Centre on Regulation and Competition

WORKING PAPER SERIES

Paper No. 22

THE RELATIVE PERFORMANCE OF PUBLIC AND PRIVATE ENTERPRISE UNDER CONDITIONS OF ACTIVE AND PASSIVE OWNERSHIP

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October 2002

ISBN: 1-904056-21-0

Further details: Fiona Wilson, Centre Secretary
Published by: Centre on Regulation and Competition,
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INTRODUCTION[1]

The present tendency to privatise and deregulate is largely explained by the widespread view that public ownership is inefficient, in particular under monopoly (Millward and Parker, 1983; Kay and Thompson, 1986; Vickers and Yarrow, 1988). The empirical research is fairly inconclusive, however, and the same can be said about the the theoretical literature. Together, these studies raise questions about policies that favour, unequivocally, either nationalisation or privatisation. A useful economic theory of ownership should therefore be consistent with the fact that there are both efficient and inefficient private and public enterprises. To know when a given form of ownership works and how it can be best improved might be more useful than assertions that one ownership form is always better.

Our model is not necessarily more general than models used in the previous literature, but it is consistent with some stylised facts. In particular, private ownership is often dispersed and the largest shareholders may be institutional investors that focus on shareholder value only. We therefore assume that ownership can be either *passive* or *active*, depending on the level at which the strategic decisions are made. As in the real world, disappointing performance and/or excessive costs means that the manager is replaced (Shy, 1995). The probability of such an outcome can be affected through decisions on costs.

Most economists would argue that both public and private ownership is improved by market entry and competition, but we show that this is not always true and that other factors may be equally important. The efficiency comparison between public and private ownership can then go either way, depending on whether owners are active or passive, on the payment schedule, and the conditions under which the owners choose to replace the manager. Motivation, market structure and institutional details will also affect the ranking.

Our starting point that the previous literature on privatisation and performance is inconclusive is in itself controversial (cf. Megginson and Netter, 2001) and section 2 therefore details the relevant literature. Section 3 then presents a model of managerial slack under conditions of

asymmetric information. Using this model, section 4 compares the performance of firms that differ only with respect to ownership; while section 5 extends the main analysis to topics like regulation and risk-aversion. Section 6 provides concluding remarks.

2. AN OVERVIEW OF EARLIER RESEARCH

2.1. Comparisons of private and public ownership

A large number of studies have been published over the last twenty years or so on private versus public sector efficiency. The fact that they have provided mixed results is not always given due attention. Empirical studies of the relative performance of public and private sector firms and studies of the effects of privatisation, measured in terms of costs of production, productivity, employment and various financial ratios, have tended to find that competition is more important than ownership in explaining efficiency differences (Vickers and Yarrow, 1988; Martin and Parker, 1997). Where firms retain monopoly positions after privatisation (e.g. in some parts of telecommunications, power, water and transport sectors) effective regulation appears to be crucial in stimulating the conditions that are a proxy for real competition.

Some studies of private sector versus public sector performance, for example by Davies (1971, 1977), Boardman and Vining (1989), Galal *et al* (1994), Dewenter and Malatesta (1998), Megginson, Nash and Van Randenborgh (1994), and Majumdar (1996) have reported higher efficiency in the private sector. Megginson and Netter (2001), whose survey is dominated by transition economies and third-world comparisons of efficiency, conclude in favour of private ownership. But this seems premature given that Tyler (1979), Caves and Christensen (1980), Millward (1988), Nelson and Primeaux (1988), Bruggink (1982), Parker and Wu (1998), and others, have reported results more favourable to public ownership or no statistically significant differences (see also the overview in Willner, 2001). In terms of studies of Britain's privatisation experiment interpreting the performance results is complicated by interactions between macroeconomic policy, industrial restructuring, market liberalisation, regulation and the change in ownership over the time periods studied. After taking into account such factors, a number of the studies do not provide conclusive evidence of economic advantages from the privatisation process (Kay and Thompson, 1986; Martin and Parker, 1997). This result is consistent with research showing strong performance gains by UK publicly-owned firms in the 1980s (Molyneux and Thompson, 1987; Bishop and Thompson, 1992). The results of studies of the performance of privatised firms in the

transition economies of central and eastern Europe are also ambiguous (e.g. Earle and Estrin, 1996; Pistor and Spicer, 1996; Claessens *et al.*, 1997).

Thus, while public sector inefficiency is sometimes seen as a 'stylised fact', it appears from the empirical evidence that a change of ownership from public to private is not necessarily a cure for an under-performing organisation.

2.2. Mechanisms behind differences in performance

Turning to the theoretical literature on privatisation, most analyses of ownership have in common the assumption that individuals behave as the economic man (*homo oeconomicus*) in all their roles in society, be it as an entrepreneur, an employee, a consumer, a taxpayer, a public or private sector manager, a politician, or a civil servant. However, while this abstraction may be useful for understanding traditional economic topics, it may be misleading when analysing non-commercial organisations or social institutions such as government (Rainey, Backoff and Levine, 1976;Rainey, 1991;Udehn, 1996). To assume that civil servants, public sector managers or politicians are predictably opportunistic, lazy and greedy, as in the public choice literature (Niskanen, 1971;Buchanan, 1972;Tullock, 1976), seems to imply a bias against public ownership.

Also, public choice arguments imply that elections, rather than public ownership as such, are the main sources of inefficiency. If Boycko *et al.* (1996) are right, public ownership should be more efficient in a Soviet-style economy without democratic elections than in, for example, North America or Western Europe and Scandinavia, where politicians more obviously compete for votes. In fact, however, experience suggests that the reverse is true. Moreover, the literature ignores market failures associated with commercial behaviour. The comparison is, of course, more complex if both markets and political decisions are distorted. A genuine concern for welfare maximisation might be mistaken for an ambition to please special interest groups. Politicians and civil servants may in practice be imperfect welfare maximisers, but this does not make it meaningless to identify the scope for enlightened political intervention (Rainey, 1991; Udehn, 1996).

Other explanations for higher costs under public ownership are based on labour rents. For example, in Haskel's and Szymanski's (1993) bargaining model the presence of internal rent capture causes losses in public enterprises because of the larger size of the public-sector pay-

off (see however section 5.5 below and Willner, 1999b). As in Boycko *et al.* (1996) this result reflects political failure but wages **might** be higher in their setting even under genuine welfare maximisation[2]. Alternatively, Corneo and Rob (2000) provide a theoretical framework in which labour 'socialising' at work leads to equivocal results regarding the impact of privatisation on labour productivity.

Wage rates and working conditions have often been an issue in competitive tendering, in particular in Scandinavia, because of some public-sector agreements being more generous than those negotiated in the private sector. But such experiences cannot necessarily be generalised, and public sector wage rises have often lagged behind those in the private sector in the UK. Moreover, 'excessive' wages, salaries, and benefits may represent internal rent capture and not a welfare loss (see Willner, 1996)[3]. Public sector wages that are somewhat higher than among private competitors may even be part of a welfare-improving arrangement (De Fraja, 1993a, Willner, 1999b).

A third set of contributions deal with incentives to cut unnecessary costs. Few would question that these are strong in an entrepreneurial firm, which is managed by its owner and exposed to competition. But large companies in private and public ownership are in general managerial with a distinct separation between ownership and control (Berle and Means, 1932; Segal, 1998). Higher efficiency under private ownership must then be caused by stronger incentives for management to cut costs in the private sector than in similarly large organisations in the public sector (Martin and Parker, 1997, pp.15-24). In the principal-agent literature the main reason why public ownership is inferior is the lack of a profit motive in a world of incomplete contracts (Grossman and Hart, 1986; Shapiro and Willig, 1990; Bös, 1991; Shleifer, 1998). This puts state enterprises in the same category as not-for-profit firms in the private sector.

Vickers and Yarrow (1988) provide an early attempt at formal analysis of the impact of ownership. If public ownership is less cost efficient in their model, this depends on weaker management incentives as reflected in given parameters. Hart and Shleifer (1997) assume that a private manager-owner can be a residual claimant for own cost savings but a public sector manager cannot. Bös and Peters (1991) go one step further in analysing what goes on in the firm and predict that a firm in public ownership will be inferior in terms of both costs and R&D investments. This inferiority, however, is not implied by wider objectives or other

public sector features, but by an assumption that private owners are experienced investors who know business practices better than the public-sector monitors of management, who are in addition never rewarded for good performance[4].

But when there is no assumed built-in inferiority in the public sector relating to management monitoring, also contrary to Vickers and Yarrow (1988) and Bös and Peters (1991), no similar simple conclusions emerge. While Lülfesmann (2000) identifies the virtues of privatisation, he also argues that public governance can be optimal if the firm operates under a serious shut-down threat. Sappington and Stiglitz (1987) **and more recently Cook and Fabella (2002)** conclude that there is no unambiguously superior form of ownership; while Laffont and Tirole (1993, ch.17) demonstrate conditions under which public ownership may be more desirable than private ownership. Moreover, where privatisation leads to monopoly or oligopoly, some kind of regulation may be needed to protect consumers from monopoly abuse including dedicated regulatory offices and anti-trust authorities. Regulation means that the agent has to face two possible principals, shareholders and regulators, whose interests are likely to be in conflict. It is then not certain that the joint effect of privatisation and regulation is higher efficiency than under public ownership (Laffont and Tirole, 1991).

Under certain assumptions, it has been demonstrated that public ownership can even lead to higher cost efficiency (Laffont and Tirole, 1991; De Fraja, 1993b; Pint, 1991)[5]. For example, wider objectives than profit maximisation imply a stronger willingness to pay the greedy and lazy manager for cost reductions, because this benefits society as a whole. Private shareholders are prepared to pay only to the extent that it benefits themselves (De Fraja, 1993b). This mechanism of optimal (in)efficiency is more plausible under asymmetric information, but works under full information as well (Willner, 1999a).

The theoretically optimal managerial reward function in a principal-agent relationship can be extremely complex and may not even be monotone. In practice managers are therefore often rewarded according to incentive schemes that are much simpler than the solutions of a principal-agent problem would suggest. For example, Charnley *et.al.* (1989) discuss a linear compensation rule designed to induce managers to achieve the government's objectives. This literature, however, seems to have had little impact on how managers are actually compensated! In some cases their pay is not performance-related at all but the manager is replaced if the firm's performance is not satisfactory (Jensen and Murphy, 1990; Shy, 1995).

It follows that it is not possible to derive any definite conclusions about the superiority of private or public ownership from a completely general model[6]. This conclusion from the theoretical literature mirrors the empirical literature in rejecting any simplistic and axiomatic relationship between private and public ownership and efficiency. The purpose of our contribution below is to build on this literature and provide a principal-agent model of public and private enterprise that provides some new mechanisms which help to explain why performance changes under privatisation may go either way, and why therefore privatisation may sometimes delight and sometimes disappoint.

3. A DESCRIPTION OF THE MODEL

3.1. The State-owned and the Private Firm

Like most of the previous literature, such as De Fraja (1993b) and Boycko *et al*. (1995), sections 3 and 4 focus on how ownership, as reflected in a monopolist's objectives, affects performance (as made more precise in 3.2 below). Competition and other determinants of performance are discussed in sections 5.1 and 5.4.

Private ownership here is equated with the objective of profit maximisation, and public ownership with a weighting that is given to social welfare or the total of consumer and producer surplus. Let γ and $1-\gamma$ be weights attached to the total surplus and the profits respectively, and note that we may assume that γ is low enough to ensure that the firm breaks even. A version of the model with a weight for consumer surplus is presented in section 5.5.

The inverse demand function is $p = p(x)$, where p stands for price and x for output. For simplicity marginal costs with respect to output are assumed to be constant and equal to c in all firms[7]. Differences in efficiency are reflected in fixed costs rather than in fuel, raw materials and labour costs. Other authors such as De Fraja (1993b) have explored how ownership may affect marginal costs. Fixed costs consist of the manager's salary y, of managerial slack (s), and of a component $F-\varepsilon$, where F is a positive constant and ε a uniformly distributed random variable in $[-D, D]$ with zero mean and a standard deviation that is proportional to D. These items are described in more detail in *3.2* below, but it will be useful to define a variable $B(x,\gamma)$, where γ=0 represents private ownership:

$$B(x,\theta)=\int_0^x p(z)dz+(1-\theta)p(x)x-cx-F. \qquad (3.1)$$

The full objective function $O(s,x)$ is then[8]:

$$O(s,x)=B(x,\theta)+s-\theta-(1-\theta)y. \qquad (3.2)$$

It is obvious that maximising B with respect to x also maximises θ. In what follows x^G and x^P stand for output under public and private ownership respectively; the abbreviation B_i means $B^G = B^G(x^G,\theta)$ or $B^P = B^P(x^P,0)$.[9]

Monopoly profits have to be concave in output; this is sufficient for concavity also when $\theta>0$. Moreover, when dealing with market entry, in section 5.1 below, we want to rule out exceptional cases, such as when this causes each firm to produce more output. Let x^{MC} be associated with $p=c$, as when $\theta=1$, and note that output in the model is bounded from above by x^{MC}:[10]

Assumption 1.a) $p'(x)x+2p'(x)<0$ *holds true for all x in* $[0, x^{MC}]$.

In particular, this ensures that demand is well behaved in the sense that x and B are increasing in θ (and that B is reduced by competition in section 5.1). These are well-known results but a formal proof is available upon request.

3.2. Managerial Slack

The principal-agent models usually propose a contract that makes the agent's payment depend on variables such as profits, output or consumer welfare which can be verified *ex post*. In earlier applications of principal-agent theory to ownership, such as De Fraja, 1993b, the principal decides on output, while the manager decides on efforts and inputs. In addition we explore cases where the manager decides on output as well. Her remuneration y may be fixed or performance-related, but she is also replaced if the firm's performance falls below a threshold profit. The term *passive ownership* will be used for cases where the principal observes only profits or some other target[11]; while *active ownership* means that the owner

decides on how much to produce and monitors costs but cannot distinguish between necessary costs and managerial slack. The manager can in both cases misuse resources, blaming disappointing results on misfortune.

In what follows, bad management means excessive fixed costs, in the spirit of Oliver Williamson's original description of managerial discretion (Williamson, 1965)[12]. For example, the manager's utility may depend on the size of the staff that reports to her and on perquisites, such as the quality of the office, travel, limousines, etc, but also on pet projects (which will be ignored below)[13]. But to assume that only personal utility matters would rule out intrinsic motivation, which is usually described as either work for work's sake or as related to work morale (see Frey, 1997). We shall include intrinsic motivation by assuming that the manager maximises a weighted sum of her own utility and some part of the organisation's objective that she can affect, that is $B(x,?)?s$. The weights are $?$ and $1?\ ?$ respectively, with $?$ =1 as a special case; we ignore the possibility that intrinsic motivation is crowded out by managerial incentives imposed by owners in the form of sticks and carrots.

It is sometimes believed that the public sector attracts less greedy managers than in private firms (the 'public sector ethos'), but the reverse might be the case**,** most obviously, for example, in a corrupt regime. The normative public enterprise literature often assumes a $?$ -value close to zero; while the managerial discretion and public choice literatures focus on the opposite case[14]. It makes sense to consider systematic differences in $?$ related to ownership, and this is undertaken in section 5.4 below, But first, in sections 4 and 5, we focus on ownership assuming identical managers or identical $?$s.

The managerial employment contract may offer a fixed or performance-related salary**,** but in this section we assume that owners are not able to calculate an 'optimal' pay schedule. Let $?$, and y_0 be parameters ($?\ ?\ ?$), so that $y = y_0\ ?\ ?\ ?B\ ?\ s\ ?\ ?\ ?$. This approach is conventional and realistic (see Chamley et al., 1989, and Corneo and Rob, 2000). Note that a fixed salary ($y_0 = \bar{y}$ and $?$ = 0) is an important special case (see Jensen and Murphy, 1990, on the occurrence of performance-related pay).

Risk-aversion is technically awkward if $\rho<1$. Our main analysis is therefore based on risk-neutrality, except in section 5.3. The manager's utility is assumed to be $y+s$. Output and slack will affect both $B(x,\theta)+s$ and the probability of not being fired, $q(s,x)$. The manager therefore maximises the following expression with respect to s and x:

$$V = q(s,x)(y - s) + (1 - q)B(x,\theta) + s. \qquad \textbf{(3.3)}$$

The decision on s is made before knowing θ, in the hope that $F+\theta+s$ will not become alarmingly large.

3.3. Active and Passive Ownership

The owner either observes $O(s,x)$ or $F+\theta+s$, depending on whether ownership is active or passive. First, suppose that both government and shareholders are passive owners who are at arm's length from both strategic and operational decisions. They do not intervene directly but the manager is typically replaced if the firm is underperforming. We shall operationalise this idea by assuming that the percentage deviation between B and $B + s + \theta$, which the owner can observe, should not exceed a threshold 100δ. In other words, $s+\theta<\delta B$ must hold true.

Let e_i^* denote the specific value of θ that make the realised target equal to the threshold value, i.e. $e = \delta B + s$. Thus, if s is large, the manager might be fired even if θ is small, but she can remain in office despite large shocks if slack is low. The probability of not reaching the threshold is then $(e^*+D)/2D$, or:

$$q = \frac{\delta B(x) + s + D}{2D}. \qquad (3.4)$$

Note that the expected value $\bar{\theta}$ of θ is the average of $-D$ and e^* (i.e $\bar{\theta} = (\delta B + s - D)/2$) as long as the manager remains in office, because the manager is replaced if $\theta > e^*$. The expected salary is then $y_0 + (\delta B + s + \bar{\theta})$, or:

$$y = y_0 + (2 + \delta)B + s - D/2. \qquad (3.5)$$

Insert into (3.3):[15]

$$V = \frac{(B-x)^2 (s+D)}{4D} - 2y_0 + 2\alpha + \beta s + \gamma(2+\alpha)BD + (1+\alpha)B(x+s) \quad (3.6)$$

Next, suppose that the owner is active and that she maximises B_i with respect to x, being able to monitor $F+s+\varepsilon$ but not to distinguish between its necessary ($F+\varepsilon$) and unnecessary (s) components. Without slack, $F+s+\varepsilon$ can be at most $F+D$. If $s+\varepsilon$ means a higher percentage than 100% of D, the manager is replaced because of excessive spending. This happens, for a given level of slack s_i if the random variable takes the value $\varepsilon^* = D+s$. It follows that $\bar{\varepsilon}$ is then $(s+1-\rho)D/2$, which implies:

$$y = 2y_0 + 2\beta B + \beta s + \gamma(1+\rho)D/2. \quad (3.7)$$

In turn this implies that the probability of costs lower than the critical value is:

$$q = \frac{(1-\rho)D+s}{2D}. \quad (3.8)$$

The expected value of ε is now $(1-\rho)D+s/2$. Inserting and rearranging yields the following managerial objective function:

$$V = \frac{(1-\rho)D+s}{4D} - 2y_0 + 2\beta B + 2\alpha + \beta s + (1-\rho)D + (1+\alpha)B(x+s) \quad (3.9)$$

The analysis would predict differences in efficiency in either direction if there are systematic differences in α, β, γ, ρ, and y_0 due to ownership. Some asymmetric cases are dealt with in 5.4, but this section focuses on the impact of ownership under similar rules of the game. We shall assume that ρ and γ are either independent of ownership or chosen so as to equalise the probabilities of the manager being replaced. Optimal thresholds are dealt with in 5.3.

4. OWNERSHIP AND PERFORMANCE

4.1 Passive ownership

The manager will maximise the owner's objective function with respect to output, as follows from the fact that (3.6) is increasing in $B_i(x_i)$. It is possible that the input decision is also optimal ($s ? 0$) because ?*V*/?*s* is negative for all positive *s* if ? is below a critical value $\hat{?}$. If this is not the case there will be managerial slack. Property rights theory argues that selfishness (high values of ?) would be more harmful under public ownership, but this is not necessarily true in this model.

If an interior solution for *s* exists, it will be affected by ownership through the size of *B* via *x*, as described by Proposition 1 below:

Proposition 1. Suppose that ? ? $\hat{?}$ and ownership is passive. a) If? is the same under both forms of ownership, public ownership means higher slack unless there is performance-related pay, in which case the opposite may hold true if ? ? ? ; b) If $?_i$ is chosen so that q is the same under both forms of ownership, there is no difference in slack unless there is performance-related pay, in which case slack is lower under public ownership.

Proof: Differentiate (3.6), and set ?*V*/?s_i =0:

$$s_i^I ? \frac{? ?? _i ? ? ?B_i ? ?3? ? ? ? ? 2?D ? ?y_0}{?2 ? ? ??} . \qquad (4.1)$$

Assumption 1 ensures that $B^G > B^P$. a) *a)* Set $?^G = ?^P = ?$. If *y* is fixed ($y_0 = \bar{y}$ and ? = 0), (4.1) implies $s_G^I ? s_P^I$ if ? ? ? , and *vice versa. b)* Suppose that $?^G$ and $?^P$ are chosen so that $q^G = q^P$, in which case (3.4) implies:

$$?^G B^G ? s^G = ?^P B^P ? s^P . \qquad (4.2)$$

Insert (4.1) into (4.2) and rearrange:

$$?^G B^G ? ?^P B^P ? ? ?B^G ? B^P ?/?1 ? ? ?. \qquad (4.3)$$

It follows that $? ? ?$ implies $s^P ? s^G$. Use (4.3) to rewrite s^G and assume $? > ?$. It then follows that $s^P ? s^G$ because $B^G > B^P$. Q.E.D.

Thus, passive ownership when $? ^G ? ? ^P$ makes the amount of resources that can be wasted on managerial slack depend on the size of the principal's target via B_i. To understand this intuitively, note that the probability of not being fired is increasing in B_i for a given level of slack if the threshold level represents the same proportion of the target under both forms of ownership. This effect is reduced and can even be reversed by performance-related pay because the manager then has more to lose. Slack tends to be higher under both forms of ownership under high uncertainty (large values of D); note also that the critical value $\hat{?}$ depends on D[16]. The results would be similar under full welfare maximisation with a break-even constraint.

It is commonly believed that managers have more job security under public ownership than in a private company. This does not necessarily reflect public sector inertia, however, because the probability of reaching the target is affected by B_i via s_i. Inserting (4.1) in (3.4) shows that the probability of not being fired is higher under public ownership if $? ? \hat{?}$ and if $? ^G ? ? ^P$. However, if the manager is fired with the same probability in both types of firms, the public sector owners are in fact more stringent in the sense that a smaller deviation from the target (a lower $?$) leads to dismissal. This explains why the comparison is almost reversed as compared to the case when thresholds are set according to the same rules.

The model also highlights the fact that a focus on managerial slack can lead to higher costs in another respect. The sum of the costs $s ? y$ associated with the management (managerial costs) may in fact increase when slack is reduced through performance-related pay. Note also that $s ? y$ is always higher under public ownership if $? ^G ? ? ^P$ but there is no difference if $q^G = q^P$. If the ambition is to make public ownership at least as efficient as private ownership, there may therefore be better ways than adopting performance-related pay for managers, as follows from Corollary 1 below and from sections 4.2 and 4.3:

Corollary 1. a) Consider an organisation with passive ownership and a fixed salary $\bar{y}$ *. Intermediate values of* $\bar{y}$ *mean that a change to performance-related pay reduce both slack and managerial costs, but high values mean that this increases slack and reduce managerial costs, while low values mean that slack is reduced and managerial costs increased. b) Suppose that public and private ownership are associated with fixed and performance-related pay respectively and that* $?^{G} ? ?^{P}$ *. Managerial costs are then lower under public ownership if and only if* $\bar{y}$ *is below a threshold value. c) Managerial costs are the same under both forms of ownership if* $?^{G}$ *and* $?^{P}$ *are chosen so that* $q^{G} = q^{P}$ *.*

Proof: See Appendix.

Thus, privatisation and the introduction of performance-related pay can occasionally lead to a 'fat-cat' salary that costs more than is saved by, for example, reducing superfluous staff. However, note also that the fact that $x^{G}>x^{P}$ under public ownership means that costs per unit of output may be lower than in a private company despite higher slack and/or managerial costs.

4.2 Active ownership

Active ownership means that the owner can monitor costs and that a manager who is seen as causing excessive costs is fired. The agent then maximises (3.9) only with respect to s because x is chosen by the owner. Again, the objective function may be monotone and decreasing in s everywhere, but if $?$ is sufficiently large we get:

$$s_i^{II} ? \frac{?3? ? 2 ? ? ? ? ? ?_i ?D ? ? ?B_i ? ?y_0}{(2 ? ?)?} . \qquad (4.4)$$

It follows that slack is unaffected by ownership if $y_0 = \bar{y}$ and $? = 0$, but otherwise it is *lower* under public ownership, as follows directly from (4.4) when $?^{G} ? ?^{P}$.

Proposition 2. Suppose that $? ? \hat{?}$ *, that owners are active and that ? is chosen so that either* $?^{G} ? ?^{P}$ *or* $q^{G} ? q^{P}$ *holds true. Ownership then matters only if there is performance-related pay, in which case the absolute amount of slack is lower under public ownership.*

Proof: (The proof is omitted because proposition 2 follows from (4.4), in close analogy to the proof of Proposition 1.)

The explanation is a higher willingness to pay for cost reductions under public ownership, as in De Fraja (1993b), whose analysis is based on given probabilities. Also, the cost gains caused by lower slack through performance-related pay may be offset by the relatively high performance-related salary that needs to be paid. Moreover, the total managerial costs would become higher under public ownership, while there would be no difference if the salary is fixed. For example, suppose that pay is fixed only in the public firm. The difference in slack can then go either way, but to introduce performance-related pay would increase managerial costs despite reduced slack through a 'fat-cat' effect. We can summarise these insights as follows:

Corollary 2: a) Consider an organisation with active ownership and a fixed salary $\bar{y}$ *. A change to performance-related pay then reduces both slack and managerial costs for intermediate values of* $\bar{y}$ *, but increases slack and reduces managerial costs for large values and reduces slack but increases managerial costs for small values. b) Suppose that public and private ownership are associated with fixed and performance-related pay respectively. Managerial costs are then lower under public ownership if and only if* $\bar{y}$ *is below a threshold value.*

(The proof is similar to Corollary 1 and therefore omitted.)

Unit costs are lower under public ownership if the salary is fixed. Similar arguments as in section 4.1 suggest that unit costs may otherwise be either higher or lower and that there is less turnover among managers under public ownership.

5. SOME EXTENSIONS

5.1. Oligopolistic Competition

The extension of the analysis to competition after privatisation and to mixed markets is straightforward. If privatisation also means competition between *n* firms, as when the market is liberalised, the crucial components in the objective functions are B^G and B_j^P respectively;

j=1, 2,...n. Competition reinforces the differences driven by B insofar as $B_j^P < B^P < B^G$, if $?$ is large enough for managerial slack to be an issue. The same would be true if there is mixed ownership and if $?>0$, because this would both reduce the private firm's profit margins and increase the public firm's pay-off. Note also that that increased competition when all firms are private would have the same ambiguous effect as privatisation because an increase in n would normally reduce B_j^P.

Thus, slack is reduced by privatisation and/or competition under passive ownership if the salary is fixed or if $?$ is small when $?^G \; ? \; ?^P \; ? \; ?$. If instead all managers have the same probability of being replaced, both active and passive ownership then mean equal slack under public and private ownership, but performance-related pay means that both privatisation and competition lead to higher slack.

Some authors, such as Vickers and Yarrow (1988), have suggested that competition may be more crucial than privatisation. The fact that managerial slack may under certain circumstances be increased by competition may therefore be our most controversial finding. However, competition increases slack also in Martin (1993), where asymmetric information works in a similar way as in De Fraja (1993b), because it makes it more difficult for firms to afford pay for slack-reducing activities. Note also the cases where competition does not lead to improved post-privatisation performance in Martin and Parker (1997).

5.2. Regulation of a privatised monopoly

Although some authors have argued that natural monopolies are most efficient when privatised and not regulated (see, for example, Bradburd, 1996), privatised industries like water, electricity, telecommunications, gas and the railways are usually state regulated. Utilities in Britain are regulated under an *RPI-X* price cap system. Prices are allowed to change to the extent of the difference between the percentage increase in the price index (*RPI*) and the required increase in an efficiency factor (*X*), which is set by the regulator after negotiations with the firm. This approach was chosen because of the negative incentive effects associated with rate of return regulation (Averch and Johnson, 1962; Littlechild, 1983).

Our setting is static and we have not modelled technical change. There is, therefore, limited scope for changes in efficiency other than because of changes in organisational slack. Regulation can be included in the model as follows. Suppose that the privatised company is initially allowed to maximise profits. The initial price is then the monopoly price p^M. This is not an entirely unreasonable assumption where companies are restructured before privatisation in order to ensure high sale proceeds. After privatisation there is bargaining about the percentage price cut. The manager makes her decision after knowing the result of the bargaining process; hence, we ignore the important issue of risks related to the regulatory process[17].

Suppose that the regulator would prefer a price that maximises the same objective as under public ownership. The ideal price would then be p^G, which would mean that $X = 100(p^M - p^G)/p^M$. Suppose that the bargaining strengths of the regulator and the monopoly are α and $1 - \alpha$ and that we get p^M if the regulator is extremely weak ($\alpha = 0$) and p^G in the opposite case. Nash-bargaining can then be modelled as maximising the following expression, where the fall-back levels are $B^G(p^M)$ and $B^P(p^G)$ respectively:

$$N = (B^G - B^G(p^M))^{\alpha} (B^P - B^P(p^G))^{1-\alpha}. \qquad (5.1)$$

This yields a solution p^N and a value of $X^N = 100(p^M - p^N)/p^N$ such that $p^M \geq p^N \geq p^G$.[18]

Passive ownership can be interpreted as bargaining between management and regulators. The next step is to analyse how the manager maximises her utility given $B^N = B^P(p^N)$; the solution is obtained by inserting in (4.1). It is obvious that $B^G > B^P > B^N$, hence slack is lower than under both public ownership and unregulated privatisation. However, it is not obvious why a public sector that is able to regulate properly would not also be capable of being an effective, active owner.

Regulation may also be a repeated procedure. If the first period means that the price is set as p^N, the regulator might require a new price reduction in the next round, resulting in a percentage price cut of $100(p^N - p^G)/p^N$. As the model does not include technical progress, the price would sooner or later converge to p^G. However, as pointed out in Martin and Parker (1997), in practice the *RPI-X*-approach has meant that *X* is set according to some agreement

on what is a satisfactory profit. This would mean that p^G is sufficiently high, as when profits are given some weight in the objective function. Naturally, the outcome of privatisation then becomes sensitive to the definition of 'satisfactory' profits.

Moreover, there would be bargaining between management and regulators also when ownership is active. If the manager's salary is fixed, the absolute level of slack is the same before and after privatisation with or without regulation. However, performance-related pay would, in light of (4.4), mean that regulation is the worst alternative in terms of the absolute amount of slack, because $B^G > B^P > B^N$.

5.3. Risk averse managers, constrained maximisation, and optimal thresholds

We have hitherto abstracted from risk aversion, but a brief discussion may be needed in order to ensure that this simplification has caused no major distortion. Suppose that $\gamma = 1$ as in a conventional model and that $\gamma^G = \gamma^P$ or $\gamma^G \neq \gamma^P$ and consider the following utility function where r is a positive parameter, such that $1 \geq r$:

$$v_i = (y_i - s_i)^r . \tag{5.2}$$

Substituting this expression for $y_i - s_i$ in (3.6) and (3.9) yields the following expressions for managerial slack under passive and active ownership respectively:

$$s_i^I = \frac{\gamma r^2 - \gamma^2 r + \gamma^2 B_i - 2r + r + D - 2y_0}{2\gamma - \gamma^2 - 1 + r}, \tag{5.3}$$

$$s_i^{II} = \frac{(2 - \gamma)r(1 - \gamma) + \gamma - 1 + D - 2y_0 + 2B_i}{2 - \gamma - (1 - r)}. \tag{5.4}$$

It is now a simple exercise to use similar procedures as in sections 4.1 and 4.2 to prove that Propositions 1 and 2 and Corollaries 1 and 2 remain valid.

The assumption that owners are free to choose the pay schedule may also be an oversimplification. Traditionally, the principal maximises subject to an incentive compatibility constraint (ICC) and a participation constraint (PC). The threat of dismissal (a

stick) replaces the ICC (a carrot) in our model, but we may consider the possibility that that the manager can threaten to quit unless her salary is consistent with an outside-option utility level, v_0. If this PC is binding, the salary should be solved from the equation $q_i(s_i - y_i^r) = v_0$. Set $y_i = y_0$ and $\varepsilon = 0$ in (5.3), insert and rearrange:

$$\frac{(\beta B_i - D - y_i^{\gamma - r} r^r}{2D(1 - r)^2} - v_0 . \qquad (5.5)$$

We can now formulate:

Proposition 1': Suppose that $\varepsilon = 0$, that owners are passive, managers risk-averse, and that the expected utility of managers must equal v_0. a) Managerial costs are the same under public and private ownership, but private ownership means higher salary and lower slack and public ownership the opposite. b) Unit costs are lower under public ownership.

Proof: a) Use (5.5) to solve for y_i, insert into (5.3) with $y_0 = y_i$ and $\varepsilon = 0$ and introduce the following abbreviation:

$$G^I = (2Dv_0)(1 - r)^2 r^{-r})^{1/(1-r)} . \qquad (5.6)$$

The solutions can then be written:

$$y_i^I = G^I - D - \beta B_i . \qquad (5.7)$$

$$s_i^I = D + \beta B_i + G^I/(1 - r) . \qquad (5.8)$$

It is now obvious that $s_G^I < s_P^I$ and $y_G^I < y_P^I$ because of Lemma 1. Note also that B_i cancels out from $s_i^I - y_i^I$. This proves part a); part b) is obvious because $F + s_i^I - y_i^I$ is divided by a higher output under public ownership. Q.E.D.

At the same time, if owners are active, a PC means that the model works as when there is a fixed wage because *y* does not then not depend on B. Alternatively, the model could be reformulated so as to allow the manager to know $?$ *ex ante* and to replace the threat of being fired with an ICC. However, this would bring us close to the De Fraja-model (De Fraja, 1993), and we already know that public ownership is then associated with lower slack, at least in the better of two states of nature.

Finally, consider the case where the owners choose the threshold parameter optimally. This makes more sense under active ownership. Suppose, therefore, that the threshold parameter is represented by $?$. The expected utility of the manager is then increasing in $?$, which means that there must be a binding participation constraint such that $v ? v_0$.Suppose that the manager is risk-neutral, as when r =1 in (5.2), and that $?$ =1:

$$v_0 ? \frac{?!1 ? (1 ? ?)?\,?D ? ? B_i ? y_0 ?^2}{4(2 ? ?)D} \qquad (5.9)$$

It is obvious that $?$ is decreasing in B_i. Note that s_i is given by (4.4); a lower $?$ means lower slack. Public ownership (a higher B_i) therefore means lower slack. This result is not restricted to performance-related pay.

5.4. Asymmetric cases

The analysis in section 4 has focused on public and private firms where the rules of the game have been fairly similar, in order to highlight the significance of the wider objectives that are usually associated with public ownership in the literature. However, the model also suggests a number of other ways in which ownership may matter.

For example, it seems restrictive to assume that managers always have the same kind of motivation. We might argue that those who are more affected by monetary rewards might feel more attracted by employment in the private sector (while the opposite might be true in an extremely corrupt regime with an ailing private sector). To highlight the implications of systematic differences in motivation, suppose that there is a 'public-sector ethos', for

example so that θ^G=0.5 and θ^P=0 and that $\theta^G = \theta^P = \theta$. Inserting into (4.1) shows that slack is then lower under public ownership if $B^G - B^P - 2D/(\theta - \theta^2) < 0$.

It may also be the case that performance-related pay is more frequent under private ownership. Suppose therefore that the public sector manager gets a fixed salary $\bar{y}$, while it is performance-related in the private firm, and simplify by setting θ=1. Applying (4.1) suggests that the difference in slack can go either way, but that the total managerial costs are lower under public ownership if $\bar{y} < y_0 + (B^G - B^P)(\theta - \theta^2)/(1 + \theta - \theta^2)B^P$, and *vice versa*. But it might also make sense to include cases where there are differences in the details of the wage schedule (y_0 and/or θ).

The rationale for public ownership is often interventionist, in contrast to private institutional investors focusing on shareholder value only, though some state enterprises are fairly autonomous of government; while there are private owners that monitor their companies in detail.) Suppose that θ=1.0. Slack is then lower if the state is active and the private owner passive if $(\theta - \theta^2)B^P > \theta D + \theta B^G$, which is less likely to hold true under large uncertainty (a large D). The condition for total managerial costs to be lower is $\theta B^G - (\theta - \theta^2)(1 + \theta - \theta^2)B^P < (1 + \theta - \theta^2)\theta D$, which also depends on D.

This small sample of asymmetric cases reinforces the point that we should consider how a given organisation can be made more efficient rather than focus simply on a change of ownership, if low cost efficiency is the problem. Moreover, the choice between private and public ownership may be based on the desirability of wider objectives than profit maximisation.

5.5. The significance of the objective function

We have now presented a number of modifications that do not cause major changes to the model, but this subsection deals with a less innocuous feature. Our results are sensitive to how public sector performance is defined. A weighted sum of total surplus and profits is by definition larger than private sector profits (and, hence, $B^G > B^P$) and this drives the differences predicted in section 4 above.

However, some economists may prefer a model with a weighted sum of consumer surplus (*CS*) and profits (*?*). When focusing on output, such an approach would be formally similar for certain combinations of weights because $?(CS+?)+(1??)?$ can be written $?CS+?$. Dividing the objective function by $1+?$ yields new weights $?=?/(1+?)$ and $1??=1/(1+?)$ that sum to unity. Conversely, if we start with an objective function of the form $?CS?(1???)?$, we can transform it into our type of objective function with the weights $?/(1??)$ and $(1?2?)/(1??)$ respectively, provided that $?<0.5$. It follows that our approach restricts the weight given to the consumer surplus. This is so because the assumption $1???0$ rules out public firms that set prices below marginal costs. Note also that $?CS+(1??)?$ is not always concave for large values of *?*[19].

This formal similarity of the objective functions does not extend to managerial slack. Suppose that inverse demand is of the form $p?a?x$, where *a* is a positive parameter. This would imply the following expressions for *B:*

$$B^G ? \frac{(1???)(a?c)^2}{2(2?3??)} ? F . \qquad (5.10)$$

$$B^P ? \frac{(a?c)^2}{4} ? F . \qquad (5.11)$$

It now follows that $B^G ? B^P$ can hold true only if *?* is greater than 0.5, which would require that the public firm sets prices below marginal costs. This objective function would therefore turn our results on their head.

This sensitivity to the definition of the public-sector objective function would be highly embarrassing for those who want to prove that one form of ownership is unequivocally superior to another. But our model is suggesting that the ranking depends on the circumstances, with the additional twist that the way in which the public sector's wider objectives are defined also matters. This definition also affects the outcome of wage bargaining under public ownership. It has been argued that public firms need subsidies because of excessive wages that in fact depend on how the public-sector pay-off function has

been modelled (see, for example, Haskel and Szymanski, 1993). Such public firms would no longer be viable, and this has been used as a rationale for privatisation (Bös,1993).

6. CONCLUSIONS

Our analysis suggests that the way in which a company is organised may be more important than ownership from the standpoint of cost efficiency. For example, public-sector officials and private-sector shareholders may be either active or passive owners and managers may or may not get performance-related pay, or their utility may be determined within the firm or by the market. Therefore, public ownership may sometimes lead to higher slack (for example under passive ownership, fixed salaries and equally determined performance thresholds), but slack may also be equal or lower than under private ownership under other circumstances (for example passive ownership with equal probabilities that the manager will be fired, or active ownership)[20]. Moreover, public ownership can mean that the sum of salary and slack is lower despite higher slack if the salary is modest as compared to that found in a private company with performance-related pay.

While our analysis has challenged some conventional views, we are not suggesting that privatisation is necessarily a misguided policy. Both privatisation and state ownership are valid strategies in our model given particular conditions. However, the findings from our model do imply that assessing privatisation requires a more sophisticated and cautious treatment of the role of ownership in determining organisational performance. This is particularly so given the adoption of privatisation policies internationally and in countries with different capital markets and managerial pay systems to that found in the UK and USA. Also, ownership should be related to objectives: where will commercial behaviour be consistent with society's values and where not? There will always be disagreement on the limits of a market solution. The results from the model presented here are consistent with the mixed empirical and theoretical evidence on post-privatisation performance reviewed at the outset of the paper. Both suggest that there may exist better remedies than privatisation if excessive costs are the main problem in an enterprise. Hopefully our analysis provides a focus for a better understanding of the *mechanisms* behind excessive costs of production, under both state and private enterprise.

A natural way forward is to develop further the theoretical and empirical understanding of the issues that have been the focus of this paper and to extend the approach towards innovation

and dynamic efficiency. Our analysis also identifies a particular topic that future research should direct even more attention to than has already been the case, the real nature of agent motivation, as reflected in the exogenous parameter $?$ in our model. This has been crucially important in our model in determining whether there is any inefficiency in the organisation at all. It is well known from the management literature and from other social sciences that the way in which individuals behave in an organisation is changed by means other than the obvious sticks (e.g. threat of redundancy) and carrots (e.g. performance-related pay) (e.g. Rowlinson, 1997). Employees can be creative in a certain kind of work environment and they can be ineffective and burnt-out in another kind. It has been suggested that intrinsic motivation may even be crowded out by rewards and punishments (see, for example, Frey, 1997) and cultural factors may mean that sticks and carrots impact on employee behaviour differently across different societies (North, 1990) . If we are correct in our conclusion that there could be a weak chain of causality between ownership and efficiency, nationalisation or privatisation may be appropriate only when a change of ownership provides the best way to improve internal motivation. In other cases, attention to factors that affect motivation in state-owned enterprises might provide a better remedy than simply concentrating upon changing the ownership form.

Appendix

Proof of Corollary 1. a) Set ? = 0 and $y_0 = \bar{y}$ in (4.1) to get the solution for the case of a fixed salary and equal percentage threshold:

$$s_i^I ? \frac{? ?B_i ? (3? ? 2)D ? ? \bar{y}}{2?}. \qquad \text{(A.1)}$$

Consider the following abbreviations and note that $a^I ? b^I$:

$$a^I ? \frac{2?y_0 ? ? ? (2 ? ?)B_i ? ? (2 ? ?)D}{(2 ? ?)?}, \qquad \text{(A.2)}$$

$$b^I ? y_0 ? ? (1 ? ?)B_i. \qquad \text{(A.3)}$$

Comparing with (4.1) shows that performance-related pay reduces slack if $\bar{y} < a^I$. Insert s_i according to (4.1) into (3.5) and add to get the total managerial costs:

$$y_i ? s_i ? \frac{?y_0 ? ? (? ? ? ? ? ?)B_i ? (3? ? 2)D}{2?}. \qquad \text{(A.4)}$$

Set ? = 0 and $y_0 = \bar{y}$ to get the managerial costs associated with a fixed salary:

$$\bar{y} ? s_i ? \frac{? \bar{y} ? ? ? ?B_i ? (3? ? 2)D}{2?}. \qquad \text{(A.5)}$$

Comparing (A.4) and (A.5) shows that performance-related pay yields lower managerial costs if and only if $\bar{y} > b^I$. In other words, a change to performance-related pay then reduces both slack and managerial costs if $a^I > \bar{y} > b^I$ and if $?^G ? ?^P$, but increases slack and reduces managerial costs if $\bar{y} > a^I$, and reduces slack but increases managerial costs if $\bar{y} < b^I$ This proves part a). b) Insert B^P into (A.4) and B^G into (A.5). Part b) then follows from comparing and rearranging, because it is obvious that managerial costs are lower under public

ownership if and only if $\bar{y} < y_0 ? ? (1 ? ?)B^P ? ? ?B^G ? B^P ?$. c) This results follows from (3.5), (4.1) and from the condition that $q^G ? q^P$. Q.E.D.

Notes

[1] We would like to thank Dieter Bös, David Saal, Mikko Leppämäki and participants in the Workshop 'Enterprise Strategies and Regional Growth Policies in the Global Economy', University of Wisconsin/Milwaukee, July 2000, the IVth Annual Conference of EUNIP, Tilburg, December 2000, the 28th Annual Conference of EARIE, Dublin, August 2001, and the XXIVth Symposium of Finnish Economists, Mikkeli/St Michel, February 2002, for helpful comments on earlier drafts. The usual disclaimer applies.

[2] See however section 5.5 on how the definition of public-sector pay-off may affect cost efficiency and distribution.

[3] It is well known that the lower profitability of unionised firms may depend on internal rent capture rather than genuine differences in efficiency (see, for example, Cable and Machin, 1991 and Machin, 1991). Avishur (2000) recognises that privatisation involves a distribution of the benefits of increased efficiency across different groups. In his analysis, privatisation provides a Pareto-dominating mode of operation that generates political support.

[4] By contrast, in Schmidt (1996a&b) privatisation reduces the government's knowledge of the firm's production costs, but a harder budget constraint and managers' information rents provide greater incentives for cost reduction.

[5] In Pint (1991) state ownership is biased towards excessive labour intensity and private ownership towards excessive capital intensity. The overall effect in the model is ambiguous in terms of which form of ownership will, overall, be more efficient.

[6] Nor is it clear whether total privatisation is superior to partial privatisation (e.g. Sasaki and Wen, 1998). We avoid discussion of this issue, although it seems that our model could be extended to include degrees of privatisation.

[7] Constant marginal costs are empirically plausible and affect the results in the sense that an alternative assumption would cause the larger of the two otherwise identical firms to have higher marginal costs, leading to the trivial conclusion that one firm is more cost efficient than the other.

[8] We subtract $(1-\gamma)y$ and not y, because salaries are here assumed to be part of the total surplus. This does not affect the results.

[9] A positive γ can also be interpreted in terms of 'distorted' objectives, as described, for example, by Boycko *et al*. (1996). Our model yields the same result as when there is bargaining between opportunistic politicians who want to maximise output and/or employment and managers/shareholders who wish to maximise profits, with bargaining strengths γ and $1-\gamma$ respectively.

[10] Profits may be nonconcave if for example $p''(x)x$ is positive and large, but not if the price elasticity of demand ε_p is increasing in p, as when demand is linear, or if γ is a constant (and larger than one under monopoly) or even moderately decreasing.

[11] A passive public-sector owner may not be able to observe a weighted sum of profits and consumer surplus and therefore the total surplus. But we would get similar results by assuming targets in terms of output and profits. Note that a high weight for output or the consumer surplus would imply the special case of 'soft budget' constraints as described by Kornai (1986) and Maskin (1999).

[12] The Williamson model includes the salary, including bonuses and stock options, in the definition of slack, but we treat remuneration as a separate variable which may affect the manager's decision on s. Some reader might argue that slack in this sense is comparable to theft, but most firms accept some extent of managerial discretion on outlays that are not necessary for production.

[13] The model allows for excess employment insofar as it is part of the managerial slack. But there might be 'over-employment' in a state-owned company if for good or bad welfare reasons it produces more output than under profit maximisation.

[14] Bös (1994) provides a general treatment of the objectives of public firms. Also wider objectives are included in Bös (1991, pp. 108-114) however these do not represent disinterested behaviour, as when $\gamma=0$, but a more sophisticated form of self-interest.

[15] The extension to cases where there is some payment v_0 - e.g. a 'golden parachute' or an outside-option utility - is straightforward; the chosen level of slack would then depend on $y_0 - v_0$ rather than on just y_0.

[16] Without slack unit costs are lower under public ownership because identical fixed costs are then divided by a higher output.

[17] This is, of course, a simplification. The results of decision making in regulated firms under conditions of imperfect information deserve fuller investigation. Space precludes this development of our model here.

[18] Note that we first derive p^N for a given level of slack as in a usual two-step procedure; but, p^N does not depend on slack because s cancels out in the pay-off functions.

[19] If there is competition, a weight for the total surplus implies that some weight is also given to the competitors' profits. This might seem strange, but it is well known in the mixed oligopoly literature that full welfare maximisation and equal marginal costs would mean that the private competitors are completely crowded out. It makes sense to give some weight to private sector profits if the intention is not to create a public monopoly.

[20] Our findings on passive ownership do not mean that organisational autonomy is harmful because intrinsic motivation may then dominate; universities in some countries being a case in point.

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