

The Performance of Privatised Industries:
A Report by NERA for the Centre for Policy Studies

Volume 3: Efficiency

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National Economic Research Associates (NERA) is a firm of economic consultants, specialising in the application of micro-economics to regulatory and competition issues, policy-evaluation and business strategy. NERA was established in 1961 and now employs more than 200 professional economists in offices in Europe and across the United States. NERA's clients include large and small businesses, government departments, regulatory authorities, law firms, industries preparing for privatisation, trade associations and international organisations. NERA works in most sectors of the economy and has built a special expertise in energy, telecommunications, broadcasting, environment, finance, water, transport, health care and pharmaceuticals.

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EXECUTIVE SUMMARY

National Economic Research Associates (NERA) was commissioned by the Centre for Policy Studies (CPS) to examine aspects of the economic record of privatised companies in the UK. The results of the work are intended for publication, as a contribution to policy debate.¹

The present report focuses on the links between privatisation and cost efficiency or productivity performance. Unlike the other reports in the series, it is not based on original research, but instead reviews a number of studies published since 1992, which have presented evidence on recent trends in productivity growth in the privatised firms and industries in the UK.

The view that a transfer from public to private ownership would improve cost efficiency performance dates back at least as far as Adam Smith. Discussing the factors affecting the productivity of land in the "Wealth of Nations", Smith suggested that "when the Crown lands become private property, they would in the course of a few years, become well improved and well cultivated". Modern economic analysis broadly supports Smith's perceptions. By introducing more effective incentive structures and creating new threats in the form of takeover and bankruptcy, privatisation can potentially increase managers' efforts to control and reduce costs. However, cause and effect are not entirely straightforward in practice, especially if competitive pressures are muted. Effective competition, in conjunction with privatisation, is likely to deliver the strongest safeguard against cost inefficiency.

Measuring the effect of privatisation on productivity requires the researcher to specify a "counter-factual"; what would have happened if privatisation had not taken place. This is necessarily a complex task, because productivity is affected by factors such as the level of demand, and hence the wider macroeconomic situation. Estimating changes in total factor productivity, rather than labour productivity raises further difficult measurement issues, particularly in respect of capital inputs.

Given these technical problems, the relatively limited post-privatisation experience available to the researchers and the lack of serious work done on the subject, it is perhaps not surprising that no entirely clearcut picture emerges from the empirical studies of whether or to what extent privatisation has led to an increased rate of growth in total factor productivity. However, there is a consensus that the growth of labour productivity in the

¹ The first two reports in the series covered respectively the safety record of the privatised companies, and the effect of privatisation on the public finances. Each report is available from the Centre for Policy Studies, 52 Rochester Row, London SW1P 1JU, at a price of £20.00 for the main report and £50 for the Technical Appendices. A further study covers prices and service quality.

nationalised sector improved significantly in the 1980s, with especially strong improvements in performance being registered in cases such as British Steel, Associated British Ports, BA, and British Coal, all of which operate in broadly competitive product markets. There is also evidence that labour productivity growth improved significantly in certain industries in anticipation of privatisation.

A necessarily tentative conclusion from this analysis is that the growth of effective competitive pressures in telecommunications, domestic energy and the rail sector will be a continuing source of improvement in the cost efficiency of the industries concerned over the next five-ten years.

1. INTRODUCTION

This report, by National Economic Research Associates (NERA), is the third in a series commissioned by the Centre for Policy Studies into the economic consequences of privatisation, and examines the effects of privatisation on productivity and cost efficiency performance.² We begin in Chapter 2 by discussing what is meant by the term cost efficiency, and how, in principle, it might be affected by privatisation and other changes in firms' market environment linked to privatisation. The analysis suggests that whilst privatisation is indeed likely to improve cost efficiency, by clarifying objectives and introducing the threats of takeover or bankruptcy, the extent to which performance improves depends importantly on wider changes in firms' economic environment. In particular, if privatised firms do not face effective competition, then shareholders may find it difficult to monitor managerial performance and cost efficiency improvements may be disappointing. If, on the other hand the privatised firm operates in a competitive marketplace, then the effects of competition and privatisation should be mutually reinforcing and cost efficiency performance should improve as a consequence.

Chapter 3 covers some of the technical issues involved in assessing the effects of a change from public to private ownership on productivity and cost efficiency. We note that productivity performance is subject to a potentially wide range of influences, and establishing a "privatisation effect" requires careful specification of a counter-factual; what would have happened if privatisation had not taken place. Finally, Chapter 4 reviews a number of published studies which have sought to assess empirically the performance of privatised firms and industries in improving cost and productivity performance. We find little evidence of clearcut links between the privatisation process and changes in the annual rate of growth of total factor productivity (TFP), although equally, there is no evidence of any adverse impact. However, it is clear that labour productivity growth improved very significantly both in absolute terms and relative to economy wide performance in the majority of privatised and state-owned businesses in the 1980s. It is probably significant that the most impressive improvements occurred in privatised firms such as British Steel (BS), BT, and Associated British Ports (ABP), operating in markets which were already competitive or which became more competitive in the post privatisation period.

² Earlier studies examined the performance of privatised firms in protecting employees, consumers and the general public from injury and the effect of privatisation on the public finances. The development of prices and service quality before and after privatisation is analysed in a companion volume to the present study.

2. PRIVATISATION AND EFFICIENCY

2.1. Introduction

This chapter begins in section 2.2 by discussing different concepts of efficiency used by economists, and, in particular, the distinction between allocative efficiency and cost efficiency. Section 2.3 shows how economists have sought to analyse the links between cost efficiency, ownership status and other characteristics of the firms economic environment. Section 2.4 presents a summary and conclusions.

2.2. The Concept of Efficiency

It is useful at the outset to identify more precisely what we mean by the concept of efficiency. Following the pioneering approach developed by M. J. Farrell in the 1950s, a firm is said to be productively efficient if it is operating on the "efficiency frontier". The efficiency frontier - the line AA in Figure 2.1 - shows the minimum or technical best practice combinations of inputs 1 and 2 required to produce a specified level of output.³

The relative prices of the factor inputs are given by the slope of the line PP in Figure 2.1. If the ratio of prices is equal to the ratio of the marginal products of the inputs (point X in Figure 2.1) the firm is said to be allocatively efficient since, for the specified level of output, costs cannot be reduced by substituting between inputs. If it is operating at a point such as Y in Figure 2.1, the firm is said to be allocatively efficient but not productively efficient, because in this case, more of both types of input are being used to produce the output than are strictly necessary.

Productive and allocative efficiency combine to determine the firm's cost efficiency since, for a specified level of output, costs may be reduced either by producing the same output with fewer inputs, or by substituting inputs to use a more efficient mix. However, there is a difficulty in explaining what cost efficiency signifies, other than random variation and measurement error, and how it can persist.

Insights into this phenomenon have been gained as a result of work on principal-agent issues, which occur when one party (the agent) acts on behalf of another (the principal), but the agent has his or her own separate and differing economic interests. In industrial economics, the principal-agent framework has been applied in analysing the relationship between a firm's owners (the principal), who may be either private sector shareholders or the government) and the managers who run it (the agent).

Application of the principal-agent approach suggests that cost inefficiency can best be understood as another facet of allocative efficiency. In the same way that variables such as price or quality of service reflect the choices made by consumers and managers, so

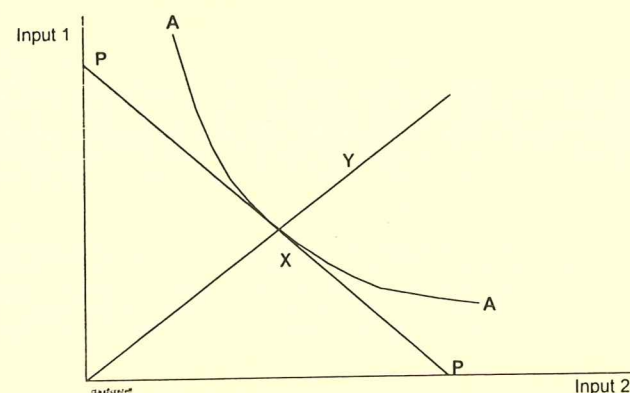
³ Although the discussion is couched in terms of just two inputs, the analysis applies equally to situations where there are multiple inputs.

management also has to make choices regarding the time and effort spent on controlling and reducing costs, in the interests of improving profitability.

In this framework, the levels of capital and labour productivity depend upon the level of cost economising efforts exerted by managerial employees on behalf of the firm's owners. These in turn determine the level of real wages and the economic returns to owners. However, the objectives of salaried managers may not be the same as those of the shareholders, and it may be difficult for the owners to monitor and control the performance of managers.

External factors, such as whether the firm is publicly or privately owned, and the degree of competitive pressure which it faces in its product markets, affect the outcome through their effects on the pressures and incentives acting upon the parties concerned.

Figure 2.1: Allocative and Cost Efficiency



2.3. The Determinants of Cost Efficiency

The idea that external factors such as a change in ownership from public to private can, in some circumstances, improve efficiency and output is certainly not a new one. Discussing the factors affecting the productivity of land in the "Wealth of Nations", Adam Smith suggested that,

"when the crown lands had become private property, they would in the course of a few years, become well improved and well cultivated".

More recently, the greatly increased interest in privatisation as a means of improving economic performance has encouraged economists and others to examine the mechanisms by which a change from public to private ownership might affect the efficiency of an enterprise.

In addition to changes in ownership, a policy of privatisation has often gone hand in hand with initiatives to liberalise or de-regulate the product markets within which the recently privatised businesses operate, leading, it is hoped, to increased competitive pressures in the

newly privatised firms. The potential importance of competition as a stimulus to cost efficiency has also been recognised for a long time. Sir John Hicks, writing in 1935,⁴ noted that "the best of all monopoly profits is a quiet life"; more recently, Leibenstein and others have sought to analyse explicitly the links between the level of effort devoted by managers to cost reduction and the competitive environment of the firm.

The discussion which follows is based upon these well established insights. Our key assumptions are, first, that the cost efficiency of the firm is determined primarily by the effort choices of its managers. They may be proprietors (as in small bus companies) or salaried employees (as in large utilities). Other things being equal, we assume that the greater the supply of effort forthcoming from managers, the more cost efficient will be the firm.

Second, it is reasonable to suppose that managers' effort choices reflect a trade-off between the "psychic" costs of additional effort and the benefits which it yields. The benefits which are relevant here may be summarised in terms of income, but there may be wider non-pecuniary benefits involved as well. The terms of the trade-off between the costs and benefits of managerial effort are affected, *inter alia*, by the ownership status of the firm, and the degree of product market competition which it faces. These factors affect the trade-off through their effects on the relationship between effort and the benefits which increased managerial effort can be expected to yield.

It is also helpful to distinguish another set of factors which affect managers' effort choices. Changes in labour practice, in particular, have to be negotiated with non-managerial employees or their representatives, and the degree of cost efficiency achieved reflects the outcome of bargaining between management and non-managerial employees over the division of the economic rents available to the firm; economic rents in this context being defined as the extent of pecuniary or non-pecuniary benefits in excess of those which would prevail if product and labour markets were perfectly competitive. It is also plausible to assume that the extent to which employees resist changes sought by management depend upon the constitution of the firm and the competitive environment within which negotiations are conducted.⁵

We now examine more precisely how and why ownership status and the competitive environment might affect managerial effort choices.

2.3.1. The Effects of Privatisation on Managerial Effort and Cost Efficiency

There are several ways in which a change in the ownership status of the firm might affect managers' conduct and hence the cost efficiency performance of the firm. First, privatisation could lead to a redefinition of the firm's objectives. This in turn could

⁴ Hicks, J. (1935), "Annual Survey of Economic Theory: The Theory of Monopoly," *Econometrica*, Vol 13, pp 1-20.

⁵ The extent to which changes are resisted affects the benefit-effort trade-off via the "productivity" of effort - the extent to which extra effort yields improvements in cost efficiency.

encourage further changes in the operation of the firm's internal managerial labour market, such as the introduction of new reward structures, such as executive stock option schemes, which help to ensure that these objectives are achieved. Privatisation may also encourage the development of new reward structures by removing certain constraints on the firm's conduct which are peculiar to public sector organisations (eg. in terms of organisation and pay structures). Finally, it may be argued that a privately owned firm is exposed to stronger external threats, in the form of takeover or bankruptcy, than a public sector organisation. These threats may directly impinge on conduct, even in the absence of formal constitutional changes; however, they are also likely to encourage changes in the firm's internal management processes and thus to reinforce the effects of any change in objectives consequent on privatisation.

2.3.1.1. *Ownership and Objectives*

The switch from public to private ownership is widely perceived to result in a significant change in the framework of objectives and constraints within which internal business policies are framed. We may assume that private shareholders wish those running the business to maximise its profitability over a longer or shorter time horizon; this objective is pursued subject to external regulatory constraints (including competition policy). Some privatised firms also face direct economic regulation, in the form of constraints over maximum prices or profitability.

By contrast, public sector businesses pursue more diffuse objectives, subject to constraints on financial performance (such as external financing limits). A frequent complaint of public sector managers has been that neither the weighting attached to different objectives nor the hardness of the constraints is sufficiently constant over time to permit the sound long-term development of the business. For example, there have been many examples in the UK and elsewhere where public sector businesses have been required temporarily to restrain prices in support of macro economic anti-inflationary policies. Shifts in objectives usually necessitate adjustment of the financial performance constraints.

Public sector firms may also find themselves saddled with "hidden agendas". These may be expressed as constraints, for example, on the firm's ability to reduce employment. The hidden agenda is that the firm is really being used as an instrument in pursuit of policy objectives such as the need to preserve employment in areas of above average unemployment. It has even been argued⁶ that managers of publicly owned firms attach a positive weight to the economic rents accruing to the employees of the public enterprise; or that managers may consider that the extent of political support available to the firm is positively related to the size of the rents secured by employees. To the extent that such factors impinge on managerial decision making, they are likely to weaken the perceived benefits of cost economising efforts and hence to reduce the supply of such efforts that are forthcoming.

⁶ See Vickers, J. and Yarrow, G. (1988), "Privatisation: An Economic Analysis", The MIT Press, Cambridge, Mass.

Finally, the incentive characteristics of the financial framework faced by monopoly public enterprises, usually expressed in terms of a requirement to set prices such that revenues are broadly in line with the continuing costs of supply, are very similar to those faced by a private sector firm subject to rate of return or cost of service regulation.⁷ Cost of service regulation imposes what amounts to a 100% marginal tax rate on the returns to inputs of managerial time and effort devoted to improving internal efficiency and hence cutting costs. In response to this perceived weakness of cost of service regulation, there is now a great deal of interest in so-called incentive regulation schemes, such as the price cap approach, which should offer stronger incentives to improve cost efficiency performance.

Although privatisation produces a clear shift in firms' formal objectives, this is not a sufficient condition for an improvement in cost efficiency performance, because there is no guarantee that changes in high level (principal) objectives are transmitted into changes in managerial (agent) conduct, except in the case of owner-managed firms. Especially in firms with diffused share ownership, there are substantial transaction costs restricting shareholders ability to ensure that complementary changes are made to the firm's internal procedures (selection/promotion procedures; reward structures) which transmit the new objectives into managers' decision making calculus. At the same time, if average shareholdings are small, a decision by any individual shareholder to sell stock as an expression of dissatisfaction carries little threat to the incumbent managers.

Nevertheless, the task of devising procedures to ensure conformity between objectives of owners and of managers is probably somewhat easier for private than for public sector businesses. First, transfer from the public to the private sector may allow the firm to escape constraints on public sector pay structures. Second, when the objectives of the enterprise are diffuse, because of non-commercial or political considerations, and subject to change, it is more difficult to establish incentive structures which encourage competition between employees to improve performance. This, as we have argued above, is more likely to be the case in publicly owned companies. Further, if, as is the case with most UK privatised firms, the company is largely owned by major institutional shareholders, the problem of transmitting owners' objectives to managers is somewhat reduced. Nevertheless, the incentive problems outlined above mean that privatisation alone gives no guarantee of satisfactorily resolving principal-agent issues.

2.3.1.2. *Takeover Threats*

In a private company, the outcome of managerial action is revealed, to some extent, in the profitability, and, hence in the share price of the company. If the company is a quoted company, a fall in the share price relative to that expected for the industry raises the probability of a takeover. In the event of a takeover, and the subsequent drive to attain improved profitability, some, perhaps many, of the existing management can expect either

⁷ The term cost of service is arguably the more accurate description of the basis of regulation. Under this form of regulation, maximum permitted tariffs are set by reference to the total costs of meeting expected demand, one element of which reflects the use of capital inputs, on which a reasonable rate of return must be allowed.

to lose their jobs or to face increased uncertainty over future job prospects in their existing posts. This threat of takeover brought about by the market for corporate control should therefore encourage cost economising efforts by managers by increasing the perceived returns from such efforts, even if management action cannot be directly monitored by shareholders.

Against this, it is sometimes claimed that such pressures are weakened by market failure problems in the market for corporate control. The information required to establish whether poor performance is the result of bad luck or inadequate management may be difficult and costly to obtain. Also, takeovers may be pursued not as a result of under performance but in order to increase market power or simply to create larger units which offer better career opportunities for managers. The effects of takeovers on the fortunes of managers in the firm taken over are uncertain as well. There are well publicised cases where some senior managers who have lost their jobs after takeovers have been generously compensated.

There are nevertheless sufficient examples where takeovers, especially hostile takeovers, have produced unpleasant consequences for managerial employees in the acquired business to suggest that the threat is a real one for many companies. However the effectiveness of the threat is probably weakened if the company enjoys significant market power, because market power may allow poor performance to be disguised by apparently reasonable profitability performance. It may also be weakened for certain special categories of firm, such as national champions or recently privatised monopoly utilities supplying essential services.

Some recent discussions of managerial incentives⁸ have argued that apart from the threat of takeover, the threat of bankruptcy and the consequent loss of employment will provide a powerful incentive to increase the supply of effort devoted to improving cost efficiency in private sector organisations. In contrast, the threat of bankruptcy is less credible for public sector companies precisely because the owner is also the lender of last resort. Partly for this reason, public enterprises have been characterized as operating under "soft-budget" constraints.⁹ One effect of the ability to expand borrowing beyond previously agreed limits is that losses arising from poor cost-efficiency performance can be funded by government. This tends to erode incentives to improve efficiency. It is very difficult for governments to exert a credible financing threat on companies they own and this affects behaviour inside state owned companies.

As with the threat of takeover, there is probably something in this line of argument. However, the threat of bankruptcy is probably relatively remote, except for very small businesses, many of which may be, in any case, proprietor owned. Like the threat of

⁸ See Holmstrom, J. and Tirole, J. (1989), "The Theory of the Firm", in Handbook of Industrial Organisation, ed Schmalensee, R.

⁹ See Kornai, J. (1979), "Resource Constrained versus Demand Constrained Systems", *Econometrica*, Vol 47, pp 801-20.

takeover, the threat of bankruptcy may be particularly weak if the firm enjoys any significant degree of market power; is a national champion; or provides an essential service.

2.3.2. Competition, Managerial Effort and Cost Efficiency

In the same way that market power increases managerial discretion over the price and quality of service to offer, so it may also increase managerial discretion over the extent to which efforts are expended in the search for improving cost efficiency. The effectiveness of managerial performance becomes more difficult to monitor if high costs can be passed on in high prices without profitability suffering too much. Hicks' statement, quoted earlier, that "the best of all monopoly profits is the quiet life" encapsulates the idea that lack of competitive pressures allows substantial profits to be earned without requiring managers to exert themselves unduly.

By contrast, vigorous competition in the product market is likely to encourage cost economising effort through a series of mutually reinforcing effects. First, the more price elastic the demand curve facing the firm, the more strongly inadequate cost efficiency performance will impact on profitability, market shares and employment; this also implies greater rewards for effective performance. Competition thus allows principals, whether they be private shareholders or government, to monitor the effectiveness of their agents (the managers) more effectively. In particular, they can compare any individual firm's profit level and growth with the performance of other firms in the industry and those comparisons should reflect differences in efficiency and productivity. A lack of price competitiveness, deficiencies in service quality, and ultimately poor profitability performance are observable in market share outcomes. Moreover, the fact that they are observable helps the owner to structure managerial employment contracts to reward increased effort. This incentive enhancing effect of competition¹⁰ thus reinforces the monitoring effect.

Regulation of monopoly industries can be seen as an attempt to introduce competitive pressures where competition itself is not feasible. However, it is important to recognise that the incentives for managers to minimise costs may differ significantly depending on the precise characteristics of the regulatory regimes. As noted previously, one of the main disadvantages of cost of service regulation is that while ensuring the alignment of prices and costs, there is very little reward for cost-economising efforts, and hence no guarantee that the level of costs is similar to the level prevailing under competitive conditions.

2.3.3. Competition and Bargaining

We have already noted that the extent to which managers' efforts are translated into improvements in cost efficiency and labour practice depends upon the strength of resistance which they face from employees. Managers may wish to see non-managerial employees

¹⁰ It is important to note that competition can take the form of potential as well as actual competition. Potential competition presents a threat which, to some extent, may force the incumbent to behave "as if" actual competition were present.

productively employed, but managers are, in general, unable to pursue this objective without taking into account the potentially conflicting objectives of non-managerial employees. The conflict typically finds expression in the bargaining between unions and employers over wages and conditions. These conditions often include manning levels and physical working conditions as well as non-wage benefits and determine, to some extent, the level of effort that is required to get a job done.

It is traditionally thought that unions gain bargaining power the less elastic is the demand for labour.¹¹ The "Marshallian Rules" suggest that the elasticity of demand for labour will be lower and hence that union strength will be greater:

- the less price elastic is the final product demand;
- the less easy it is to substitute other inputs for the workers in question;
- the smaller is the share in total costs that labour costs constitute;¹²
- the lower is the elasticity of substitution of complementary factors.

Consequently, we would expect the extent of product market competition to affect the nature of the wage-effort bargain, with the level of effort forthcoming at any given real wage level to increase with the strength of competition in the product market.¹³

Privatisation may also reduce the power of unions involved in bargaining. A switch from maximising a socio-political objective to maximising shareholder welfare might encourage management to "act tough" in the bargaining game. Their credible threat is take-over and job losses. There are, however, a number of factors which tend to operate in the opposite direction; for example, a valuable externality for governments is gaining a tough reputation in wage bargaining. Indeed, game theoretic bargaining models¹⁴ point to the cost of "not agreeing" borne by either party as the key determinant of the "size of cake gained" - a government which was willing to accept a strike should be able to force a lower wage deal than a private employer. The expected outcome is therefore an empirical issue.

¹¹ See Addison, J. and Siebert, W. S. (1979), "The Market for Labour: An Analytical Treatment", Goodyear, California.

¹² Although Hicks has shown that this condition is reversed if the elasticity of product demand is low relative to the elasticity of substitution - if it is difficult to find a substitute it is worthwhile being a major component of cost.

¹³ For a formal model of the bargaining process, see Nickell, S., Wadhwani, S. and Wall, M. (1990), "Productivity Growth in UK Companies, 1975-86", Centre for Economic Performance Working Paper 36, London School of Economics.

¹⁴ See Binmore, M., Rubinstein, A. and Wollinsky A. (1986), "The Nash Bargaining Solution in Economic Modelling", Rand Journal of Economics, Vol 17.

2.4. Summary and Conclusions

The discussion indicates that privatisation is potentially likely to improve the cost-efficiency performance of privatised firms, by clarifying objectives and by introducing the threats of take-over or bankruptcy. However, the extent to which potential gains are translated into actual improvements in performance depends upon shareholders' ability to monitor the effectiveness of managers. Where privatised firms operate in product markets with little or no competition, it is difficult to monitor efficiency performance through reported growth in sales or profits, or through growth of dividends and movements in share prices. If share ownership itself is widely diffused, then it is likely to be difficult for shareholders to exert effective control over management. The threat of take-over or bankruptcy may also be limited for large utilities, providing an essential service, or for companies thought of as national champions.

Whilst privatisation should lead to improvements in cost efficiency, its effects will therefore be strongly reinforced if the privatised firm faces effective competition in its marketplace. Unless they maintain and improve efficiency levels, firms in competitive product markets can rapidly expect to lose market share. This provides strong direct incentives to raise productivity and contain costs. The presence of effective competition also improves the effectiveness of capital market disciplines, since movements in sales, profits, dividends and share prices relative to those of competitor firms will reflect changes in relative efficiency performance. Finally, competition in product markets can be expected to reduce the ability of workers and unions to sustain protected wage levels or low levels of effort (i.e. wage-effort combinations incorporating a significant element of economic rent).

3. TECHNICAL ISSUES IN ASSESSING THE EFFECT OF PRIVATISATION ON COST EFFICIENCY

3.1. Introduction

This chapter examines some of the technical issues involved in measuring the links between privatisation and cost efficiency. We begin, in Section 3.2 by considering how these effects have been measured empirically. Section 3.3 examines some of the technical issues arising and Section 3.4 presents a summary and conclusions.

3.2. Measuring Productivity Changes

All of the studies included in the survey have been based either directly or indirectly on an analysis of trends in labour productivity or total factor productivity (TFP) in the firms or industries concerned. In theory, the TFP approach, which measures changes in the efficiency with which all of the inputs are deployed, is preferred to analysis based on changes in the productivity of particular factors (labour or capital), because changes, for example, in labour productivity, may result from the substitution of capital for labour, without any necessary improvement in overall cost efficiency having occurred. For example, in Figure 3.1, an increase in the quantity of capital employed per unit of output, shown by a shift from point X to point Y, would lead to an increase in labour productivity (labour input per unit of output having fallen). However, the new combination, Y, may be just as far from the efficiency frontier as X. In other words, the increase in labour productivity has been offset by a reduction in capital productivity, so that overall productive efficiency is no higher. Whilst the TFP approach is preferred to labour productivity measures in principle, we see in section 3.3 below that changes in TFP are more difficult to measure than changes in labour productivity, especially because TFP requires estimates of the changes in capital inputs. The review of empirical studies in Chapter 4 covers findings in respect of both labour productivity and TFP.

Irrespective of which measure of productivity is used, analysis of the effect of privatisation in the studies reviewed in Chapter 4 is based on a comparison of changes in the rate of growth of productivity in the period before and after privatisation, so that a projection of pre-privatisation experience constitutes the counterfactual or baseline against which actual post-privatisation outcomes are assessed.¹⁵

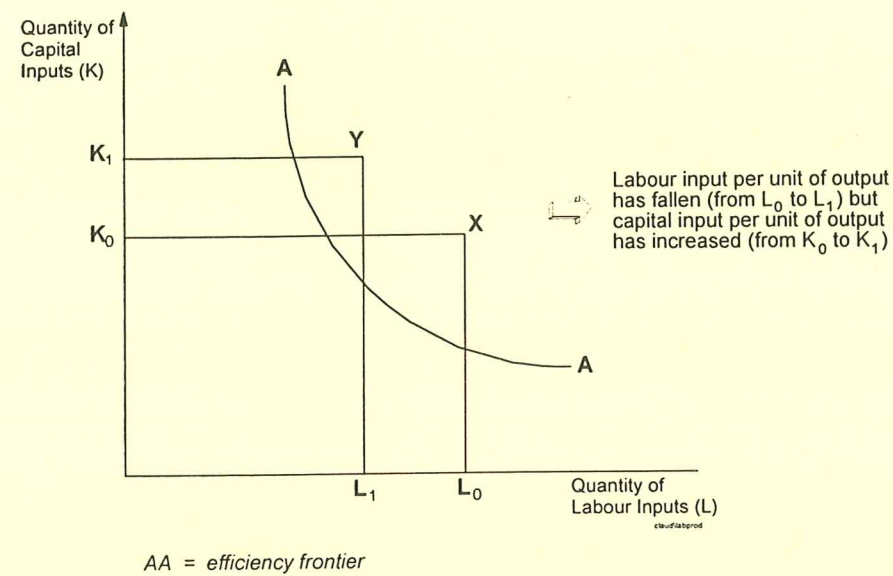
¹⁵ An alternative approach to assessing the privatisation effect, not explored in any of the published studies reviewed below, would be to compare changes in productivity in privatised and non-privatised firms in the same industry over a given time period. For example, in telecoms, the BT's performance could be compared with that of France Telecom.

3.3. The Problem of the Counterfactual and Other Technical Issues

3.3.1. The Determinants of Productivity Change

The rate of growth in productivity may alter for a variety of reasons, most of them wholly or largely unconnected with any change in ownership.

Figure 3.1
An Increase in Labour Productivity may not imply Improved Cost Efficiency

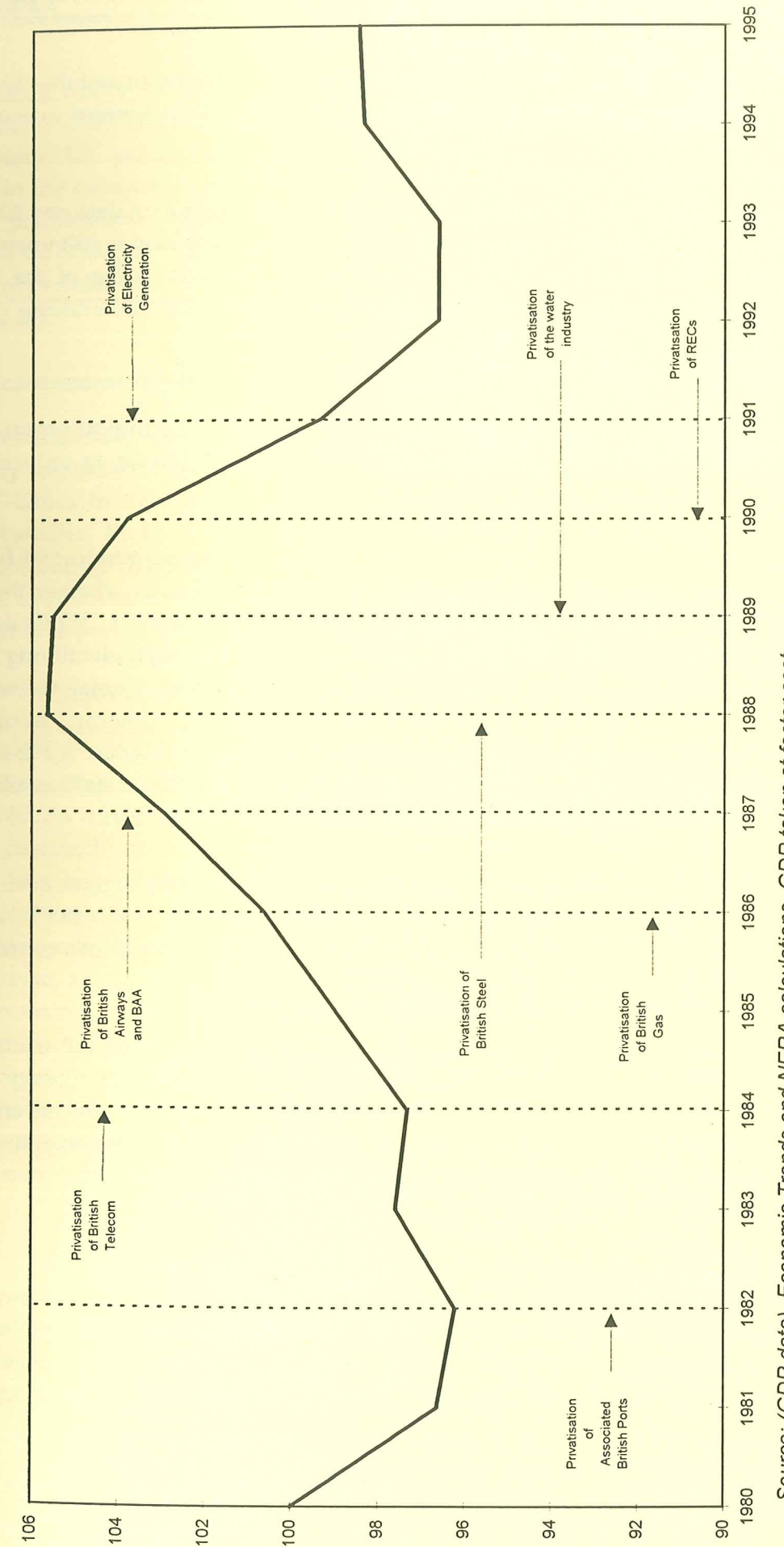


3.3.1.1. Cyclical Factors

In the short term, the most important influence on productivity growth is the economic cycle. Because factors of production, especially capital, are far from fully variable with the level of economic activity, observed productivity growth is usually more rapid during cyclical upswings, when market demand is usually increasing quite rapidly, than in recessions, where output is either stagnant or declining. Such effects are particularly marked the more capital intensive is the industry concerned, and many of the privatised utilities are by their nature highly capital intensive. Cyclical effects *per se* are less marked, other things being equal, in industries experiencing rapid exogenous growth in demand for their product, which has been the experience of the telecoms sector, for example, over the past 15-20 years.

Figure 3.2 charts the behaviour of the UK economic cycle over the period from 1980, in terms of trend adjusted GDP, and relates this to the timing of the principal privatisations covered in the academic studies reviewed in Section 3.3. The figure shows that companies privatised in the early and mid-1980's, such as ABP, BT, British Gas and BAA, would all have benefited post privatisation from the cyclical upswing and high levels of economic

Figure 3.2
GDP Relative to Trend*, 1980=100 and Privatisation Dates



Source: (GDP data), Economic Trends and NERA calculations, GDP taken at factor cost
*Values greater than 100 indicate above trend levels of GDP; values less than 100 indicate below trend values of GDP

activity experienced in the mid-late 1980's. Conversely, BS, the water plcs and the electricity industry all entered the private sector during or shortly before the downturn in economic activity in the early 1990's.

The effects of cyclical factors can be controlled if a sufficiently long run of data, say 10 years, is available pre and post privatisation. However, experience of this kind is still unavailable for the more recent privatisations, and was not available even for some of the earlier privatisations at the time the studies of productivity performance were undertaken.

3.3.1.2. *Scale Effects and Technical Progress*

In the long run, the major determinants of productivity growth are technical progress and scale effects, both of which allow an increase in output per unit of input, or reductions in input per unit of output.

The extent to which an industry (rather than an individual firm in an industry) benefits from scale economies depends upon industry technology, for example, whether there are economies of traffic density, and on the growth of demand for its output. While demand growth partly depends on the firm's ability to generate demand through identifying unmet needs, product differentiation and effective marketing, it also reflects external factors such as availability of substitutes, income, and structural changes in the economy. In order to identify a privatisation effect, it is therefore necessary, in principle, to account for the effects of variations in *exogenous* output growth, especially in network industries, such as telecoms, gas, electricity distribution and water, where scale effects may be significant.

Although productivity growth is also affected by exogenous technical progress, such as the shift from electro-mechanical to digital switching technology in telecoms, it can be argued that the rate at which new technology is applied may depend upon the firm's constitution and conduct.

For example, because technical progress is often "embodied" in new capital equipment, firms' ability to access investment funds may affect the spread of the new technology within the firm. An important argument in favour of privatisation has been the adverse effect on investment of constraints on nationalised industries' access to capital markets inherent in traditional methods of public expenditure control.¹⁶

3.3.1.3. *Competition*

The discussion in Chapter 2 indicates that changes in a firms' competitive environment could have a significant effect on cost efficiency, irrespective of whether the firm was publicly or privately owned. It follows that whenever privatisation is accompanied by industry re-structuring, aimed at increasing competitive pressures in some or all stages of

¹⁶ See Holder, S. (1996), "The Performance of Privatised Industries: A Report by NERA for the Centre for Policy Studies, Volume 2: Finance" for further discussion.

production, it will be difficult or impossible to disentangle the two effects. However, with the exception of the electricity generating sector and most recently, the privatisation of the rail industry, UK privatisations have not been marked by significant re-structuring or changes in the competitive environment in which the privatised business operated at the point of privatisation. Subsequent developments, resulting from regulatory action and wider market changes, some of which were originally proposed and set out in a timetable at the time of privatisation, have begun to introduce greater competitive pressures in the cases of BT and BG.

3.3.2. *Measurement Issues*

Apart from the issues involved in separating the effects of privatisation from those of other potentially significant influences on productivity growth, there are several narrower technical issues in measuring changes in productivity which may affect the results of empirical studies. Probably the most important of these in the present context are first, how to measure output changes, and, second, how to measure changes in capital inputs. It should be emphasised at the outset that empirical studies of productivity change are obliged to use highly imperfect data on both inputs and outputs.¹⁷

3.3.2.1. *Output Measurement*

All of the privatised industries, to varying degrees, supply multiple outputs and purchase many different types of input. The existence of a multiplicity of outputs and inputs can cause problems in measuring and defining outputs. For example, even in an apparently "simple" case such as the energy industries, an increase in the quantity of gas or electricity supplied to a large industrial customer may have very different cost implications to an equivalent change in units purchased by domestic customers, because of the differences in load profiles, and hence the extra pipeline etc capacity required to meet the demand. At the other extreme, an organisation such as BT sells a wide range of services to many different types of customer.

Because different types of output require different combinations of inputs to supply them, it is important to account for changes in the output mix supplied in estimating TFP or labour productivity growth. As we shall see in Chapter 4, differences in the choice of output measure may lead to quite different perspectives on productivity performance in a given period.

3.3.2.2. *Accounting for Changes in Capital Inputs*

Capital is, by definition, a stock variable, whereas in measuring changes in TFP, it must be specified as a flow variable. In principle, the value of the flow of services provided is equal to the sum of the economic depreciation of the capital stock over the period in question, plus

¹⁷ For further discussion of the technical issues in measuring productivity changes, see, for example, Fried, H.O. Lovell, C.A.K., Schmidt, S.S. (eds.) 1993, "The Measurement of Productive Efficiency. Techniques and Applications."

the cost of capital applied to the depreciated economic value of the assets. In practice, researchers usually have to rely on capital consumption data as measured by depreciation figures reported in company accounts, and to apply an imputed real cost of capital to the estimated CCA value of the capital stock.¹⁸ However, the depreciation figures in published accounts may bear little relationship to "true" economic depreciation, partly because the economic life of assets may not correspond to accounting conventions.¹⁹

3.3.3. The Appropriate Time Frame

There is little doubt that an impending privatisation can affect managerial and employee conduct in advance of the point at which the business is formally transferred to private sector owners through flotation or sale. The stimulus for change may be external, as the financial constraints imposed by government are tightened, in order to improve profitability and increase potential sales proceeds. Industry managers may also believe that their long term employment prospects in the privatised business will be enhanced if its cost efficiency and profitability in the public sector are improved.

3.4. Summary and Conclusions

A recurrent problem is assessing the effect of privatisation on any of the dimensions of performance covered in the present series of papers is to specify a counterfactual - what would have happened if the firms remained in the public sector. In the case of productivity or cost efficiency performance, the approach in empirical studies has been to compare productivity growth pre- and post-privatisation. As we have shown, this task is complicated because of measurement problems, "announcement effects", and, above all, because productivity may be affected by a wide range of factors which must, in principle, be controlled for if the contribution of ownership change itself is to be identified. The following chapter discusses how these issues have been addressed by researchers, and summarises their findings.

¹⁸ Many of the studies reviewed below have used an 8% real cost of capital, as recommended in Spackman, M. (1991), "Discount Rates and Rates of Return in the Public Sector," Government Economic Service Working Paper 113.

¹⁹ The unavailability even of depreciation data for sub-units of privatised firms creates particular difficulties for studies seeking to assess changes in productive efficiency using data on the performance of a cross-section of production units within a business.

4. EMPIRICAL STUDIES OF UK PRIVATISATION AND COST-EFFICIENCY PERFORMANCE

4.1. Introduction

Our initial literature search identified seven candidate studies which had reported findings on the relationship between privatisation and productivity growth in the privatised firms and industries.²⁰ The discussion which follows in Section 4.2 focuses on just three of the seven papers, by Bishop and Thompson, Parker and Martin and Haskel and Szymanski, each of which reports estimates of productivity performance across a sample of firms or industries, although we also refer to the findings from two for the remaining studies, which report results for single firms or industries (BG, and electricity distribution).²¹ Section 4.3 presents a summary and conclusions.

4.2. Scope, Methodology and Findings of the Principal Studies

Although each of the three principal studies covered in our review has examined changes in productivity before and after privatisation, the scope of the studies and the methodology used by the researchers has differed from one study to another.

4.2.1. Parker and Martin

As its title suggests, the paper by Parker and Martin addresses most directly the relationship between privatisation and productivity performance, and reports results both for labour productivity and for TFP changes in eleven privatised firms.²² The authors examine changes in the two productivity measures in five sub-periods linked to the privatisation process:

- i) a nationalisation period;
- ii) a pre-privatisation period (defined as the period following the point at which firm management became aware that privatisation was likely to occur but prior to the formal announcement of the decision to privatise);
- iii) a post-announcement period;
- iv) a post-privatisation period up to 1989;
- v) the 1989-92 period (to reflect the effects of economic recession).

²⁰ Full details of the studies are given in the appendix.

²¹ Interpretation of the findings of the remaining studies (by Bousofiane et al and Kwoka) has proved difficult because of the somewhat incomplete results reported in the papers.

²² ABP, BA, BAA, BG, British Aerospace (BAe), BT, Britoil, BS, Jaguar, National Freight Corporation (NFC) and Rolls Royce.

Labour productivity change within each sub-period was estimated by relating changes in the volume of output to changes in the volume of labour input, as measured by total employment, adjusted by changes in hours worked. TFP change was measured by relating changes in output to changes in factor inputs, with the contribution of each individual input weighted by its share of total cost (the Törnqvist index approach).

Similar to the approach adopted in NERA's earlier report in the present series on safety,²³ Parker and Martin show changes in productivity in the sample industries both in absolute terms and relative to the changes in the rest of the economy, the second (relative) basis providing an admittedly crude means of controlling for cyclical effects on demand.

The principal findings can be summarised as follows:

- Throughout the period from the late 1970s, labour productivity has increased more rapidly than TFP in nearly all of the industries studied. The disparity was especially marked in the pre-privatisation and post-announcement periods, reflecting the de-manning that occurred in several industries in the run up to privatisation.
- The authors recognise that measuring the privatisation effect itself is complex. If a comparison is made between experience in the nationalisation period and the subsequent time periods, a marked improvement, especially in labour productivity growth, can be observed in seven of the eleven cases (BA, BAA, BG, BAe, NFC, ABP and BT). However, in the four of the seven cases (BA, BAA, BG and NFC) the improvement in performance was stronger in the run-up to privatisation than in the post-privatisation period. In part, this reflects experience in the 1989-92 recession, when productivity growth slackened in several of the privatised firms and in the whole economy.
- Productivity performance throughout the post-privatisation period has been especially strong in BAe, ABP and BT. In the case of ABP, the authors link this to the abolition of the Dock Labour Scheme, which not only enabled ABP to shed highly unproductive labour (thus enhancing labour productivity) but to capture traffic from other ports (thus increasing capital productivity and further boosting TFP growth). The improvement in BT's performance has been especially marked in the period since 1989, when productivity growth in the economy as a whole slowed dramatically. The authors link this to the increasingly competitive environment in which BT has been operating, which has encouraged far more wide ranging changes in labour practice than BT management had previously sought.

²³ See "The Performance of Privatised Industries: A Report by NERA for the Centre for Policy Studies, Volume 1: Safety" for further discussion.

4.2.2. Bishop and Thompson

Bishop and Thompson note that privatisation was only one of a range of reforms in the framework of nationalised industry control and regulation which may have affected the cost efficiency performance of the nationalised industries during the decade. The reforms included the introduction, in 1976, of external financing limits (EFLs), which constrained the total cash inflow/outflow of the enterprises, and the changes introduced following publication of the 1978 White Paper on the Nationalised Industries,²⁴ principally the far greater emphasis placed on profitability targets and the introduction of targets for costs. The underlying changes were reinforced by the steady tightening of financial targets for nationalised industries that occurred in the 1980's, both in industries which were subsequently privatised and in businesses remaining in the public sector (notably the railways and the Post Office). Consequently the paper seeks to examine the impact of this wider package of reforms, rather than of privatisation per se. The results are nevertheless of considerable interest, and despite the differences in approach, show some consistency with the findings of Parker and Martin.

Bishop and Thompson examine the annual rate of increase of labour and total factor productivity in nine nationalised firms or industries²⁵ in the sub-periods 1970-80 and 1980-90. TFP changes are calculated using the same Törnqvist index approach used by Parker and Martin. Direct comparisons between the Bishop-Thompson and Parker-Martin results is not possible primarily because of the differences in the time periods over which productivity growth rates are computed. In some cases, notably BA and BAA, this is compounded by differences in the output measure used. For example, in estimating productivity growth in BAA, Bishop and Thompson measure output growth by reference to the volume of air traffic movements (ATMs) and passengers. Parker and Martin also report findings based on changes in ATMs (but not passengers) but they also present an alternative measure based on the change in total revenues, including income from airport retailing and other commercial activities.²⁶

Bishop and Thompson's principal findings are as follows:

- In common with the Parker and Martin study, Bishop and Thompson found that labour productivity increased more rapidly than TFP during the 1980s. Labour productivity grew particularly rapidly in BS, BC and BT.
- There was a significant increase in the growth of labour productivity between the 1970s and 1980s in six of the nine case study firms or industries (BAA, BT, BC, PO, BR and BS). Labour productivity growth either remained unchanged or fell between the 1970s and 1980s in BA, in BG and in the electricity supply industry.

²⁴ HM Treasury, "The Nationalised Industries", Cmnd 7131.

²⁵ BA, BAA, BT, British Coal (BC), electricity supply, BG, Post Office, British Rail and BS.

²⁶ Not surprisingly, in view of the rapid growth in on-airport retailing that occurred in the 1980s, the two measures give a different picture of BAA performance.

- Performance with respect to growth in TFP was more mixed, with improvements between the 1970s and 1980s in BC, the Post Office, BR and BS, but a reduction in TFP growth in BA, BAA, BT, electricity supply and BG.
- In aggregate, turnover weighted TFP growth across the nine public enterprises concerned was significantly faster in the 1980s than in the 1970s.

The authors relate the changes in performance between the two sub-periods to changes in the rate of growth of output. In three of the cases where productivity performance improved, the Post Office, BR and BS, output growth was more rapid (or the decline in output less rapid) in the 1980s than in the 1970s. In each of the remaining cases, however, output grew more slowly in the 1980s than in the 1970s; given the decline in output growth, the performance of BT, BG, BAA and especially BC in maintaining or increasing labour productivity growth (and in BC's case TFP growth) is notable. The authors themselves conclude that "a large part of the increased productivity growth observed during the 1980s is attributable to increases in efficiency, although it is clear that one cannot say with certainty how large that part is".

4.2.3. Haskel and Szymanski

Haskel and Szymanski report the findings of an econometric study of the factors affecting the growth of labour productivity in twelve nationalised firms or industries²⁷ over the period 1972-88. Specifically the authors study the effects on labour productivity growth of changes in employment, hours worked, capital inputs (defined simply as the value of the capital stock), materials, and in a set of institutional factors, including privatisation and the competitive environment. Although the authors appear to have used less sophisticated measures of output than Parker and Martin and Bishop and Thompson in several of the industries studied,²⁸ some of Haskel and Szymanski's findings are strikingly similar to those reported earlier. In particular, in common with the other studies, they report a major improvement in labour productivity growth in the period 1980-88, compared to the period 1972-80, both in absolute terms and relative to the whole economy. The acceleration in labour productivity growth between the two periods was especially marked in the cases of BC and BS. Contrary to the findings of Bishop and Thompson, Haskel and Szymanski report a decline in the growth of labour productivity in BT and an increase in productivity growth in the electricity supply industry, although in both cases it appears that the Haskel-Szymanski findings are based on less appropriate output measures.²⁹

²⁷ BAA, BA, BC, BG, BR, BT, electricity supply, London Regional Transport (LRT), the Post Office, the regional water authorities (RWAs) and the Scottish Transport Group (STG).

²⁸ Such as number of connections for BT, or the number of passengers for BAA and STG.

²⁹ Connections in the case of BT and a simple Kwh measure for electricity. Changes in the numbers of connections give no indication of the intensity of use of the telecommunications system; changes in Kwh take no account of changes in the mix of output, which in the case of the electricity industry would have been very substantial over the 1972-88 period.

The other principal findings are, first, that the growth in labour productivity is enhanced by a more competitive environment; second, that privatisation appears to have had a positive and statistically significant effect on performance in two of the four cases (BA and BG), and, third, that cyclical factors had a significant effect on the year-to-year change in labour productivity where it was included in the set of explanatory variables.

As Haskel and Szymanski point out, the extent of post-privatisation experience in each case was extremely limited, allowing no very firm conclusions to be drawn. In general, the authors found that much the most important source of productivity change was the change in labour inputs; however, this finding necessarily begs the question of what actually lay behind the observed changes in labour input.

4.2.4. Other Studies

We report more briefly on two other studies which have presented findings on the relationship between privatisation and productivity growth. The change in TFP in the electricity distribution sector has been examined by Burns and Weyman-Jones, and Waddams-Price and Weyman-Jones have examined the change in TFP in BG. Both papers have used a more sophisticated approach to measuring the change in TFP than the studies reviewed above, based on the so-called Malmquist approach. By combining cross-sectional data from a number of production units in each industry (individual RECs in electricity and British Gas area boards), with time series data, this approach enables the analysis to decompose the change in TFP into two components, one reflecting technical change (or "frontier shift"), the other gains in technical efficiency relative to industry best practice (the "catch-up" effect). Within this framework the authors estimate a positive link between privatisation and TFP growth in the gas industry (contrary to the findings of Parker and Martin) and no significant effect of privatisation in electricity distribution (not covered by Parker and Martin).

Whilst this approach is of considerable technical interest, the study findings are compromised because the analysis has not accounted for external factors, especially the cyclical effect which the Haskel-Szymanski findings suggest are an important source of year-to-year variation; the researchers also encountered significant measurement problems, especially in deriving meaningful capital input measures for the business units concerned. The results for electricity distribution are further weakened by the very limited post-privatisation experience.

4.3. Summary and Conclusions

Our survey of the existing empirical literature on the relationship between privatisation and cost efficiency yields no very clearcut evidence on the nature or strength of the effect, although we believe that some important clues can be discerned.

- Most importantly, each of the three most comprehensive studies of productivity change in UK state-owned firms and industries have concluded that in most of the

firms concerned there has been a significant increase in the annual rate of growth of labour productivity, not only in absolute terms but relative to labour productivity growth economy-wide. In some cases, notably BS, BC, BT, ABP and NFC, the improvement was quite dramatic.

- Second, the improvement in labour productivity performance appears to have outstripped the improvement in TFP performance, although there have been some striking improvements in TFP growth post-privatisation, especially in BA and ABP, the latter no doubt linked in part to the abolition of the Dock Labour Scheme.
- Third, Parker and Martin's analysis suggests that the prospect of privatisation began to affect conduct and performance well in advance of the actual privatisation date; impressive improvements in labour productivity in the period leading up to privatisation were recorded in BA, BS, Jaguar, NFC and ABP.
- The improvement in labour productivity has been associated with a rapid reduction in employment in the publicly owned firms, whether or not these firms were privatised.

Linking these improvements in productivity performance to privatisation is problematic for several reasons:

- First, the discussion in Chapter 2 suggested that whilst on balance we would expect the transfer of ownership from public to private to improve cost efficiency performance, the strength of the effect is uncertain, particularly in the absence of changes in the competitive environment. If, however, the competitive environment itself alters at the point of privatisation, as occurred, for example, in the bus industry, or in electricity generation, separating the two sets of effects may be difficult or impossible.
- Second, the Bishop and Thompson and Haskel-Szymanski papers remind us that privatisation was part of a more wide-ranging reform programme aimed at improving nationalised industry performance through a process of more rigorous controls and more demanding financial targets. Experience in industries such as BC, BR and the Post Office, which have either remained in the public sector or have only very recently been privatised, would suggest that reform measures falling short of privatisation may significantly affect performance.
- Finally, the extent of post privatisation experience available to each set of researchers has been very limited. In some of the later privatisations, its effects are conflated with those of economic recession.

Our own interpretation both of the theoretical literature and of the findings of the empirical studies are that the most important influence on cost efficiency is the effectiveness of

product market competition faced by the firm, and that the effects of privatisation and those of more effective competition are mutually reinforcing. For these reasons, we would expect the process of extending competition in the utility sector, now well established in telecoms, electricity generation, commercial and industrial energy supply, and railways, and now in prospect in the domestic energy sector, to be a continuing source of cost efficiency improvement in the industries concerned.

APPENDIX 1. PUBLISHED STUDIES ON PRIVATISATION AND PRODUCTIVITY PERFORMANCE**A. Principal Studies Consulted**

1. Parker, D and Martin, S (1995), "The impact of UK privatisation on labour and total factor productivity", *Scottish Journal of Political Economy*, Vol 42, 2, pp 201-220.
2. Bishop, M and Thompson, D (1992), "Regulatory reform and productivity growth in the UK's public utilities", *Applied Economics*, Vol 24, 11 pp 1180-1190.
3. Haskel, J and Szymanski, S (1993), "The effects of privatisation, restructuring and competition on productivity in UK public corporations", *Paper no. 286*, Department of Economics, Queen Mary and Westfield College.

B. Other Studies

4. Burns, P and Weyman-Jones, T (1994), "Privatisation and productivity growth in UK electricity distribution", *CRI Discussion Paper*.
5. Waddams-Price, C and Weyman-Jones, T (1996) "Malmquist indices of productivity change in the UK gas industry before and after privatisation", *Applied Economics*, Vol. 28, 1 pp 29-39.
6. Boussofiane, A, Martin, S and Parker, D (1995), "The impact of technical efficiency of the UK privatisation programme", *Occasional Paper No. 30*, University of Birmingham, Research Centre for Industrial Strategy,
7. Kwoka, J. (1993), "The effects of divestiture, privatisation and competition in US and UK telecommunications", *Review of Industrial Organisation*, Vol. 8, 1 pp 49-61.

The Performance of Privatised Industries:

A Report by NERA for the Centre for Policy Studies

Volume 3: Efficiency

National Economic Research Associates (NERA) was commissioned by the Centre for Policy Studies to examine aspects of the economic record of privatised companies in the UK. The results of this work are intended for publication, as a contribution to policy debate.

The present report focuses on the links between privatisation and cost efficiency or productivity performance. Unlike the other reports in the series, it is not based on original research, but instead reviews a number of studies published since 1992, which have presented evidence on recent trends in productivity growth in the privatised firms and industries in the UK.

The view that a transfer from public to private ownership would improve cost efficiency performance dates back at least as far as Adam Smith. Discussing the factors affecting the productivity of land in the "Wealth of Nations", Smith suggested that "when the Crown lands become private property, they would in the course of a few years, become well improved and well cultivated". Modern economic analysis broadly supports Smith's perceptions. However, cause and effect are not entirely straightforward in practice, especially if competitive pressures are muted. Effective competition, in conjunction with privatisation, is likely to deliver the strongest safeguard against cost inefficiency.

A necessarily tentative conclusion from this analysis is that the growth of effective competitive pressures in telecommunications, domestic energy and the rail sector will be a continuing source of improvement in the cost efficiency of the industries concerned over the next five-ten years.

This volume is the third in a series commissioned by the Centre for Policy Studies investigating various aspects of the performance of privatised firms in the UK. The first two examined the safety record of privatised firms and the impact of privatisation on government finances.

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