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Privatization and efficiency: differentiating ownership effects from political, organizational, and dynamic effects

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Abstract

This paper argues that the private-public ownership factor should be differentiated from other factors that also influence the effect of privatization on efficiency. This is empirically confirmed in a longitudinal study of 24 Spanish firms, for which several political and organizational factors are found to influence the estimated effects of privatization on efficiency. The analysis of the timing of the effects reveals a strong significance for post-privatization years 5–6 (negative), and 7–8 (positive). This suggests that the negative effect of these factors is transitional, being eventually offset by the positive effects of the change to private ownership. ©2000 Elsevier Science B.V. All rights reserved.

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1. Introduction

One of the most significant economic phenomena of recent years has been the privatization of state-owned enterprises all over the world. According to Megginson and Netter (1997), the amount raised by all governments during the last two decades, considering only public offers, is over $400 billion, a figure that would be considerably surpassed if direct sales were also taken into account. [1] While there are several possible reasons why privatization may be undertaken (Yarrow, 1986), the main driver of this trend has been the search for an increase in the efficiency of the firms involved (Megginson et al., 1994).

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[1] According to the World Bank, over 2000 firms were privatized during the period 1980–1993 (almost half between 1991 and 1993), less than 5 percent of which involved public share offerings.

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Whether privatization actually leads to that improvement in efficiency has been the subject of what appears to be a considerable amount of research, both theoretical and empirical. Most of this research, however, has actually been concerned with whether private ownership leads to a higher efficiency than state ownership, which is only part of the former question. As a consequence, empirical results do not always support the theoretical predictions. Several factors, independent of the private-public distinction, also intervene in the relationship between privatization on efficiency. Moreover, some of them do so in a dynamic way, thus affecting the timing of privatization effects. Therefore, they need to be controlled for, not only in empirical research, but also in a complete theory of privatization.

This paper addresses such need in two ways. First, by discussing the different factors that affect the privatization-efficiency relationship, which are grouped into political, organizational, and dynamic factors. The latter reflect the transition and evolution inherent to any privatization process which are ignored, however, in studies about public-private ownership. Second, by empirically testing for the presence of all these factors in a longitudinal study using a sample of 24 Spanish firms which were privatized between 1985 and 1993. While the superior efficiency of private (versus state-owned) firms in Spain has been confirmed in a number of cross-sectional studies, this is the first time the effects of privatization processes are analysed in this country. It is also the first time the privatization-efficiency relationship is examined in a representative sample of firms from a Western country other than the UK, [2] and one of the few *statistical* analyses of privatization effects that have been done, as the empirical literature review will show. More importantly, this study is the first to pay attention to the political, organizational, and transitional effects of privatization on efficiency.

Section 2 reviews what has been said in theoretical and empirical research about the effect of privatization on efficiency. Section 3 discusses what is missing from this literature, namely the political, organizational, and dynamic implications of privatization that may affect firm efficiency, and states the hypotheses. Section 4 describes the methods and results of the empirical study, and Section 5 discusses its findings, limitations and implications.

2. Background

Privatization can be defined in a strict sense as the sale of a state-owned firm to the private sector. [3] Many theoretical and empirical articles have examined the differences between state-owned and private firms and what these differences imply for firm efficiency.

2.1. Theoretical approaches

Three distinct streams of thought have dealt with the public-private firm comparison: (1) Agency/Property Rights Theory; (2) Public Choice; and (3) organization theories. The

[2] Barberis et al. (1996) have tested it for Russia, and Dyck (1997) for Eastern Germany. This paper will not consider those studies or any other about privatization in Eastern countries, given the peculiarities these economies entail.

[3] Note that this definition of privatization, which is the most widespread, does not include the possible changes in the competitive or regulatory environment that may accompany it.

Table 1
Theoretical studies of public versus private ownership and/or privatization

Agency/property rights theories	Public choice	Organization theories
Property rights theory	Zeckhauser and Horn (1989)	Fernández (1984, 1985)
Alchian (1965)	Haskel and Szymanski (1992a)	Perry and Rainey (1988)
De Alessi (1980, 1987)	Boycko and Vishny (1996)	
Borcherding (1983)		Ricart et al. (1991)
Positive agency literature		Bishop and Thompson (1992)
Aharoni (1981)		Parker (1993, 1995)
Kay and Thompson (1986)		Martin and Parker (1997)
Sappington and Stiglitz (1987)		Walker and Vasconcellos (1997)
Vickers and Yarrow (1988, 1991)		
Caves (1990)		
Estrin and Perotin (1991)		
Fernández (1995)		
Martin and Parker (1997)		
Principal-agent models		
Shapiro and Willig (1990)		
Bös (1991)		
Bös and Peters (1991)		
Laffont and Tirole (1993)		
García Cestona and Salas (1995)		
Schmidt (1996)		

specific theoretical studies within each of these streams are listed chronologically in Table 1. The table also incorporates Jensen's (1983) generic distinction between 'the two agency literatures' (positive agency theory versus principal-agent models), both of which have been represented in the public-private context. Essentially, each stream provides a different explanation for a common outcome: private firms are more efficient than state-owned.

The *Agency Theory* explanation is based on the different agency problems and availability of solutions to them that are associated with each form of ownership. Managers (the agent) in both types of firms are assumed to seek the maximization of their own utility rather than that of the organization or its owners (the principal). In private firms, this divergence is reduced through the existence of: (1) a market for ownership rights which enables the owners to sell if they are not satisfied with managerial performance — this is the focus of *Property Rights Theory*; (2) the threat of takeover; (3) the threat of bankruptcy; and (4) a managerial labor market. In the case of state-owned firms, not only are all of these mechanisms absent,[4] but also, the owner-manager relationship is broken down into two other agency relationships: owner (the public)-politician, and politician-manager.

The *Public Choice* school's central argument is that politicians pursue their own utility rather than the public interest. Accordingly, they impose on state-owned firms goals that can lead them to gain votes but can conflict with efficiency. For the general public, who are the ultimate owners of the firm, the costs of monitoring this public sector behavior (e.g.

[4] The fourth mechanism, the managerial labor market, may not be exactly absent. More typically, there are two separate managerial labor markets, one for private firms managers, another for state-owned. But since the latter is frequently governed by political decisions rather than by the price of managerial ability, it may be useless as a threat to managerial discretion. Cragg and Dyck (1997a, b, 1998) provide empirical evidence about this fact.

information gathering, lobbying) are likely to offset the benefits (e.g. less taxes, or more efficient public spending). This is not the case, however, for interest groups such as trade unions, which makes state-owned enterprises an easy target for rent-seeking activity.

Organizational theories about this topic draw heavily from the other two approaches, but focus on the organizational characteristics of private firms that are different in state-owned firms, such as incentives and control mechanisms (Ricart et al., 1991); culture (Bishop and Thompson, 1992); objectives, organization structure, communications/reporting systems, nature and location of the business, management, and labor (Parker, 1993, 1995; Martin and Parker, 1997).

2.2. Empirical approaches

The empirical literature can be classified into two groups: cross sectional studies of public-private ownership effects, and longitudinal studies of privatization effects.

2.2.1. Cross-sectional studies of public-private ownership effects

Nearly all of the empirical research comparing the efficiency of state-owned and private firms has been in the form of cross-sectional comparisons of both types of firms in industries in which they coexist.[5] The most rigorous method that has been used for this consists on calculating the relative inefficiency of firms of both types with respect to an estimated profit, cost, or production frontier. Pestieau and Tulkens (1993) have argued for the superiority of this approach to efficiency measurement. They have also reviewed most of its applications in the private versus public context. Table 2(a) includes all the studies they cite, as well as others.

Cross-sectional studies of ownership using more traditional methods (regression) are listed in Table 2(b). Cross-industry comparisons of public and private sectors are also included in this table, within the 'various' industry category. Since most of these studies have already been included in one or more empirical reviews, and these reviews are frequently cited in the theoretical literature, the table indicates, for each of the studies, the review(s) in which they appear.

As Table 2(a) and (b) shows, although a simple count of results would give a considerable edge to private ownership (adding up in both tables there are 104 in favor, 14 against and 35 neutral), the cumulative evidence is not wholly conclusive. Two factors play a significant role in explaining the diversity of results within these tables: the market structure of each of the industries (and countries) to which the firms studied belong, and the way their efficiency is measured. With respect to market structure, as Vickers and Yarrow note, "statistical tests have rarely been sophisticated enough to take account of the interacting (non-separable) effects of ownership, competition and regulation on incentive structures, and hence on the performance of firms" (1988, p. 39). As for efficiency measurement, one thing to be noted first is that many different concepts of efficiency are relevant in this context: productive and allocative, static and dynamic. . . (see Martin and Parker, 1997: pp. 47–53; Walker and Vasconcellos, 1997: pp. 27–29). Second, three different measures —

[5] All of the articles included in Table 2a and b, except Boussofiane et al. (1997) and Ehrlich et al. (1994), which are longitudinal.

Table 2
Cross-sectional studies of public versus private ownership[a]

Industry	State-owned more efficient	No significant differences	Private more efficient
(a) *Based on efficiency frontiers*			
Electricity	Färe et al. (1985), US; Côte (1989), US; Pollit (1994, 1995), US and UK*	Hjalmarsson and Veiderpass (1991), Sweden	
Airlines		Barla and Perelman (1989), US and Europe	
Refuse collection		Distexhe (1993), Belgium	Cubbin et al. (1987); Burgat and Jeanrenaud (1990), Switzerland
Railways		Filippini and Maggi (1991), Switzerland	Oum and Yu (1991), Canada
Financial		Tulkens (1993), Belgium	
Insurance	Fecher et al. (1993), France		
Healthcare	Grosskopf and Vladamis (1987), US		Wilson and Jadlow (1982), US*
Education			Rhodes and Southwick (1988), US
Petroleum			Al-Obaidan and Scully (1991), International*
Sugar			Ferrantino and Ferrier (1991), India
Various			Boussofiane et al. (1997), UK*; Argimón et al. (1997), Spain*
(b) *Other*			
Electricity	Meyer (1975), US; {D[b],BPS,M,BB,B, Y,VY,BV,PM}; Neuberg (1977), US; {M,B,Y[c],BV,PM}; Primeaux (1977), US {M}; Pescatrice and Trapani (1980), US {PM}	Shepherd (1966), US {D,BV}; Mann (1970), US {D,BV}; Yunker (1975), US {M,BB,B,Y,BV,PM}; Spann (1977), US {BPS,BV}; Edison Electric Institute (1985), US {VY}; Atkinson and Halvorsen (1986), US, {PM}; Di Lorenzo and Robinson (1982), US, {PM}; Holmes (1990), Europe {PM}	Moore (1970)[d], US {D,BPS,B,BV, MP}; Wallace and Junk (1970), US {BPS, PM}; Peltzman (1971), US; {D,MP,B,Y,VY,BV,PM}; Tilton (1973), US {D,BV}; De Alessi (1974, 1975, 1977), US; {M,B[e],Y,VY,BV,PM}; Foreman-Peck and Waterson (1985), US; {PM}
Airlines		Forsyth and Hocking (1980), Australia; {MP,BB,DP,BV,PM}; Morrison (1981), Australia {BV}; Jordan (1982), US and Australia; {BB,DP,BV}; Millward and Parker (1983), Australia {DP}; Ashworth and Forsyth (1984), International; {PM}	Davies (1971, 1977), Australia; {D,BPS,M,BB,B,DP, Y,BV,PM}; Mackay (1979), Australia {DP,VB}; Pryke (1982), UK {Y,VY,VB}; Findley and Forsyth (1984), Australia{VB}; Kirby and Albon (1985), Australia {DP}; Kirby (1986), Australia {DP,VB}; Forsyth et al. (1986) {VY,VB, PM}; Gillen et al. (1989), Canada {VB}; Windle (1991), US & Europe {PM}; Ehrlich et al. (1994), International

Table 2 (*Continued*)

Industry	State-owned more efficient	No significant differences	Private more efficient
Refuse collection	Pier et al. (1974), US; {BPS,M,Y,BV}	Hirsch (1965)[f], US {D,BPS,MP,Y,BV}; Spann (1974), US {Y}; Feller and Menzel (1976), US {B}; Kemper and Quigley (1976), US {BPS,BV}; Collins and Downes (1977), US {BPS,BV}; Savas (1977a), US {D[g]M,B}; Audit Commission (1984), UK {VY}	Savas (1974, 1977b, c, d, 1980), US; {D,BPS[h],M,B, Y,VY,BV}; Edwards and Stevens (1976, 1978), US; {BPS,M,BV}; Kitchen (1976), Canada; {BPS,M,B,Y, VY,BV}; Pommerehne (1976), Switzerland {BPS}; Petrovic and Jaffee (1977), US {BPS}; Pommerehne and Frey (1977), Switzerland; {M,B,Y,BV}; Stevens (1978), US {BPS,MP,VY,BV}; Stevens and Savas (1978), US {BPS}; Bennett and Johnson (1979, 1980) US {D,M}; Boorsma (1982), Netherlands {VB}; Hartley and Huby (1985), UK {VY}; McDavid (1985), Canada {VB}; Lawarrée (1986), Belgium {VB}
Water supply	Mann and Mikesell (1971), US; {BPS[i],B,Y,BV,PM}; Bruggink (1982), US {Y,VY,BV, PM}	Feigenbaum and Teeples (1983); {Y,BV,PM}	Hausman (1976), US {BV}; Morgan (1977), US {BPS,BV}; Crain and Zardkoohi, (1978, 1980), US; {D,BPS,M,B,Y,VY,BV,PM}; Boland (1983), US {VB}; Lynk (1993), UK {PM}
Railways		Caves and Christensen (1980), Canada; {BPS,M,BB,B,Y,BV,PM}; Caves et al. (1982), US and Canada {BV}; Freeman et al. (1985), Canada {VB}	
Urban transportation			Oelert (1976), Germany {BPS,PM}; Pashigian (1976), US {D,MP,BB,Y,BV}; Bails (1979) {VB}; Pucher (1982) {VB}; Palmer et al. (1983), Canada; {BB,BV,PM}; Pucher et al. (1983) {VB}; McGuire and Van Cott (1984), US {BV}; Wallis (1985) {VB}; Perry and Babitsky (1986) {VB}
Construction			Schneider and Schuppener (1971), Germany {BPS}; Rechnungshof Rheinland-Pfalz (1972), Germany {BPS}; Muth (1973), US {BPS}
Telecom	Denny et al. (1983), Canada {BB};	Gordon (1981), Canada {BB}; Duch (1991), International {PM}	Foreman-Peck (1985), International; {PM}
Financial		Lewin (1982), Europe {BV}	Davies (1981), Australia {BPS,BV,PM}; Davies and Brucato (1987) {VB}
Insurance		Finsinger (1981, 1984[j]), Germany; {BPS, Y, BV, PM[k]}	Frech (1976, 1979, 1980) {BPS,Y,BV}; Kennedy and Mehr (1977),Canada {BPS}; Hsaio (1978) {VB}

Table 2 (*Continued*)

Industry	State-owned more efficient	No significant differences	Private more efficient
Healthcare		Becker and Sloan (1985) {BV}; Renn et al. (1985) {BV}	Clarkson (1972), US; {D,BPS,MP,BV,PM}; Hrebiniak and Alutto (1973) {VB}; Lindsay (1975, 1976), US {D,BPS[l],BV}; Bishop (1980) {BV}; Frech and Ginsburg (1981), US {BV}; Schlesinger and Dorwart (1984), US {BV}; Schulz et al. (1984) {VB}; Frech (1985), US {VB}
Cleaning services			Hamburger Senat (1974),Germany {BPS}; Bundesrechnungshof (1972), Ger {BPS}; Fischermenshausen (1975), Ger {BPS}
Timber			Bundesregierung Deutscheland (1976a, b), Germany {BPS}; Pfister (1976), Germany {BPS}
Various	Millward (1990, 1991), UK & US {PM}; Pryke (1971), UK {PM}; Molyneux and Thompson (1987), UK; {PM}		Ahlbrandt (1973, 1974), US; {BPS,MP,Y,BV}; Pausch (1976), Germany {BPS}; Funkhouser and MacAvoy (1979), Indonesia {MP,BV,PM}; Bennett and Johnson (1980), US {BPS}; Kim (1981), Tanzania {BV,PM}; Pryke (1981, 1982), UK {Y,VY,VB, PM}; Boardman and Vining (1989), non-US; {VB,PM}; Picot and Kaulmann (1989), non-US; {VB,PM}; Vining and Boardman (1992), Canada; {PM}; Bhaskar and Khan (1995), Bangladesh; {PM}; Enderwick (1994), Latin America, Asia; {PM}; Adhikari and Kirkpatrick (1990), {PM}; Hamilton (1971), UK {PM}; Gantt and Dutto (1968), Less Developed; countries {PM}; Monsen and Walters (1983), Europe {PM}; Plane (1992), International {PM}

[a] (*) Not included in Pestieau and Tulkens; D=De Alessi (1980); BPS=Borcherding et al., (1982); M=Millward (1982); MP=Millward and Parker (1983), not included in M; BB=Borins and Boothman (1985); B=Boyd (1986); DP=Domberger and Piggott (1986); Y=Yarrow (1986); VY=Vickers and Yarrow (1988); BV=Boardman and Vining (1989); VB=Vining and Boardman (1992), not included in BV; PM=Martin and Parker (1997). Note: Millward (1982) is included and extended in Millward and Parker (1983). So is Boardman and Vining (1989) in Vining and Boardman (1992).

[b] Classified as neutral by De Alessi.

[c] Classified as neutral by Yarrow.

[d] Classified as neutral by Boyd and by Martin and Parker.

[e] Boyd classifies De Alessi (1975) as neutral or as favorable to state ownership, depending on the measurement employed.

[f] Classified as favorable to private ownership by De Alessi and Yarrow; as favorable to state ownership by Millward and Parker.

[g] Classified as favorable to private ownership by De Alessi.

[h] Classified as neutral by Borcherding et al.

[i] Classified as favorable to private ownership by Borcherding et al.

[j] Classified as favorable to private ownership by Vining and Boardman; as favorable to state ownership by Yarrow.

[k] Classified as favorable to state ownership by Martin and Parker.

[l] Classified as favorable to state ownership by Borcherding et al.

profitability, productivity, and costs can be and have been used in these studies, and the appropriateness of using one or another is highly dependent on market structure (Cuervo and Peres, 1981; Borins and Boothman, 1985: pp. 100–104; Cuervo, 1995c: pp. 37–38). Still, after accounting for these two factors, the evidence about which form of ownership is associated with a higher level of efficiency remains mixed.

In fact, the authors of the various review articles mentioned offer very different conclusions, depending on the studies selected.[6] For instance, Borcherding et al. report that "the findings in most studies are consistent with the notion that public firms have higher unit cost structures" (1982, p. 134). In contrast, Millward finds "no broad support for private enterprise superiority" (1982, p. 83). Fifteen years later, during which many more empirical studies of public-private ownership have been published, Martin and Parker still conclude from their survey that "on balance it seems that neither private nor public sector production is *inherently* or *necessarily* more efficient" (their emphasis; 1997, p. 93).

2.2.2. Longitudinal studies of privatization effects

The availability and variety of studies in this category sharply contrast with the previous one. Many summaries of different countries' privatization programs have been written, but almost always of a qualitative nature. In fact, so far there has only been one country for which quantitative studies of privatization are available: the UK (see Martin and Parker, pp. 85–86, for a review). Of these, only five studies have dealt with a sample size large enough to allow some kind of statistical analysis: Haskel and Szymanski (1992b), Boussofiane et al. (1997), and Cragg and Dyck (1997a, b, 1998) the last three based on the same data base. Two cross-country studies are also of a statistical nature: Megginson et al. (1994) and Nash et al. (1997). Other than this, the only empirical evidence regarding privatization comes from case studies such as those included in Galal et al. (1994), Vickers and Yarrow (1988), Ramamurti (1996), Martin and Parker, or Walker and Vasconcellos (1997).

As in the cross-sectional studies of public-private ownership, the evidence from longitudinal studies about whether privatization leads to an efficiency increase is not totally conclusive.

3. Political, organizational and dynamic implications of privatization

The previous literature review shows that the positive effects of privatization on efficiency predicted by the different theories are not always supported by the existing empirical evidence. Why is there such a mismatch between theory and evidence?

The answer proposed here is that the existing privatization literature has only looked at part of the problem, which is whether private ownership leads to a higher efficiency than

[6] While a proper meta-analysis is beyond the scope of this paper, Table 2 can give some hints on: (1) how influential each study has been, (2) the pro/con proportion of the set of studies chosen by each of the reviewers, (3) indirectly, the methodological rigor required for the papers reviewed and (4) the subjectivity with which the original results are sometimes interpreted. Hirsch's (Hirsch, 1965) study provides a good illustration for this point: it has been classified as favorable to private ownership by Yarrow (1986) and by De Alessi (1975), as favorable to state ownership by Millward and Parker (1983), and as neutral by Borcherding et al. (1982) and by Boardman and Vining (1980) and in this paper, in view of the discrepancies.

state ownership. Privatization implies a change in a firm's ownership, from state to private. Hence, the superiority of private to public ownership in terms of firm efficiency is a necessary condition for the existence of a positive relationship between privatization and efficiency. However, the condition is not sufficient, for two reasons. First, public versus private ownership is primarily a static question, which can be typically addressed by comparing both types of firm in a given period of time, as the above classification of empirical research has highlighted.[7] However, privatization is by definition a *change*, and needs to be addressed dynamically by looking at a given firm's evolution and transition between its private and public stages within a given firm.[8] Second, privatization has other implications, *political* and *organizational*, that are likely to affect the firm's efficiency, either positively or negatively, and therefore, reinforce or counteract the effect of the change in ownership per se.

All these other implications of privatization, however, have been overlooked by previous researchers, even within the organizational stream. In fact, among all the theoretical privatization studies listed in Table 1, there are only two exceptions to this oversight: Boycko and Vishny (1996), for whom the effect of privatization on efficiency hinges on the firm's restructuring which for them means strictly reducing employment, and Martin and Parker, who argue: "... in so far as ownership and competition are important, they impact on performance through *an internal adjustment process*" (their emphasis, p. 170).[9] Moreover, my classification of the empirical research, by separating out ownership (cross-sectional) studies from privatization (longitudinal) studies, shows that the evidence regarding the relationship between privatization and efficiency is actually much more scarce than what has been implied by (1) previous empirical reviews of this relationship (e.g. Yarrow, 1986); and (2) previous theoretical works about privatization claiming support for their theories (e.g. Bös, 1991).

The basic prediction of all existing privatization theories is the following:

Hypothesis 1. *Privatization increases firm efficiency*.

How, exactly, is this prediction affected by the political, organizational, and dynamic factors mentioned?

3.1. Political and organizational implications of privatization

Political implications of privatization are all the government decisions triggered by the decision to privatise a given firm.[10] These may affect the firm's efficiency either positively or negatively. A positive effect will take place if, for instance, the government chooses to

[7] Of 153 studies of the public-private distinction, 151 are cross-sectional and only two are longitudinal.

[8] Obviously, all the empirical privatization studies cited are longitudinal.

[9] The former points to what we call an *organizational implication of privatization*, the latter to a *transitional implication*.

[10] Decisions about competition or regulation that frequently accompany the privatization decision but are not implied by it are ruled out here. These are obviously two factors affecting the privatized firm's efficiency, and several researchers have pointed out the need to control for them in empirical studies (e.g Vickers and Yarrow, 1988; Haskel and Szymanski, 1992b). However, they are not the focus of this paper, and are not what I mean by 'political implications of privatization'.

privatize a firm from an industry that will rapidly grow, in order to make privatization look good. On the other hand, negative effects are typically a consequence of giving priority to privatization goals other than efficiency, when the choice between those goals and that of efficiency involves a trade-off. Such would be the case, for instance, of privatizing a monopoly before introducing competition or an appropriate regulation, as opposed to afterwards, in order to increase the revenue from privatization (Vickers and Yarrow, 1988); or of hastening to privatize the firm in a period of recession in the industry or in all of the economy, as opposed to waiting for a better time, because the government wants to increase its revenues in that period for political reasons. There is also the possibility of unintended negative effects, such as a government's mistake or failure in choosing the optimal buyer or privatization method.

Organizational implications of privatization are all the decisions taken by the new owners or managers of the privatized firm that cannot be predicted by the government at the time of choosing who to sell the firm to. Again, these can affect the firm's efficiency either positively or negatively. As an example of a positive effect, consider a firm which, under state ownership, is being managed through a large conglomerate, and is privatized through its direct sale to a more specialized company. If the buyer is able to exploit some synergies with its former business, and part of the savings are passed on to its acquired (the privatized) firm, the gains in efficiency for this one would have been obviously brought about by its privatization, but would have nothing to do with the private/public distinction. Negative effects may also take place if, like government representatives before privatization, managers of a newly-privatized firm give a higher priority to other conflicting objectives. For instance, consider a firm which is privatized by direct sale to another firm, and is maintained as a separate business unit of the acquirer. The corporate strategy of a firm may be such that not all business units are treated equally (Brush and Bromiley, 1997); thus, it may be the case that it is not in the acquiring firm's interest as a whole to maximize the performance of the individual unit constituted by the privatized firm. Also, as with political decisions, there is the possibility of unintended negative effects from the new management's decisions: managers may find themselves unable to turn around a low-performing firm, encounter resistance to change at some level of the organization, or face any other unintended situation.

These two groups of implications, then, lead to the following hypothesis:

Hypothesis 2. *The observed effect of privatization on efficiency is influenced by political and organizational factors*.

Which of these implications actually take place, and hence whether their overall effect on efficiency is positive or negative, is ultimately an empirical question that depends on the specific case(s) examined.

3.2. Dynamic implications of privatization

The ownership effect per se raises some dynamic issues which are likely to influence the timing of the effect of privatization on efficiency. For instance, Pelikan (1989, 1993) has argued that the main advantage of private (and tradeable) ownership of firms over state ownership is that, under the former, the search for competent owners never stops, while

under the latter all such searched is blocked, regardless of how good or poor an owner the government proves to be. One implication of such argument for privatization is that a privatized firm may not show an efficiency improvement immediately after privatization, but it may exhibit an increasing trend in the evolution of its post-privatization efficiency.

In addition, some of the political and organizational factors with negative effects discussed have an important dynamic component associated to them, in the sense that those negative effects are likely to diminish over time. Such would be the case of the political decision to privatize the firm in a period of industrial or economic recession, when the industry or economy starts to recover; or of the organizational inertia encountered by the newly-privatized firm's management, as the initial resistance to change begins to be overcome. All these are reflections of the transition inherent to any privatization process, as a result of which, political and organizational factors not only may influence the observed effect of privatization on efficiency, but also the timing of this effect. Thus, I hypothesize:

Hypothesis 3. *The observed effect of privatization on efficiency is contingent upon the time period considered*.

4. Privatization in Spain, 1985–1996

The three hypotheses are tested in a sample of 24 Spanish firms which were privatized between 1985 and 1993. The superior efficiency of private (versus state-owned) firms in Spain has been confirmed in a number of cross-sectional studies (see Maroto, 1991, for a review; Azofra et al., 1991; Argimón et al., 1997). However, this is the first time the effects of privatization processes are analysed in this country. [11] Before Spain's official privatization program was started in 1996, 73 firms were fully privatized (all except two through direct sales) by the former government, and four others had their privatization process started through public share offerings (Villalonga, 1996). [12] Therefore, time has gone by for enough firms to allow an analysis of privatization effects, for which the Spanish case may be as good as any other country's. Besides, given the scarcity of empirical privatization (longitudinal) analyses and of samples studied (British firms, and Megginson et al.'s sample), this study may add some variety to the literature; I do not attempt to extend any specific conclusion drawn from its results beyond the Spanish case, though, since the institutional environment and the privatization process during the socialist government were highly idiosyncratic (Villalonga, 1996; Cuervo, 1997). Details of the Spanish state-owned sector's structure and reorganizations during that period can be found in Sanchís (1996). For the purpose of this

[11] Sanchís (1996) claims to be doing so on a dataset that ends in 1990. However, of the 17 firms in his sample for which he examines the effects of 'privatization', 11 were not really privatized (3 were transferred to another state-owned firm, 8 — counting Repsol as 5 had just minority stakes sold through IPO, and remained under the state's control and majoritary ownership), and 5 (plus the 5 included in Repsol) were privatized in 1989 (including 3 that he says were privatized in 1988), so he just has 1 year of post-privatization data for them. Thus, only his results for one company (Seat) may be trustworthy estimates of the effect of privatization on efficiency, and so it cannot be properly considered as a privatization study.

[12] See, for a dynamic source of information on Spain's privatization program, Expansion newspaper's website at: http://www. recoletos.es/privatizaciones.

paper, it is sufficient to note that all the firms in the sample were operating in competitive environments at the time of their privatization, so no *de*- or *re*-regulation interferes with the estimation of strict privatization effects.

Following the order of the three hypotheses, I first determine whether privatization has actually increased the efficiency of each of the firms in the sample (Hypothesis 1). I then examine some of the political and organizational factors that may have played a role in arriving at those results (Hypothesis 2). Although I am constrained by the data in the choice of the specific factors to be examined, I have been able to include the following: As political factors, (1) the stage of the business cycle at which the company was privatized (which captures the government's decision of when exactly to privatize the firm); and (2) the foreignness of the buyer, which is typically an issue of political concern. As organizational factors, (1) the company's starting performance level as a private firm, which is assumed to be reflecting the difficulty of running or turning around a low-performing privatized firm; (2) the size of the organization at the time of its privatization, which is assumed to be proportional to any possible resistance to change encountered; and (3) the firm's capital intensity (also at the time it was privatized), since if a firm in a capital-intensive business has its capital investment increased as a result of being privatized, its efficiency will probably increase in the longer run, but might not appear so in the early post-privatization years. This issue particularly merits investigation in the Spanish case between 1985 and 1996, since several firms were privatized in that period for lack of appropriate size or technology (De la Dehesa, 1992). Note that all three organizational factors, as well as the first political factor mentioned, are also transitional in nature. However, following Hypothesis 3, the actual dynamic effect of these factors is tested separately.

4.1. Method

4.1.1. Population

The population of interest is comprised of the 77 Spanish firms privatized between 1985 and 1995, as listed in Villalonga (1996). Unlike more recent Spanish privatizations, these were undertaken by the socialist government without any explicit privatization program or goal statement and can, therefore, be considered as a separate population.

4.1.2. Sample

My sample of 24 firms results from excluding companies from the population in the following order: (1) Those that were privatized after 1993, for which a maximum of only 2 years of post-privatization data would be available; (2) partial privatizations, i.e. those that remained under state control; (3) those for which data could not be obtained for a minimum of 3 years of public and 3 years of private ownership, on the following variables: profits before taxes, assets, financial expenses (interests), sales, and number of employees.

Data on the state ownership period for each firm have been obtained from the annual reports kept at the (former) Instituto Nacional de Industria (INI)'s library. In most cases, however, individual companies' reports were not available, and data come from the annual reports of the holding groups to which the firms belonged when they were sold (INI, Teneo, or Patrimonio). Post-privatization data were directly requested from companies through fax

and/or phone and/or in person. If and when the request was denied, company reports were requested from the Registro Mercantil of the province in which the firm was incorporated. The requirement to file in company reports is fairly recent, though (1989) and, as it appears, often disregarded. The most recent year of data in the sample is 1996. In addition, data on the average profitability of Spanish firms until 1995 is available from the annual reports of the Central de Balances del Banco de España (Spain's central bank).

This information has allowed me to construct a panel data set on profitability, sales, employees, a dummy for whether the buyer was a foreign company or not, and average profitability of Spanish firms, for 24 firms and a number of years between 7 and 14 (between 3 and 5 pre-privatization, the privatization year, and between 3 and 8 post-privatization). The average number of years per firm is 9.9.

The list of firms in the sample, together with the available data for each of them in the year of their privatization, is shown in Table 3. The table also contains information on the year each firm was privatized, the industry, the buyer, and whether such buyer is foreign or not.

4.1.3. Dependent variable(s)

As will be explained in more detail within the *models* section, a different econometric model is used to test each of the three hypotheses. The dependent variable in Model 1 is *efficiency* (*EFFI*), measured by Return on Assets (ROA) — calculated as earnings before interest and taxes divided by total net assets. It is the measure more commonly used in cross-industry *privatization* studies, and is considered a correct indicator of efficiency in competitive environments (Borins and Boothman, 1985; Cuervo, 1995), as it is the case for all the firms in the sample in the time period considered.

In Model 2, the dependent variable is *efficiency increase* (EFFINC), measured by the estimated coefficient of the *time*post-privatization* period interaction term from Model 1. In Model 3, it is *efficiency growth* (EFFGROwth), measured as $(\mathrm{ROA}_t - \mathrm{ROA}_{t-1})/\mathrm{ROA}_{t-1}$.

4.1.4. Independent variables

In Model 1 there are two main independent variables: *post-privatization period* (PRIV), which is a dummy variable (=1 if within period, 0 otherwise), and TIME (a discrete variable ranging from 1 (year –5 before privatization) to 14 (year 8 after privatization). In Model 3 there are two groups of variables: (a) Political, which include: (1) *initial stage of cycle* (CYCLE_0) — average ROA of Spanish firms in the year the firm was privatized — , as published in the annual reports of the Central de Balances del Banco de España; and (2) a dummy for whether the *buyer* was *foreign* (=1) or not (=0) — FBUYER; and (b) Organizational: (1) *initial level of performance* (PERF_0) — firm's ROA; (2) *initial firm size* (SIZE_0), measured as real sales (in 1990-pesetas); [13] and (3) *initial capital intensity* (CAPINT_0) — firm's assets per employee. All three variables are measured in the year the

[13] Nominal sales have been deflated using year-wide averages of industry-specific industrial price indices (IPRI) for each firm, except for Jobac, which is a supermarket chain, and for which we have used the food and drinks consumer price index (IPC) instead. The source for these indices is Spain's Instituto Nacional de Estadística (INE). We have maintained the base period from the original source, January 1990.

Table 3
Summary data at privatization dates[a]

Priv. date[b]	Company	Industry	Buyer[c]	ROA (%)	EBIT[d]	Sales[d]	Real sales[e]	#Empl.
1985	Ingenasa	Biotechnology	ERT	−26.2	−64	38	39	n/a
1985	SKF Española	Bearings	Aktiebogalet SKF*	8.5	302	8513	11187	991
1986/1990	Seat	Automotive	Volkswagen AG*	−6.3	−27434	231954	275807	22197
1987	Evatsa	Aluminum	Cebal*	3.9	15	642	650	77
1987	Litofan	Aluminum	Baumgartner Iberica*	−5.6	−37	554	592	48
1987	Alumalsa	Aluminum	Montupet*	13.7	98	1518	1622	*n/a*
1986/**1988**/1994	Telesincro	Electronic	Bull*	14	149	2715	4182	175
1989	Astican	Shipbuilding	Italmar	14	−490	3457	3510	329
1989/1992	MTM	Equipment	GEC Alsthom*	−4.3	−1727	2315	2458	1315
1989/1992	Ateinsa	Equipment	GEC Alsthom*	4.5	−636	4255	4517	482
1989/1991	Enfersa	Fertilizers	Ercros	3.2	382	25587	27630	1657
1989	Oesa	Food	Ferruzi*	−1.6	−598	19096	19115	125
1989	Pesa	Electronic	Amper	8.8	401	7141	7042	351
1990	Hytasa	Textile	Textil Guadiana	−14.7	−3363	3768	3731	1047
1990	Salinas Torrevieja	Salt	U. Salinera (Solvay*)	−17.2	−1049	1608	1597	354
1991/1993	Enasa	Automotive	Iveco (Fiat*)	−19.1	−19738	54876	52867	5123
1991	GEA	Indust. Crafts	Pickman (Estudesa)	−32.4	−3171	3606	3511	1291
1991	TSD	Electronic	Telepublicaciones	−22.7	−364	1021	1069	41
1991	Coisa	Frozen food	Rusticas	4.1	−14	592	580	60
1991	Jobac	Distribution	Consum (Eroski)	−1.8	−504	20731	21219	1419
1992	Icuatro	Medical Equip	Grupo Alegre	10.4	136	2419	2439	23
1989/1990/**1992**/ **1993**/1995/1996	Repsol (Grupo)	Petroleum	PUBLIC OFFER	10.2	122319	2167287	1868351	18797
1993	FSC	Equipment	Navacel/ TTT/ L.Telleria	−37.2	−1486	566	525	259
1993/1994	Palco	Aluminum	Alcan Deutscheland*	−6.8	−66	867	942	44

[a] Sources: Firms' annual reports, Villalonga (1996).

[b] The date in bold shows when the state became a minoritary owner. These are the dates that have been considered as the effective privatization dates (year 0) for this study.

[c] Foreign buyers have been marked with an asterisk. There are no 'partially foreign' companies among these.

[d] Millions of pesetas.

[e] Millions of January 1990-pesetas. Nominal sales are deflated using year-wide averages of industry-specific industrial price indices (or the food and drinks consumer price index, in the case of Jobac), as supplied by Spain's Instituto Nacional de Estadística (INE). The base period from the original source is maintained.

firm was privatized. In Model 2, all the independent variables are *bi-yearly time dummies* (YEARt_1t_2).

4.1.5. Control variables

Control variables in Model 1 refer to external factors *not* implied by privatization that may affect firm efficiency, and therefore, should be discounted in order to estimate the net effect of privatization. These are: firm *size* (SIZE) and *business cycle* (CYCLE) — measured as indicated above. In Model 3, the only factors considered as external are *industry dummies* for all industries which are represented by more than one firm in the sample: aluminum (ALUM), automobile (AUTO), *ELECTRONIC*, *FOOD*, and equipment (EQUIP).

4.2. Models

Hypothesis 1 is tested using similar methods to those that have been used in previous statistical analyses of this hypothesis (or of the superiority of private ownership) on longitudinal datasets like mine. Similarly to Megginson et al., the differences between the means and medians of the efficiency measure in the pre- and post-privatization periods are compared through *t*-statistics, and *z*-statistics are used to test if the proportion of firms that changed in the expected direction is significantly different from 0.5.[14] As in Ehrlich et al. (1994), the time trends of efficiency in both periods are also compared, by estimating the following fixed-effects model:[15]

$$\text{Model 1}: \text{EFFI}_{it} = \alpha_{\text{i}} + \beta^*_{\text{1i}}\text{PRIV}_{it} + \beta^*_{2i}\text{TIME}_{it} + \beta^*_{3i}\text{TIME}^*\text{PRIV}_{it} + \gamma^*_1\text{SIZE}_{it} + \gamma^*_2\text{CYCLE}_{it} + \varepsilon_{it}, \quad (1)$$

where $E(\varepsilon_i\varepsilon'_j)=\sigma_{ij}$.

The effect of privatization in this model can be seen from the coefficients of PRIV and TIME*PRIV: PRIV captures differences in performance *levels* before and after privatization, while TIME*PRIV captures changes in performance *trends*. That is, a positive coefficient in TIME*PRIV would indicate that performance increases more over time after privatization than before (or decreases less, if the *time* coefficient is negative).[16] Chow specification tests shown at the bottom of Table 5 lead to reject the hypothesis of common intercept and slope coefficients across pool members for the PRIV, TIME and TIME*PRIV terms. Thus, those coefficients are estimated individually for each firm (α_i, β_{1i}, β_{2i}, and

[14] A 0.5 proportion corresponds to the null hypothesis of privatization having no effect on efficiency. A proportion significantly above (below) 0.5 would provide statistical evidence of privatization having a positive (negative) effect on efficiency.

[15] Ehrlich et al. use a similar model to test the effect of public versus private ownership (though not of privatization) on a panel of 23 international airlines over a 10-year period.

[16] I am treating the effects as fixed, as opposed to random, for two reasons: (1) Given the idiosyncratic nature of the Spanish privatization process during the period considered in this study, and how the sample has been selected, my inferences are conditional on the individual characteristics, not unconditional on the population characteristics (Hsiao, 1986, 41, 136; Baltagi, 1995, 10, 13), and (2) I have no reason to assume that the regressors are uncorrelated with individual-specific coefficients, which is a key assumption in random effects models (Mátyás and Sevestre, 1996). These arguments respond to the two alternative views within the panel data econometrics literature as to what justifies the choice of fixed versus random effects models.

β_{3i}), but those of the control variables, *size* and *cycle*, (γ_4 and γ_5) in common. [17] The error structure specification, based on the evidence and diagnostic tests reported in Table A.1 of the Appendix, allows for groupwise heteroskedasticity and cross-sectional correlation, but not for autocorrelation. [18] Given this error structure, the appropriate method of estimation is Feasible Generalized Least Squares (FGLS), as in a *Seemingly Unrelated Regressions* (SUR) model (Zellner, 1962). That is, the covariance matrix across pool members is estimated in a preliminary OLS regression and then applied in GLS estimation in a second stage.

Hypothesis 2 is tested as a second step after the estimation of Model 1. The estimated firm-specific parameters of TIME*PRIV from Table 5 (those of β_{3i} in Model 1) are used as measures of *efficiency increase* (in trend), which becomes the *dependent* variable in the following cross-sectional model:

$$\begin{aligned}\text{Model 2}: \ \text{EFFINC}_i = {} & \alpha + \beta_1^*\text{CYCLE}_{i0} + \beta_2^*\text{FBUYER}_i + \beta_3^*\text{PERF}_{i0} + \beta_4^*\text{SIZE}_{i0} \\ & + \beta_5^*\text{CAPINT}_{i0} + \beta_6^*\text{ALUM}_i + \beta_7^*\text{AUTO}_i \\ & + \beta_8^*\text{ELECTRONIC}_i + \beta_9^*\text{FOOD}_i + \beta_{10}^*\text{EQUIP}_i + \varepsilon_i, \qquad (2)\end{aligned}$$

where $E(\varepsilon_i \varepsilon_j')=\sigma_i{}^2$ and the regressors represent all the political and organizational factors and controls, as described before. Hypothesis 2 may be tested from this model by a Wald test of the joint significance of the coefficients of CYCLE, FBUYER, PERF, SIZE, and CAPINT. The correlation matrix of the data used for this regression is reported in Table A.2 of the Appendix A weighted least squares (WLS) estimator is now used to correct for heteroskedasticity, which in this case arises from the dependent variable's being estimated with varying precision. Following Saxonhouse (1976), each observation is weighted on all variables by the inverse of the estimated standard error of the dependent variable.

Hypothesis 3 is tested by regressing efficiency growth on time dummies. The diagnostic tests (also shown in Table A.1) and assumptions support the same error structure as in Model 1, so the same estimation procedure is followed. I have chosen to specify and report results from the regression in bi-yearly dummies to keep the specification parsimonious (results were similar, though, when yearly dummies were used). Thus, the model can be written as:

[17] Since the number of cross-sectional units (firms) in the data set is very small, I do not need to difference away the intercepts through a 'deviation from individual means' transformation, as it is common practice in the estimation of fixed effects models in large *N* panels.

[18] I find evidence of groupwise heteroskedasticity in the residual variances for each firm, which differ by as much as 400 times. I cannot, however, reject the null hypothesis of no autocorrelation within firms, based on any of the two different tests used. This suggests that any possible autocorrelation in the dependent variable (firm ROA) has been captured by the control variables, most likely by the economy-wide ROA (business cycle). I have not tested for cross-sectional correlation, but I want to allow for it since I have two powerful reasons to assume there is: (1) Several firms share a common industry affiliation with others, and I have not been able to control for it explicitly within the regression (the inclusion of industry dummies yielded a near-singular matrix); and (2) time observations for each firm have been aligned with respect to the privatization date so that year 0 corresponds to a different date in each case. Thus, any unobservable factor due to privatization is likely to affect the individual firms in a related way.

Table 4
Tests for changes in efficiency after privatization[a]

Efficiency measure	Sample statistic	Pre-priv. mean (%)	Post-priv. mean (%)	Mean of differences	*t*-stat for differences	Proportion of firms that changed as predicted	*z*-stat for prop >0.5
ROA	Means	−4.9	−2.4	2.5	0.96	0.46	−0.28
	Medians	−3.4	−1.4	2.1	0.98	0.54	0.28
ROA	Means	−670	50	719	1.16	0.54	0.28
Growth	Medians	−630	–57	574	0.96	0.58	0.57

[a] N=24.

$$\text{Model 3: } \text{EFFGROWTH}_{it} = \alpha + \beta^*_{1i}\text{YEAR43}_{it} + \beta^*_{2i}\text{YEAR21}_{it} + \beta^*_{3i}\text{YEAR12}_{it} + \beta^*_{4i}\text{YEAR34}_{it} + \beta^*_{5i}\text{YEAR56}_{it} + \beta^*_{6i}\text{YEAR78}_{it} + \varepsilon_{it}, \quad (3)$$

where $E(\varepsilon_i \varepsilon'_j)=\sigma_{ij}$ and the coefficients on the bi-yearly time dummies measure the increase in efficiency growth that takes places in each pair of years with respect to the privatization year, which is the base period captured by the intercept.

4.3. Results

The values of the *t* and *z*-statistics used to test Hypothesis 1 are reported in Table 4. As the table shows, none of the statistics are significant at the conventional levels. This hypothesis is also tested through the estimation of Model 1, the results of which are reported in Table 5. There it can be seen that the coefficient of the post-privatization period dummy (PRIV) is significant in nine (out of 24) cases, of which five are positive and four negative. The coefficient of TIME*PRIV is significant in 13 cases, which are also split into six positive and seven negative.

Results of the estimation of Model 2 appear in Table 6. As the table shows, the two variables representing political factors are significant and positive, and so are, among the three organizational factors, firm size and capital intensity (the latter only at the 10 percent level). However, the initial performance level has no significant effect on efficiency increase. The Wald test of the joint significance of the coefficients of these five variables (the political and organizational factors altogether), through which Hypothesis 2 may be more directly tested, yields a chi-square statistic of 246.28, with a probability value of 0.001. Four of the five industry dummies included (all except equipment) also turn out to have a significant positive effect.

The results of regressing efficiency growth on time dummies through which Hypothesis 3 is tested are shown in Table 7. A positive and significant effect obtains for years 1–2, 3–4, and 7–8 after privatization, and for years 4–3 *before* privatization. Note that only the last two are large enough to offset the negative value of the constant term coefficient. In particular, the 7–8 post-privatization effect, net of the base year's (2260.5) is nearly five times larger than the next largest coefficient in absolute value (−486.1 , for years 3–4 after privatization, which is the only significant negative estimate).

Table 5
Model 1: Fixed-effects regression of efficiency on time, post-privatization period, and time*post-privatization period[a]

Dependent variable: Efficiency (ROA)
Estimation method: FGLS (SUR)
Common cofficients
Size[b] 1.87E–7 (3.11E–8)***
Business cycle[c] 0.011 (0.001)***

Firm-specific coefficients[d]

Variable	Constant		Time		Post-PRIV period		Time*Post-PRIV period	
Firm								
Ingenasa	−0.321***	(0.100)	−0.104**	(0.046)	−0.264	(0.163)	0.225***	(0.056)
SKF Española	0.001	(0.032)	0.013	(0.012)	0.096**	(0.045)	−0.068***	(0.013)
Seat	−0.188***	(0.036)	−0.017	(0.012)	0.042	(0.048)	0.006	(0.014)
Evatsa	0.142**	(0.055)	0.153***	(0.024)	−0.295***	(0.076)	−0.127***	(0.025)
Litofan	−0.087*	(0.047)	0.025	(0.019)	−0.003	(0.066)	−0.018	(0.021)
Alumalsa	0.023	(0.034)	0.050***	(0.018)	−0.055	(0.046)	−0.053***	(0.019)
Telesincro	−0.037**	(0.017)	0.003	(0.006)	−0.066***	(0.023)	0.017**	(0.008)
Astican	−0.239***	(0.021)	−0.066***	(0.007)	0.125***	(0.029)	0.072***	(0.008)
MTM	−0.229***	(0.054)	0.095***	(0.020)	0.086	(0.094)	−0.097***	(0.030)
Ateinsa	−0.172***	(0.049)	0.009	(0.018)	0.117	(0.079)	−0.021	(0.023)
Enfersa	−0.165***	(0.044)	−0.040*	(0.022)	0.069	(0.109)	0.056*	(0.031)
Oesa	−0.112***	(0.026)	−0.015*	(0.009)	0.001	(0.039)	0.017	(0.011)
Pesa	−0.037	(0.083)	−0.027	(0.028)	0.375***	(0.135)	−0.139***	(0.039)
Hytasa	−0.194***	(0.046)	−0.035**	(0.017)	0.108	(0.084)	−0.004	(0.023)
Salinas Torrevieja	−0.428***	(0.090)	−0.064**	(0.030)	0.252	(0.150)	0.084*	(0.046)
Enasa	−0.328***	(0.015)	−0.058***	(0.005)	−0.154***	(0.021)	0.168***	(0.007)
GEA	−0.379***	(0.028)	−0.011	(0.010)	0.106*	(0.056)	0.080***	(0.016)
TSD	−0.465***	(0.140)	−0.100	(0.064)	0.043	(0.229)	0.139*	(0.081)
Coisa	−0.073***	(0.015)	0.051***	(0.007)	−0.216***	(0.022)	0.018*	(0.009)
Jobac	−0.125***	(0.020)	−0.015	(0.010)	0.029	(0.031)	0.026*	(0.013)
Icuatro	0.005	(0.035)	0.036	(0.012)	0.346***	(0.061)	−0.186***	(0.020)
Repsol (Grupo)	−0.291***	(0.059)	−0.015**	(0.007)	−0.001	(0.015)	−0.004	(0.008)
FSC	−0.538***	(0.118)	−0.019	(0.043)	0.724***	(0.234)	−0.292***	(0.107)
Palco	−0.101***	(0.013)	−0.047	(0.008)	0.034	(0.025)	0.051***	(0.013)
Unweighted statistics[e]								
R^2=0.73								
Adjusted R^2=0.51								

[a] Total number of panel observations: $N\Sigma\ T_i$=238. N=24; T=T_i , i.e. the panel is unbalanced. Values of T_i for each firm appear in Table 8. Average T=9.9.

[b] Real sales, measured in millions of January 1990-pesetas. Nominal sales are deflated using year-wide averages of industry-specific industrial price indices (or the food and drinks consumer price index,in the case of Jobac); Sources: Firms' and state holding companies's (Instituto Nacional de Industria (INI), Teneo, or Patrimonio) annual reports, for nominal sales figures; Instituto Nacional de Estadística (INE), Spain, for inflation indices.

[c] Average ROA of Spanish firms for each year. Source: Central de Balances del Banco de España, Spain.

[d] *F*-statistics from *Chow* tests of different coefficients across firms: 184.86 for intercept; 99.24 for *Time*; 43.98 for *Post-PRIV period*; 108.85 for *Time*Post-PRIV period*. All test statistics are significant at the 1% level.

[e] The *unweighted* are reported because the GLS transformation inflates the R^2 from the regression (Greene, 1997). These unweighted statistics come from regressing the untransformed dependent variable on the predicted values using untransformed regressors and the coefficients from the weighted (GLS) regression. Standard errors are in parentheses.

* Statistically significant at the 10% level.

** Statistically significant at the 5% level.

*** Statistically significant at the 1% level.

Table 6
Model 2: Regression of efficiency increase on political and organizational factors[a]

Dependent variable: efficiency increase[b] Estimation method: weighted least squares (WLS)		
Constant	−0.324***	(0.037)
Political factors[c]		
Business cycle at privatization date[d]	2.210***	(0.379)
Foreign buyer[e]	0.093**	(0.029)
Organizational factors		
Initial performance level[f]	0.086	(0.170)
Size[g]	1.14E−7**	(4.1E–8)
Capital intensity[h]	0.002*	(0.001)
Controls		
Aluminum industry[e]	0.251**	(0.078)
Automotive industry[e]	0.160*	(0.072)
Electronic industry[e]	0.151***	(0.024)
Food industry[e]	0.124**	(0.037)
Equipment industry[e]	−0.045	(0.035)
Unweighted statistics[i]		
R^2=0.95		
Adjusted R^2=0.80		

[a] N=22.

[b] Measured by the estimated coefficient of the *Time*Post-privatization period* interaction term from Table 3.

[c] *Wald* test of joint significance of political and organizational factors: χ^2-statistic=246.28, p-value=0.001.

[d] Average ROA of Spanish firms in the year the firm was privatized. Source: Central de Balances del Banco de España, Spain.

[e] Dummy variable (=1 if true, 0 otherwise). Source: Villalonga (1996).

[f] Firm's ROA at privatization date. Source: Firms' annual reports.

[g] Real sales, measured in millions of January 1990-pesetas. Nominal sales are deflated using year-wide averages of industry-specific industrial price indices (or the food and drinks consumer price index,in the case of Jobac). Source: Instituto Nacional de Estadística, Spain.

[h] Firm's assets per employee at privatization date. Source: Firms' annual reports.

[i] The *unweighted* statistics are reported because the GLS transformation inflates the R^2 from the regression (Greene, 1997). These unweighted statistics come from regressing the untransformed dependent variable on the predicted values using untransformed regressors and the coefficients from the weighted regression. Standard errors are in parentheses.

* Statistically significant at the 10% level.

** Statistically significant at the 5% level.

*** Statistically significant at the 1% level.

5. Discussion and implications

Hypothesis 1 (that privatization increases efficiency) has been tested in two different ways. First, based on the test results reported in Table 4, the null hypotheses that the mean and median levels of efficiency for each firm are the same before and after privatization cannot be rejected. Neither can the null hypothesis that the proportion of firms for which these levels increased after privatization is equal to 0.5. And the conclusions are the same concerning mean and median efficiency *growth*. Second, the results from estimating Model 1 show that, in this sample, the effect of privatization has led to significant increases in

Table 7
Model 3: Regression of efficiency growth on bi-yearly dummies[a]

Dependent variable: Efficiency (ROA) growth Estimation method: FGLS (*SUR*)		
Year 0 (Privatization year)	−141.753***	(30.013)
Years –4 to –3 (pre-privatization)	159.345***	(39.463)
Years –2 to –1 (pre-privatization)	−13.288	(37.666)
Years 1 to 2 (post-privatization)	89.889**	(36.758)
Years 3 to 4 (post-privatization)	87.297**	(37.029)
Years 5 to 6 (post-privatization)	−344.345***	(51.030)
Years 7 to 8 (post-privatization)	2402.241***	(276.720)
Unweighted statistics[b]		
R^2=0.92		
Adjusted R^2=0.91		

[a] Total number of panel observations: $N\Sigma\ (T_i-1)$=214, due to loss of the first observation for each firm to calculate growth series (N=24; $T=T_i-1$, Values of T_i for each firm are reported in Table 8. Average T=9.9.).

[b] The *unweighted* statistics are reported because the GLS transformation inflates the R^2 from the regression (Greene, 1997). These unweighted statistics come from regressing the untransformed dependent variable on the predicted values using untransformed regressors and the coefficients from the weighted (GLS) regression. Standard errors are in parentheses: *Statistically significant at the 10% level; ** Statistically significant at the 5% level; ***Statistically significant at the 1% level.

efficiency in about as many cases as it has led to significant *decreases*. Consequently, *Hypothesis 1 is rejected*. This finding, together with the evidence reported in previous studies that, in the same country and period, private ownership was significantly associated with higher levels of performance, lends support to my claim that privatization involves more than pure ownership effects. Neither does the positive effect of ownership on efficiency observed in other studies lead to a positive effect of privatization on efficiency, nor does the inconclusive effect of privatization on efficiency observed in this study imply that ownership has no effect on efficiency, as would be concluded from estimating the effect of private versus public ownership in this sample in the 'traditional' way ignoring the effect of all factors other than ownership. Thus, the discrepancy can only be resolved by examining what other factors may have intervened in the observed relationship between privatization and efficiency.

The analysis of Model 2 reveals that several political and organizational factors unrelated to ownership have significantly intervened. The result of the Wald test for the joint significance of all these factors provides *statistical support for Hypothesis 2*. Among the political factors, the significant positive effect found for the state of the business cycle at which the company was privatized suggests that the government may have sold some of the firms at a period of economic recession, which, as it had been predicted, would be a potential negative factor contributing to the net effect of a firm's privatization on efficiency. The foreign buyer dummy's positive sign and significance provide evidence of another political factor affecting the observed privatization-efficiency relationship: the trade-off governments face between the efficiency objective and responding to popular and political concerns about 'selling the country away'. Among the organizational factors, the firm's initial performance level turns out to be insignificant, so the difficulty of running or turning

around a low-performing privatized firm does not seem to have played a role in arriving at the observed effects of privatization in efficiency. Firm size, however, does have a positive and significant effect. If, as it has been assumed, size is proxying for the resistance to change encountered within the organization, the positive sign found appears to contradict my expectation (that larger firms would be less prone to confirm the positive effects of privatization on efficiency). On the other hand, as a dynamic and transitional factor, it is consistent with the overall timing of effects observed from Model 3 (discussed below). Finally, the positive sign on capital intensity reveals that efficiency increases are associated with the more capital-intensive firms within the sample and, insofar as it is another transitional factor, its effect is also consistent with the observed timing of the total privatization effect.

The estimation of Model 3 yields the strongest evidence of efficiency increase for years 7 and 8 after privatization, as well as fairly strong evidence of decrease for the 2 previous years (5 and 6). This *confirms Hypothesis 3* (that the observed effect of privatization on efficiency is contingent upon the time period considered), thus making clear that conclusions about the privatization-efficiency hypothesis drawn from looking at short post-privatization periods (e.g. Sanchís, 1996) may be misleading. It also suggests that one or more of the negative transitional factors described might have actually been operating during the first 6 years after privatization, but their impact has finally been offset by the effects of private ownership and possibly other positive implications of privatization. The positive significance of years 4–3 *before* privatization is worth noting. None of the theories mentioned offer any prediction about the efficiency of privatized firms *before* they are privatized, but there is typically a popular concern, supported by empirical evidence from some British companies, that governments pick out for privatization firms that have already begun to experience an efficiency increase. On the other hand, such an explanation easily fits within the framework presented here, as another possible political factor. Nevertheless, the fact that the positive significance is observed 4–3 years before privatization, but not immediately before (e.g. in years 2–1), seems at odds even with that explanation. In this sense, all that can be said is that both my specific finding and the more general issue of the timing of efficiency effects before privatization deserve further investigation.

Two limitations of this empirical study that qualify the results just discussed have already been mentioned: the idiosyncrasies of the Spanish institutional environment and privatization process during the socialist government, which limit the generalizability of my *specific* findings; and the data constraints faced in the choice of the factors to be examined. To these, three more may be added, which are also a product of the data availability problem. First, sample size; while adequate for the population it is representing, and reasonable compared to those in former privatization studies, it is admittedly small from a statistical point of view. This may have been the reason, for example, for the inconclusiveness of the tests in Table 4. Second, the accuracy with which the variables included have been measured. Particularly, although I have noted that profitability is a valid measure of efficiency in competitive environments, it would be highly desirable to complement it with costs or productivity indicators, which unfortunately I do not have. Also, I must admit that size is a rather indirect measure of organizational inertia, and so its observed effect on efficiency increase may lend itself to alternative interpretations. For instance, it may

well be the case that large firms have been able to downsize themselves to a greater extent than small firms, and that the higher efficiency increase observed for them is just a consequence of that restructuring. Third, given the evidence I have provided that the effect of privatization on efficiency is contingent upon the time period considered, this is a limitation of any empirical privatization study to which mine is no exception. For instance, it is possible that some of the results would have been different if the panel had been balanced.

These limitations are hardly solvable within the context of the population of this study, since they are mostly data-driven and I believe I have exhausted all possible means of data collection for most of the sample. However, they may be solved by investigating a different population of privatized firms for which more internal data are available. Given the large number of firms that have been privatized all over the world in recent years, this extension is likely to become increasingly feasible. Moreover, I believe this is highly desirable, since (1) there are still very few statistical studies of privatization effects, and (2) my findings definitely encourage further research.

This study has important implications for the privatization literature, since it has identified a major mismatch between privatization theories and evidence, and contributed to explain it. It has proven the relevance of some implications of privatization that had, however, been ignored by previous privatization theorists and empiricists, namely, political, organizational, and dynamic implications that go beyond the private-public distinction. I think this should be of interest not only to academics, but also to the multiple stakeholders involved in privatization programs: governments undertaking these programs, companies or investors participating on the demand side, and even the general public, to the extent that we are all the ultimate owners of the state-‘owned’ enterprises of our countries of citizenship.

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Appendix

The following tables report the results of the diagnostic tests carried out for Models 1 and 3 (Table A.1), and the correlation matrix of the variables included in Model 2 (Table A.2).

Table A.1
Heteroskedasticity and autocorrelation tests for Models 1 and 3: residual variances, Durbin–Watson, and *F*-statistic from Breusch–Godfrey test equations

Firm	T_i	Model 1			Model 3	
		Residual variances[a]	Durbin–Watson[a]	Breusch–Godfrey F[b]	Residual variances[c]	Durbin–Watson[c]
Ingenasa	8	0.0136	2.85[na]	0.85	6.43E+06	1.10[na]
SKF Española	12	0.0019	1.97	0.67	3.05E+06	0.60[I]
Seat	13	0.0028	2.75[I]	2.57	1.58E+08	2.11[I]
Evatsa	11	0.0245	3.42[I]	3.77	2.98E+06	0.67[I]
Litofan	14	0.0154	2.58[I]	2.24	1.57E+06	1.17[I]
Alumalsa	13	0.0043	2.75[I]	1.95	2.01E+06	2.15[I]
Telesincro	11	0.0014	2.63[I]	5.22*	2.05E+05	1.72[I]
Astican	11	0.0024	2.75[I]	4.52*	2.62E+06	1.35[I]
MTM	11	0.0132	3.11[I]	3.06	8.76E+04	1.94[I]
Ateinsa	11	0.0046	3.21[I]	3.79	6.21E+05	2.17[I]
Enfersa	10	0.0176	3.21[I]	7.38*	3.21E+06	2.10[na]
Oesa	12	0.0149	1.90[I]	0.20	3.80E+06	2.23[I]
Pesa	11	0.0035	3.02[I]	3.66	7.28E+05	0.46[I]
Hytasa	11	0.0037	3.41[I]	16.32	5.67E+05	2.06[I]
Salinas Torrevieja	10	0.0282	3.22[na]	9.44	6.79E+05	2.45[na]
Enasa	9	0.0021	2.07[I]	0.53	2.02E+05	1.46[na]
GEA	10	0.0062	2.46[I]	1.42	4.40E+04	1.96[na]
TSD	7	0.0458	3.00[na]	5.82	7.00E+05	1.98[na]
Coisa	7	0.0007	3.37[na]	43.70*	2.35E+05	1.71[na]
Jobac	6	0.0002	3.13[na]	n/a	1.30E+06	1.95[na]
Icuatro	8	0.0024	3.46[na]	4.32	1.19E+05	1.77[na]
Repsol (Grupo)	8	0.0001	2.37[na]	0.12	3.79E+04	2.64[na]
FSC	8	0.0501	2.72[na]	0.41	4.80E+05	0.89[na]
Palco	6	0.0014	3.64[na]	n/a	8.72E+04	2.18[na]
Pooled	9.9	0.3160	2.98[I]	3.18E+08	2.26[na]	

[a] The residual variances and Durbin–Watson statistics come from the individual firm regressions:

$$\mathrm{EFFI}_t = \alpha + \beta_1^*\mathrm{PRIV}_t + \beta_2^*\mathrm{TIME}_t + \beta_3^*\mathrm{TIME}^*\mathrm{PRIV}_t + \beta_4^*\mathrm{SIZE}_t + \beta_5^*\mathrm{CYCLE}_t + \varepsilon_t,$$

I=Test is inconclusive; *na*=*dL* and *dU* critical values are *not available* in tables for this sample size.

[b] The Breusch–Godfrey *F*-statistic is testing the null hypothesis that the coefficient of the lagged residuals e_{it-1} is zero in the individual firm regressions:

$$e_t = \alpha + \beta_1^*\mathrm{PRIV}_t + \beta_2^*\mathrm{TIME}_t + \beta_3^*\mathrm{TIME}^*\mathrm{PRIV}_t + \beta_4^*\mathrm{CYCLE}_t + \beta_5^* e_{it-1} + u_{it},$$

where e_t are the estimated residuals of ϵ_{it} for each firm *i* from Model 1 (Table 5).

[c] The residual variances and Durbin–Watson statistics come from the individual firm regressions:

$$\mathrm{EFFGROWTH}_t = \alpha + \beta_1{}^*\mathrm{YEAR43}_t + \beta_2{}^*\mathrm{YEAR21}_t + \beta_3{}^*\mathrm{YEAR12}_t + \beta_4{}^*\mathrm{YEAR34}_t + \beta_5{}^*\mathrm{YEAR56}_t + \beta_6{}^*\mathrm{YEAR78}_t + \varepsilon_t,$$

I=Test is inconclusive; *na*=*dL* and *dU* critical values are *not available* in tables for this sample size.

* Statistically significant at the 10% level.

Table A.2
Correlation matrix of variables in Model 2[a]

Variables	1	2	3	4	5	6	7	8	9	10	11
1. Efficiency increase (dependent)[b]	1.00										
2. Business cycle[c]	0.40	1.00									
3. Foreign buyer[d]	0.49	0.52	1.00								
4. Initial performance level[e]	−0.66	−0.05	−0.34	1.00							
5. Size[f]	0.00	−0.07	−0.13	0.30	1.00						
6. Capital intensity[g]	−0.04	−0.17	−0.18	0.30	0.29	1.00					
7. Aluminum industry	−0.12	−0.18	0.01	0.05	−0.12	−0.18	1.00				
8. Automobile industry	0.51	0.32	0.57	−0.44	0.05	−0.03	−0.14	1.00			
9. Electronic industry	−0.04	−0.07	0.14	0.28	−0.10	−0.14	−0.18	−0.12	1.00		
10. Food industry	0.10	0.20	−0.35	0.05	−0.09	0.35	−0.18	−0.12	−0.15	1.00	
11. Equipment industry	−0.20	0.02	−0.04	−0.02	−0.13	−0.19	−0.24	−0.16	−0.20	−0.20	1.00

[a] N=24.

[b] Firm's assets per employee at privatization date. Source: Firms' annual reports.

[c] Average ROA of Spanish firms in the year the firm was privatized. Source: Central de Balances del Banco de España, Spain.

[d] Dummy variable (=1 if true, 0 otherwise). Source: Villalonga (1996).

[e] Firm's ROA at privatization date. Source: Firms' annual reports.

[f] Real sales, measured in millions of January 1990-pesetas. Nominal sales are deflated using year-wide averages of industry-specific industrial price indices (or the food and drinks consumer price index, in the case of Jobac); Source: Instituto Nacional de Estadística (INE), Spain.

[g] Firm's assets per employee at privatization date. Source: Firms' annual reports.

References

Adhikari, R., Kirkpatrick, C., 1990. Surveys of practice and principles. In: Heath, J.(Ed.), Public Enterprise At The Crossroads. Routledge, London.

Aharoni, Y., 1981. Managerial discretion, In: Vernon, R., Aharoni Y. (Eds.), State-Owned Enterprises in the Western Economies. St. Martin's Press, New York, pp. 184–193.

Ahlbrandt Jr., R., 1973. Efficiency in the provision of fire services Public Choice 16, 1–15.

Ahlbrandt Jr., R., 1974. Implications of contracting for public service Urban Affairs Quarterly 9, 337–358.

Al-Obaidan, A.M., Scully, G.W., 1991. Efficiency differences between private and state-owned enterprises in the international petroleum industry Applied Economics 23, 237–246.

Alchian, A.A., 1965. Some economics of property rights Il Politico 30, 816–829.

Argimón, I., Artola, C., González Páramo, J.M., 1997. Empresa pública y empresa privada, Titularidad y eficiencia relativa. Borrador de trabajo. Banco de España.

Ashworth, M., Forsyth, P., 1984. Civil aviation policy and the privatisation of British Airways. IFS Report 12. Institute for Fiscal Studies, London.

Atkinson, S., Halvorsen, R., 1986. The relative efficiency of public and private firms in a regulated environment: the case of U.S. electric utilities Journal of Public Economics 29, 281–294.

Audit Commission, 1984, Securing Further Improvements in Refuse Collection. HMSO, London.

Azofra, V., Fernández, A.I., Hernangómez, J., De Miguel, A., 1991. Análisis sectorial del comportamiento financiero de las empresas públicas and privadas en España. Anales de Estudios Económicos and Empresariales, 6, Valladolid.

Bails, D., 1979. Provision of transportation services Public Choice 34, 65–68.

Baltagi, B., 1995. Econometric Analysis of Panel Data. Wiley, New York.

Barberis, N., Boycko, M., Shleifer, A., Tsukanova, N., 1996. How does privatization work? Evidence from the Russian shops Journal of Political Economy 104, 764–790.

Barla, P., Perelman, S., 1989. Technical efficiency in airlines under regulated and deregulated environment Annals of Public and Cooperative Economics 60, 103–124.

Becker, E.R., Sloan, F.A., 1985. Hospital ownership and performance Economic Inquiry 23, 21–36.

Bennett, J.T., Johnson, M.H., 1979. Public versus private provision of collective goods and services: garbage collection revisited Public Choice 34, 55–63.

Bennett, J.T., Johnson, M.H., 1980. Tax reduction without sacrifice, private sector production of public services Public Finance Quarterly 8, 363–396.

Bhaskar, V., Khan, M., 1995. Privatization and employment: a study of the jute industry in Bangladesh American Economic Review 85 (1), 267–273.

Bishop, C.E., 1980. Nursing home cost studies and reimbursement issues Health Care Financing Review 1, 47–64.

Bishop, M., Thompson, D., 1992. Regulatory reform and productivity growth in the U.K.'s public utilities Applied Economics 24, 1181–1190.

Boardman, A., Vining, A., 1989. Ownership and performance in competitive environments: a comparison of the performance of private Journal of Law and Economics 32, 1–33.

Boland, J.J., 1983. Water and wastewater pricing and financial practices in the U.S. metametrics, Washington, DC.

Boorsma, P.B., 1982. Public sector productivity and relative efficiency in the netherlands, mimeo, Department of Public Administration, Twente University.

Borcherding, T.E., 1983. Towards a positive theory of public sector supply arrangements, In: Prichard, J.R.S. (Ed.), Crown Corporations in Canada, The Calculus of Instrument Choice. Butterworth, Toronto.

Borcherding, T., Pommerehne, W., Schneider, F., 1982. Comparing the efficiency of private and public production, the evidence from five countries Zeitschrift für Nationalökonomie Suppl. 2, 127–156.

Borins, S.F., Boothman, B.E.C., 1985. Crown corporations and economic efficiency, In: McFetridge, D.G. (Ed.), Canadian Industrial Policy in Action. University of Toronto Press, Toronto, pp. 75–129.

Bös, D., 1991. Privatization: A Theoretical Treatment. Clarendon Press, Oxford.

Bös, D., Peters, W., 1991. A principal-agent approach on manager effort and control in privatized and public firms. In: Ott, A.F., Hartley, K. (Eds.), Privatization and Economic Efficiency. A Comparative Analysis of Developed and Developing Countries. Edward Elgar, Aldershot, pp. 26–52.

Boussofiane, A., Martin, S., Parker, D., 1997. Estimating technical efficiency using data envelopment analysis. In: Martin, S., Parker, D. (Eds.), The Impact of Privatisation. Ownership and Corporate Performance in the UK. Routledge, London, pp. 127–150.

Boycko, A.S., Vishny, R., 1996. A theory of privatization Economic Journal 106, 309–319.

Boyd, C.W., 1986. The comparative efficiency of state-owned enterprises, In: Neghandi, Thomas, Rao (Eds.) , Multinational Corporations and State-Owned Enterprises, A New Challenge in International Business. Research in International Business and International Relations 1, pp. 179–194.

Bruggink, T.H., 1982. Public versus regulated private enterprise in the municipal water industry: a comparison of operating costs Quarterly Review of Economics and Business 22, 111–125.

Brush, T.H., Bromiley, P., 1997. What does a small corporate effect mean? A variance components simulation of corporate and business effects Strategic Management Journal 18, 825–835.

Bundesrechnungshof, 1972. Bemerkungen des bundesrechnungshofs zur bundeshaushalts-rechnung: einschliesslich bundesvermögensrechnung) für das haushaltsjahr 1972, Bundestagsdrucksache 7(2709) 110-111.

Bundesregierung Deutschland, Agrarbericht 1976. Bundestagsdrucksache, 7(4680), 63-65.

Bundesregierung Deutschland, 1976. Agrarbericht 1976. Bundestagsdrucksache, 7(4681), 146.

Burgat, P., Jeanrenaud, C., 1990. Mésure de l'éfficacité productive et de l'éfficacité-coût: cas de déchets ménagers en suisse. Working Paper 9002, Institut de Recherches Economiques et Régionales, Université de Neuchâtel.

Caves, R.E., 1990. Lessons from privatization in Britain. State enterprise behavior, public choice, and corporate governance Journal of Economic Behavior and Organization 13, 145–169.

Caves, D.W., Christensen, L.R., 1980. The relative efficiency of public and private firms in a competitive environment: the case of Canadian railroads Journal of Political Economy 88, 958–976.

Caves, D.W., Christensen, L.R., Swanson, J.A., Tretheway, M.W., 1982. Economic performance of U.S. and Canadian railroads: the significance of ownership and the regulatory environment, In: Stanbury, W.T., Thompson, F. (Eds.), Managing Public Enterprises. Prager, New York, pp. 123–151.

Clarkson, K.W., 1972. Some implications of property rights in hospital management Journal of Law and Economics 15, 363–384.

Collins, J.N., Downes, B.T., 1977. The effect of size on the provisions of public services: the case of solid waste collection in smaller cities Urban Affairs Quarterly 12, 333–345.
Côte, D., 1989. Firm efficiency and ownership structure. The case of U.S. electric utilities using panel data Annals of Public and Cooperative Economics 60, 431–450.
Crain, W.M., Zardkoohi, A., 1978. A test of the property rights theory of the firm: water utilities in the U.S. Journal of Law and Economics 21, 395–408.
Cragg, M.I., Dyck, I.J.A., 1997a. Management control and privatization in the UK: a quiet life disturbed. Harvard Business School Working Paper 97–045.
Cragg, M.I., Dyck, I.J.A., 1997b. Fat cats or corporate agents? U.K. privatization and corporate control. mimeo, Harvard Business School, November.
Cragg, M.I., Dyck, I.J.A., 1998. Executive pay and U.K. privatization, the demise of 'one country, two systems', mimeo, Harvard Business School, January.
Cubbin, J., Domberger, S., Meadowcroft, S., 1987. Competitive tendering and refuse collection: identifying the sources of efficiency gains Fiscal Studies 8, 431–450.
Cuervo, A., 1995. Opiniones ante la reforma de la empresa pública Cuadernos de Información Económica 101/102, 34–41.
Cuervo, A., 1997. La privatización de la empresa pública (Ediciones Encuentro, Madrid).
Cuervo, A., Peres, W., 1981. Eficacia y eficiencia de la empresa pública: Reflexiones Hacienda Pública Española 68, 27–46.
Davies, D.G., 1971. The efficiency of public versus private firms: the case of Australia's two airlines Journal of Law and Economics 14, 149–165.
Davies, D.G., 1977. Property rights and economic efficiency — the Australian airlines revisited Journal of Law and Economics 20, 223–226.
Davies, D.G., 1981. Property rights and economic behaviour in private and government enterprises: the case of Australia's banking system Research in Law and Economics 3, 111–142.
Davies, D.G., Brucato Jr., P.F., 1987. Property rights and transaction costs: theory and evidence on privately-owned and government-owned enterprises Journal of Institutional and Theoretical Economics 143, 7–22.
De Alessi, L., 1974. An economic analysis of government ownership and regulation: theory and the evidence from the electric power industry Public Choice 19, 1–42.
De Alessi, L., 1975. Some effects of ownership on the wholesale prices of electric power Economic Inquiry 13, 338–526.
De Alessi, L., 1977. Ownership and peak-load pricing in the electric power industry Quarterly Review of Economics and Business 17, 7–26.
De Alessi, L., 1980. The economics of property rights: a review of the evidence Research in Law and Economics 2, 1–47.
De Alessi, L., 1987. Property rights and privatization Proceedings of the Academy of Political Science 36 (3), 24–35.
De la Dehesa, G., 1992. Privatización europea: El caso de España Información Comercial Española Revista de Economía 707, 55–71.
Denny, M., de Fontenay, A., Werner, W., 1983. Comparing the efficiency of firms: Canadian telecommunications companies, In: Courville, L., de Fontenay, A., Dobell, R. (Eds.), Economic Analysis Of Telecommunications: Theory and Applications. Elsevier Science, New York.
Di Lorenzo, T.J., Robinson, R., 1982. Managerial objectives subject to political market constraints: electric utilities in the U.S. Quarterly Review of Economics and Business 22 (2), 113–125.
Distexhe, V., 1993. L'éfficacité productive des services d'enlèvement des inmondices en Wallonie Cahiers Economiques de Bruxelles 137, 119–138.
Domberger, S., Piggott, J., 1986. Privatization policies and public enterprise: a survey The Economic Record 62, 145–162.
Duch, R.M., 1991. Privatizing The Economy. Telecommunications Policy In Comparative Perspective. University of Michigan Press, Ann Arbor.
Dyck, A., 1997. Privatization in Eastern Germany: management selection and economic transition, American Economic Review, 565–597.
Edison Electric Institute, 1985. Analysis of the differences among alternative forms of utility ownership in the U.S.A, Washington, DC.

Edwards, F.R., Stevens, B.J., 1976. Relative efficiency of alternative institutional arrangements for collecting refuse: collective action vs. the free market, mimeo, Columbia University.

Edwards, F.R., Stevens, B.J., 1978. The provision of municipal sanitation by private firms: an empirical analysis of the efficiency of alternative market structures and regulatory arrangements Journal of Industrial Economics 27, 133–147.

Ehrlich, I., Gallais-Hamonno, G., Liu, Z., Lutter, R., 1994. Productivity growth and firm ownership: an analytical and empirical investigation Journal of Political Economy 102 (5), 1006–1038.

Enderwick, P., 1994. Multinational enterprises and partial privatisation of state-owned enterprises International Business Review 3 (2), 135–147.

Estrin, S., Perotin, V., 1991. Does ownership always matter? International Journal of Industrial Organization 9, 55–72.

Färe, R., Grosskopf, S., Logan, J., Lovell, C.A.K., 1985. Measuring efficiency in production with an application to electric utilities, In: Dogramaci, A., Adam, N. (Eds.), Current issues in productivity, Boston, pp. 185–214.

Fecher, F., Kessler, S., Perelman, S., Pestieau, P., 1993. Productive performance of the French insurance industry Journal of Productivity Analysis 4, 77–93.

Feigenbaum, S., Teeples, R., 1983. Public versus private water delivery: a hedonic cost approach Review of Economics and Statistics 65, 672–678.

Feller, I., Menzel, D.C., 1976. Diffusion of technology in municipal governments. Final Report. National Science Foundation Grant DA-44350, Pennsylvania State University Center for the Study of Science Policy.

Fernández, Z., 1984. La estructura organizativa de las empresas públicas. Un análisis del caso español. Unpublished doctoral dissertation, Universidad de Oviedo.

Fernández, Z., 1985. Rasgos diferenciales de la dirección de las empresas públicas Economía Industrial 24, 107–120.

Fernández, Z., 1995. Formas de privatización de empresas Economistas 63, 21–30.

Ferrantino, M.J., Ferrier, G.D., 1991. The technical efficiency of the vacuum-pan sugar industry in india: an application of a stochastic frontier production function using panel data, mimeo. Southern Methodist University.

Filippini, M., Maggi, R., 1991. Efficiency and regulation in the case of the Swiss private railways. Journal of Regulatory Economics.

Findley, C.C., Forsyth, J., 1984. Competitiveness in internationally traded services: the case of air transport. ASEAN-Australia Joint Research Project Working Paper.

Finsinger, J., 1981. Competition, ownership and control in markets with imperfect information: the case of the German liability and life insurance markets, mimeo. International Institute of Management, Berlin.

Finsinger, J., 1984. The performance of public enterprises in insurance markets. In: Marchand, M., Pestieau, P., Tulkens, H. (Eds.), The Performance of Public Enterprises. Concepts and Measurement. Elsevier Amsterdam.

Fischermenshausen, H., 1975. Entlastung des staates durch privatisierung von aufgaben Wirtschaftsdienst 55, 545–552.

Foreman-Peck, J., 1985. Competition and performance in the United Kingdom telecommunications industry Telecommunications Policy 9, 215–228.

Foreman-Peck, J., Waterson, M., 1985. The comparative efficiency of public and private enterprise in Britain: electricity generation between the World Wars, Economic Journal 95 suppl., 83–95.

Forsyth, P.J., Hill, R.D., Trengrove, C.D., 1986. Measuring airline efficiency Fiscal Studies 7, 61–81.

Forsyth, P.J., Hocking, R.D., 1980. Property rights and efficiency in a regulated environment: the case of Australian airlines The Economic Record 56, 182–185.

Frech, H.E., 1976. The property rights theory of the firm: empirical results from a natural experiment Journal of Political Economy 84, 143–152.

Frech, H.E., 1979. Mutual and other nonprofit health insurance firms: comparative performance in a natural experiment. Research in Law and Economics 1 suppl., 61–73.

Frech, H.E., 1980. Property rights, the theory of the firm, and competitive markets for top decisionmakers Research in Law and Economics 2, 49–63.

Frech, H.E., 1985. The property rights theory of the firm: some evidence from the U.S. nursing home industry Journal of Institutional and Theoretical Economics 141, 146–166.

Frech, H.E., Ginsburg, P.B., 1981. The cost of nursing home care in the U.S., government financing, ownership and efficiency. In: Der Gaag, Van J., Perlman, M. (Eds.), Health, Economics and Health Economics. North Holland, New York, pp. 67–81.

Freeman, K.D., Oum, T.H., Tretheway, M.W., Waters II, W.G., 1985. The total factor productivity of the Canadian class I railways, 1956–1981 The Logistics and Transportation Review 21, 249–276.

Funkhouser, R., MacAvoy, P.W., 1979. A sample of observations on comparative prices in public and private enterprises Journal of Public Economics 11, 353–368.

Galal, A., Jones, L.P., Tandon, P., Vogelsang, I., 1994. Welfare Consequences Of Selling Public Enterprises: An Empirical Analysis. Oxford University Press, Oxford.

Gantt, A.H., Dutto, G., 1968. Financial performance of government-owned corporations in less developed countries IMF Staff Papers 15 (1), 102–140.

García Cestona, M.A., Salas, V., 1995. Privatización eficiente con contratos incompletos. II Jornadas de Economía Financiera, Bilbao, April.

Gillen, D.W., Oum, T.H., Tretheway, M.W., 1989. Privatization of Air Canada: why it is necessary in a deregulated environment Canadian Public Policy 15, 285–299.

Greene, W.H., 1997. Econometric Analysis, 3rd Edition. Prentice-Hall, New Jersey.

Grosskopf, S., Vladamis, V., 1987. Measuring hospital performance: a non-parametric approach Journal of Health Economics 6, 89–107.

Hamburger Senat, 1974. Abschlussbericht des beauftragen zur gebäudereiningung. Hamburg.

Hamilton, N.M., 1971. Pricking Pryke: The facts of state industry. Aims of Industry, London.

Hartley, K., Huby, M., 1985. Contracting out in health and local authorities: prospects, progress and pitfalls. Public Money 5, 23–26.

Haskel, J., Szymanski, S., 1992a. A bargaining theory of privatization Annals of Public and Cooperative Economics 63 (2), 207–227.

Haskel, J., Szymanski, S., 1992b. The effects of privatization, restructuring, and competition on productivity growth in UK public corporation. Working Paper 286, Dept. of Economics, Queen Mary and Westfield College, University of London.

Hausman, J.M., 1976. Urban water services pricing: public vs. private firms. Unpublished doctoral dissertation, Department of Economics, George Washington University.

Hirsch, W.Z., 1965. Cost functions of an urban government service: refuse collection Review of Economics and Statistics 47, 47–92.

Hjalmarsson, L., Veiderpass, A., 1991. Productivity in Swedish electrical retail distribution, mimeo. Gothenburg University.

Holmes, A., 1990. Electricity in Europe: Power and profit. Financial Times Management Report, London.

Hrebiniak, L.G., Alutto, J.A., 1973. A comparative organizational study of performance and size correlates in inpatient psychiatric departments Administrative Science Quarterly 18, 365–382.

Hsaio, W., 1978. Public versus private administration of health insurance: a study in relative economic efficiency Inquiry 14, 379–387.

Hsiao, C., 1986. Analysis Of Panel Data. Cambridge University Press, New York.

Jensen, M., 1983. Organization theory and methodology The Accounting Review 58 (2), 319–339.

Jordan, W.A., 1982. Performance of North American and Australian airlines, regulation and public enterprise, In: Stanbury, W.T., Thompson, F. (Eds.), Managing Public Enterprises. Prager, New York, pp. 161–199.

Kay, J.A., Thompson, D.J., 1986. Privatisation: a policy in search of a rationale The Economic Journal 96, 18–32.

Kemper, P., Quigley, J.M., 1976. The Economics Of Refuse Collection. Ballinger, Cambridge, MA.

Kennedy, K.F., Mehr, R.I., 1977. A case study in private versus public enterprise, the Manitoba experience with automobile insurance Journal of Risk and Insurance 4, 595–621.

Kim, K.S., 1981. Enterprise performance in the public and private sectors: Tanzanian experience, 1970–1975 The Journal of Developing Areas 15, 471–484.

Kirby, M.G., 1986, Airline economies of scale and Australian domestic air transport policy, Journal of Transport Economics and Policy 20 339–352.

Kirby, M.G., Albon, R.P., 1985. Property rights, regulation and efficiency: a further comment on Australia's two-airline policy The Economic Record 61, 535–539.

Kitchen, H.M., 1976. A statistical estimation of an operating cost function for municipal refuse collection Public Finance Quarterly 4, 56–76.

Laffont, J.J., Tirole, J., 1993. Privatization and incentives, In: A Theory of Incentives in Procurement and Regulation. MIT Press, Cambridge, MA.

Lawarrée, J., 1986. Une comparison empirique des performances des secteurs privé et public: le cas des collectes d'inmondices en Belgique Cahiers Economiques de Bruxelles 109, 3–31.

Lewin, A.Y., 1982. Public enterprise, purposes and performance, a survey of Western European experience, In: Stanbury, W.T., Thompson, F. (Eds.), Managing Public Enterprises. Prager, New York, pp. 51–78.

Lindsay, B.E., 1975. Veterans administration hospitals: An economic analysis of government enterprise. Washington, DC.

Lindsay, B.E., 1976. A theory of government enterprise Journal of Political Economy 84, 1061–1077.

Lynk, E.L., 1993. Privatisation, joint production and the comparative efficiencies of private and public ownership: the U.K. water industry case Fiscal Studies 14 (2), 98–116.

Mackay, K.R., 1979. A comparison of the relative efficiency of Australian domestic airlines and foreign airlines, Appendix A 6.1 of Department of Transport. Domestic Air Transport Policy Review, 2, app. AGPS, Canberra.

Mann, P.C., 1970. Publicly owned electric utility profits and resource allocation Land Economics 46, 478–484.

Mann, P.C., Mikesell, J.L., 1971. Tax payments and electric utility prices Southern Economic Journal 38, 69–78.

Martin, S., Parker, D., 1997. The Impact Of Privatisation. Ownership and Corporate Performance In The U.K. Routledge, London.

Maroto, J.A., 1991. Los análisis económico-financieros comparativos entre empresas públicas y privadas en España: Un estado de la cuestión, In: Varios autores, En memoria de Mª Angeles Gil Luezas. Editorial AC, Madrid, 341–363.

Mátyás, L., Sevestre, P. (Eds.), 1996. The Econometrics Of Panel Data, 2nd Revised Edition. Kluwer, Boston.

McDavid, J.C., 1985. The Canadian experience with privatizing residential solid waste collection services. Public Administration Review, 603–604.

McGuire, R.A., Van Cott, T.N., 1984. Public versus private economic activity: a new look at school bus transportation Public Choice 43, 25–43.

Megginson, W.L., Nash, R.C., Van, M., 1994. The financial and operating performance of newly privatized firms: an international empirical analysis The Journal of Finance 49 (2), 403–452.

Megginson, W.L., Netter, J.M., 1997. Equity to the people. The record on privatisation by public offers. Privatisation Yearbook, London, pp. 27–34.

Meyer, R.A., 1975. Publicly owned versus privately owned utilities: a policy choice Review of Economics and Statistics 57, 391–399.

Millward, R., 1982. The comparative performance of public and private ownership. In: Roll, E. (Ed.), The Mixed Economy. McMillan, London, pp. 58–93.

Millward, R., 1990. Productivity in the U.K. services sector: historical trends 1956–1985 and comparisons with the U.S.A. 1950–85 Oxford Bulletin of Economics and Statistics 52 (4), 423–435.

Millward, R., 1991. The nationalized industries. In: Artis, M., Cobham, D. (Eds.), Labour's Economic Policies 1974–1979. Manchester University Press, Manchester.

Millward, R., Parker, D.M., 1983. Public and private enterprise, comparative behaviour and relative efficiency, In: Millward, R., et al. (Eds.), Public Sector Economics. Longman, London, pp. 199–274.

Molyneux, R., Thompson, D.J., 1987. Nationalised industry performance: still third rate? Fiscal Studies 8 (7) 48–82.

Monsen, R.J., Walters, K.D., 1983. Nationalized Companies: A Threat To American Business. McGraw-Hill, New York.

Moore, T.G., 1970. The effectiveness of regulation of electric utility prices Southern Economic Journal 36, 365–375.

Morgan, W.D., 1977. Investor owned vs. publicly owned water agencies, an evaluation of the property rights theory of the firm Water Resources Bulletin 13, 775–781.

Morrison, S., 1981. Property rights and economic efficiency, a further examination of the Australian airlines, mimeo, Faculty of Commerce and Business Administration, University of British Columbia.

Muth, F., 1973. Public housing: An economic evaluation. Washington, DC.

Nash, R.C., Netter, J.M., Megginson, W.L., 1997. The long term return to investors in share issue privatizations, mimeo, University of Georgia.

Neuberg, L.G., 1977. Two issues in the municipal ownership of electric power distribution systems Bell Journal of Economics 8, 303–323.

Oelert, W., 1976. Reprivatisierung des öffentlichen personalverkehrs Der Personen-verkehr 4, 108–114.

Oum, T.H., Yu, C., 1991. Economic efficiency of passenger railway systems and implications on public policy, mimeo, University of British Columbia.

Parker, D., 1993. Ownership, organizational changes and performance. In: Clarke, T., Pitelis, C. (Eds.), The Political Economy Of Privatization. Routledge, London, pp. 31–53.

Parker, D., 1995. Privatization and agency status, identifying the critical factors for performance improvement British Journal of Management 6, 29–43.

Palmer, J., Quinn, J., Resendes, R., 1983. A case study of public enterprise, Gray Coach Lines Ltd., In: Prichard, J.R.S. (Ed.), Crown Corporations In Canada: The Calculus Of Instrument Choice. Butterworths, Toronto, pp. 369–446.

Pashigian, B.P., 1976. Consequences and causes of public ownership of urban transit facilities Journal of Political Economy 84, 1239–1259.

Pausch, R., 1976. Möglichkeiten einer privatisierung öffentlicher unternehmen. Göttingen.

Pelikan, P., 1989. Evolution, economic competence, and the market for corporate control Journal of Economic Behavior and Organization 12, 279–303.

Pelikan, P., 1993. Ownership of firms and efficiency: The competence argument Constitutional Political Economy 4 (3), 349–392.

Peltzman, S., 1971. Pricing in public and private enterprises, electric utilities in the United States Journal of Law and Economics 14, 109–147.

Perry, J.L., Babitsky, T.T., 1986. Comparative performance in urban bus transit: Assessing privatization strategies. Public Administration Review, 63–64.

Perry, J.L., Rainey, H.G., 1988. The public-private distinction in organization theory: a critique and research strategy Academy of Management Review 13 (2), 182–201.

Pescatrice, D.R., Trapani, J.M., 1980. The performance and objectives of public utilities operating in the United States Journal of Public Economics 13, 259–276.

Pestieau, P., Tulkens, H., 1993. Assessing and explaining the performance of public enterprises Finanzarchiv 50, 293–323.

Petrovic, W.M., Jaffee, B.L., 1977. Aspects of the generation and collection of household refuse in urban areas, mimeo. University of Indiana, Bloomington.

Pfister, W., 1976. Steigende millionenversluste der Bayerischen staatsforstverwaltung, ein dauerzustand? Mitteilungsblatt des Bayerischen Waldbesitzerverbandes 26, 1–9.

Picot, A., Kaulmann, T., 1989. Comparative performance of government-owned and privately-owned industrial corporations — empirical results from six countries Journal of Institutional and Theoretical Economics 145, 298–316.

Pier, W.J., Vernon, R.B., Wicks, J.H., 1974. An empirical comparison of government and private production efficiency National Tax Journal 27, 653–656.

Plane, P., 1992. Production efficiency of public enterprises: a macroeconomic analysis based on a cross-section estimation of a neoclasssical production function Applied Economics 24, 833–844.

Pommerehne, W.W., 1976. Private versus öffentliche müllabfuhr ein theoretischer und empirischer vergleich Finanzarchiv 35, 272–294.

Pommerehne, W.W., Frey, B.S., 1977. Public versus private production efficiency in Switzerland, a theoretical and empirical comparison. In: Ostrom, V., Pennell Bish, F. (Eds.), Comparing Urban Service Delivery Systems. Urban Affairs Annual Review, 12. Sage Publications, Beverly Hills, pp. 221–241.

Primeaux, W.J., 1977. An assessment of X-efficiency gained through competition Review of Economics and Statistics 59, 105–108.

Pryke, R., 1971. Public Enterprise In Practice. McGibbon and Kee, London.

Pryke, R., 1982. The comparative performance of public and private enterprise Fiscal Studies 3, 68–81.

Pucher, J., 1982. A decade of change for mass transit Transportation Research Record 858, 48–57.

Pucher, J., Markstedt, A., Hirscham, I., 1983. Impacts of subsidies on the costs of urban public transport Journal of Transport Economics and Policy 17, 155–172.

Ramamurti, R. (Ed.) 1996. Privatizing Monopolies, Lessons from the Telecommunnications and Transport Sectors in Latin America. John Hopkins University Press, Baltimore, MD.

Rechnungshof Rheinland-Pfalz, 1972. Jahresbericht über die Prüfung der Haushalts-und Wirtschaftsführung sowie der Landeshaushaltsrechnung 1971. Drucksache 7(1750) 1972, 81–84.

Renn, S.C., Schramm, C.J., Watt, J.M., Derzon, R.A., 1985. The effects of ownership and system affiliation on the economic performance of hospitals Inquiry 22, 219–236.

Rhodes, E.L., Southwick, L., 1988. Comparison of university performance differences over time, mimeo.

Ricart, J.E., Gual, J., López, G., Rosanas, J.M., Valor, J., 1991. Incentivos y control en la empresa pública. Ariel Economía, Barcelona.

Sanchís, J.A., 1996. Privatización y eficiencia en el sector público español Revista de Economía Aplicada 10 (4), 65–92.

Sappington, D., Stiglitz, J.E., 1987. Privatization, information and incentives Journal of Policy Analysis and Management 6, 567–582.

Savas, E.S., 1974. Municipal monopolies vs. competition in delivering urban services. In: Hawley, W.D., Rogers, D. (Eds.), Improving The Quality Of Urban Management. Sage Publications, Beverly Hills, pp. 437–500.

Savas, E.S., 1977a. Policy analysis for local government: public vs. private refuse collection Policy Analysis 3, 49–74.

Savas, E.S., 1977b. An empirical study of competition in municipal service delivery Public Administration Review 37, 717–724.

Savas, E.S., 1977c. Evaluating The Organization and Efficiency Of Solid Waste Collection. Lexington, Massachusetts.

Savas, E.S., 1977d. The Organization and Efficiency Of Solid Waste Collection. Lexington, Massachusetts.

Saxonhouse, G.R., 1976. Estimated parameters as dependent variables American Economic Review 66 (1), 178–183.

Schlesinger, M., Dorwart, R., 1984. Ownership and mental health services: a reappraisal of the shift toward privately-owned facilities New England Journal of Medicine 311, 959–965.

Schmidt, K.M., 1996. The costs and benefits of privatization: an incomplete contracts approach, Journal of Law, Economics and Organization 12 (1), 1–24.

Schneider, H.K., Schuppener, C., 1971. Soziale Absicherung der Wohnungsmarkt-wirtschaft durch Individualsubventionen. Göttingen.

Schulz, R.I., Greenley, J.R., Peterson, R.W., 1984. Differences in the direct costs of public and private acute inpatient psychiatric services Inquiry 21, 380–393.

Shapiro, C., Willig, R.D., 1990. Economic rationales for the scope of privatization. In: Suleiman, E.N., Waterbury, J. (Eds.), The Political Economy Of Public Sector Reform and Privatization. Westview Press, Boulder, CO, pp. 55–87.

Shepherd, W.G., 1966. Utility growth and profits under regulation, In: Shepherd, W.G., Gies, T.G. (Eds.), Utility Regulation: New Directions In Theory and Practice. Random House, New York, pp. 3–57.

Spann, R.M., 1974. Rate of return regulation and efficiency in production: An empirical test of the Averch-Johnson thesis. Bell Journal of Economics.

Spann, R.M., 1977. Public versus private provision of governmental services. In: Borcherding, T.E. (Ed.), Budgets and Bureaucrats: The Sources Of Government Growth. Duke University Press, Durham, NC.

Stevens, B.J., 1978. Scale, market structure and the cost of refuse collection Review of Economics and Statistics 60, 438–448.

Stevens, B.J., Savas, E.S., 1978. The cost of residential refuse collection and the effect service arrangements Municipal Year Book 44, 200–205.

Tilton, J.E., 1973. The nature of firm ownership and the adoption of innovations in the electric power industry. Public Choice Society conference, March, Washington, DC.

Tulkens, H., 1993. On FDH efficiency analysis: Some methodological issues and application to retail banking Journal of Productivity Analysis 4, 183–210.

Vickers, J., Yarrow, G., 1988. Privatization: An Economic Analysis. MIT Press, Cambridge.

Vickers, J., Yarrow, G., 1991. Economic perspectives on privatization Journal of Economic Perspectives 5, 111–132.

Villalonga, B., 1996. Qué pasó con las setenta y siete privatizaciones del gobierno socialista? Expansión, July 24, 38–39.

Vining, A.R., Boardman, A.E., 1992. Ownership versus competition: efficiency in public enterprise Public Choice 73 (2), 205–239.

Walker, J.S., Vasconcellos, G.M., 1997. A Financial-Agency Analysis Of Privatization, Managerial Incentives and Financial Contracting. Associated University Press, London.

Wallace, R.L., Junk, P.E., 1970. Economic inefficiency of small municipal electric generating systems Land Economics 46, 98–104.
Wallis, I., 1985. The $90m case for private buses, mimeo. Bus and Coach Association, Sydney, Australia.
Wilson, G.W., Jadlow, J.M., 1982. Competition, profit incentires, and technical efficiency in the provision of nuclear medicine services Bell Journal of Economics 13 (2), 472–482.
Windle, R.J., 1991. The world's airlines: A cost and productivity comparison Journal of Transport Economics and Policy 25, 31–49.
Yarrow, G., 1986. Privatization in theory and practice Economic Policy 2, 324–377.
Yunker, J.A., 1975. the case of U.S. electric utilities Journal of Economics and Business 28, 60–67.
Zeckhauser, R.J., Horn, M., 1989. The control and performance of state-owned enterprises. In: MacAvoy, P.W., et al. (Eds), Privatization and State-Owned Enterprises. Kluwer, Boston, pp. 7–58.
Zellner, A., 1962. An efficient method of estimating seemingly unrelated regressions and tests of aggregation bias Journal of the American Statistical Association 58, 500–509.