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Ownership and Productive Efficiency: Evidence from Estonia*

by

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Abstract:

The emergence of varied ownership configurations in Estonia since privatization enables conflicting hypotheses on the effects of ownership on enterprise performance to be tested. Findings based on a unique enterprise panel and fixed effects production function models for varying time periods during 1993-97 and using different proxies for key variables indicate that: (i) private ownership is 13-15% more efficient than state ownership; (ii) majority ownership by foreigners, managers and employees are respectively 19-21%, 15-31% and 13-24% more productive than state ownership. While the first result supports the standard theory of privatization, the second result provides stronger support for theorists who argue that insider ownership may be preferred in some circumstances in transition economies.

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1. Introduction.

In this paper we provide empirical evidence on the key economic issue of which forms of enterprise ownership are more efficient. The need for more reliable empirical evidence on this matter is especially acute in transition economies since most theorists (e.g. Boycko et al. 1993) argue that the place of state ownership in post communist economies is very limited and that economic efficiency demands that the vast bulk of firms in the socialized sectors should be privatized. The other key topic concerns the preferred ownership structure for privately owned firms -- whether firms are to be insider or outsider owned and, if insider controlled, whether the controlling group are to be managers or workers (Bim et al., 1994). The importance of this issue has grown enormously since an important feature of the privatization process has been the largely unexpected growth of widespread insider ownership (Nuti, 1997; Estrin and Wright, 1999). This stylized fact stands in sharp contrast to the implications that emerge from standard theory. For reasons including easier access to capital markets and ease in solving the agency problems of governments that try to control firms, the dominant view is that firms with outside ownership are expected to be more efficient than firms owned by insiders (e.g. Boycko et al. 1996). In addition, primarily because of allegedly providing superior ways of resolving agency issues within the firm, the most efficient form of insider ownership typically is argued to be manager (rather than employee) ownership (e.g. Earle et al. 1996).[i]

The empirical evidence that bears on the effects of different ownership structures on enterprise performance for transition economies is growing, with recent valuable by contributions including Frydman et al. (1999), Earle and Estrin (1998), Pohl et al. (1997), Estrin and Rosevear (1999) and Buck et al. (1999). However, as noted by many researchers (e.g. Aghion and Carlin, (1997); Estrin and Wright, (1999)), many studies suffer from important weaknesses, particularly difficulties in obtaining data for large and representative samples of firms. In addition, most studies have tended to focus only on selected cases (particularly Russia

and the Visegrad countries) and, in part because of data restrictions, researchers have employed differing empirical approaches, some of which have well-known weaknesses (e.g. the use of cross sectional analysis). Unsurprisingly perhaps, in view of these difficulties, no firm or general conclusions have yet emerged in this area, though some of the more influential papers provide empirical evidence that support key propositions of the conventional wisdom.[ii]

In this paper, in part because we are fortunate to be able to draw on a rich new panel for more than 600 Estonian firms, we provide evidence that is more robust than much of the available evidence. Furthermore, the Estonian case is an especially informative one to investigate the effects of ownership since, after privatization, diverse patterns of enterprise ownership soon emerged. Indeed privatization in Estonia resulted not only in the sale of a number of firms to foreigners and domestic outsiders but also in the creation of insider-owned enterprises including a significant proportion of employee-owned firms (Jones and Mygind, 1999). By using this large panel to estimate fixed effects production function models, we find evidence of a privatization effect but only partial support for other propositions associated with the standard theory of privatization. Stronger support is found for hypotheses that insider ownership may be preferred in some circumstances in transition economies.

II Conceptual Framework

The theoretical case for privatization rests on several arguments (e.g. Boycko et al.. 1996). Besides the alleged need for depoliticization, it is argued that only non-state forms of ownership will produce an environment conducive to nurturing financial discipline in firms. The alleviation of the woes of state-owned firms would be achieved in several ways. Unlike state planners, the dominant goals of privatized firms would be profit maximization or revenue growth. New owners would introduce more efficient methods for monitoring firm performance. Private owners would also be expected to bring with them improved technologies and knowhow

as well as funds for investment in new technology. Privatized firms would be more likely to shed excess labor as they might be less vulnerable than government-controlled firms to the political and social consequences of such actions. While not everyone accepts these views, in this section we accept the need for privatization and a large private sector and instead discuss the arguments for the preferred form of private ownership.[iii]

To consider these issues, the dominant approach in the corporate governance literature classifies firms by ownership (see, e.g. Schleifer & Vishny, 1997). For reasons including greater ease in raising new capital, it is argued that ownership by outsiders is preferred. However, it is recognized that new private owners may fail to ensure proper control of management. For example, mass privatization schemes could lead to diffuse private ownership by small outside shareholders that often lack the means and incentives to restructure and monitor firms (Pohl *et al.*, 1997). Therefore concentrated private ownership by outsiders is often argued to be the preferred form of privatization.

When insiders dominate, it is argued that the most efficient form of insider ownership is managerial (rather than worker) ownership (e.g Boycko et al., 1996). The conclusion that firms owned by their workers will have inferior economic performance is based on several arguments. It is argued that the perceived interests of enterprise workers are likely to conflict in important respects with the long-run interests of their enterprise. It is held that workers will underinvest in capital equipment, that productivity will be low as worker-owners expend little effort and that layoffs will be resisted. Consequently, the conventional wisdom is that significant employee ownership will have detrimental effects on enterprise performance and undermine the ability of newly-privatized firms to undertake meaningful restructuring (Frydman et al., 1993b). However, there are several reasons why these conclusions may not always be most appropriate for transition economies and why, in fact, formal economic theory yields no clear cut predictions concerning the preferred form of ownership.

Critics question whether stock markets actually perform their intended functions effectively, especially in the context of formerly centrally planned economies with very underdeveloped capital market institutions. Aoki and Kim (1995) note that much of the traditional analysis assumes an idealized view of advanced market economies and that the argument for the promotion of outside ownership and efficient securities markets ignores crucial matters such as inherited factors and assumes competitive product and labor markets. In the context of transition economies, Earle and Estrin (1996) also argue that the effects of employee ownership may be dependent on a host of factors such as market conditions. In particular cases, some forms of employee ownership may be a feasible solution to the choice of ownership structure.

More generally, some types of insider-owned structures, can be justified on several grounds (Ben-Ner, 1993). Advocates of insider owned and controlled firms argue that such firms are more likely to be characterized by a focused, tightly-knit, flesh and blood ownership group with a strong stake in enterprise performance--as compared with the alternative of external ownership of joint stock companies. In such firms, the security and stability of the enterprise and its work force will weigh more heavily in decision-making. Arguably insider ownership and insider control is more conducive to enterprise stability and long term employment relationships and thus may contribute to better economic performance in a number of ways. Also, greater enterprise stability may encourage more salvaging of still useful capital stock, and it may help to avoid a cascade of business failures due to the shutdown of one key enterprise in a productive structure still characterized by an inflexible network of input sources and output outlets.

The closer alignment of the goals of different economic agents within insider-owned firms may better motivate workers to join in restructuring efforts and to better use their accumulated experience and firm-specific knowledge. Ownership by non-managerial employees (as well as managers) may thus be expected to lead to enhanced productivity and, at some point,

enterprise success will be reflected in a higher stock price. In such cases, the interest of the firm is more aligned with the interest of its employees. For several reasons, these interest alignment effects can be expected to be more significant in firms in which the precise institutional arrangements enable broad participation by employees (and are not restricted to executives) and in which employee ownership constitutes a significant part of the average employees' wealth.[iv]

III Privatization and Ownership Structures in Estonia

In this section we consider key aspects of the differing legal arrangements and formal institutional structures (especially ownership structures) that have emerged in Estonia in the 1990s. We give special consideration to employee ownership and privatization.[v] Compared to the Russian case (and also those of Poland, Hungary and the Czech Republic), unsurprisingly not only have the Baltic States in general received much less attention, but also much less is known about them.[vi] What is known is sometimes quite surprising. In Estonia, while initially the privatization legislation did convey special advantages to employees, best represented by the nurturing of a handful of "people's enterprises", these advantages were soon ended. Yet concerning the privatization of small firms, some advantages were given to employees -- e.g. through concessional shares. Hence the employee ownership that has emerged apparently has largely occurred in spite of legislation and a political climate which mainly had other objectives. Thus there has been limited use of vouchers and the bulk of the privatization of big firms has come through mechanisms resembling those used in the former East Germany -- with a Treuhand-like privatization agency soliciting tenders for state firms. A core investor model has been encouraged and foreign ownership has been aggressively and fairly successfully sought.

While the discussion thus far suggests that there are believed to be very different patterns of ownership emerging within Estonia, at the same time, the data available at enterprise level with which to gauge what is actually happening, have so far been quite limited.[vii] To

provide more reliable information on some of these processes in this study we make use of a unique data set. With the cooperation of the central statistical authority in Estonia, annual economic and financial data were extracted from company records for a random sample of 666 firms for 1993-1997 to construct a rich panel. To complement these standard economic data, including profits, sales, assets and employment, special ownership surveys were undertaken. In these, detailed data on the distribution of ownership for insiders, available separately for managers and employees, and outsiders, split into foreigners and domestic outsiders, and the state were collected for this large panel. By selecting a large sample, we expect to have representation of all the main forms of ownership, as well as firms which had been privatized or started from scratch at different times and firms from a broad range of industries.[viii]

These data enable not only estimation of diverse specifications, but also construction of measures of key variables. Concerning ownership, most previous studies of transition economies which investigate the impact of different forms of privatization upon economic performance, have used measures of which group is the largest or the *dominant* shareholder (Frydman *et. al.*, 1997; Jones, 1998; Earle *et. al.*,1996). They have proceeded this way since classifications based on majority ownership would have led to the vast bulk of firms being designated as "no-majority". Fortunately, in most cases in Estonia, we are able to classify firms based on the analytically preferable method of majority ownership. While dispersed shareholdings within a category may lead to limited cohesiveness by the largest ownership group, this problem is likely to be more acute in classifications based on dominant ownership which may account for as little as 25% of the total voting stock.

The descriptive statistics for the whole sample are reported in Table 1; variable definitions are given in the Appendix.[ix] All financial data are denominated in thousands of real 1993 Estonian kroons ($1=approximately 12-14 kroons). Using a 50% benchmark for majority ownership, importantly it is evident that the transition in Estonia resulted in a simple majority in

almost all firms. In 1993, 42.3% of the firms were state-owned. Foreigners controlled 14.7% of the firms, domestic outsiders owned 17.7% while insiders had a majority stake in 24% of the firms, with managers controlling11.4% and employees 12.4%. Only 1.4% of the firms did not have a simple majority.

The comparison of the data for 1993 and 1997 show a great degree of change in ownership configurations. The proportion of firms in which the state had a majority stake declined to 21.3% as privatization continued. While the fraction of enterprises with a foreign majority stayed about the same, domestic outsiders and managers increased their shares to 28.1% and 20.5%, respectively. The percentage of firms with an employee majority declined somewhat to 10.1%. There were still few firms with no majority (3.3% of the sample).

Transition is seen to have had a negative impact on real sales and employment but not on real fixed assets and real energy and fuel consumption (Table 1).[x] Moreover, the analysis indicates significant differences between ownership groups (Table 2). In particular, state-owned firms have significantly higher real sales, real fixed assets, real fuel and energy consumption, and employment than private firms. For example, in 1997, firms with state majority had average real fixed assets of 25,735,000 kroons and employment of 301 whereas private firms had real sales of 7,084,000 kroons and employed 100 on average. Clearly, firms that remained state-owned retain some features of the larger firms of the socialist era.

Within the private sector, insider-owned firms have smaller real sales and real fixed assets than outsider-owned firms. Except for 1995, a comparable observation applies to energy and fuel consumption. By contrast, insider owners employ similar number of workers as do firms in which outsiders own a majority of the equity, with the exception of 1997. By focussing solely on employee ownership, we see that there are mixed results for all relevant variables. In particular, employee-owned firms do not seem to be undercapitalized relative to manager-

controlled firms but are definitely smaller both in terms of real fixed assets and energy and fuel consumption than firms with an outsider majority.

IV Estimating Framework and Results

In designing our empirical strategy, we note that there are relatively few hypothesis-testing studies on the effect of ownership structures on enterprise behavior for former communist countries. Broadly speaking, there are two main approaches. The most frequent type of econometric study to date employs diverse single indicators of economic performance which are explained by using models in which the key variable is either a privatization dummy or a set of dummy variables for different ownership structures (e.g. Earle and Estrin, 1996). Most often cross sectional regressions are estimated by using OLS though, to deal with potential problems of endogeneity, sometimes instrumental variable methods are used. Reviews of studies which adopt this empirical strategy do not reveal any consistent findings on the effects of ownership.

Frydman et al, (1997), adopt another approach that is broadly comparable insofar as they too attempt to model a single indicator of performance, such as the change in the labor force or labor productivity. However, by measuring all key variables in privatization (rather than in calendar) time, including a control for inherited pre-privatization differences in performance, and measuring average performance over a period of time (rather than for a single year), their work makes significant innovations. In some regressions the coefficient on a privatization dummy measures the performance effect specific to privatized firms whereas in other specifications a set of dummies for the largest owner (different forms of privatization) are included instead of the privatization dummy variable. Importantly, in their empirical work, which pools data for 1990-1993 for a sample of 185 firms in Poland, Hungary and the Czech Republic, strong evidence is found of privatization effects, and that the most efficient forms of privatization are outsider-owned and that firms owned by employees are the least efficient.

However, the adoption of a similar approach for other countries has not yielded comparably firm conclusions.[xi]

These empirical strategies have been developed partly in response to the unusual difficulties that confront applied researchers in transition countries–for example, the large measurement errors in key variables such as capital. However, a potential criticism of these innovative strategies is that much of this work is not grounded in well-established conceptual frameworks. Partially in response to these difficulties, in examining the effects of privatization upon enterprise performance, another method has begun to appear (e.g. Smith et al. 1997, Pohl et al., 1997; Jones and Mygind, 1999). This approach is derived from a standard empirical strategy in the literature for western firms, namely the estimation of production functions. Indeed there is a huge literature that has examined diverse matters concerning the effects of ownership for firms in western countries.[xii] This intellectual pedigree argument as well as a strong sense that the quality of the Estonian data is quite high, leads us to use a production function approach in this paper.

In estimating the impact of various ownership structures on productive efficiency, we therefore estimate equations of the general form:

$$Q = F(K, L, H, Z) \qquad (1)$$

where Q denotes a measure of output, K and L are a measure of total capital stock and total employment; H is a vector of variables representing the effects of ownership structures; and Z is a vector of control variables such as industry and labor quality. To see how the ownership variables enter equation (1) consider the Cobb Douglas case when the effects of ownership structures are disembodied. In logarithmic form this becomes:

$$\ln Q_{it} = \beta_K \ln K_{it} + \beta_L \ln L_{it} + \Sigma_i \gamma_i H_{it} + \Sigma_i \delta_i Z_{it} + \alpha_i + \tau_i + \mu_{it} \qquad (2)$$

Since the data are quite rich, often we are able to use different proxies for key variables. For example, and unlike many other studies of transition economies, our measures of

enterprise production are the conceptually preferable value added, as well as sales. For capital, not only do we use a measure of fixed assets, but also, following the literature for transition economies (e.g. Pohl et al., (1998) we also employ a measure of energy use as a surrogate for capital use. In our basic regressions ownership is simply represented by a dummy variable for whether or not the firms is majority state owned. In subsequent regressions this single dummy variable is replaced by a vector of four majority ownership (with the base case being majority state owned). To examine hypotheses concerning the effect of concentrated ownership on firm performance, we create a single dummy variable, Anymaj, for whether or not the firm has (any) majority owner group. Note that in the regressions that focus on the effects of different majority ownership structures, firms without a clear majority are omitted form the reported findings. For control variables, Z, always our data allow us to include industry dummies, and one or more dummies that capture an important regional dimension (e.g. in Estonia, location in Tallinn or otherwise).

Another important aim of our analysis is to identify the most appropriate form of the production function, in case the effects attributed to the ownership variables when a single functional form is imposed are in fact due to misspecification of technology. We therefore estimate diverse specifications and, after estimating forms including the generalized Cobb-Douglas and translog production functions, the production function that is best supported by the data is selected on the basis of appropriate test statistics.

Key findings are contained in Tables 3-4. In these reported regressions, the dependent variable is always the natural logarithm of real sales. Whereas in Table 3 real fixed assets are used as a measure of capital, real energy and fuel consumption are used in the regressions reported in Table 4. In both sets of estimates, translog specifications are reported as they are preferred at the 1% level. Also, firm fixed effects are always found to be significant at the 1% level.

The main finding that emerges from Table 3 is that, after controlling for firm-specific effects, strong evidence is found that ownership helps to account for differences in productivity. Moreover, the magnitudes of ownership effects are at reasonable levels.[xiii] In particular, the coefficient on Majpriv in Specification 1 is positive and significant, indicating that firms with a private majority outperform state firms by 15.2%.

Turning to the second specification in Table 3, an important finding is that the null hypothesis that the joint effect of the majority ownership variables is zero is rejected at the 1% level. In terms of the impact of different ownership configurations, we see that firms in which there is a majority foreign owner (Majfor) have a 21.2% edge over state firms. As such this finding corroborates results from other studies (e.g. Frydman et al., 1999). However, the Estonian results also indicate that there are other forms of private ownership that outperform the base case of state ownership. Most interestingly, both forms of insider ownership are also found to be statistically significantly (at the 1% level) more productive than are state firms. Moreover, the effects are quite large, though not unrealistically so. Firms in which managers have majority ownership outperform state firms by 31.2%. As such, from 1993 to 1997, managerial ownership is the most productive form of private ownership, outperforming even foreign owned firms. Firms in which non-managerial owners are the main owners also do very well. Employee owned firms are found to be 24% more productive than state owned firms; also, they perform 3% better than do firms in which foreigners are the majority owners. [xiv]

In other regressions, the exercises reported in Table 3 are replicated but alternative proxies for key variables are used. In the main the key findings remain unaltered when these alternative specifications are estimated. Thus in Table 4 findings are reported when real energy and fuel consumption is used as an alternative surrogate for capital.[xv] Again we find that the translog specification is preferred to Cobb-Douglas at the 1% level. From specification 3 we see that the coefficient on Majpriv is positive and statistically significant indicating that privatization

is a more efficient form of business organization than is state ownership. Again we see that three forms of majority ownership -- by foreigners, managers and employees--are found to be more productive than state ownership. Again we find that the hypothesis that domestic outside ownership delivers enhanced business performance is not supported by the findings for Estonia.

In some cases the size of the effects is essentially unaltered by the use of a different measure of capital. Thus the results for specification 3 suggest that private firms have a 13% edge over state owned firms (this compares with a 15% effect in specification 1 reported in Table 3). Also the impact of foreign ownership on enterprise productivity is about the same in specifications 2 and 4. However, the size of the effects of majority ownership by managers and employees, while still strongly positive, are not nearly as great in specification 4 as in model 2. In turn, the findings in Table 4 indicate that the most efficient form of private ownership is ownership by foreigners (for example, these findings suggest that foreign ownership outperforms manager (insider) ownership by 4%).[xvi]

V. Conclusions

In this paper we use Estonian data to investigate the effects of ownership on firm performance. In Estonia, while privatization and new start ups has led to the emergence of a significant number of firms in which foreigners and domestic outsiders own the majority of shares, a large number of firms that are owned by insiders also exist. Also, some firms that continue to be state-owned. These heterogeneous ownership structures mean that Estonia is a particularly apt case for the empirical analysis of ownership issues. Our empirical work is based on new enterprise-level data that are especially rich in details of ownership structures and which we have collected during annual surveys over a five year period. By using this large panel and a fixed effects production function framework, we provide some of the most rigorous findings for a transition economy on the effects of ownership on business performance to date.

Estimates for the period 1993-1997 (when capital is measured using a measure of fixed assets) indicate that: (i) private ownership is about 15% more efficient than state ownership; (ii) the null hypothesis that the joint effect of the majority ownership variables on productivity is zero is rejected at the 1% level; (iii) majority ownership by foreigners, managers and employees are respectively 21%, 31% and 24% more productive than state ownership; by contrast, majority ownership by domestic outsiders has no discernible impact on business performance. In the main these findings are corroborated when different proxies for key variables are used (and sometimes data for a shorter time period are used). Thus, estimates for the period 1995-97 (using a measure of energy and fuel use to proxy capital) confirm the second and fourth findings reported above and also suggest that domestic ownership has no impact on firm productivity. They also support the other findings although the magnitude of the effects usually falls. Thus private ownership is found to be about 13% (rather than 15%) more efficient than state ownership. Majority ownership by foreigners, managers and employees are respectively 19%, 15% and 13% more productive than state ownership.

Thus our findings for Estonia strongly confirm the hypothesis that privatization will be accompanied by gains in economic efficiency. As such, this findings corroborated those for other transition countries for the Visegrad countries which are usually based on earlier data and which use alternative empirical strategies notably Frydman et al. (1999). Moreover, the size of the privatization effect is comparable to that found in these other studies (e.g. Pohl, 1997).The finding of this strong evidence of a privatization effect for a country other than those in Central and Eastern Europe is important since many studies for Russia and CIS countries (e.g. Estrin and Rosevear (1999) for Ukraine; Jones (1998) for Russia) do not find evidence that private ownership improves economic performance. These sharply differing cross-national findings point to the importance of factors other than privatization per se in accounting for successful

business performance. An important task of future research is to uncover these other determinants of business performance.

So far as the impact of specific forms of ownership are concerned our findings are quite different than other influential studies. For example, unlike Frydman et al. (1999) we find that insider ownership can be not only more productive than state ownership but also that types of insider ownership can rank amongst the most effective forms of private ownership. As such our findings support those who predict the beneficial effects of insider ownership in some transition economies. Thus our findings on firms that are employee owned are consistent with hypotheses that employee ownership is expected to produce more interest alignment and more involvement of employees and, in turn, better organizational performance (compared to majority ownership by outsiders as well as state ownership). In turn these results thus provide only partial support for the standard theory of privatization and stronger support for theorists who argue that insider ownership may be preferred in some circumstances in transition economies. The results are especially persuasive since our findings are based on firms with dissimilar ownership structures within an economy that is fairly homogeneous. By contrast, studies of transition countries which have tended to find that firms with substantial insider ownership perform poorly, have sometimes relied on pooling data from firms with different ownership structures from different countries. More generally our findings on the effectiveness of employee ownership square with those for western economies. More generally, our findings point, as many have argued (e.g. Murrell, 1991) to the dangers both of theory and policy that seek to promote universal prescriptions for transition economies.

Appendix

Table 1 Descriptive Statistics: Means (Standard Deviations) for the Entire Sample

Year	**1993**	**1994**	**1995**	**1996**	**1997**
Rsale	18880	17241	16471	14905	17431
	(65762)	(56534)	(54136)	(52232)	(59614)
Rfa	8811	7297	7831	8416	9794
	(46170)	(37716)	(40475)	(41801)	(47719)
Emp	152	138	129	135	130
	(514)	(461)	(420)	(486)	(420)
Renergy			1168	1228	1505
			(6396)	(7001)	(12062)
Majsta	279	256	243	162	110
	(42.3%)	(38.8%)	(36.5%)	(27.4%)	(21.3%)
Majpriv	381	404	423	430	406
	(57.7%)	(61.2%)	(63.5%)	(72.6%)	(78.7%)
Majfor	97	100	96	89	86
	(14.7%)	(15.2%)	(14.4%)	(15.0%)	(16.7%)
Majdom	117	127	144	155	145
	(17.7%)	(19.2%)	(21.6%)	(26.2%)	(28.1%)
Majman	75	79	83	94	106

Table 2 Descriptive Statistics: Means (Standard Deviations) by Ownership

Year **Majority**		**1993**	**1994**	**1995**	**1996**	**1997**
state	**Rsale**	31162	25905	23662	28740	41188
	Rfa	15752	12371	12137	16836	25735
	Emp	234	207	208	246	301
	Renergy	N/A.	N/A.	2367	3222	6794
	N	279	256	243	162	125
foreign	**Rsale**	13158 (29820)	18743 (35574)	28263 (54404)	21257 (40004)	26414 (45724)
	Rfa	4372 (15590)	9709 (31477)	16001 (37965)	17353 (38697)	18628 (47065)
	Emp	41 (77)	59 (105)	70 (106)	98 (143)	92 (135)
	Renergy	N/A.	N/A.	1280	1378	1754
	N	97	100	96	89	92
domestic	**Rsale**	10991	12659	12220	12634	13861
outsiders	**Rfa**	4769	3665	5024	5648	6136
	Emp	128	119	111	129	134
	Renergy	N/A.	N/A.	506	752	746
	N	117	127	144	155	155
managers	**Rsale**	5442	5327	5732	7698	6876
	Rfa	651	727	1382	2318	2459
	Emp	71	72	63	107	80
	Renergy	N/A.	N/A.	215	358	368
	N	75	79	83	94	111

Table 2 Continued

Year **Majority**		**1993**	**1994**	**1995**	**1996**	**1997**
other	**Rsale**	7227	6789	8289	5670	7454
employees	**Rfa**	1726	1549	1924	1819	2336
	Emp	111	101	127	88	83
	Renergy	N/A.	N/A.	494	438	536
	N	83	88	74	71	55
no majority	**Rsale**	14555 (29821)	14449 (27966)	5330 (7975)	4053 (6746)	7535 (9103)
	Rfa	3821 (6818)	3680 (6802)	765 (759)	828 (911)	1424 (1985)
	Emp	157 (243)	152 (249)	28 (21)	21 (19)	59 (68)
	Renergy	N/A.	N/A.	143	58	275
	N	9	10	26	21	18
private	**Rsale**	9708	11485	12937	11550	13433
	Rfa	3134	4148	5696	6306	7084
	Emp	92	92	90	106	100
	Renergy	N/A.	N/A.	564	699	798
	N	381	404	423	430	431

Table 3 Fixed-Effects Estimates for 1993-1997

Dependent Variable: LnRsale		
Variables	**Specification 1**	**Specification 2**
LnRfa	-.0073	-.0054
	(.0626)	(.0625)
LnRfasqr	.0018	.0017
	(.0052)	(.0052)
LnEmp	.7764*	.7633*
	(.1184)	(.1185)
LnEmpsqr	-.0344***	-.034***
	(.0189)	(.0188)
LnRfaEmp	.036**	.0361**
	(.0152)	(.0152)
Majpriv	.1519**	
	(.0641)	
Majfor		.2123**
		(.1005)
Majdom		.064
		(.0717)
Majman		.3123*
		(.0826)
Majemp		.2441*
		(.0899)

Notes:

1. Rfa is used as a proxy for capital.
2. Standard errors are in parentheses.
3. * denotes significance at the 1% level; ** at the 5% level; *** at the 10% level
4. In specifications 1 and 2, the omitted variable is Majsta.
5. In Specification 3, the omitted variable is Nomaj.

6. The translog specification is preferred at the 5% level.
7. The inclusion of all ownership dummies in Specification 2 is significant at the 1% level [$F(5, 1830)=4.26$].

Table 4 Fixed-Effects Estimates for 1995-1997

Dependent Variable: LnRsale		
Variables	**Specification 3**	**Specification 4**
LnRenergy	.4042*	.4075*
	(.091)	(.0914)
LnRenergysqr	.0364*	.0359*
	(.0093)	(.0094)
LnEmp	.362***	.3596***
	(.2151)	(.2165)
LnEmpsqr	.0947*	.0943*
	(.0323)	(.0325)
LnRenergyEmp	-.1121*	-.1119*
	(.0262)	(.0262)
Majpriv	.1302***	
	(.0722)	
Majfor		.1944***
		(.1194)
Majdom		.1037
		(.0779)
Majman		.1544***
		(.095)
Majemp		.1399***
		(.0803)

Notes:

1. Renergy is used as a proxy for capital.
2. Standard errors are in parentheses.
3. *-significant at the 1% level; **-at the 5% level; ***-at the 10% level.
4. In specifications 1 and 2, the omitted variable is Majsta.
5. In specification 3, the omitted variable is Nomaj.
6. The F-test showed that the translog specification is preferred to Cobb--Douglas at the 1% level [F(3, 811)=6.79].
7. The inclusion of all ownership dummies in Specification 2 is significant at the 5% level

Variable Definitions

Dependent Variable

LnRsale- natural logarithm of real sales

Explanatory Variables

Labor and Capital

LnRfa- natural logarithm of real fixed assets

LnEmp- natural logarithm of employment

LnRfasqr- square of LnRfa

LnEmpsqr- square of LnEmp

LnRfaEmp- product of LnRfa and LnEmp

LnRenergy- natural logarithm of real energy and fuel consumption

LnRenergysqr- square of LnRenergy

LnRenergyEmp- product of LnRenergy and LnEmp

Ownership

Majsta-1 if the state has a majority stake in a firm, 0 otherwise

Majpriv- 1 if private ownership groups have a majority stake in a firm, 0 otherwise

Majfor-1 if foreigners have a majority stake in a firm, 0 otherwise

Majdom-1 if domestic outsiders have a majority stake in a firm, 0 otherwise

Majman-1 if managers have a majority stake in a firm, 0 otherwise

Majemp-1 if other employees have a majority stake in a firm, 0 otherwise

Nomaj-1 if no ownership group has a majority stake in a firm, 0 otherwise

Anymaj- 1 if any ownership group has a majority stake in a firm, 0 otherwise

Control Variables

Year Dummies

Firm Dummies

Industry Dummies (x8)

Tallinn (a regional dummy)

Note:

Nominal sales are deflated using the CPI (1993 base year). The capital stock is deflated using the PPI.

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Notes

[i]However, as we discuss later, in fact theory is more ambiguous on some of these matters.

[ii] In particular see Frydman et al. (1999) and Pohl et al. (1997). However, for reviews that are less supportive of the conventional wisdom see Estrin and Wright (1999) and Carlin and Landesman, (1997).

[iii]Also there is empirical evidence which suggests that the issue is not as clear cut as proponents believe. Thus for Poland see Pinto et al.. 1993 and for Russia, Jones (1998).

[iv] In addition powerful complementarities may be expected to exist when employee participation accompanies employee control. Goal alignment effects of employee participation (e.g. small group activities) are more subtle (but not necessarily weaker) than effects through ownership. Small group activities may provide valuable opportunities for both management and labor to learn about each other in a cooperative atmosphere and thus develop stronger trust. With stronger trust, sharing vital business information with labor will help convince labor that it is in their interest to improve productivity and firm performance. Various forms of employee participation may play an important role of providing employees a voice in the firm and thus reduce the costs of exit from the firm, saving specific human capital.

[v] Our account draws heavily on (Mygind, 1999). We do not consider the fading days of communism and, for example, attempts at reform by leasing. On this see Frydman et al. 1993.

[vi] For broader discussions of Estonia see World Bank (1993) and Jones and Mygind (1998).

[vii] For example, the pioneering study of privatization by Frydman et al. (1993) does not contain much enterprise-level information.

[viii]8. Thus we include some firms that were never privatized and also some privatized firms in which the state remained the majority owner during the period of study.

[ix]Mainly because of missing values, the precise number of observations that can be used for estimation each year is less then 600.

[x] Many of these differences are statistically significant (using paired t tests).

[xi] For the case of Russia see Jones (1998). For Kyrgystan see..Roberts??.....

[xii].. By using a panel we can control for time-invariant, firm fixed effects. In particular, there may be some firm characteristics such as superior organization, location or better quality of labor force whose effect is only partially explained by industry and region dummies in cross-sectional analysis. Studies which have adopted this approach when examining the impact of ownership on firm performance see, for example, Svejnar et al. (199X)–EER, Jones and Kato, 1995 and J Finance study. For reviews see Kruse (1999).

[xiii] These coefficient estimates are much more reasonable than those obtained from cross-sectional analysis. Compare for example with Jones and Mygind (1999).

[xiv] An F test of the joint hypothesis that all privatization coefficients are equal is rejected at the 5% level.

[xv]Note that, because energy data are not available for earlier years, the model is estimated for a shorter time period, namely 1995-1997.

[xvi] We also replicated the models reported in table 3 but using value added as an alternative measure of productivity. We choose to report findings using sales because many firm had either tiny or negative value added. In the logarithm models that are estimated this then leads to a censoring of observations. In any event, the estimates using value added do not produce a dramatic effect on the findings reported in Tables 3-4. For example, estimation of specification 1 reduces the sample size to 1825. However, again we find that there is a privatization effect that is statistically significant (the size of the effect is about 22%). When the privatization dummy is replaced by dummies for types of majority ownership (model 2) the ranking of best performing forms of ownership does not change and all three individual forms of ownership

continue to be statistically significant. These and other regression results are available from the authors upon request.