

## **The Performance Differential between Private and State Owned Enterprises: The Roles of Ownership, Management and Market Structure**

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**ABSTRACT** This article examines differences in performance between private companies (POEs) and state owned enterprises (SOEs), with an emphasis on the effects of market structure. The study uses a comprehensive panel covering in principle all registered companies during the 1990s in Norway, a country where SOEs play an important role in regular markets. Return on assets as well as costs relative to sales revenue are used as measures of performance in markets where SOEs and POEs compete with each other. Overall, POEs perform significantly better than SOEs. The study tests the hypothesis that SOE managers may learn from POE managers in environments with stronger competition, but finds only weak empirical support for such a learning mechanism.

### **INTRODUCTION**

Even though the dominant type of ownership in market-based societies is private ownership, cases of state ownership are easy to find. In the Scandinavian welfare economies, the presence of state owned companies in regular markets is particularly strong. Yet, active and deliberate liberalization and privatization policies, especially during the last two decades, have led to a considerable reduction in the number of state owned enterprises (SOEs) in most countries (Sheshinski and López-Calva, 2003; see also Buck et al., 1998; Cuevas Rodríguez et al., 2007; Djankov and Murrell, 2002; Uhlenbruck and De Castro, 1998 for discussions of corporate governance issues related to the implementation of privatization schemes), but many companies remain state owned. There has been a long-standing debate on the merits – and problems – of government control over business enterprises (Kay and Thompson, 1986; Megginson and Netter, 2001; Nombela, 2001). State ownership has been defended on the grounds of various types of market failure, and it has been regarded as an instrument for the attainment of non-economic goals such as the need for public control over natural resources, regional policies, employment or social issues etc (Grout and Stevens, 2003). The contrasting views are

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that state ownership is mainly used for ideological reasons, that it suits the interests of a ruling elite, or that it simply is retained due to institutional inertia. Also, if state ownership does increase the scope for deviations from profit-maximizing behaviour, the economic performance of SOEs is likely to suffer when compared to private companies (POEs) (Andrews and Dowling, 1998; Boycko et al., 1996; Djankov and Murrell, 2002).

Independent of one's particular point of view on the issue of state ownership versus private ownership, most scholars agree that a core question in the privatization debate is whether type of ownership has an effect on the performance of companies. Recent research on corporate governance suggests that ownership issues, such as the concentration and identity of owners, affect the performance of companies (Januszewski et al., 2002; Shleifer and Vishny, 1997; Thomsen and Pedersen, 2000). In this article, we focus on ownership identity. If certain ownership types consistently show superior economic performance relative to others, it seems reasonable to expect a move away from existing ownership arrangements towards the most efficient ones.

An agency theory perspective on state versus private ownership suggests that economic performance levels by and large are the result of the management incentives, costs, and exposure to disciplinary (market) forces implied by the different ownership structures. Traditional reasoning in industrial economics, however, suggests that firm performance is a result of the level of competition in a given market and the strategies followed by individual firms in that market. Whereas the former view proposes that government owned companies should be expected to display inferior performance because of inadequacies of that particular type of ownership, the latter view suggests that performance differences, if any, can largely be explained by differences in market structure.

We develop a model that allows us to test the effect of both ownership type and market structure on firm performance. Furthermore, we explore whether the economic performance of firms is driven by the interaction between type of ownership and the degree of competition in the market. It is commonly believed that a more competitive environment affects the management of firms. Managers will seek to improve the competitiveness and performance of their firm, at least if they have incentives that are based on performance (Cuervo and Villalonga, 2000; Villalonga, 2000). Such improvements can be made through a stronger focus on innovation and cost control. Moreover, managers of firms that experience strong competition also face a higher potential for learning from their competitors (Barnett et al., 1994). This learning potential should be particularly relevant for firms that have not attained the best practice and that operate under softer budget constraints (Tan, 2002; Tan and Peng, 2003), allowing them to learn over time without having to exit the market.

Because previous studies on privatization have not paid sufficient attention to the various determinants of economic performance, it has been unclear whether and to what extent observed performance differences are driven by ownership or by market characteristics.<sup>[1]</sup> In their seminal contribution to the study of privatization, Vickers and Yarrow (1989, p. 39) give the following comment on the empirical literature: '... many studies focus almost exclusively upon the ownership variable and fail to take proper account of the effects on performance differences in market structure, regulation, and other relevant economic factors'. Boardman and Vining (1989) conducted one of the first systematic

empirical studies of the difference of economic performance between SOEs and POEs. Their approach was motivated by the fact that earlier empirical studies had failed to adequately control for other relevant factors when investigating the ownership effects on performance. In particular, the link between competition and performance makes it crucial to include market structure measures when assessing the performance across different ownership categories. According to Boardman and Vining (1989), previous studies focused exclusively on heavily regulated companies and/or industries, or industries with the characteristics of monopolies or duopolies. As a result, the consequences of market conditions and regulation were virtually impossible to distinguish from the effect of different types of owners.

Recent surveys of available empirical evidence suggest that the findings of previous studies do not offer conclusive evidence of systematic performance differences between SOEs and POEs. Shirley and Walsh (2000) mention that among the 52 studies they survey, five indicate that SOEs outperform POEs. However, these studies are all based on analyses of monopoly firms in the utility sectors. In 32 of the 52 studies, POEs were better performers than SOEs. In the remaining 15 studies no clear performance differences were detected. Villalonga's (2000) meta-review draws a similar picture. As pointed out by Shirley and Walsh (2000) and Villalonga (2000) as well as by Megginson and Netter (2001), the studies covered in their surveys display a substantial degree of heterogeneity with respect to methodology and choice of empirical context, which complicates comparisons between them. Also, they suffer from a range of design, measurement, and sampling problems; most studies have either selected only the largest companies in a particular area or region, or focus on companies belonging to one given industry. None of the studies cover what can be considered as the population of companies in a country.

In our study, we utilize a comprehensive panel data set containing accounting information for all registered companies in Norway over the period 1990 to 1999. We explicitly model both the ownership and market structure effects on performance. Even more important, we look at how the market structure affects the performance of firms with different ownership. Simply comparing the performance of all SOEs and POEs in a population of firms is likely to lead to flawed conclusions because most POEs do not compete with any SOEs in their respective markets, and vice versa. To deal with this problem, we conduct analyses where we impose various selection criteria to increase the likelihood that firms with different types of ownership actually compete in the same market. To our knowledge, no previous study has analysed the performance differences of different owner types based on a data set covering basically the full population of firms in a country, and examined such differences while checking for the presence of competition between firms.

We employ two alternative performance measures: return on assets and cost share measured in terms of operational costs as share of sales revenue. Using either measure our data indicate that the performance of SOEs is indeed inferior to that of POEs after controlling for the market structure. This finding is not sensitive to alternative selection criteria and is also robust when controlling for geographical and industrial characteristics that may serve as indicators for regional and industrial policy. Our study also shows that performance is positively related to the market share of companies as well as the market concentration (measured by the Herfindahl index on a NACE 5-digit level). Hence,

the findings support both the ownership identity and the market structure views on performance. We also test whether POEs and SOEs react differently to the intensity of competition, measured in terms of the Herfindahl index of market concentration. The results indicate that stronger competition is less detrimental to SOE performance than to POE performance. Given the weaker overall performance of SOEs, this may seem surprising, but the results are in line with theoretical predictions based on competition as a learning mechanism (see, e.g. Barnett et al., 1994): managers as well as owners gain access to external information from competitors on how to run operations efficiently (see also Nalebuff and Stiglitz, 1983), meaning that managers become better informed as well as better monitored.

The article is organized as follows: after briefly explaining the choice of empirical context, we examine the theoretical relationship between ownership and market structure. We then describe the data set and discuss our choice of performance measures and the operationalization of variables. The empirical models and results are subsequently presented, analysed and discussed. The final section draws the conclusions from the empirical findings of the study.

### **WHY FOCUS ON NORWAY?**

The availability and quality of relevant data in Norway makes our choice of country highly pertinent. Also, the country's labour market legislation protects employees rather rigorously and largely independently of corporate ownership type, and hence there are few, if any, systematic differences between state and private sector, which in turn could lead to higher social costs for SOEs. Finally, the ownership composition in Norway is in itself particularly well suited for exploring the issue of state versus private ownership. Despite several examples of privatization and partial privatization during recent years, state ownership remains common in Norway. According to Roland et al. (2001) the value added share of SOEs in the business sectors in Norway is the highest of all EU and European Economic Area countries. In 1998, the share was 29 per cent, up from 27 per cent in 1991, which is approximately double of what we find in Sweden and Greece, the nations ranked below Norway. In the EU, the average SOE share of value added was only 9%. The Norwegian pattern is partly related to the dominance of SOEs in the oil industry, but state ownership is definitely present in many other sectors as well (Benito et al., 2002). This makes it especially appropriate to study the performance difference of SOEs and POEs in the Norwegian context, since we can expect to find a relatively large set of comparable companies that actually compete in the same market. Just to mention a few examples: Telecom services (Opplýsningin 1880 vs. 1881), fish farming (Cermaq vs. Marine Harvest), cinemas (Oslo Municipal Cinemas vs. Soria Moria cinemas) and kindergartens (municipal kindergartens vs. Kanvas).

### **THEORY ON OWNERSHIP AND PERFORMANCE DIFFERENTIALS**

The vast majority of theoretical contributions to the study of performance and ownership identity explain the inferiority of SOEs based on management incentive problems in the public sector. Even so, from the industrial economics and strategic management

literatures we know that performance in terms of profits or, alternatively, returns on capital or rewards to shareholders, is also a function of the structure of the market. Lack of competition may enhance the financial performance of a company due to higher prices and/or lower quality of the services or products offered to customers (Kay and Thompson, 1986; Parker and Hartley, 1991). Stronger competition tends to drive down profits and the ability to reward the owners through dividends (Hart, 1983). Thus, an empirical analysis of the relationship between ownership identity, management and performance must take the existing market structures into consideration. Below, we first present a brief theoretical discussion of the links between ownership identity and performance primarily based on principal–agent theory. We then introduce market structure as a disciplining force and learning mechanism, and discuss how that may affect the performance of SOEs and private firms differently. Finally, we briefly discuss alternative motives for state ownership, and the consequence for the management and performance of SOEs.

### **Ownership Identity and Performance Incentives**

In the field of corporate governance, the relationship between ownership and performance is predominantly analysed within the context of conflicting interests between owners and managers, and the ‘collective action’ problems that arise when firm ownership is highly fragmented (Baumol, 1959; Berle and Means, 1932; Jensen, 1986; Jensen and Meckling, 1976; Rappaport, 1986). In addition to the composition and concentration of owners, the institutional identity of owners may play an equally important role with regard to performance (see, for example, Thomsen and Pedersen, 2000). In the case of regulated markets with few, if any, competitors, the owners have a limited ability to monitor their managers by benchmarking the performance and management practices of their company against other competing companies. This is especially problematic in sectors where SOEs have a monopoly position. In public economics, increasing attention is devoted to the factors that explain why performance may differ between SOEs and POEs (Boycko et al., 1996; Grout and Stevens, 2003; Stiglitz, 1988). Once again, the analysis is predominantly based on how different principal–agent configurations affect the incentives to perform.<sup>[2]</sup> Stiglitz (1988) distinguishes between two categories of incentives in his discussion of the incentives ramifications of public ownership:

- *Individual incentives:* Whereas private owners are predominantly concerned about firm performance in terms of indicators such as return on their assets, equity, or investment, public owners often have alternative or multiple objectives. Even in the case where the only public objective is, say, return on assets, the ability of maximizing such returns is hampered due to incentive problems on the ownership side. Returns from a SOE are not passed on directly to the government representatives appointed to follow the company, but are channelled into a public budget that no specific individual can take advantage of as a principal. Hence, the incentives to closely scrutinize the actions and efforts of managers are vastly reduced in SOEs. Second, in most countries there are institutional rigidities that limit the ability of SOEs to correct for information asymmetries between owners and managers through incentive systems. For instance, the public sector is locked into a pay

structure that limits the ability to link management salaries, as well as workers' wages, to performance (efficiency wages). Third, in most industrialized countries job security has traditionally been stronger in the public sectors than in the private sector. This may attract workers with a strong preference for job security. With a reduced probability of getting fired, workers may put less effort into their jobs and hence have less incentive to perform well.

- *Organizational incentives:* Markets – and especially the capital market – constantly monitor POEs. If managers of POEs employ their resources inefficiently, the market may respond by withdrawing capital from the company, taking over the company and reallocating its resources (internally or externally), replacing the managers or ultimately shutting the company down. As outlined in Megginson and Netter (2001), SOEs have softer budgets and are not directly subject to the disciplining laws of the capital markets. The question of whether to shut down a SOE is not decided by the market, but by politicians.<sup>[3]</sup>

Although Cuervo and Villalonga (2000) apply their theoretical reasoning on the issue of privatization, their analysis is equally relevant when the objective is to provide managerial explanations for why some SOEs perform worse than others. In addition to the incentive perspective, they highlight the positive effect of a more decentralized organization, the possibility of replacing the top management, and the implementation of more innovative and less narrowly focused business strategies. In line with the argument of soft budgets and the lack of disciplining capital markets, it is held that managers of SOEs have a different set of skills than their private counterparts (Barberis et al., 1996). While managers of POEs have to focus on the market to survive and prosper, managers of SOEs may have benefited more from their competence at dealing with politicians (Mar and Young, 2001; Tan and Peng, 2003).

### **Competition, Learning and the Performance of POEs and SOEs**

According to Stiglitz (1988), competition also sorts under what is termed organizational incentives. From standard Cournot oligopoly theory we know that as the number of firms increases in a market, the monopoly rent is competed away. Thus, even though a state owned firm is less efficient, for example due to management incentive problems, its performance in terms of profits may be larger than that of a privately owned firm since it confronts less fierce competition. If less efficient SOEs compete with POEs in a given market, one would expect that the SOEs would suffer the most from strong competition. Without soft budget constraints, the SOE should either exit the market or reformulate its strategy in order to improve competitiveness, for example through innovation and cost control (Tan and Peng, 2003). However, there is an additional aspect of competition that tends to be ignored. For firms with softer budget constraints, like many SOEs, managers may benefit from strong competition through learning. Where inefficient POEs will have to exit the market, SOEs may spend a longer time adapting to the competition through learning and imitation; see, for example, Cohen and Levinthal (1989, 1990). Studies also show that managers pay attention to the performance of similar others. Managers form reference groups based on industry, product, market or production methods (Porac et al.,

1995; Reger and Huff, 1993), which shape their social aspiration levels, i.e. targets that trigger organizational change, or learning, if actual performance falls short of them (Greve, 2003).

Moreover, the owners may also benefit from strong competition, both because reductions in slack resources due to competition constrain managers' discretionary behaviour (Hart, 1983) and because it becomes easier to benchmark the performance of the managers against the best practice among the competing firms. This mechanism is discussed in Nalebuff and Stiglitz (1983) and later analysed more thoroughly in Bertoletti and Poletti (1997). Also, Demski and Sappington (1984) and Vickers (1995) show that the possibility of relative performance evaluations in a market changes the principal-agent problem drastically in favour of the principal. One should, nevertheless, notice that the state as an owner rarely has the necessary competence to conduct such benchmarking.

For simplicity, let us assume that privately owned firms are profit maximizing and that private principals have no problems with information asymmetries. In that case, privately owned firms will minimize costs regardless of the level of competition. Stronger competition will simply lead to reduced profits. Furthermore, let us accept, for the moment, that the incentive structure provides lower profits in the SOE. If the SOE operates in a market open for existence of other firms, stronger competition will on the one hand drive down profits, but will on the other hand contribute to more efficient production through the outlined learning mechanism (Barnett et al., 1994; Januszewski et al., 2002). All other things equal, this means that stronger competition may be less detrimental in the long run to state owned firms than to privately owned firms. The claim is that efficiency seems to depend more on competition and regulation than on ownership (Cuervo and Villalonga, 2000; Vickers and Yarrow, 1989; Villalonga, 2000). Thus, in our context we expect to find that stronger competition may be less detrimental to SOEs than to POEs, *ceteris paribus*.

### **Alternative Reasons for Weaker Performance under State Ownership**

As mentioned above, there are several alternative motives for state ownership that may directly affect performance. One of the most common examples relates to the supply of public goods where limited excludability contributes to lower profits. Another evident example relates to the existence of so-called natural monopolies where the government finds reason to produce the good itself at a socially optimal price level. In our empirical analysis we explicitly leave out public firms that are public goods providers and natural monopolies with regulated prices. If the authorities allow POEs to enter a market and private entrepreneurs want to enter this market, these motives for reserving a market for SOEs are obviously absent, and we should expect SOEs and POEs to be more similar in terms of objectives. Thus, seeing the SOE as a provider and keeper of multiple objectives has less meaning in a market with POEs present, and will eventually confront the POEs with distorted competition. Politicians will not be inclined to open markets to private entrepreneurs, if this is the case.

In Norway, several SOEs are established in specific areas to maintain a desired population settlement pattern. If transportation costs are high, or the access to skilled workers is limited, regional policies may contribute to reduced performance. In this

study, we employ a large set of regional dummies in order to take account of possible regional policy effects on performance. Security policy has repeatedly been put forward as a reason for running SOEs that provide goods and services that are regarded as crucial in times of conflict. This applies not only to providers of equipment to the armed forces, but also for infrastructure services and agricultural products.

Finally, public control over natural resources is commonly seen as an argument for public ownership. For instance, the rent or profits related to extraction of natural resources such as oil are often high and it can be important for the government to keep as much of the rent as possible in the hands of the state. Consequently, we exclude natural resource sectors with strong public control and supra-normal profits, i.e. the oil and natural gas sector and the electricity sector.

### A Model of Ownership, Management and Competition Effects on Performance

The model presented in Figure 1 summarizes the various mechanisms through which ownership type and market structure affects the performance of firms.

We expect above all that ownership identity influences performance through the management incentive mechanism (*i*). The principals of SOEs will generally have less means to remunerate managers according to the performance of the company and hence to align the interest of the manager to the interest of the owners. Also, the degree of competition in the industry is expected to drive down performance in terms of profit (*v*). However, the degree of competition among SOEs and POEs may modify the effect of ownership identity on performance in two ways. First, if there is scope for learning from competitors, we expect that SOEs will gain more through this mechanism than POEs since their managers are expected to operate further behind the best practice front, and since they have softer budget constraints, allowing the managers to take advantage of a longer learning process (*ii* and *iv*). Second, stronger competition should allow SOE principals to benchmark the management of their firms against the managerial practices of competing firms (*iii*). In line with traditional industrial economics reasoning, the market share of a company is expected to increase its performance (*vi*). Finally, alternative firm

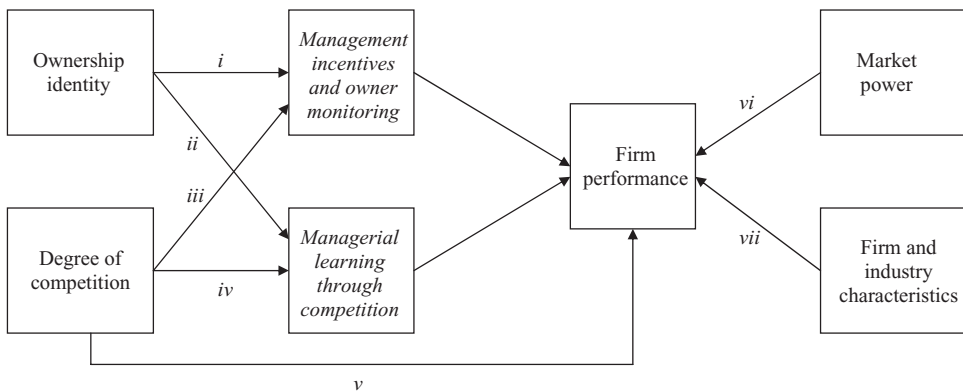


Figure 1. Effects of ownership, management and market structure on performance



characteristics like size and geographical location, as well as alternative motives for SOEs are expected to affect the performance. In addition, industry characteristics are normally believed to affect performance since some industries are more profitable than others (*vii*).

## DATA AND RESEARCH METHOD

### Data

In this study, we use data from the Norwegian Register of Company Accounts (NRCA).<sup>[4]</sup> According to current accounting laws in Norway, commercial companies that are joint-stock companies or that have more than four employees or more than 5 million NOK in annual turnover, must hand in extensive information to the NRCA. Thus, in principle the NRCA database covers the full population of companies in Norway above a certain size. In 1999, a total of 130,000 companies were included in the NRCA. As far as we know, no other empirical study of performance differences between SOEs and POEs has been based on data covering the full population of firms in a country.

The dataset contains information on a large number of company characteristics.<sup>[5]</sup> An ownership variable identifies whether the majority owner of each firm is a private person, a public authority, another firm or a foreign owner.<sup>[6]</sup> The municipal location of a firm is identified, providing us with information on geographical location along several dimensions. The NACE industry classification code is given on a 5-digit level. This allows us to study industrial activities on a highly disaggregated level and helps us to ensure that competition in the market is specified at the correct level. The remaining variables are accounting items.

For several reasons, the full NRCA dataset must be reduced before conducting an econometric analysis. First, since we focus on the ultimate owner, we disregard companies that are organized as co-operative ventures or as groups, i.e. companies that have firms as their owners or that are part of a holding company. Campbell et al. (1995) argue that many corporate parent companies systematically destroy value, which in turn will produce performance figures that are biased. Second, the banking and finance sectors report accounts in a way that is different from other sectors. These industries are usually omitted in studies that rely on accounting information for comparative purposes. Third, we further delimit our dataset by excluding natural resource extracting sectors and a wide selection of sectors where the presence of public sector regulations is strong. Health and social services provided through institutions is one example, theatrical services is another. In the Appendix, we give an overview of the sectors that are included in the analysis of the year 1999 for the most restrictive models (see Table AIII). Finally, unexpected events in the operations of small firms usually have a higher impact on their performance than is the case for larger firms. Also, experience shows that reporting errors are much more common in firms with few employees. Consequently, we have set a lower size limit for the dataset at a minimum of 10 employees.

### Using Registered Accounting Values to Measure Performance

For accounting purposes, transactions are normally measured at their historical cost, the amount of cash or other resources exchanged for the assets or liabilities. Most accounting

regimes, including the Norwegian, have chosen to ignore changes in values subsequent to acquisition. Thus, market value, exit value and repurchase value are seldom considered in financial reports. Historical costs have dominated accounting reports mainly because they are objective and verifiable. Compared to the alternatives, historical cost data are simple to obtain and easy to control. If inflation is moderate and the transactions are fairly recent, historical costs generally provide an objective proxy of the market value of the assets.<sup>[7]</sup>

A strong point of using accounting values is that they are available for all Norwegian companies. Also, well-established accounting laws, institutions, and practices in Norway ensure that they are reasonably reliable. Nevertheless, accounting based adjustments and procedures may remove the true economic information from internal accounts and annual reports (Fisher and McGowan, 1983; Solomon, 1970), and we acknowledge that accounting based measures do not represent a perfectly objective assessment of true economic performance. However, the crucial issue in this study is whether any bias introduced by using accounting values differs for POEs versus SOEs. We maintain that it does not. Using accounting measures is likely to introduce a similar bias for both kinds of firms.

### Performance Measures

This study does not intend to analyse performance in terms of *productivity* or *productivity growth* (see Boardman and Vining, 1989 and Januszewski et al., 2002 for studies focusing on productivity measures). Such a study would require fixed price data on the firm level, which are not available in the present setting. The choice of a performance measure is a complex subject. Barney (1997) discusses several measures of performance that might be appropriate when conducting strategic analyses of a firm. One is survival. The simple argument is that if the firm survives, it generates normal economic value. This measure is not suitable for the present study because SOEs rarely are exposed to the sanctions of disciplining market forces, which in turn lead to exit. Other measures of performance include stakeholder approaches, which focus on several dimensions of the activities of the company. Such approaches are useful if the idea is to investigate the success of SOEs in reaching multiple goals (Arens and Brouthers, 2001), but unfortunately it is difficult to operationalize relevant performance measures in such contexts.

Since this study is grounded on corporate governance and industrial economics perspectives, it is reasonable to employ a performance measure that reflects the benefits for owners in terms of an economic profitability measure of the company. Hence, we chose to study performance in terms of return on assets (*ROA*), calculated as the ratio of the operating profit to the total assets of the firm.<sup>[8]</sup> By using *ROA*, we employ a performance measure that captures the performance differences between SOEs and POEs that will be affected both by managerial (operational and financial) slack and by market conditions.<sup>[9]</sup> Selling and Stickney (1989) examine *ROA* and its components profit margin and asset turnover for 22 different sectors of commerce from 1977 to 1986. They note that an infinite number of combinations of turnover and profit margin could lead to the same level of *ROA*. For example, real estate and grocery stores both had a *ROA* of around 6%, although their profit margins were 1.6% and 12.1% respectively. The explanation is simply that the grocery stores turn around their assets much faster than a real estate

company. In fact, Selling and Stickney illustrate that the profit margin is not sufficient as a cross-industry performance measure. Combined with asset turnover, the performance measure becomes more stable across industries. *ROA* is calculated as follows:

$$ROA_t = 100 \left( \frac{RaFP_t + FC_t}{(TA_{t-1} + TA_t)/2} \right) \quad (1)$$

where  $t$  = time period, *RaFP* = Result after Financial Posts, *FC* = Financial Costs and *TA* = Total Assets.<sup>[10]</sup> Due to extraordinary situations or dispositions, some companies will have extremely high or low *ROA*. Below we set a standard for what is obviously not normal 'interest' on commercial engagements. If *ROA* is higher than 100% it follows that the profit of the company is at least equal to all its assets. This means that the company has doubled the value of its (average) assets during the last year. Similarly, a *ROA* of less than -100% means that the company has lost all its assets, financed by both equity and debt, in the course of the preceding year. Thus, we only allow firms with *ROA* within this range.<sup>[11]</sup> In addition to *ROA*, we present estimates based on an alternative cost-based performance measure. Since the goals and purposes of SOEs are often complex and multifaceted, one may argue that focusing exclusively on return on assets is too simplistic or even that the measure lacks clear relevance for many such firms. Operational costs as share of sales value (*Cost*) is a measure that deals more directly with the running of operations, and is possibly more consistent with measures of cost minimization. Results based on this alternative performance measure are presented in the Appendix (Tables AI and AII).

### Explanatory Variables

The main explanatory variable in this study is *ownership* identity. The variable is designed as a dummy variable taking the value of 0 if a company is an SOE and 1 if it is a POE. We use two alternative measures describing the market structure: the firm's *market share* is a firm specific variable, while the *Herfindahl* concentration index is a market specific variable. We calculate market shares and Herfindahl indexes on a 5-digit NACE-code level. In 1999, the database comprised activities in 577 different 5-digit sectors. Hence, the basis for calculating market shares and competition is highly detailed. According to Davies and Geroski (1997), sector specific concentration measures like the Herfindahl index do not vary much over time, while firm specific measures like the market share display more variation across time. Furthermore, sector specific measures tend to correlate strongly with industry dummies. Consequently, we run regressions with the two measures separately in order to identify possible differences. Performance may correlate with size due to economies of scale. Thus, a *size* variable measured in terms of total sales revenue is included. New companies often have an 'incubation period' where performance is low, because attention is given to getting the enterprise on its feet. We take into account the effect of age on performance by including the variable *age*. A small number of the companies in the population are listed on the Oslo stock exchange (*public listing*). It is likely that the value of assets in these companies lies closer to the market value. Thus, we expect *ROA* to be lower among publicly listed firms. We control for this by including a public listing dummy. The location of companies can be an important factor explaining perfor-

mance. In Norway, location effects are mainly expected to have an urban/rural dimension (*town*), a capital/not capital dimension (*Oslo*), and a North–South dimension (*Northern Norway*). We consider all three dimensions separately, which also serve to cancel out some of the effects of political goals regarding, *inter alia*, settlement and regional policies.

Different measures of performance vary systematically from industry to industry (see Venkatraman and Vasudevan, 1986). The nature and type of assets vary systematically by industries, and the valuation of these different assets will in turn affect various performance measures based on these assets. In addition, profit margins vary substantially between industries. In addition, if SOEs predominantly exist in industries with strongly deviating performance patterns, that should be taken into account. In all our empirical models industry affiliation is controlled for at the NACE 2-digit level (containing approximately 50 sectors).

## EMPIRICAL MODELS AND RESULTS

Our objective is to test the theoretical model outlined in Figure 1. We do this in several steps. We first design an empirical model where we ignore the learning and management monitoring effects of competition (relations *ii*, *iii* and *iv* in Figure 1). Thereafter, we test how market concentration modifies the link between ownership type and performance in a separate model. The baseline empirical model is given by:

$$\begin{aligned}
 ROA_{it} = & \alpha + \beta_1 \text{ownership}_{it} + \beta_2 \text{marketshare}_{i,t-1} + \beta_3 \text{Herfindahl}_{i,t-1} \\
 & + \beta_4 \text{size}_{i,t-1} + \beta_5 \text{age}_i + \beta_6 \text{publiclisting}_{i,t-1} \\
 & + \sum_l \delta_l \text{location}_{it} + \sum_k \gamma_k \text{industry}_{ik} + \varepsilon_{it} \quad i \in \mathcal{N}_h \subseteq \mathcal{N} \quad t = [1990, 1999] \quad (2)
 \end{aligned}$$

where  $i$  is an index over firms.  $\mathcal{N}$  is the full set of firms, while  $\mathcal{N}_h$  ( $h = 1, 2$ ) is the subset of firms that corresponds to the sector selection criteria described below.  $l$  is an index over location specific properties and  $k = 1, \dots, K$  is an index over industries defined at the 2-digit NACE level, and  $t$  is time. Time variant variables are lagged one year.

The ownership variable captures the hypothesized performance effect of differences in managerial incentives and the owners' ability to monitor the management (corresponding to the *i*-relation in Figure 1). The market share variable maps the hypothesized market power effect indicated by relation *vi*. The variable named *Herfindahl* aims to cover competition effects (i.e. relation *v* in Figure 1), while the remaining explanatory variables are associated with relation *vii* in Figure 1. For now, we leave out relations *ii* through *iv*, and return to them later.

In 1999, SOEs were present in 72 of the 577 NACE 5-digit sectors. An analysis of how competition affects performance based on all sectors could thus be severely distorted since a majority of the sectors do not have any state owned activity. To deal with this problem, we estimate three versions of (2) based on alternative sector selection criteria:

- Selection criterion 1 ( $\mathcal{N}_1$ ) is the most restrictive and requires that the number of SOEs or POEs in a sector must represent at least 10 per cent of the firms. This

criterion reduces the total number of NACE 5-digit sectors over the period 1990 to 1999 from 631 to 53, and reduces the number of observations from more than 70,000 to about 2,300. Table AIII in the Appendix gives an overview of which sectors we include under this criterion and the number of SOEs and POEs in each sector for the year 1999.

- Selection criterion 2 ( $N_2$ ) requires that a sector contains at least one SOE and two POEs. This criterion is considerably less restrictive as it allows 73 sectors and more than 20,000 observations to enter the model.
- Finally, we run regressions for the unrestricted sample ( $N$ ) in order to check whether the results based on the models with selection deviate substantially from the results derived in a model that represents all firms.

In light of the strong tendency to privatize SOEs during the 1980s and 1990s, one may claim that the model suffers from endogeneity problems. There is a potential upward bias in our estimates due to endogeneity effects driven by high performing SOEs being turned into POEs. Conversely, public authorities could sometimes delay privatization, or even abstain from it altogether, if they fear that the consequences in the form of, *inter alia*, lay-offs, closures, and relocations are socially unacceptable. Ideally, one could adjust for such endogeneity by estimating a selection model (e.g. a two-stage Heckman model) where firms that change from SOE to POE are identified in the first stage. Unfortunately, the number of registered firms that shift ownership identity in our population is very small (less than 10). Consequently, it is not possible to identify a robust selection process.

The models based on (2) are estimated without time lags, since it is reasonable to expect that the performance of a firm in period  $t$  is predominantly determined by the market structure and its firm characteristics in that specific year. However, when we turn our attention to the models that focus on the interaction between market structure and ownership, we use lagged ( $t-1$ ) explanatory variables.

Tables I and II present summary statistics and cross-correlations for the unrestricted sample and the sample under selection criterion 1, respectively.

A closer look at the cross-correlation tables reveals that there is no reason to expect large problems of multicollinearity. The only variables that display some correlation of significance are the two market structure variables *market share* and *Herfindahl*, but they never enter the same regression models. Inspection of residual plots did not reveal any problems due to non-normality of independent variables.

## Results Based on Selection Criterion 1

The estimates based on regression models under selection criterion 1 are reported in Table III as models 1A to 1D. Models 1A and 1B report OLS regression estimates for *ROA* using *market share* and *Herfindahl* respectively.<sup>[12]</sup> Since the OLS regressions report significant differences from one year to another (see the year dummies), we suspect that year specific coefficient estimates may vary significantly. In response to this, we estimate 'average' models using the between estimator, which are reported in models 1C and 1D. All models include industry dummies. Under the strict selection criterion 1, estimates are based on 2,306 observations over the ten-year period, of which 650 are SOEs.

Table I. Summary statistics

	<i>Number of obs</i>	<i>Mean</i>	<i>Std. dev.</i>	<i>Min</i>	<i>Max</i>
Full population					
ROA	74,583	15.30	14.61	-100.00	100.00
Market share	74,583	0.07	0.17	0.00	1.00
Herfindahl	74,583	0.12	0.20	0.00	1.00
Size	74,583	29,558.24	146,122.00	-30.00	13,200,000.00
Age	74,583	12.58	13.65	0.00	138.00
Cost share	74,583	0.96	1.18	0.00	10.00
Restricted sample according to criterion 1					
ROA	2,306	14.79	15.89	-71.17	98.18
Market share	2,306	0.11	0.18	0.00	1.00
Herfindahl	2,306	0.27	0.22	0.05	1.00
Size	2,306	68,235.87	461,772.50	0.00	13,200,000.00
Age	2,306	16.76	18.67	0.00	117.00
Cost share	2,288	0.97	0.87	0.01	10.00

In all four models, both the ownership identity and market structure variables are significant with expected signs. *ROA* in SOEs is approximately 10 percentage points below the *ROA* in POEs. From the lower part of Table I, we know that the average *ROA* amounts to approximately 15%, thus SOE *ROA* is only a third of the POE *ROA*. The preceding discussion will show that this finding is highly robust to alternative model specifications. There is therefore reason to claim that ownership identity has a surprisingly strong effect on *ROA*, even when market structure factors and other relevant factors are controlled for.

A larger market share contributes consistently to a higher *ROA*, implying that there is a positive effect on returns from a stronger monopoly rent. A 10 percentage point increase in the market share lifts *ROA* by somewhere between 0.4 and 0.8 percentage points. Similarly, a 10-percentage point increase in the market concentration rate (i.e. independent of the firm's market share) lifts *ROA* by almost 1 percentage point. This suggests that pricing power is stronger in more concentrated sectors, which contributes directly to an improved *ROA*. It is somewhat surprising that neither firm size nor firm age has significant impact on *ROA* in the regressions using selection criterion 1, but in models 2 and 3 these variables become significant with expected signs. The dummy variable for *public listing* is also highly significant with an expected negative coefficient, since publicly listed companies are compelled to report asset values closer to the market value, which drives down the reported *ROA*. Finally, firms located in the capital region have a higher *ROA*, while being located in Northern Norway contributes to lower *ROA*.

## Results Based on Selection Criterion 2

By relaxing the sector selection according to criterion 2, the empirical results (see Table IV) are altered only marginally. The analyses then comprise more than 20,000 observations covering 5,202 firms. The number of SOE observations is almost doubled compared to criterion 1.

Table II. Cross correlations

	ROA	Ownership	Market share	Herfindahl	Size	Age	Public listing	Town	Oslo
Full population									
ROA	1								
Ownership	0.109*	1							
Market share	0.008*	-0.012*	1						
Herfindahl	-0.010*	-0.018*	0.767*	1					
Size	-0.012*	-0.075*	0.224*	0.142*	1				
Age	-0.036*	-0.046*	0.119*	0.102*	0.106*	1			
Public listing	0.016*	0.043*	0.034*	0.019*	0.035*	0.072*	1		
Town	-0.027*	0.019*	0.185*	0.143*	0.299*	0.100*	0.042*	1	
Oslo	0.020*	0.036*	0.084*	0.070*	0.064*	0.105*	0.344*	0.068*	1
Northern Norway	-0.027*	-0.056*	-0.046*	-0.047*	-0.020*	-0.031*	-0.136*	-0.025*	-0.146*
Restricted sample according to criterion 1									
ROA	1								
Ownership	0.252*	1							
Market share	0.001	-0.144*	1						
Herfindahl	0.036*	-0.042*	0.340*	1					
Size	-0.041*	-0.140*	0.386*	0.201*	1				
Age	-0.061*	-0.201*	0.101*	0.066*	0.010	1			
Public listing	-0.032	-0.081*	0.160*	0.095*	0.091*	0.031	1		
Town	-0.024	0.097*	0.176*	0.116*	0.073*	0.194*	0.106*	1	
Oslo	0.034	0.056*	0.219*	0.156*	0.158*	0.049*	0.401*	0.017*	1
Northern Norway	-0.051*	-0.171*	-0.071*	-0.050*	-0.029	0.038*	-0.094*	0.026*	-0.158*

\* 10% significance level.

Table III. Regression results: models where SOEs and POEs compete; selection criterion 1

	<i>Model 1A</i>	<i>Model 1B</i>	<i>Model 1C</i>	<i>Model 1D</i>
	<i>OLS</i>	<i>OLS</i>	<i>BE</i>	<i>BE</i>
Ownership	9.21*** (0.84)	9.14*** (0.83)	10.46*** (1.60)	10.21*** (1.58)
Market share	4.18* (2.25)		8.39* (4.47)	
Herfindahl		8.24*** (2.37)		10.72*** (3.65)
Size	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
Age	-0.01 (0.02)	-0.01 (0.02)	0.01 (0.04)	0.01 (0.04)
Public listing	-6.36** (2.35)	-6.22** (2.21)	-7.22* (3.90)	-6.65* (3.83)
Town	-0.70 (0.72)	-0.55 (0.72)	-0.36 (1.24)	-0.14 (1.23)
Oslo	1.22 (1.24)	1.25 (1.23)	0.92 (1.65)	1.13 (1.64)
Northern Norway	-0.61 (0.95)	-0.63 (0.96)	0.29 (1.78)	0.19 (1.78)
1990	2.22 (1.66)	2.05 (1.66)		
1991	4.68*** (1.28)	4.62*** (1.27)		
1992	7.28*** (1.50)	7.24*** (1.49)		
1993	6.86*** (1.50)	7.08*** (1.50)		
1994	4.26** (1.63)	4.52** (1.63)		
1995	3.40** (1.48)	3.51** (1.48)		
1996	1.99 (1.35)	1.91 (1.34)		
1997	0.65 (1.40)	0.96 (1.41)		
1998	0.12 (1.16)	0.46 (1.17)		
Constant	5.88*** (1.19)	3.86** (1.47)	3.96 (7.06)	1.71 (7.11)
Number of obs	2,306	2,306	2,306	2,306
Number of SOE obs	650	650	650	650
Number of firms			790	790
F(17, 21425)	11.84	12.62	2.73	2.91
Prob > F	0	0	0	0
R-squared	0.119	0.1238	0.097	0.1
Adj R-squared	0.1039	0.1087		
Root MSE	15.045	15.004		

Huber White sandwich heteroskedasticity consistent standard errors in parentheses.

\*\*\* 0.01 significance level, \*\* 0.05 significance level, \* 0.1 significance level.



Table IV. Regression results: models where SOEs and POEs compete; selection criterion 2

	<i>Model 2A</i>	<i>Model 2B</i>	<i>Model 2C</i>	<i>Model 2D</i>
	<i>OLS</i>	<i>OLS</i>	<i>BE</i>	<i>BE</i>
Ownership	9.21*** (0.55)	8.93*** (0.55)	10.55*** (1.34)	10.09*** (1.33)
Market share	8.40*** (2.27)		8.86* (4.58)	
Herfindahl		-1.01 (1.45)		-1.97 (2.59)
Size	0.00 (0.00)	0.00** (0.00)	0.00 (0.00)	0.00** (0.00)
Age	0.00 (0.01)	0.00 (0.01)	0.03* (0.02)	0.04* (0.02)
Public listing	-7.65*** (1.58)	-6.73*** (1.52)	-12.31*** (2.66)	-11.52*** (2.64)
Town	-0.25 (0.22)	-0.24 (0.22)	-0.18 (0.46)	-0.15 (0.46)
Oslo	1.57*** (0.44)	1.64*** (0.44)	1.32* (0.70)	1.35* (0.70)
Northern Norway	-0.55* (0.30)	-0.57* (0.30)	-0.67 (0.64)	-0.69 (0.64)
1990	0.58 (0.57)	0.69 (0.57)		
1991	2.02*** (0.51)	2.12*** (0.51)		
1992	2.83*** (0.51)	2.89*** (0.51)		
1993	2.42*** (0.47)	2.46*** (0.47)		
1994	3.59*** (0.46)	3.62*** (0.46)		
1995	-0.14 (0.45)	-0.13*** (0.45)		
1996	-0.08 (0.44)	-0.08 (0.44)		
1997	1.30*** (0.44)	1.31*** (0.44)		
1998	1.13** (0.45)	1.12** (0.45)		
Constant	5.43*** (0.65)	5.79*** (0.66)	2.65 (5.57)	4.59 (5.55)
Number of obs	21,469	21,469	21,469	21,469
Number of SOE obs	1,139	1,139	1,139	1,139
Number of firms			5,202	5,202
F(17, 21425)	28.21	28.04	5.8	5.71
Prob > F	0	0	0	0
R-squared	0.0299	0.0293	0.0368	0.0362
Adj R-squared	0.0279	0.0274		
Root MSE	15.321	15.326		

Huber White sandwich heteroskedasticity consistent standard errors in parentheses.

\*\*\* 0.01 significance level, \*\* 0.05 significance level, \* 0.1 significance level.

The *ownership* coefficients remain highly significant and stay in the range between 8 and 10. The market share coefficient has approximately the same size and significance level as those reported in Table III, but the Herfindahl index is no longer significant. This may indicate that our selection criterion is too loosely defined, implying that models 1A–1D are better suitable to analyse how market structures affect *ROA*. Although one should not put too much emphasis on the  $R^2$  measure, the fact that  $R^2$  is four times higher in the most restrictive model may also serve as an indicator of the most appropriate specification.

### **A Comparison with Results Based on an Unrestricted Model**

In Table V, we report our findings based on practically all firms in our Norway that fulfil the criteria outlined in the methodology section (i.e. regardless of whether SOEs and POEs are represented in the same sector or not).

It turns out that the unrestricted model provides the same predictions regarding the effect of ownership identity on *ROA*. The market share coefficients are once again significant, while the Herfindahl index is either insignificant or weakly significant with an unexpected sign. This finding strengthens once more the claim that models 1A to 1D are the best specifications for modelling the effect of market structure on firms' performance.

### **The Interaction between Ownership Identity and Market Structure**

As outlined, the degree of competition may affect SOEs and POEs differently, due to different patterns with respect to management incentives and the management learning potential through competition. Based on traditional industrial economics theory, with heterogeneous firms stronger competition will have a relatively stronger negative impact on profits and thus *ROA* for the weaker performers. However, if weak performance is due to principal–agent problems, the learning effect through competition may improve efficiency and contribute to improved *ROA*. In order to examine how the degree of competition affects the performance of firms with different owners (mechanisms *ii*, *iii* and *iv* in Figure 1), we estimate owner-specific versions of the baseline model in (2). We lag the market concentration variable with one year, to take into account that learning through competition takes time. In addition, we take advantage of the panel-characteristics of our data and estimate a firm fixed effects model, where we concentrate on studying how firm performance changes with the degree of competition over time.<sup>[13]</sup> The results are reported in Table VI. Regressions based on OLS show that whereas POEs experience a lower *ROA* when competition increases, that is not the case for SOEs. This is indicative evidence supporting the hypothesis suggested in relations *ii*, *iii* and *iv* (Figure 1). Yet, one should expect that variations in competition over time could affect the firms' learning from competitors over time. Our fixed effects estimates give no support to this claim, but one should notice that the variance in the Herfindahl index over time is highly limited. As shown in the correlation matrix, market concentration and market share are highly correlated. To adjust for this correlation, we tested an alternative model using the Herfindahl index adjusted for firms' market shares (squared). The results did not change. We interpret these findings as providing weak evidence to support a learning effect through stronger competition. Hence, managers of SOEs competing with

Table V. Regression results: full population models

	<i>Model 3A</i>	<i>Model 3B</i>	<i>Model 3C</i>	<i>Model 3D</i>
	<i>OLS</i>	<i>OLS</i>	<i>BE</i>	<i>BE</i>
Ownership	8.46*** (0.43)	8.57*** (0.43)	8.34*** (0.86)	8.45*** (0.86)
Market share	2.04*** (0.36)		1.63** (0.83)	
Herfindahl		-0.33 (0.35)		-1.30* (0.73)
Size	0.00 (0.00)	0.00*** (0.00)	0.00 (0.00)	0.00** (0.00)
Age	-0.03*** (0.00)	-0.03*** (0.00)	0.01 (0.01)	0.01 (0.01)
Public listing	-5.01*** (0.75)	-4.68** (0.74)	-8.12*** (1.33)	-7.73*** (1.33)
Town	0.04 (0.11)	0.05 (0.11)	0.04 (0.25)	0.05 (0.25)
Oslo	0.43** (0.20)	0.49** (0.20)	0.39 (0.37)	0.47 (0.37)
Northern Norway	-0.68*** (0.16)	-0.69*** (0.16)	-0.70** (0.36)	-0.72*** (0.36)
1990	-1.76*** (0.26)	-1.67*** (0.26)		
1991	0.30 (0.24)	0.36 (0.24)		
1992	1.58*** (0.24)	1.63*** (0.24)		
1993	1.54*** (0.23)	1.59*** (0.23)		
1994	1.80*** (0.22)	1.84*** (0.23)		
1995	-0.51** (0.22)	-0.48** (0.22)		
1996	-0.14 (0.22)	-0.11 (0.22)		
1997	0.75*** (0.22)	0.78** (0.22)		
1998	0.57** (0.23)	0.59*** (0.23)		
Constant	7.06*** (0.45)	7.06*** (0.45)	7.32*** (1.55)	7.49*** (1.55)
Number of obs	74,583	74,595	74,583	74,595
Number of SOE obs	2,849	2,849	2,849	2,849
Number of firms			15,167	15,170
F(17, 21425)	55.73	54.96	8.21	8.16
Prob > F	0	0	0	0
R-squared	0.0281	0.0277	0.0316	0.0314
Adj R-squared	0.0272	0.0268		
Root MSE	14.408	14.412		

Huber White sandwich heteroskedasticity consistent standard errors in parentheses.

\*\*\* 0.01 significance level, \*\* 0.05 significance level, \* 0.1 significance level.

Table VI. Owner specific estimates (selection criterion 1)

	<i>Model 3A</i>	<i>Model 3B</i>	<i>Model 4A</i>	<i>Model 4B</i>
	<i>POE</i>	<i>POE</i>	<i>SOE</i>	<i>SOE</i>
	<i>OLS</i>	<i>FE</i>	<i>OLS</i>	<i>FE</i>
Herfindahl [ $t-1$ ]	5.82** (3.02)		0.32 (3.38)	1.13 (5.50)
Size	0.00** (0.00)	0.00** (0.00)	0.00 (0.00)	0.00 (0.00)
Age	-0.08** (0.00)		0.05** (0.00)	
Constant	16.28*** (1.09)	13.75*** (1.61)	6.54*** (2.11)	8.72*** (1.61)
Number of obs	1,296	1,296	518	518
Number of firms	426	426	148	148
F-stats	6.62	0.38	3.49	0.19
Prob > F	0	0.38	0	0.82
R-sq (within)	0.09	0.0009	0.18	0.001

Huber White sandwich heteroskedasticity consistent standard errors in parentheses.

\*\*\* 0.01 significance level, \*\* 0.05 significance level, \* 0.1 significance level.

POEs have positive effects from the observation and learning from fairly similar companies, while the principals of SOEs seem to strengthen their ability to monitor.

## DISCUSSION

Our empirical findings give strong support to the claim that there is a significant difference between POEs and SOEs with respect to performance. Those who argue that these differences can be explained by aspects relating to market structure are only partly right. Market structure does count, but does not change the fact that POEs do perform better. It is particularly interesting to observe that when one narrows the selection of firms to those assumed to compete in markets where both POEs and SOEs operate, the performance differences are actually accentuated, and the explanatory power of the models increase. This is an important observation because the most common critique against studies such as the present one is that apples are compared with oranges. We demonstrate that this is not the case. Focusing on only 'comparing apples with apples' actually accentuates the differences.

The results support corporate governance explanations, i.e. that owners of SOEs have other and less effective means to instruct and direct the actions of their managers, and that the management in SOEs may not be as proficient as the management in private companies. Nevertheless, we find weak evidence supporting the notion that SOE managers are able to learn from their competitors. This learning advantage of SOEs is probably partly due to soft budget constraints: being a SOE improves the likelihood

of surviving in the market, which again enables learning over time. In addition, SOEs have an overall weaker performance, which indicates that there is a larger learning potential in SOEs.

Our results correspond well with many other studies of private versus public ownership. Yet, to our knowledge such comparisons have never before been done on basically the full population of firms in a country. Furthermore, our findings indicate that the government as an owner of SOEs should not be too worried about stronger competition in the markets where they operate. Such competition may trigger improved performance through managerial learning and imitation (Barnett et al., 1994). Managers in SOEs should be aware of their potential for learning in the market, which is particularly relevant if the budgets are soft (Tan and Peng, 2003). Under such circumstances, the reduced threat of exit opens up for a longer learning period. Nevertheless, our results indicate that the learning effect of being exposed to competition from POEs is actually limited. This suggests that effective learning may take more than just observing and emulating the behaviour of competitors. Managerial competence is to a great extent embodied in individuals, and effective transfer of such knowledge hence requires that people relocate from one company to another. Currently, it appears that POEs are generally more successful than SOEs in attracting managerial talent and competence, thereby reducing the scope for learning spillovers between the two types of companies. An important managerial challenge for SOEs is therefore to attract managerial competence from their privately owned counterparts.

One may claim that ROA only tells one part of the performance story.<sup>[14]</sup> A cost measure could shed stronger light on the productivity aspects of our data set. The empirical results based on our alternative performance measure (*cost as share of sales revenue*) are presented in Tables AI and AII in the Appendix. Here we only report results based on the between-estimator, since the OLS results provide similar estimates.<sup>[15]</sup> The ownership coefficients are highly significant in all model specifications and vary between  $-0.04$  and  $-0.06$ . Since the population mean cost share is registered around 0.96, ownership identity (SOE or POE) will in many cases determine whether a firm runs with an operational surplus or deficit. The *Herfindahl* index (see Table AI) is significant and negative in the restricted models, indicating that market concentration affects our alternative performance measure in the same way as it affects *ROA*. Similarly, a higher *market share* contributes to reducing costs relative to sales revenue (see Table AII), while *size* and *age* have negligible effects on our cost performance measure in all models. We thus conclude that ownership identity affects the alternative performance measure in the same way as it affects *ROA*.

Notice that ownership appears to have a stronger effect on ROA than on cost shares, indicating that SOEs may run with a less efficiently allocated capital base.<sup>[16]</sup> From a managerial perspective, this is an important observation. Over-capitalization and inefficient capital structuring could be solved by adopting managerial practices that put more emphasis on financial matters. Due to strict public sector requirements on balance, solidity and liquidity issues, the management of many SOEs has little discretion regarding financial decisions. However, this study clearly indicates that the potential for higher capital returns through improved capital management in SOEs is substantial.

Is there something with the Norwegian or Scandinavian societies that makes it hard to generalize our results? We believe not. As described in the introduction, the proportion of SOEs in the population of firms is high in Norway. Relative to many other countries, we find a strong presence of SOEs in regular markets. This should imply that managers of Norwegian SOEs are more adapted to regular competition and more focused on forces driving demand and costs as compared to managers of SOEs in other countries. To a certain extent, one could hence argue that the performance differences in Norway should be smaller than in other countries, all other things equal. It is true that there are also some sectors in Norway that are almost exclusively supplied by SOEs. The health sector is one such example, where competition between POEs and SOEs is much more pronounced in other countries, e.g. the USA. However, since such sectors were excluded from the analysis through a careful selection procedure, we have reason to assume that confounding problems of that sort were avoided in the present study.

## CONCLUSIONS

Performance must be regarded as a critical issue in any discussion of the pros and cons of state owned provision of goods and services. If companies owned and operated by the state systematically generate weaker economic results than privately owned firms, the advocates of privatization seemingly get a strong card in their hands. As it is, most theoretical contributions to the study of performance and ownership identity maintain the inferiority of state enterprises based on incentive problems in the public sector. However, given the various non-economic goals that underlie the very existence of many state owned enterprises, the inferior economic performance of SOEs in general should not be surprising (Grout and Stevens, 2003). A more relevant question relates to whether SOEs perform worse or better than comparable POEs.

There are two different views on this issue. The corporate governance literature focuses on ownership identity and suggests that managers of SOEs have weaker incentives to perform, and that their principals have less efficient means of monitoring the managers, since they are less exposed to the disciplining and learning forces of markets. The industrial economics literature maintains that economic performance is a direct function of the market structure. Competition will drive down profits and the ability to reward the owners through dividends. If state owned enterprises and privately owned companies operate under market structures that are systematically different from each other, performance differences could well be attributable to such differences rather than some ownership identity effect. Thus, an empirical analysis of the relationship between ownership identity and performance must take the existing market structure into consideration.

We claim that in addition to these two views, there exists an interaction effect that links the effect of ownership identity to the effect of market concentration through management learning. This interaction effect could contribute to narrow the performance gap between POEs and SOEs. We find weak evidence supporting this hypothesis, which as pointed out earlier, could be due to somewhat ineffective mechanisms for transferring knowledge and competence from one type of company to another. SOEs could seemingly benefit from recruiting managers with experience from privately owned

companies, but such transfers seem to be rare in reality. In our opinion, therein lies a major challenge for the managers of SOEs and their principals.

In this article, we have employed a comprehensive data set containing annual accounts information of a nearly full population of Norwegian companies. The empirical literature comparing the performance of POEs and SOEs is almost exclusively based on smaller sample studies, usually focusing on selected industries (see, e.g. Megginson and Netter, 2001). However, the contribution of this article goes beyond sample size. We take the approach of Boardman and Vining (1989) a step further by studying how the interaction between ownership and market structure affects performance through learning in markets. We combine learning and ownership perspectives (see also Tan, 2002), and thereby add to the understanding of the links between ownership, management and the learning that occurs through competition.

We find that the performance of SOEs is indeed inferior to that of POEs. However, the results also show that performance is consistently positively related to the market share of companies as well as the market concentration. Hence, our findings provide support for both the ownership identity and the market structure explanations for performance differences. Our results also provide some support to the idea that a weaker market power (measured in terms of the firm's market share) is less detrimental to SOE performance than to POE performance, through learning effects for SOE managers and better monitoring opportunities for their principals.

While we believe that this analysis represents an improvement over previous empirical studies, we acknowledge that further work should be done on the performance ramifications of public versus private enterprise.

First, the Norwegian setting of the study is a mixed blessing from a research perspective. On the one hand, it represents a particularly well-suited empirical context due to the relatively abundant co-existence of SOEs and POEs in many industries as well as to the high quality and comprehensiveness of available data. On the other hand, Norway is a small, peripheral, and rich country with deep-rooted social democratic norms and values of egalitarianism and a history of active welfare policies and state intervention in the business sector. Even though we think that our findings depict economic mechanisms of a rather general nature, similar studies in other settings are obviously needed to establish the generalizability of the findings.

Second, in this study we focus on two performance measures: *ROA* and costs. Both are highly appropriate in assessing the economic performance of companies, but inevitably they provide only a partial view. Describing a more complete picture of companies' performance would necessitate a richer set of measures, especially to take proper account of the non-economic goals of business enterprise. That, however, must be left to future research.

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## NOTES

- [1] One important exception is Vining and Boardman (1992) who investigated both ownership identity and competition factors.
- [2] The identity of owners is important because different types of owners are likely to have different preferences with regard to issues like risk and time horizon and because they have different abilities and opportunities in using various mechanisms of governance such as monitoring and decision-making. The relative benefits and costs of ownership are therefore likely to vary depending on the type of owner.
- [3] On the other hand, and for other reasons, political authorities may also decide to shut down state owned firms that would have survived if they had been organized as privately owned firms.
- [4] The data have been registered by Dun & Bradstreet Norway.
- [5] Our data set contains the following variables over the period 1990–99: company identity number, name of the company, municipal location, year of establishment, NACE-code, number of employees, owner identity, turnover, cost of employees, operational profit/loss, financial costs, results after financial posts, total assets, equity value.
- [6] The NRCA data do not reveal whether the foreign owned and stock exchange listed companies are governed by persons, public authorities or firms. We therefore chose to exclude foreign owned companies in the empirical analysis.
- [7] In addition, the activation of goodwill in the accounts may increase the book value, resulting in a higher book value than intrinsic value. Depending on the nature of the activated goodwill, some can be marketed and thus be regarded in the intrinsic value (e.g. a brand), and some cannot (e.g. the culture of a firm). Goodwill, which has many components, is often activated in the context of a take-over price of businesses. Generally, a more dynamic market for businesses will tend to depolarize the book and intrinsic value.
- [8] Subsidies and other kinds of government financial support may distort the picture of *ROA* differences between SOEs and POEs. The effect of some of these schemes is captured in estimates of so-called Effective Rates of Assistance (ERA). A recent study by the Central Bureau of Statistics in Norway (Fæhn et al., 2001) looked at a systematic sample of assistance arrangements. The study shows that some industries are more favoured than others. Our performance measure considers the profit margin before extraordinary accounting items, and most of the direct subsidies are included as extraordinary earnings in the accounts. Consequently, our performance measure will not be affected, in any significant way, by most subsidy schemes. Subsidies through the payroll tax do affect the profit margin directly, but such schemes are primarily related to geographical location, which we control for.
- [9] Return on equity (*ROE*) is an alternative a measure of performance and was used in the study of Thomsen and Pedersen (2000). However, *ROE* is associated with some troublesome characteristics. First, it is a measure of profitability that is highly influenced by the debt/equity ratio. This introduces a gearing effect to *ROE* that can lead to an excessively large variance, and thus display company performance differentials that are incorrect. In addition, *ROE* cannot be calculated for companies with negative equity, a problem that we face in approximately 20% of Norwegian companies.
- [10] This formula calculates *ROA* before taxes. For some companies we have no accounting information for  $t-1$ , and for those companies we use only total assets from period  $t$  in the denominator.
- [11] The deviant peak is due to a number of companies that have *ROA* equal to 0. A closer inspection of such companies reveals that only one of the 313 companies with 0 in *ROA* had no turnover; that particular company was in a sense a 'sleeping' company. However, for the other 312 companies, it seems relevant to keep them in the sample, even though they are imposing a deviation from the normal distribution.
- [12] Notice that we cannot estimate fixed effects since the ownership variable hardly varies over time.
- [13] Since there is hardly any variation in ownership location specific variables, age and industry specific variables over time, all these factors are dropped from the fixed effects models.
- [14] We tested for alternative *ROA* measures, reported in Table AIV, models A1 and A2. We find that shifting from *EBIT* to *EBITDA* has no effect on the *ROA*-difference between SOEs and POEs. Actually, the coefficient is enlarged when we run the regressions with this alternative *ROA*-measure. Also, by subtracting the current liabilities component in the denominator, hence moving to *ROCE*, the effect of ownership is boosted dramatically. This is due to the fact that current liabilities in SOEs represent a



much smaller share of total assets, as compared to POEs. We also added models using log transformation on all continuous explanatory variables in models A3–A5 in Table AIV. There are no qualitative changes except for the variable *market share* which changes to negative significant if size is included in the regression. This qualitative shift relates to the fact that log of market share and log of size are highly correlated. Leaving out the log of size, the market share variable maintains its predicted sign and significance.

[15] Results based on OLS are available from the authors upon request.

[16] As an additional robustness check we also estimated the model using a wage based performance measure, based on operational result relative to wage costs. In contrast to an employment based measure, this measure will be sensitive to wage differences that may reflect differences in productivity between firms due to employee characteristics. Also, the measure is sensitive to general wage differences between SOEs and POEs. The regressions were conducted using logs, since the distribution of this measure has a larger variance. Using the wage based return measure produced essentially the same estimation results. The median operational result relative to wage costs is almost two times higher in POEs compared to SOEs.

## APPENDIX

Table AI. Regressions with cost share as dependent variable (Herfindahl index as the market structure indicator)

	<i>Restr. criterion 1</i>	<i>Restr. criterion 2</i>	<i>Unrestricted</i>
	<i>BE</i>	<i>BE</i>	<i>BE</i>
Ownership	-0.06* (0.03)	-0.04* (0.02)	-0.05*** (0.01)
Herfindahl	-0.14* (0.07)	-0.09** (0.04)	0.02* (0.01)
Size	0.00** (0.00)	0.00*** (0.00)	0.00*** (0.00)
Age	0.00 (0.00)	0.00** (0.00)	0.00*** (0.00)
Public listing	0.41*** (0.08)	0.31*** (0.04)	0.23*** (0.02)
Town	-0.01 (0.02)	0.01 (0.01)	0.00 (0.00)
Oslo	0.04 (0.03)	0.00 (0.01)	0.00 (0.00)
Northern Norway	-0.03 (0.04)	0.00 (0.01)	0.01 (0.00)
Constant	1.07*** (0.13)	1.77*** (0.08)	0.99*** (0.02)
Number of obs	2,285	21,372	74,297
Number of firms	781	5,184	15,115
F(17, 21425)	3.91	7.55	8.74
Prob > F	0	0	0
R-squared	0.135	0.0475	0.0337

Huber White sandwich heteroskedasticity consistent standard errors in parentheses.

\*\*\* 0.01 significance level, \*\* 0.05 significance level, \* 0.1 significance level.

Table AII. Regressions with cost share as dependent variable (market share as the market structure indicator)

	<i>Restr. criterion 1</i>	<i>Restr. criterion 2</i>	<i>Unrestricted</i>
	<i>BE</i>	<i>BE</i>	<i>BE</i>
Ownership	-0.06* (0.03)	-0.04* (0.02)	-0.04*** (0.01)
Market share	-0.12 (0.09)	-0.20** (0.07)	-0.01* (0.01)
Size	0.00* (0.00)	0.00* (0.00)	0.00*** (0.00)
Age	0.00 (0.00)	0.00* (0.00)	0.00*** (0.00)
Public listing	0.43*** (0.08)	0.32*** (0.04)	0.23*** (0.02)
Town	-0.01 (0.02)	0.01 (0.01)	0.00 (0.00)
Oslo	0.04 (0.03)	0.00 (0.01)	0.00 (0.00)
Northern Norway	-0.03 (0.04)	0.00 (0.01)	0.01 (0.00)
Constant	1.04*** (0.13)	1.73*** (0.08)	0.99*** (0.02)
Number of obs	2,285	21,372	74,279
Number of firms	781	5,184	15,115
F(17, 21425)	3.84	7.62	8.69
Prob > F	0	0	0
R-squared	0.134	0.048	0.0335

Huber White sandwich heteroskedasticity consistent standard errors in parenthesis.

\*\*\* 0.01 significance level, \*\* 0.05 significance level, \* 0.1 significance level.

Table AIII. Sectors represented in models 1A–1D (year = 1999)

<i>Activity</i>	<i>NACE-5 sector</i>	<i># SOE</i>	<i># POE</i>
Wooden and fibre boards	20200	2	12
Wooden containers	20400	2	2
Other wooden products	20510	1	2
Metal wires	28730	1	2
Medical and surgical equipment	33100	1	6
Sports goods	36400	1	3
Electricity distribution	40102	8	2
Tram transport	60210	3	10
Bus transport	60211	8	7
Domestic coastal sea transport	61104	3	1
Transport hubs	63211	1	8
Parking lots and houses	63212	1	4
Tourist information services	63302	2	2
Telecommunication	64200	1	5
Real estate services	70100	9	78
Real estate development	70110	2	14
Real estate rental	70200	2	19
Database maintenance	72400	2	11
Architect services	74200	1	5
Consulting: product development	74405	1	9
Engineering education	80220	1	5
Rehabilitation	85114	1	9
Medical labs	85148	2	5
Veterinary services	85200	1	3
Social services, not institutions	85320	2	2
Sewage and sanitary services	90000	6	25
Cinema theatres	92130	1	2
Cultural activities, not theatre	92320	12	5
Other museums	92520	2	1
Natural reserves, recreational areas	92530	1	1
Sports arenas	92610	4	21
Cleaning services	93010	5	33

Table AIV. Alternative models

<i>ROA</i>	<i>Model A1</i> <i>ROA, using EBITDA</i> <i>instead of EBIT</i> <i>Coef.</i>	<i>Model A2</i> <i>ROA using EBITDA</i> <i>and excl. current liabilities</i> <i>Coef.</i>	<i>Model A3</i> <i>Continuous variables</i> <i>on logarithmic form</i> <i>Coef.</i>	<i>Model A4</i> <i>Continuous variables</i> <i>on logarithmic form</i> <i>Coef.</i>	<i>Model A5</i> <i>Continuous variables</i> <i>on logarithmic form</i> <i>Coef.</i>
Ownership	11.421***	22.092***	10.298***	10.154***	9.506***
Market share				-0.996*	0.606**
Herfindahl	8.548***	7.914*	2.576***		
Size	0.000	0.000*	1.442***	2.389***	
Age	-0.008	-0.080**	-0.326	-0.429	-0.062
Public listing	-10.863***	-19.809***	-6.753***	-6.335***	-4.706**
Town	-0.707	0.512	-1.029	-1.265*	-0.865
Oslo	-1.055	1.895	0.798	0.702	1.758
Northern Norway	-0.220	-2.327	-0.175	-0.239	-0.579
1990	3.240	7.267**	2.414	3.155*	2.053
1991	4.818***	8.308***	5.158***	5.329***	4.462***
1992	7.258***	8.216***	7.753***	8.213***	7.321***
1993	6.466***	7.466**	7.318***	7.568***	6.642***
1994	5.053***	3.424	4.524***	4.654***	3.871**
1995	4.148***	4.501	3.123**	3.167**	2.941**
1996	2.435*	-1.021	1.310	1.240	1.455
1997	2.036	2.353	0.852	0.395	0.408
1998	1.551	-2.200	0.298	-0.482	-0.334
Constant	8.101***	17.017***	-3.428***	-19.283***	8.421***
N	2306	2108	2288	2288	2288
F(17, 2266)	13.96	16.61	14.02	13.86	12.75
Prob > F	0	0	0	0	0
R-squared	0.1886	0.1551	0.1415	0.137	0.1256
Adj R-squared	0.1746	0.1392	0.1266	0.122	0.1109
Root MSE	16.05	29.49	14.698	14.737	14.83

\*\*\*0.01 significance level, \*\*0.05 significance level, \*0.1 significance level.

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