Employment in Developing Countries* (Chicago: University of Chicago Press, 1983); H. Leibenstein, *Beyond Economic Man* (Cambridge, Mass.: Harvard University Press, 1976); I. M. D. Little, T. Scitovsky, and M. F. Scott, *Industry and Trade in Some Developing Countries* (Oxford: Oxford University Press, 1970).

44. J. N. Bhagwati and P. Desai, *India: Planning for Industrialization* (Oxford: Oxford University Press, 1970); R. Mohan and V. Aggarwal, "Commands and Controls: Planning for Indian Industrial Development, 1951–1990," *Journal of Comparative Economics* 14 (1990): 681–712.

45. B. Balassa, *Comparative Advantage: Trade Policy and Economic Development* (New York: New York University Press, 1989).

46. On import quotas, see Marathe (n. 35 above); see also D. Mazumdar, "Import-Substituting Industrialization and Protection of the Small-Scale: The Indian Experience in the Textile Industry," *World Development* 19 (1991): 1197–1213.

47. R. E. Caves, *Industrial Efficiency in Six Nations* (Cambridge, Mass.: MIT Press, 1990)

48. J. P. Agarwal, "Factor Proportions in Foreign and Domestic Firms in Indian Manufacturing," *Economic Journal* 86 (1979): 589–94.

49. W. S. Comanor and T. A. Wilson, *Advertising and Market Power* (Cambridge, Mass.: Harvard University Press, 1974).

50. B. Jalan, *India's Economic Crisis: The Way Ahead* (New Delhi: Oxford University Press, 1991).

51. M. C. Jensen and W. Meckling, "Theory of the Firm: Managerial Behavior, Agency Costs, and Capital Structure," *Journal of Financial Economics* 3 (1976): 305–60.

52. See Jalan; Majumdar and Chhibber (n. 31 above).

53. G. S. Maddala, *Econometrics* (New York: McGraw Hill, 1977).

54. J. K. Boyce, *Agrarian Impasse in Bengal: Institutional Constraints to Technological Change* (New York: Oxford University Press, 1987).

55. D. J. Poirier, *The Econometrics of Structural Change* (Amsterdam: North-Holland, 1976).

56. S. Garber and D. J. Poirier, "The Determinants of Aerospace Profit Rates," *Southern Economic Journal* 41 (1974): 228–38.

57. P. A. Geroski, "Specification and Testing the Profits-Concentration Relationship: Some Experiments for the U.K.," *Economica* 48 (1981): 279–88; J. Schwalbach, "Profitability and Market Share: A Reflection on the Functional Relationship," *Strategic Management Journal* 12 (1991): 299–306.

58. W. H. Greene, *Econometric Analysis* (New York: Macmillan, 1990).

59. No multicollinearity among the variables was evident. A correlation matrix is available from us. The variance inflation factor varied between 1.59 and 1.03 for the set of independent variables (averaging 1.23). These low numbers provide further evidence for the absence of multicollinearity. See S. Chatterjee and B. Price, *Regression Analysis by Example*, 2d ed. (New York: Wiley, 1991). Following R. D. Cook and S. Weisberg, *Residuals and Influence in Regression* (New York: Chapman & Hall, 1982), we conducted a test recommended by them for heteroscedasticity. The test yielded a significant F-statistic, and, hence, the final model is a weighted-least-squares estimation to correct for this heteroscedasticity. Finally, a link test advocated in D. Pregibon, "Goodness of Link Tests for Generalized Linear Models," *Applied Statistics* 29 (1980): 15–

24, revealed that the prediction squared was not significant for explaining performance. This suggests that there are no specification errors in the model. A test was also conducted to ascertain whether there were cases that had a large influence on the results. A one-step Welsch bounded-influence estimator, suggested by R. E. Welsch ("Regression Sensitivity Analysis and Bounded-Influence Estimation," in *Evaluation of Econometric Models*, ed. J. Kmenta and J. B. Ramsey [New York: Academic Press, 1980], pp. 153–67) was used to determine whether some cases influenced the results. The OLS estimates were compared with the Welsch one-step bounded-influence regression. Neither the significance of the coefficients nor the summary statistics of the regression model was very different. The size of the GOVERNMENT—HIGH coefficient in the case of the bounded regression was smaller but still negative and significant. The signs of the other key independent variables did not change, either. The size of the coefficient, however, is not critical to our substantive interpretation of the results.

60. An objection that could be raised that the results we obtain using spline may be influenced by the fact that there are only 51 firms in the category of majority state shareholding. We also ran the model using dummy variables, and even then only the variable measuring majority state shareholding was negative and significant.

61. Some of the control variables have interesting effects on firm performance and deserve some discussion. The size of a firm has a positive and significant influence on RETURN ON ASSETS as well as RETURN ON SALES. These findings are consistent with observations that SIZE is a correlate of market power and that in India large firms capture monopoly rents. A firm's age has a significant and negative influence on RETURN ON SALES, suggesting that older firms have been inflexible in reacting to the emerging market-based environment. The positive impact of QUICK RATIO can be attributed to the fact that, given the high cost and limited supply of capital in India, the ability of a firm to turn over working capital quickly may reflect, in part, unobservable managerial capabilities that influence a firm's performance. The diverse and fragmented nature of the Indian market also raises the distribution costs faced by a firm, and the distribution costs, not surprisingly, have a significant and negative relationship with returns on assets and sales. The debt a firm carries is expected to have a deleterious effect on a firm's performance. The variable measuring the debt-equity ratio is negative and significant in both regression models, suggesting that monitoring by a principal in India may not be as effective, because the principal is often the government. A surprising finding of the research is that growth in sales has a significant negative impact on RETURN ON SALES. Some part of this finding can be attributed to the fact that Indian industry faced a recession during 1992 and 1993. In addition, with liberalization the entry of new firms is likely to be pronounced in sectors that display business growth, and this phenomenon, by increasing competition, can lead to a drop in profitability for all incumbents. The influence of excise duties and INVENTORY is, as expected, negative, and the discipline introduced by exports does have a positive impact on firm performance. After controlling for these factors, liberalization has not as yet had a significant influence on firm performance in India.

62. Peter Evans, *Embedded Autonomy: States and Industrial Transformation* (Princeton, N.J.: Princeton University Press, 1995).