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Preface

The theme of the eighth Industry Economics Conference — 'Regulation, competition and industry structure' — reflects the current interest in competition policy issues and the evolution of industry regulatory frameworks.

The conference was fortunate to attract two renowned economists: in these proceedings John Panzar (Northwestern University), a specialist in regulatory economics, reviews incentive regulation in the US telecommunications industry; and Catherine Morrison Paul (University of California, Davis), an expert on cost based measures of market power, makes a strong case for including industry cost data when analysing industry structures.

A section on regulation reviews recent developments: Stephen King (Melbourne University) evaluates infrastructure access regulation; Peter Forsyth (Monash University) examines trends in price regulation; and John Robinson (Victorian Department of Treasury and Finance) comments on the role of access arrangements and spot markets in ensuring competition in the electricity and gas industries and managing their distribution networks efficiently.

Papers on the recent East Asian crisis emphasise changes to industry structures in that region: He-Ling She (Monash University) examines shifts in the costs and benefits of government regulation as countries develop; Hal Hill (Australian National University) analyses the influence of government policies on total factor productivity growth in Indonesia; and Chi Schive (Council for Economic Planning and Development, Taiwan) examines the success of adjustment strategies adopted by small and medium sized Taiwanese businesses in response to continuing challenges.

Three telecommunications papers focus on the structure of, and regulatory arrangements for, that industry: Chris Sayers (Productivity Commission) compares Australia's telecommunications performance against that of other countries; Brian Perkins (AAPT) analyses the effects of recent regulatory developments to ensure telecommunications competition; Tom Amos (Australian Telecommunications Users Group) discusses the development of competition in the industry from a users' perspective.

Rail industry papers concentrated on the structure and regulatory arrangements for that industry. Fred Affleck (National Rail Corporation) sets out regulatory requirements for effective competition in the rail industry; Keith Trace (Productivity Commission) analyses recent regulatory developments in the UK rail industry; and Rod Maddock (La Trobe University) examines the structure of the rail industry and suggests how regulation could be improved.

The conference benefited from 32 contributed papers delivered at ten sessions and a workshop on the recent East Asian crisis. These papers covered a diverse range of topics, including competition policy, access issues, industry regulation and market structures. Contributed papers are listed in appendix A and are available from Russell Smyth, Department of Economics, Monash University.

The conference organisation was a joint effort by the Productivity Commission and the Monash University Economics Department. Important contributions to the success of the conference and/or the publication of the conference proceedings were made by Jane Batchelor, Mita Bhattacharya, Peter Forsyth, Maurice Glover, Patrick Jomini, Deborah Peterson, He-Ling Shi, Russell Smyth, Marika Vicziany and Nevenka Vuckovic.

The Industry Economics Conference for the year 2000 is being organised by the Australian Graduate School of Management.

Contents

Abbreviations

AC	average cost
ACA	Australian Communications Authority
ACAF	Australian Communications Access Forum
ACCC	Australian Competition and Consumer Commission
ACIF	Australian Communications Industry Forum
AMPS	analogue mobile system
AUSSAT	Australian communications satellite
CPI	consumer price index
CPI-X	consumer price index minus x
FCC	Federal Communications Commission
HHI	Herfindahl index
IDD	international direct dialling
IPART	Independent Pricing and Regulatory Tribunal
ISDN	integrated services digital network
ISP	internet service provider
MC	marginal cost
MR	marginal revenue
NCC	National Competition Council
OPRAF	Office of Passenger Rail Franchising
SMEs	small and medium sized enterprises

STD	subscriber trunk dialling
TFP	total factor productivity
TFPG	total factor productivity growth
TPA	Trade Practices Act

SECTION I

INCENTIVE REGULATION

1 Incentive regulation in the US telecommunications industry

John Panzar
Department of Economics, Northwestern University

1.1 Introduction

The federal system in the United States provides unusual scope for social science research on the effects of regulatory policy. There are 50 states, of which each has substantial latitude to choose its own regulatory policies. During the 1990s, there was substantial variation in the public policy approach to the regulation of telecommunications and other infrastructure industries. This allows us to attempt to determine if the movement towards the adoption of price caps and other forms of so-called incentive regulation improved performance in the US telecommunications industry. Price cap regulation, first put into practice in England following the privatisation of British Telecom, spread rapidly through the United States. This represented a substantial change in policy compared with the traditional rate of return, cost-plus regulation that had been practised in the United States for the better part of a hundred years. My objective in this paper is to review the empirical evidence in an attempt to determine whether this regulatory change caused a measurable change in the performance of the telecommunications industry.

My conclusion is that it is difficult to measure any causal effect on local phone rates resulting from the move to incentive regulation. However, I think the difficulty of detecting a strong effect of incentive regulation is of some interest in this case.

1.2 Structure of the post-divestiture US telecommunications industry

To understand the discussion that follows, it is necessary to describe the structure of the US telecommunications industry after the break-up of AT&T. That structure, combined with the US system of federalism, led to *the laboratory of the states* —

that is, the variation in regulatory policies that allows us to attempt to measure the impacts of changes in regulatory regimes.

After the break up of the Bell system through the Modified Final Judgment, the telecommunications services sector consisted of the local exchange market and the interexchange (toll) market. Toll services are of three basic types: (i) interstate toll (calls that cross state lines); (ii) intrastate, interLATA toll (calls that remain within a State but cross Local Access and Transport Areas [LATAs] that the Modified Final Judgment defined as the boundaries between local and long distance services); and (iii) intrastate, intraLATA toll (calls between exchanges that do not cross LATA boundaries). Interstate calls are regulated at the federal level, by the Federal Communications Commission, for constitutional reasons. Intrastate calls fall under the authority of State Public Utility Commissions. Thus competition in the interLATA market was regulated at the State level. The decision whether to open intraLATA toll service to competition was also made at the State level.

Local exchange carriers consisted of the newly divested Regional Bell Operating Companies (such as NYNEX and Bell South), GTE and other formerly 'independent' telephone companies. Local exchange carriers provided basic local service (line connection and local use), enhanced services (for example, call waiting) and interexchange access. State Public Utility Commissions regulated local exchange carriers, except for that portion of interexchange access attributable to interstate calls which was regulated by the Federal Communications Commission.

The States had great latitude to develop an independent regulatory policy toward firms operating in post-divestiture telecommunications markets. They were not required to mimic policies developed by other States, or by the Federal Communications Commission in Washington. Until the *Telecom Act of 1996*, most states elected to regulate local exchange carriers as franchise monopolies — that is, it was illegal to offer most forms of local telecommunications services in competition with the franchisee. (Cellular and intraLATA toll markets were the most notable exceptions.) The States also choose the form of regulation: traditional rate of return regulation, some form of price cap or incentive regulation. Similarly, State policies determine the rate structure, the relationship between business and residential rates, urban and rural rates, and so on. Most states chose to keep residential rates low relative to business rates and rural rates low relative to those in urban areas. However, the extent of these policies varies from State to State. Most toll calls are interstate, and thus outside of State jurisdictions. Nevertheless, intrastate toll revenues amount to billions of dollars and are subject to State regulation.

1.3 The laboratory of the States

The ability to choose varying regulatory approaches has created what political scientists in the United States often refer to as the laboratory of the States. For the telecommunications industry this means a set of different policies towards regulation. This cross sectional variation makes it possible to attempt to determine a causal relationship between regulatory reform (as the move to incentive regulation is often called) and outcomes in the market. The outcome on which this paper focuses, and on which much work in this area focuses, is the effect on basic local rates of a move to incentive regulation. The local service is the most standardised service across States, so it is easy to understand discussions of the basic local rate (whereas the remainder of the telecommunications rate structure is hard to summarise with one number, or even a few numbers). The basic local rate is also the most politically sensitive and visible rate.

The disadvantage of using this standard of comparison is that local exchange carriers tend to claim that local rates in the United States are below costs. This is a matter of some controversy. However, to the extent that this is systematically true, basic service rates are a poor indicator of the effectiveness of regulatory reform. (Carriers would not necessarily want to lower a rate that was already below cost.) Thus, to conclude that moving to incentive regulation did not lower local rates may be a point in its favour rather than a criticism.

1.4 Alternative regulatory regimes

Three types of regulation are under discussion: price cap regulation, rate of return regulation and earnings sharing regulation. This section also explains the subsidiary conditions that may be part of any regulatory reform legislation, focusing on the separate impact of such provisions.

Price cap regulation

Price cap regulation is fairly ubiquitous these days, so I will not spend much time describing it. In any price cap regime, one must construct a price index, *(P)* or a group of such indexes for comparing the levels of multiple prices. Almost invariably, the weights used in such an index are the quantities or revenues of the previous period. Thus, a typical price index would be:

$$P^t = \sum_{j=1}^{n} p_j^t Q_j^{t-1} .$$

One must also construct a cost index *(I)*, to represent the general level of costs. Often, this index merely measures changes in the consumer price index, so $I^t = I^{t-1}(1+\Delta CPI)$. But other cost indexes can and have been used. Those that are more closely related to the input costs of firms in the industry are better for tracking the cost experience of that particular industry, as opposed to prices in the economy as a whole.

If one were regulating natural gas distributors with price caps, for example, use of the consumer price index as a cost index would ignore the impacts on the firm of variations in the wellhead price of gas. On the other hand, a regulatory scheme that merely 'passed through' increases in wholesale gas prices would not give the distributor any incentive to seek out the best supply prices. There is always this fundamental tradeoff in the choice of a cost index: industry specific indexes help prices track costs incurred, while exogenous indexes such as the consumer price index provide the best incentives because they are outside the direct control of the firm. The best compromise would seem to be an index that tracks changes in raw materials, wage rate and other industry variables, but does not depend on the choices of the firm. However, for price cap regulation in the telecommunications industry, the consumer price index typically forms the basis of the cost index used.

The typical price cap formula also employs a productivity offset factor — the *X* factor. The *X* factor is usually referred to as a productivity factor, yet it need have no relation to past or prospective industry productivity gains. It could be set equal to the expected achievable annual productivity gain in an attempt to maintain firm profit at its initial level. Nevertheless, the *X* factor is merely a parameter through which any cost savings realised by the firm can be shared with consumers.

Thus the typical price cap constraint is that the percentage increase in the price index must not exceed the percentage change in the cost index, as reduced by the productivity offset (*X*) factor. That is:

$$\frac{P^t}{P^{t-1}} \leq \frac{I^t}{I^{t-1}} - X.$$

Other features often accompany or modify the basic constraint (such as bands and/or baskets). Bands are upper and lower limits on the annual change in any individual price, which are usually introduced for political reasons. Consumer interest groups tend to support ceilings on politically sensitive basic service rates. Competitors tend to support floors placed under the rates charged for competitive services. British Telecom first introduced bands when, during the period of its initial price cap formula, it was able to boost its basic connection price by about 25 per cent while staying within its overall price cap constraint. Most plans adopted since have included bands on politically sensitive rates. 'Baskets' are various categories of the firm's services to which separate price indexes apply. Common

examples are separate baskets for basic and enhanced service and/or monopoly and competitive services.

Given that the costs incurred by the firm play no role in determining the prices it receives for its services, strong incentive virtues are associated with pure price cap regulation. During the period for which the formula is in place, the firm can keep all the cost savings it discovers.

Rate of return regulation

Rate of return regulation has never really spread beyond its origin in the United States. It is often dismissed as some type of unsophisticated cost-plus regulation, but I want to focus my remarks on its advantages. One reason is that I want to help lay the ground work for the empirical results (or non-results) that follow. Another reason is that there really is a lot to be said for rate of return regulation, as people may rediscover over the next decade or so as various price cap schemes lead to politically unacceptable results.

How does rate of return regulation work? It is important to keep in mind what rate of return regulation is trying to accomplish. Its purpose is to ensure the recovery of the costs of long lived sunk assets that produce services whose prices are subject to regulation. In such a situation the power to regulate is the power to confiscate. The only way to produce these investments is to have some sort of commitment device that ensures that the costs of these investments will be recovered in some systematic way.

In its essence, rate of return regulation ensures that a return on capital and a return of capital are included in the determination of the firm's revenue requirement each year. The basic equation of rate of return regulation is:

$$RR_t = OE_t + D_t + sRB_{t-1}.$$

The revenue requirement in any year t is equal to the operating expenses (OE_t) incurred in that year, plus the allowed (fair) rate of return, s, multiplied by the book value of the rate base entering that period (RB_{E-1}), plus the depreciation expense in the current year (D_t). (The book value of the rate base at the end of any year t is simply the acquisition price less the sum of accumulated depreciation charges.) Thus the rate of return regulation process generates revenues for a return *on* capital and a return *of* capital. The depreciation policy chosen allocates the costs of the firm's long lived investment over the years during which it provides services. A simple accounting formula, such as straight line depreciation, is usually employed.

(The importance of depreciation policy in a competitive environment is a subject for another paper.)

A rate of return regulation regime establishes a commitment for a stream of revenues and quasi-rents that will recover the costs of capital investment and provide an adequate return on the invested capital. This provides investors with the assurance that their investment will not be later confiscated by state action. US legal precedents have established that, neither a State government nor the Federal Government can commit not to regulate an industry. If the legislature sees an opportunity to make political capital by regulating some price, it can do it.

The limits on such state action were established in the Supreme Court case *Hope Natural Gas v. Federal Power Commission* during the 1940s. The Court found that government cannot regulate a firm in such a way that it confiscates its investment. This is why rate of return regulation evolved in the United States — a result of the inability of the government to commit not to regulate, combined with the constitutional limitation on the power to confiscate through regulation. That tension is still there. The elimination of rate of return regulation does not eliminate the tension that led to that regulation. As price cap regimes unwind, the tension may cause problems again. There are probably analogous tensions everywhere, even if not as sharply drawn as in the United States. Political considerations will eventually come into play. If regulated firms begin to earn 'excess' profits, for example, there will be political pressure to clamp down on their rates. If they start to go broke, there will be political pressure to give them relief of various kinds.

The disadvantages of rate of return regulation are well known. First, rate of return regulation provides little incentive for cost reduction because any savings resulting from cost reducing innovations are passed on to ratepayers at the next rate case. Second, holding a rate case is a time consuming and costly process. Finally, implementing the basic revenue requirement equation requires detailed information about the operations of the firm (costs, investment expenditures, and so on). None of this is required to implement price cap regulation, only revenues, the prices for the last period and the firm's proposal for the current period. This sharp contrast between rate of return regulation and price cap regulation needed an empirical comparison. My colleague Ron Braeutigam and I agreed to conduct such a comparison for an American Economics Association session several years ago, then we realised that while everybody talked about price cap regulation the early 1990s, nobody actually did it.

Earnings sharing regulation

Almost all the States adopting 'incentive regulation' during the late 1980s and early 1990s were actually practising earnings sharing or sliding scale regulation. This process involves a rate proceeding much like the traditional rate of return regulation rate case. Rates are set based on some target 'fair' rate of return. After the actual earnings of the firm are realised, the firm is allowed to keep all profits until that target rate of return is achieved. If earnings are such that the firm would earn more than the target rate, those 'excess' earnings are shared between the firm and its ratepayers (usually by means of rebates). Finally, if earnings are so good that the firm would achieve a rate of return greater than an agreed upon maximum rate, all such earnings are returned to the ratepayers.

The theoretical advantage of this form of regulation is that it is a mixture of a fixed price and a cost-plus contract that arise from simple models of procurement and regulatory models. Earnings sharing regulation has many of the cost incentive advantages of a fixed price contract, combined with the ability of cost-plus contracts to control profit levels. The disadvantage is that earnings sharing regulation requires every bit as much information as needed for traditional rate of return regulation.

1.5 Analysing the effects of alternative regulatory regimes

To analyse the performance of incentive regulation, it is necessary to recognise that there are at least two kinds of incentive regulation to deal with, and that their effects may well be different. Table 1.1 shows the pattern of adoption of types of incentive regulation over the past 15 years. In 1985, all 50 States had rate of return regulations. The category 'rate case moratorium' is roughly equivalent to what Braeutigam, Magura, and I (1997) treat as a 'rate freeze' — that is, a side condition that can be imposed on any regulatory regime rather than a separate regime category. Under rate of return or earnings sharing regulation, rates cannot be changed without a rate case. Thus, a rate case moratorium is tantamount to a rate freeze under those regimes. Price cap regulation is sometimes introduced in conjunction with a simple rate freeze. Given that regulatory reform usually required legislative action, states often began the reform process by refraining from holding rate cases, thereby freezing rates.

As the incentive regulation bandwagon gathered momentum, more and more States instituted a freeze (table 1.1). States began introducing earnings sharing plans in greater numbers. Price cap regimes were very rare, growing in number only gradually until 1996. There was only one price cap State in 1991, and only three

existed in 1993. In 1996, many States suddenly switched to a price cap from

Table 1.1 **United States — State based regulatory regimes, 1985–96**

Year	*Rate of return*	*Rate case moratoria*	*Earnings sharing*	*Price cap*	*Other*
1985	50	0	0	0	0
1986	45	5	0	0	0
1987	36	10	3	0	1
1988	35	10	4	0	1
1989	29	10	8	0	3
1990	23	9	14	1	3
1991	19	8	19	1	3
1992	18	6	20	3	3
1993	17	5	22	3	3
1994	20	2	19	6	3
1995	18	3	17	9	3
1996	14	4	5	24	3

Source: Ai and Sappington (1998).

earnings sharing regulation, which had been gradually replacing rate of return regulation. This change was undoubtedly a result of the *Telecom Act 1996*, which allowed the Federal Communications Commission to pre-empt some State regulatory authority. The act also shifted the focus of regulatory policy to access pricing.

Between the mid 1980s and the mid 1990s there has been substantial variation in how States exercised discretion regarding their choice of regulatory regime. Thus, the investigator wishing to study the effects of incentive regulation can put together a panel data set involving 40 plus States over six to ten years. The remainder of this paper reviews attempts to carry out such analysis.

However, note that there can be no theoretical answer to the question, what regulatory regime will lead to lower rates? For all of the regulatory regimes under consideration, the outcome for rates or anything else depends on the parameters chosen by the regulator. Under price cap regulation, the resulting price level will depend on the size of the *X* factor, as well as on the nature of any bands and baskets. Under earnings sharing regulation, the details of the sharing rules and the rate of return thresholds will certainly influence the prices charged by the firm. Similarly, under rate of return regulation, the depreciation policy and the allowed rate of return will directly affect the prices charged by the firm. Thus, from a theoretical point of view, it is impossible to predict that one regime will lead unambiguously to lower local rates than would result from the others.

1.6 Review of empirical studies

The empirical issues that must be addressed are messy. The first issue concerns regime classification. How many distinct regulatory regimes are in the sample? That is, when do differing characteristics between State plans justify classifying them as separate regimes as opposed to variations of the same type of regime? Alternatively, are there additional, separately identifiable characteristics of plans that should be analysed along with the choice of regime? The second issue concerns endogeneity. The most common approach is to assume that the choice of regime is exogenously determined before the outcome of the rate determination process that occurs under the regime. Alternatively, it seems reasonable to assume that the same (unobserved) factors that influence rate determination will also affect regime choice. These are the two main issues on which I will focus in my discussion of the literature.

Tardiff and Taylor

Perhaps the earliest study in this area was produced by National Economic Research Associates, co-authored by Timothy Tardiff and William Taylor in 1993. Their model was based on the following equation:

$$p_{it} = \alpha_i + \lambda_t + \Sigma_k(REGIME_{it})\beta_k + \varepsilon_{it.}$$

That is, the price in State *i* in year *t* is equal to some State-specific constant, some time varying parameter, plus a group of dummy variables and their coefficients. Tardiff and Taylor included several categories of incentive regimes (including price caps and earnings sharing) which they thought summarised the situation in 1991. Their basic finding was that incentive regulation, as reflected in any of these regimes, reduced intrastate, intraLATA toll rates, but did not have any significant impact in reducing local service rates.

The main criticism of this early study was that it could have better captured quite a bit of political, economic and demographic variation across States and over time by using additional exogenous variables, rather than relying on State and time dummy variables.

Crandall and Waverman

Robert Crandall and Leonard Waverman (1995) attempted to remedy the shortcomings of the Tardiff and Taylor study. The basic equation of their analysis was:

$$p_{it} = \alpha\mathbf{X}_i + \lambda\mathbf{Z}_{it} + \Sigma_k(REGIME_{it})\beta_k + \Sigma_s(ATT_{it})\,\beta_s + \varepsilon_{it}.$$

Here, $\mathbf{X}_i$ is a vector of exogenous variables that vary across States and $\mathbf{Z}_{it}$ is a vector of exogenous variables that vary across time and States. The equation also includes regime dummies for price cap and earnings sharing regulation, as well as a set of attribute dummies, ATT_{it}. The attributes they considered were whether the reform plan enacted included a rate freeze and whether competition was allowed or introduced under the plan.[1]

The most significant aspect of Crandall and Waverman's approach was to separate the effects of price cap regulation from the effects of earnings sharing regulation. They found that price cap regulation led to significant rate reductions but that earnings sharing did not.

The criticisms of their approach are as follows. First, they did not control for the effects of the incentive regulation conditional on the statutory attributes of the various State plans. That is, most new plans could be introduced by only legislative action because the existing statutes almost invariably specified rate of return regulation as the regulatory regime. Often the new enabling legislation included attributes such as minimum amounts of investment in infrastructure, quality incentives in the rate plan, and so on. Second, Crandall and Waverman did not include the state-level fixed effects variable that Tardiff and Taylor used. Finally, they also did not allow for endogenous regime choice.

Braeutigam, Magura, and Panzar

Ron Braeutigam, Matt Magura and I (1997) attempted to address all the above issues. We employed the following estimating equation:

$$p_{it} = \alpha_{0i} + \alpha\mathbf{X}_i + \lambda\mathbf{Z}_{it} + \Sigma_k(REGIME_{it})\beta_k + \Sigma_k\Sigma_s(ATT_{it})(REGIME_{it})\beta_{sk} + (COMP)\beta_{COMP} + \varepsilon_{it.}$$

Here, α_{0i} is a State fixed effects variable, $\mathbf{X}_i$ is a vector of exogenous variables across States, and $\mathbf{Z}_{it}$ is a vector of exogenous variables that vary over time and across States. We modelled regime choice using separate dummy variables for price caps (PC) and earnings sharing (ES) — that is, REGIME={PC, ES}. We interacted these regime variables with attribute dummy variables that took into accounted whether the plan had quality incentives, buyout provisions, infrastructure investment requirements and/or a rate freeze — that is,

[1] Such competition was not in local services but in other markets of the incumbent monopolies, such as intraLATA, intrastate toll, call waiting, and other so-called vertical services. The notion is that competition in these other markets may force the firm to have higher local rates.

ATT={FREEZE, BUYOUT, QUALITY, INVEST}. We also used a separate dummy variable for competition. This specification allowed us to attempt to distinguish the impacts of the two forms of incentive regulation from the effects of various plan attributes. The interaction terms allowed the plan attributes to have different effects in different regulatory regimes.

Our regime variables for price cap and earnings sharing in the above regression equation were fitted values from a 'first stage', regime choice equation. The idea is the same as applying two stage least squares. Given that the choice of regime is thought to be endogenously determined, instruments were employed to explain the choice of regime. Then, the fitted values from this trinomial logit 'first stage' regression were used in running a price equation regression.

Our basic findings were as follows. First, we rejected the hypothesis that the regime choice was exogenous. Second, we also rejected the binomial logit specification in favour of the trinomial logit specification; that is, we rejected the notion that there is no difference between a price cap and an earning sharing regime choice. Finally, we found, when interactive effects with plan attributes are controlled for, neither price cap nor earnings sharing regulation did not have any additional significant effect on local rates.

The primary limitation of our study has to do with the fact that our panel ended in 1993. As shown in table 1.1, much has happened since then. Second, the selection of this sample period resulted in the specification of an irreversible model of regime choice, whereby we assumed that each State would change regimes at most once.

This 'seemed like a good idea at the time'. When we developed the model, States had either changed from rate of return regulation or not, and any changes involved switching to either earnings sharing or price cap regulation. None had ever switched back, and there had never been a switch between earnings sharing and price cap regimes. It seemed like a natural approach to model the choice as an irreversible process, with some probability at any date of switching. If a State switched, then it was removed from the sample. This is a much more difficult model to implement than a specification that allows the regime choice to be completely 'free' each period, in terms of the basic modelling. However, many States have somehow managed to 'flip flop' since 1995, and the regime choice process needs to be respecified.

Magura

An overlooked question in this whole literature is whether incentive regulation actually lead to improved incentives. Most of the discussion thus far has focused on

the effects of regulatory regime changes on local rates. However, a price cap regime operates by giving the firm the incentive to reduce costs. Thus, even if rates never fall, a price cap regime may be effective in allowing the firm to reduce costs. This is difficult to investigate because the investigator rarely observes a firm's economic costs.

Matt Magura (1999) developed a structural regulatory incentive model using the framework developed by Laffont and Tirole. He also found a way to estimate the model's parameters under the maintained hypothesis that local rates are set residually — that is, under the assumption that all other rates are set at their profit maximising levels. Magura found that incentive regulation schemes do provide sharper incentives than provided by rate of return regulation, and rate of return regulation itself is not a purely cost-plus system. This is an interesting ancillary result, because it has long been argued that any cost reduction that occurred under rate of return regulation reflected regulatory lag (the time period that elapses before cost savings are reflected in lower rates).

Ai and Sappington

We might like to address other issues in the context of incentive regulation. An important issue, especially in less developed countries, concerns the creation of incentives for investment in infrastructure. Various characteristics of the network, such as the proportion of electronic switches or the extent of deployment of fiber optic cable, could replace local rates as the dependent variable. The impact of regime changes on service quality and firm expenditures can also be analysed in this way.

Ai and Sappington (1998) conducted such an investigation. They found, *inter alia*, that:

- both price cap and earnings sharing regulation enhanced modernisation of the network;
- neither price cap nor earnings sharing had any effect on operating costs;
- only price cap regulation led to a decline in local rates;
- only price caps increased profits;
- service delays increased under all types of regulatory reform; and
- complaints decreased under all types of regulatory reform.

They analysed several other variables. Most of the results were insignificant. They treated regime choice as exogenous because they could not reject the hypothesis of exogeneity using a Hausman test.

1.7 Conclusions and suggestions for future research

The laboratory of the States provides an environment in which it is possible for economists to analyse systematically the impact of various public policy decisions such as the choice of regulatory regime. There are many interesting but unresolved empirical issues in this area. It is important to recognise that such policy variables are endogenously determined, but the econometric model used here must be revised.

An interesting project would be to develop a political economy model to explain this endogenous regime choice. What about the various States or jurisdictions of governments predisposes them to remain with traditional rate of return regulation or switch to a more modern (currently popular) form of regulation?

Our paper (Braeutigam, Magura and Panzar 1997) modelled this purely empirically to obtain fitted values for our price equation. We threw in all the exogenous explanatory variables we could find to explain some of the variance in these regime choices, but we did not have any model that predicted the impacts of various exogenous variables. Such a model is clearly necessary if one hopes to understand the causes of a regulatory regime change in addition to measuring its effects.

References

Ai, C. and Sappington, D. 1998, 'The impact of State incentive regulation on the United States telecommunications industry', *University of Florida Economic Discussion Paper*, Gainsville.

Braeutigam, R. and Panzar J. 1993, 'Effects of the change from rate of return regulation to price cap regulation', *American Economic Review,* vol. 83, no. 2, pp. 191–8.

Braeutigam, R., Magura, M. and Panzar J. 1997, 'The effects of incentive regulation on United States local telephone rates', Northwestern University mimeo, Chicago.

Crandall, R. and Waverman, L. 1995, *Talk is Cheap: The Promise of Regulatory Reform in North American Telecommunications*, The Brookings Institution, Washington.

Magura, M. 1999, 'Regulatory reform in United States intra-State telecommunications', Unpublished Ph.D. dissertation, Northwestern University, Chicago.

Tardiff, T. and Taylor, W. 1993, Telephone Company Performance under Alternative Forms of Regulation in the United States, National Economic Research Associates.

SECTION II

OVERVIEW OF RECENT DEVELOPMENTS IN REGULATION

2 Issues in access

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2.1 Introduction

Infrastructure access is a key part of the National Competition Policy. It is now more than three years since the general (part IIIA) access regime was included in the *Trade Practices Act 1974*. Industry specific access regimes have since been introduced, for example, to cover telecommunications and airports. But these regimes remain controversial and, in the case of part IIIA, appear to face considerable problems of interpretation.

In this paper, we consider some issues surrounding access in Australia. Section 2.2 considers the problem of implementing the existing part IIIA rules. It is clear that the wording of part IIIA has significant limitations and it is unlikely that the rules capture the underlying economics of essential facilities.

Granting infrastructure access is only a first step towards achieving competition. In section 2.3 we examine the issue of access pricing. A substantial literature in economics examines access pricing from the perspective of maximising social welfare. In this paper, we take a slightly different approach and investigate desirable access pricing when the regulator wants to guarantee that downstream competition is competitively neutral. This is important when the upstream access provider is also a participant in downstream retail competition, such as in the telecommunications and electricity industries. We show that pricing to reflect the true short run marginal cost of access is necessary to avoid the potential for an access provider or access seekers to manipulate competition. Further, to allow both the access seekers and the access provider to face identical incentives to either enter or exit markets, fixed access costs need to be reflected in fixed access charges.

Inevitably, regulators have imperfect information about the costs of access, and marginal access prices are often set above the true short run marginal cost of access.

In these circumstances, a vertically integrated access provider will be able to strategically manipulate downstream competition. Is this manipulation desirable or will it harm consumers and long term competition? In particular, given the access prices, how should a regulator judge the retail prices set by an integrated firm? When will these prices be anticompetitive?

In section 2.4, we consider this problem and suggest that imputation rules can provide the regulator with some guidance. These rules have occasionally been discussed in the international literature on regulation, but they have been only poorly specified. We argue that there are (at least) two imputation rules that a regulator needs to consider when evaluating the retail prices of a vertically integrated access provider — a revenue imputation test and a marginal imputation test. We use a simple example to show how these rules can be used to detect anticompetitive behaviour.

2.2 Issues in part IIIA

What is the 'use of a production process'?

Under s44B of the *Trade Practices Act 1974*:

> 'service' means a service provided by a facility and includes:
>
> (a) the use of an infrastructure facility such as a road or a railway line;
>
> (b) handling or transporting things such as goods or people; …
>
> but does not include:
>
> (f) the use of a production process; except to the extent that it is an integral but subsidiary part of the service.

The wording of this section of the Act is clearly open to various interpretations. In particular, the federal court recently decided that a railway line owned by Hamersley Iron in Western Australia (used to transport iron ore), provides services that are 'the use of a production process'.[1]

The term 'production process' is not defined in the Act. In economics, 'production' simply refers to any value adding activity. At its most general, a production process would involve any economic activity that adds value to a product (which can be a good or a service). The dictionary definition appears consistent with the broad

1 See *Hamersley Iron Pty Ltd v the National Competition Council, 1999, FCA 867* (28 June).

economic definition. The Collins Australian Dictionary defines production as 'the producing of goods and services' with produce being defined as 'to make or manufacture' or 'to bring forth'.

This broad interpretation of 'production' clearly provides little assistance. It suggests that any process that adds value is a production process. But the Act refers to a 'service [that] … does not include … the use of a production process'. Clearly the Act means something narrower than the economic meaning of a production facility.

Justice Kenny, in *Hamersley Iron Pty Ltd versus the National Competition Council*, stated that:

> The expression 'production process' in the definition of 'service' in s44B of the Act means, in my view, a series of operations by which a marketable commodity is created or manufactured. Hamersley's production process in the Pilbara extends, on this view, from its commencement of mining operations at the mines to the completion of the product that it sells, namely, export product. There was no evidence to show that Hamersley produces a marketable commodity at an earlier stage. (paragraph 34)

Further, Justice Kenny states that:

> Hamersley's use of its railway line (and associated infrastructure) is, it seems to me, one in a series of operations that result in the creation of its export product. … By the use of its railway line (and associated infrastructure) it does not merely convey ore by rail from mine to port, it makes up the recipe that it has formulated for the creation of a particular batch of its product. The making-up of a recipe for a batch of product depends on the line being made available (by Hamersley) for Hamersley's use. … It follows from this that Hamersley's use of its railway line is an integral (indeed, essential) operation in Hamersley's production process. (paragraph 41) [2]

The interpretation adopted by Justice Kenny raises the possibility of firms avoiding part IIIA declaration by integration. Suppose one firm owns a gas transmission pipeline while a different firm carries out distribution and retailing. At present, it may be considered that the transmission company simply provides the service of transporting gas from the fields to the city gate. As such, the transmission pipeline may be declarable. But if the gas retailer and the transmission company merge, then the pipeline would provide services at only one stage of the process of gas production. These services are essential to the process of producing the marketable product (gas) for the integrated company. The gas transmission services provided by the pipeline are now only one part of a production process. In particular, after integration, if the firm can show that the pipeline does not 'merely convey' gas from field to city gate, then the pipeline should not be declarable.

2 At the time of writing this paper, the decision by Justice Kenny is under appeal.

If integration can be used to avoid declaration under part IIIA, then this is a considerable source of concern. Firms may inefficiently merge to reduce their regulatory risk. It also appears to be the exact opposite of the result envisaged by the Hilmer report. In fact, the report concentrated on vertically integrated firms, noting that access issues will be most acute for these firms and that 'the preferred response … is usually to ensure that natural monopoly elements are fully separated from potentially competitive elements' (Hilmer, Raynor and Taperell 1993, p. 241). Under Justice Kenny's interpretation, the access laws may lead to more integration and exacerbate the access problems noted by the Hilmer report.

Promoting competition in a 'market'

Under s44G2 of the Trade Practices Act, the 'Council cannot recommend that a service be declared unless it is satisfied … (a) that access (or increased access) to the service would promote competition in at least one market (whether or not in Australia), other than the market for the service'. The economics of this test are rather obvious. The aim of access is to increase social welfare. If social welfare (and particularly consumer surplus) has been limited by monopoly abuse, then access is one way to increase competition and welfare.[3]

If the aim of access policy is to raise social welfare, then the focus should be on the relevant markets for final goods and services. If access improves competition and lowers prices at one stage of the production process, for example, but market power further down the production chain means that this competition does not feed through into lower consumer prices, then there is unlikely to be a significant welfare gain.[4] Thus access is desirable if it promotes competition (in the sense that it leads to prices that better reflect social costs) in final goods and services markets.

The National Competition Council has not approached the 'promotion of competition' test with final markets in mind. The Commission has placed considerable weight on the test of vertical market definition suggested by Henry

[3] The National Competition Council (1997, p. 13), in its recommendations on Specialised Container Transport applications for declaration of services provided by Westrail (21 November 1997), notes that '[t]he purpose of this criterion is to ensure that declaration is only recommended where there are or will be tangible benefits that flow beyond the service to which access is sought. Tangible benefits usually take the form of reduced prices, but can manifest in other ways'. Further, '[c]ompetition will be promoted in different markets if the improved terms and conditions achieved in the [relevant access] market influence the conditions upon which products are available to consumers in the different markets'.

[4] There may be some gain through downstream firms using a more efficient mix of inputs, and to the extent that these gains exist they are likely to lead to lower prices downstream.

Ergas in his submission in support of Carpentaria's application. But in general this test will not lead the Council to focus on final market competition.[5] Further, it is far from obvious that the test is consistent with Australian legal experience in trade practices.

The Ergas test uses a two-stage approach: is it feasible for the relevant vertical layers to be separated or would the costs of such separation make it infeasible? and are the assets involved with each level sufficiently specialised to prevent 'supply-side substitution' between the layers? The Council's use of this test has focused on relatively narrow vertical distinctions such as the services provided by a rail line being in a different market from rail freight. But, even if these are separate markets, the real concern is whether there is a social benefit in terms of lower consumer prices. Does the declaration of a rail line promote competition in a variety of final goods markets by lowering freight rates, for example?

The Council's approach does not appear consistent with the court decisions in either the TruTone case in New Zealand or the recent Australian decision in *Regents Pty Ltd v Subaru (Aust) Pty Ltd* (1998). In both these cases, the courts decided that production stages that would clearly satisfy the Ergas test were not separate markets.

The 'development' test

Under s44G2 of the Trade Practices Act, the 'Council cannot recommend that a service be declared unless it is satisfied … (b) that it would be uneconomical for anyone to develop another facility to provide the service.' This test has led to considerable discussion, about what the test is supposed to say and what it actually says. The National Competition Council (1996) argues that '[t]he policy intent underlying the access regime is to focus mainly on what economists call "natural monopoly" situations'. The Council refers to the Second Reading Speech for the Competition Policy Reform Bill (p. 22), and justifies this view in its recommendation on the New South Wales Minerals Council. The Council claims that 'industries with natural monopoly characteristics will not allow viable duplication'. However, this claim is clearly incorrect. A potential entrant in an industry characterised by natural monopoly technology will make their decision on the basis of expected profits. These will depend on an evaluation of expected post entry competition. Subject to expectations about post entry competition, an entrant may successfully duplicate existing facilities and enter an industry in which production is characterised by natural monopoly technology.

5 This is not a criticism of the Ergas test but of the wording of the legislation.

If the 'anyone' in the test represents an individual, then 'uneconomical to develop another facility' does not mean that the facility is a 'natural monopoly'. Depending on the degree of competition, it may be 'uneconomical to develop another facility' even though the industry is not characterised by natural monopoly technology. In fact, the standard textbook version of perfect competition defines long run equilibrium in any industry as the situation where it is 'uneconomic' for any firm that is currently not in the industry to 'develop' its own facilities and enter the industry. Conversely, an industry may be characterised by a natural monopoly technology but have more than one firm competing in the industry with duplicate facilities. In fact, the standard model of natural monopoly technology with Cournot competition usually involves long run equilibria with multiple entrants and multiple facilities.

In brief, criterion (b) is neither satisfied by showing that a facility is a natural monopoly, nor exclusive of facilities that are not natural monopolies. The criterion states that it must be 'uneconomical for anyone to develop'. It is not immediately clear what bounds must be placed on the term 'anyone'. One interpretation is that 'anyone' refers to an actual or potential market participant. This interpretation appears to accord with the views of the National Competition Council. In its recommendation on Carpentaria, the Council (1997, p.37) states that it agrees with the view of Henry Ergas: '[T]he key question must be whether it is likely that an actual or potential market participant would find it commercially worthwhile to duplicate the facility in question'.

However, the Council appears to have focused its attention on whether the applicant can economically develop another facility. It seems clear that the intention of the criterion can only be met if the term 'anyone' is interpreted more widely than simply 'the applicant'. Further, there is considerable economic danger in equating 'anyone' with 'the applicant'.

If the only consideration is whether the applicant can economically develop another facility, then the criterion is biased towards poorly funded, uncompetitive, potential market participants. Declaration would then depend on the identity of the applicant, and a poorly funded applicant who could not afford to develop another facility may succeed in a declaration application where a better funded, more competitive market participant would fail.

The National Competition Council has suggested that the criterion should be interpreted as a social test. This would involve an explicit natural monopoly test so the criterion would only be met if it is socially undesirable to develop another facility. It is far from obvious that such a test is either workable or in line with the current wording of the criterion. It can be difficult to determine whether a facility

has a natural monopoly technology. If the Council follows this path, they may find themselves engulfed in extensive and contradictory econometric analyses.

Further, such a social test is open to controversy. A natural monopoly technology depends on both the current state of a technology and the level of demand. What level of (post entry) production and demand does the Council consider when analysing the existence of a natural monopoly technology? A technology may be, for example, a natural monopoly at current (monopoly firm) output levels but not a natural monopoly at higher levels of output consistent with competition.

2.3 Vertical integration, access prices and competitive neutrality

There has been significant debate, in Australia and overseas, about optimal access pricing. It is not our intention to revisit this literature. But access pricing will affect the nature of competition in the relevant final product market. In particular, if an access provider is vertically integrated into the relevant downstream market so its upstream operations supply access to its downstream competitors, then access pricing will influence downstream competition and determine if this competition is systematically biased towards or against the access supplier.

Consider a two-stage production process that involves access. The first (upstream) stage requires access to an essential input. The second (downstream) stage involves adding value to the upstream essential input and selling the final product. The final product is a well defined good or service. The true (short run) marginal cost of access is constant and given by c_a. The regulated marginal price of access is given by p_a. There may also be other fixed access charges. The relevant costs underlying these charges are denoted by A while the access charge is denoted by F.

Downstream production technology involves a fixed ratio of access input to final product output. For simplicity, we normalise units so one unit of access input is required for one unit of output. The downstream technology can be quite general but we assume there is no natural monopoly in downstream production. We assume all downstream firms have access to the same technology. The variable costs of downstream production are given by $C(q)$ where q refers to the output of an individual downstream firm. We assume $C'(q)$ and $C''(q)$ are both non-negative. There may also be downstream fixed costs denoted by R. Including the access charges, a (nonintegrated) downstream firm, i, faces production costs $R+C(q_i)+F+p_a q_i$. The integrated firm faces total production costs (including the costs of producing access) of $Qc_a+(n+1)A+R+C(q_I)$ where Q is the total output of the final product, I denotes the integrated firm, and there are n nonintegrated downstream

firms. In other words, the total costs of the integrated firm are simply the total costs of producing access plus the additional costs generated by its participation in the downstream market.

Downstream competition will be *competitively neutral* if the access provider's ownership of one downstream firm does not either create artificial benefits or impose artificial costs on that downstream subsidiary. We can define two separate forms of neutrality. The first is strategic competitive neutrality. Downstream competition will be *strategically neutral* if the strategic incentives that govern the behaviour of the downstream firms do not depend on whether a firm is integrated with the access provider. In other words, given participation in the downstream market by a fixed number of firms (including the integrated firm), strategic competitive neutrality means that the behaviour of the integrated firm does not systematically differ from that of the nonintegrated firms purely as a consequence of its integration.

Second, consider *competitively neutral entry*. Even if competition after entry into production of a specific product is strategically neutral, entry will only be competitively neutral if all firms face the same incentives to enter and compete in production. Entry is not competitively neutral even if there is strategic neutrality when entry incentives depend on integration.

Suppose there is a 'niche' product that may be profitable for one producer. If the industry is competitively neutral for entry, then whether a firm enters and produces that product will not depend on whether it is owned by the access provider.[6]

Strategic competitive neutrality

Suppose the (inverse) demand curve for the final product is denoted $P(Q)$ and downstream firms compete by simultaneously setting their level of output. The integrated firm has no control over the access prices, which are fixed, and must supply access on demand to the downstream competitors at the fixed prices. Each nonintegrated downstream firm will individually set its output q_i to maximise $q_i P(Q) - R - F - C(q_i) - p_a q_i$. The first order condition for the profit maximising output decision of a nonintegrated downstream firm is given by $P(Q) + q_i P'(Q) - C'(q_i) - p_a = 0$.

[6] Note that neither definition of neutrality rules out legitimate economies or diseconomies of scope that may exist between upstream and downstream operations. These economies, if they exist, reflect efficiencies or costs that may arise from integration. Competitive neutrality is not concerned with these costs or efficiencies, just as it is not concerned if one nonintegrated downstream firm has a competitive advantage because it is better managed than another firm. Rather, non-neutrality reflects a cost or benefit that arises purely because one downstream firm is owned by the same people who own the upstream firm.

The integrated firm will set its output q_I to maximise $Q[p_a–c_a]+(n+1)[F–A]+q_IP(Q)–R–F–C(q_I)–p_aq_I$. The first order condition for profit maximisation is given by $P(Q)+q_IP'(Q)–C'(q_I)–c_a=0$. Both first order conditions require that marginal revenue less the marginal cost equals zero. But the integrated firm considers the real marginal access cost rather than the regulated cost in its decision making. If p_a is not equal to c_a, then there will not be (strategic) competitive neutrality between integrated and nonintegrated downstream competitors. If p_a is greater than c_a then nonintegrated firms will face higher marginal costs than those facing the integrated competitor, and they will be at a competitive disadvantage. If p_a is less than c_a, then nonintegrated firms will be artificially advantaged.

Comment 1: (Strategic) competitive neutrality will only be satisfied if the marginal price of access equals the true short run marginal cost of access.

Note that strategic competitive neutrality is different from efficiency. It will often be efficient to set marginal access prices equal to short run marginal cost.[7] Further, Comment 1 shows that marginal cost pricing is also required if competition is not to be systematically biased when the access provider is vertically integrated.

Entry and exit neutrality

We now consider competitively neutral product entry. Suppose there is post entry strategic neutrality so p_a equals c_a. Each downstream firm will produce a level of output q^* after entry. In particular, q_I equals q^* in post entry equilibrium. Total production Q^* equals $(n+1)q^*$. When considering whether to enter production of the relevant product (that is, to pay the fixed costs R and F), a nonintegrated firm will want to compare the variable profits generated in the post entry competition with the fixed costs of entering production. A nonintegrated downstream firm will only commence production if $q^*P(Q^*)–R–F–C(q^*)–p_aq^*$ is positive.

If the upstream access provider does not enter production, then they still receive the access revenues generated by the n nonintegrated downstream firms. Let the equilibrium output with only n downstream firms be denoted by Q^{**}. Then, if the upstream firm does not enter downstream production, its profit is $Q^{**}[p_a–c_a]+n(F–A)$. If the upstream firm's downstream subsidiary enters production, then there are $n+1$ downstream firms and the integrated firm's total profits are given by $Q^*[p_a-c_a]+(n+1)(F-A)+q^*P(Q^*)-R-F-C(q^*)-p_aq^*$. Comparing profit for the integrated

7 See, for example, King and Maddock (1996). Under the imperfectly competitive model of production used here, it would generally be social surplus improving to set the marginal access price below marginal cost. See, for example, Armstrong, Cowan and Vickers (1994).

firm if it either enters or does not enter downstream production, it is found it is only profitable for the integrated firm to enter downstream production if $(Q^{*}-Q^{**})[p_a-c_a]+(F-A)+q^{*}P(Q^{*})-R-F-C(q^{*})-p_a q^{*}$ is greater than zero. By strategic competitive neutrality, p_a equals c_a. Comparing the incentives that face an integrated producer and nonintegrated producer to enter downstream production, these incentives only coincide if F equals A. If F is greater than A, then the integrated firm will have more incentive to enter production than will a nonintegrated downstream competitor.

Competitive neutrality for entry is equivalent to neutrality over exit incentives. If $n+1$ firms are in the industry but F is greater than A, then it may be profitable for the integrated firm to continue in downstream production even though it is not profitable for the nonintegrated firms.

Comment 2: Even if there is strategic competitive neutrality (that is p_a equals c_a), competitive neutrality over entry and exit decisions will only occur if the fixed charges for access are equal to the true fixed costs of access.

If the true fixed costs of access are less than the fixed costs charged to access seekers, then the integrated firm will have a competitive advantage in exploiting new types of product. Further, it will able to operate profitably even under conditions of free entry that drive the profits of nonintegrated downstream firms to zero.

2.4 Imputation tests and retail pricing

If access prices do not reflect the true costs of supplying access then downstream competition will not be competitively neutral. In particular, if p_a is greater than c_a then competition will be strategically biased in favour of the integrated firm. In these circumstances, what limits should a regulator place on the integrated firm's prices to prevent it abusing its market position?

One approach is to require that the integrated firm's prices must satisfy an imputation rule. At its simplest, an imputation rule states that the integrated firm cannot set a price for the final product such that the revenue it receives from the sale of that product is less than the price of the relevant access inputs (as seen by the integrated firm's competitors) plus the incremental cost of any additional value added services required for the final product.

The logic of such an imputation rule is that it imposes a degree of competitive neutrality on the integrated firm when operating in final product markets. The

integrated firm cannot set retail prices that would not be commercially feasible if it were in neutral competition with other firms.

There are (at least) two types of imputation test that a regulator could use. A *revenue imputation* test requires that the revenue earned by the integrated firm from the sale of a final product is no less than the cost of producing the product. This cost is calculated as if the integrated firm is buying access at the same price(s) facing its competitors who are not integrated.

A *marginal imputation* test requires that the marginal price charged by the integrated firm for its final product is no less than the marginal cost of producing the product. Again, this cost is calculated as if the integrated firm is buying access at the same price(s) facing its competitors who are not integrated.

To examine how imputation rules may prevent an integrated firm from engaging in anticompetitive conduct, consider the potential for the integrated firm to 'squeeze' its nonintegrated competitors when p_a is greater than c_a. Suppose downstream firms produce an identical product and compete by simultaneously announcing their price. With this form of Bertrand competition, analysis is greatly simplified by using constant marginal cost technology, so we will assume $C(q)$ equals Cq. Further, to simplify the analysis, let $R=F=A=0$. The costs of each nonintegrated downstream firm are given by $p_a q_i+Cq_i$. The integrated firm faces costs $c_a q_I+Cq_I$. Competition is not strategically neutral, so the marginal access price is set above marginal cost — that is, p_a is greater than c_a.

The pure strategy equilibrium will involve all firms setting P^* equal to p_a+C. Total sales will be given by Q^* where Q^* equals $P^{-1}(p_a+C)$. Consumers will be indifferent between downstream producers and will allocate themselves across these producers. We assume the gap between p_a and c_a is not so great that P^* exceeds the integrated firm's monopoly price. This means that nonintegrated downstream firms make zero economic profits while the integrated firm makes profits $(p_a–c_a)Q^*$. Further, if we consider total industry profits, we know this is increasing in the final product price at the equilibrium price P^*.[8]

The integrated firm, in this case, engages in a price squeeze if it lowers its final product price below P^*. Setting such a price will make the integrated firm's rivals uncompetitive and force them to leave the market. Further, such a pricing policy cannot be justified by standard profit maximising behaviour by the integrated firm. In particular, because total industry profits are increasing in price at P^*, and because

8 This follows from concavity of the industry profit function.

all these profits accrue to the integrated firm, we know that setting a price below P^* must lower the integrated firm's profits.[9]

An imputation rule can be used to detect the price squeeze. Given the specific cost assumptions in this example, the marginal and the revenue imputation tests are equivalent here. If the integrated firm engages in a price squeeze and sets its price below P^*, then the imputation rules are immediately violated. The imputed cost is given by the access price of p_a and the downstream cost of turning access into final product C. The per unit cost imputed to the final product is p_a+C and any price below this imputed cost could be viewed as anticompetitive.

Application of the imputation rule in this particular example is extremely easy. In general, application of imputation rules will be more complex, and behaviour that may be considered anticompetitive need not violate both rules. The different applications of imputation rules to detect anticompetitive behaviour is considered in more detail in King and Maddock (1999).

2.5 Conclusion

Infrastructure access has had a short but eventful history in Australia. Existing laws clearly have significant problems. Regulators are still grappling with difficult questions about access pricing and the pricing of related retail products. In this paper, we have attempted to briefly summarise the debate on some of these issues. If access is to be used successfully to foster competition in telecommunications and other infrastructure industries, rigorous analysis and some bold decisions will be needed.

References

Armstrong, M., Cowan, S. and Vickers, J. 1994, *Regulatory Reform: Economic Analysis and the British Experience*, MIT Press, Cambridge.

Hilmer, F., Raynor, M. and Taperell, G. (The Independent Committee of Inquiry) 1993, *National Competition Policy*, ABPS, Canberra.

King, S. and Maddock, R. 1996, *Unlocking the Infrastructure: The Reform of Public Utilities in Australia*, Allen and Unwin, Sydney.

[9] In this situation, a price squeeze would be very similar to predatory pricing. However, notice that the two types of behaviour differ because the integrated firm never formally sells the final product at a loss so long as it maintains a price below P^* but above its own production costs of c_a+C.

—— 1999, *Imputation Rules and the Regulation of Anti-competitive Behaviour in Telecommunications*, working paper, University of Melbourne, Melbourne.

National Competition Council 1996, *The National Access Regime: A Draft Guide to Part IIIA of the Trade Practices Act*, Melbourne.

—— 1997, Application for Declaration of Central Rail Freight Services Brisbane to Cairns Rail Corridor: Reasons for Decision, Melbourne, 3 June.

3 Monopoly price regulation in Australia: assessing regulation so far

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3.1 Introduction

This paper examines how well monopoly price regulation is working in Australia. The focus is on final product regulation, rather than access price regulation. The access pricing problem involves additional complications beyond many of the issues discussed here. Further, it is important to recognise that final product and access price regulation can be substitutes for one another, as discussed later in the paper. It is difficult, at this stage, to assess price regulation, but a number of issues are becoming clear.

The paper commences with an examination of the Australian experience of price regulation. There have been major changes in the industry structures of the utility and transport industries, requiring explicit regulation. Next, a preliminary assessment is made of how well price regulation is working, although it is difficult to form firm conclusions at this early stage. Issues that arise with price regulation are then discussed. Finally some key areas that may give rise to problems are suggested.

3.2 Australian experience with price regulation

Australia had little experience with price regulation before 1989, when explicit regulation of Telecom's prices was introduced. However, there were exceptions: for example, New South Wales regulated prices of privately owned gas utilities, and the Commonwealth Government regulated air fares during implementation of the Two Airline Policy from the 1950s to 1990. During the 1980s and early 1990s, an extensive system of prices surveillance was applied to private firms with some market power and to selected government monopolies.

An explicit break came with the introduction of price regulation of a basket of Telecom's prices in 1989. A regulator was established, and the British approach to regulation (price capping, or CPI-X regulation) was adopted. This form of regulation was designed to set a maximum allowable price that did not depend on costs; it thus avoided the problems of incentives created by cost plus regulation. However, significantly, Telecom Australia was still a publicly owned firm unlike the privatised British Telecom.

This form of telecommunications regulation is still in place, and has spread to many other industries — for example, federal regulation of the privatised airports, and state regulation of several large utility and transport industries, such as gas, water, electricity and urban transport. Most of these cases of regulation take the *form* of CPI-X regulation, though whether they embody the incentive effects of CPI-X is another matter.

This move towards explicit regulation forms part of a wider set of reforms of these industries. Many of the utility and transport operators have been either privatised or corporatised. Such changes are intended to make them more focused on increasing profits and keeping costs low. However, most of these firms also possess some market power, and they face strong incentives to use that power to raise prices to increase profits. Thus, price regulation is often introduced along with privatisation or corporatisation. Publicly owned firms may have been using market power in the past, but they would not have had strong incentives to use it to increase profits.

There has also been extensive liberalisation of markets, and competition has been given much more scope to affect prices. Thus, telecommunications has been deregulated, and Telstra faces strong competition for some of its product range. However, it is still subject to price regulation for a basket of services that are less exposed to competition. Some markets are yet to reveal how competitive they are under deregulation, and thus whether there is still any need for final product regulation.

Another change is vertical separation, which has been extensive in some industries (such as electricity) but not others (telecommunications). Vertical separation raises the possibility of competition in some parts of an industry, even though natural monopoly may partly remain in other parts of the industry. Thus, electricity generation and supply may be competitive even though transmission and distribution remain monopolies. If there is effective regulation of the monopoly components of the industry, there may be sufficient competition at the other levels to render final product regulation unnecessary. Thus, if supply is competitive, it may not be necessary to regulate final electricity prices. To this extent, final product and access regulation are alternatives to price regulation.

It is worth noting that many of the firms now subject to price regulation in Australia remain publicly owned firms, even though most are now corporatised. Telstra, the largest, remains a majority government owned firm, and much of the electricity and water industries are State government owned. The gas industry is mainly privately owned, and some roads and most major airports are private. Regulatory policy can have different emphases for these public and private firms.

3.3 How well is price regulation working?

Price regulation in the current form has only been working in Australia for a short time, and thus is difficult to make any assessment of how it is working. Problems are likely to emerge over a longer period. Price caps, for example, as they are being implemented in Australia may not create the strong incentives for cost minimisation that are expected, and this will become clear only after several years and after detailed productivity comparisons have been made. Further, problems of declining quality of output may not be immediately apparent.

However, other problems may become clear in the short term. In Britain, for example, a (political) problem developed with the profitability of electricity distributors. The electricity companies became very profitable, despite seemingly tight price caps; the companies were more efficient than had been forecast. This may not seem a poor outcome, but the high profitability became an embarrassment for the government (as did the high remuneration for regulated firms' managements).

There have been no major problems with the implementation of price regulation in Australia. Few private firms have been regulated for any length of time, and most firms that have been privatised for some time (such as CSL and Qantas) are not operating in natural monopoly industries. Victoria has privatised its electricity industry only over the past few years, while other States still own most of their utilities. Private firms are more likely to pursue profits more aggressively than are corporatised public firms, and so there has been little time for problems such as occurred in Britain to develop.

One change has been that regulation has become more detailed. The original intention of CPI-X regulation was that it would be simple, and that regulation would be light handed. This intention is rarely met: regulated industries tend to be complex, and regulators find themselves being drawn into more and more detailed regulation. This is clear in the case of some British regulated industries, such as airports, where the regulator now plays a major role in decision making. The same is happening in Australia.

3.4 Regulation — the emerging issues

Issues are emerging as Australia develops its systems of price regulation. Regulators are unable to simply set up a system of regulation for an industry, then leave it; rather they are continually confronted with problems. Some problems occur with all regulation, while others are particularly prominent in specific industries. Several of the more critical issues are:

- the extent to which allowable prices should be cost based;
- how quality can be maintained;
- whether regulated firms will have signals for efficient levels of investment;
- how to determine the appropriate basket of services to regulate;
- how to achieve price flexibility under regulation;
- how final product price regulation should interact with access price regulation.

Price regulation and costs

The fundamental problem in price regulation is the extent to which the firm's own costs are accounted for when setting prices. With rate of return regulation, the firm is allowed to pass on all of its costs (including a specified rate of return on its capital base) to its customers. The problem with this form of regulation is well known: cost plus regulation means the firm has little or no incentive to minimise its costs.

The original intention of CPI-X regulation was that prices could be set entirely without reference to the firm's costs. Prices would be set at current levels, allowing for lower real prices due to expected productivity increases. Revisions to the price cap could involve comparisons with comparable firms, so feasible price caps would be set. Such a system gives maximum incentives to the firm to minimise costs, because the firm is able to keep (as profit) the benefits of any efficiencies it achieves. The only benefits of productivity increases that would be shared with customers would be those which were anticipated; unanticipated gains or shortfalls in productivity would entirely accrue to the firm.

While price caps in their pure form give maximal incentives for productive efficiency, they may not be optimal from a broader perspective. First, they impose all the risks from profit variability on the firm; to the extent that the firm is risk averse, this will be an inefficient allocation. It is also possible that the government may be uncomfortable with this allocation of risk, especially when newly privatised firms make exceptional profits. Second, if there are distributional objectives (such

as sharing gains with customers) price caps will be inferior to other alternatives. Finally, price caps can lead to inefficient choices in dimensions other than cost and output. A price capped firm will have an incentive to undersupply quality, for example. This may be not be a concern if quality can be efficiently regulated. However, efficient quality regulation is difficult to achieve, and it may be desirable to blunt the firm's incentives to downgrade quality.

These types of problems have emerged with price caps as they have become established instruments of government policy. They were not given much attention when price caps were initially implemented. Most price caps were set at the existing level of prices, and a fall in real prices (judged to be feasible given productivity growth expectations) was factored in for the initial regulatory period. The initial emphasis was on cost reduction, and it was possible to allow for strong incentives in this area without endangering the viability of the firm. However, the problem was that profits could become embarrassingly large for the government, as happened with electricity in Britain.

At the end of the initial period of regulation, prices have to be reset, and the relevance of the firm's costs for price regulation has to be reviewed. If the firm has become very profitable, should allowable prices be reduced? Should the gains in productivity be shared with customers? If the profitability of the firm is poor, should it be allowed to charge higher prices? Once regulation has been in place for some time, the regulator is unable to avoid the question of sharing the gains from productivity growth. Such sharing does mean that efficiency is sacrificed, in that the incentives for cost reduction are weakened. However, some reference to costs is appropriate if such distributional objectives are to be pursued, and if firms are risk averse.

Governments and regulators seem to be emphasising the sharing of productivity gains more than they did in the initial days of price caps. This emphasis is clear in a recent UK paper on price regulation — (Department of Trade and Industry [UK] 1998), and in the recent statements by the Victorian Office of the Regulator-General (1998) that the ultimate objective is to pass on efficiency improvements to customers.

This is consistent with a distinct shift away from the original intent of price cap regulation. Now, in some jurisdictions, the firm's costs are very relevant when its allowable prices are being calculated. There is a move towards rate of return regulation, although the *form* of price cap regulation is being maintained. Periodically, prices come up for review, at which stage they will be set equal to allowable costs (including a predetermined rate of return). Prices will then be set for a few years, during which they will have to conform to a CPI-X formula. If the firm

achieves lower costs than anticipated, it can keep the additional profits. However, when prices are revised at the end of the period, the firm will lose these gains which are passed on to their customers. This system is akin to one of rate of return regulation, albeit with a relatively long regulatory lag.

This process is most evident in Victoria, where there is much focus on choosing the appropriate rate of return to allow regulated firms. There is also a corresponding emphasis on measuring the capital base (including sunk costs such as pipes in the ground) on which this rate of return should be applied. Regulated firms have a brief window of opportunity during which they can take advantage of productivity improvements, before they are removed. To this extent, the incentives to pursue efficiency have been distinctly weakened. It is significant that this move towards rate of return regulation has gone furthest in Victoria, which is the jurisdiction that has gone furthest with privatisation. It may be that governments feel bound to avoid the possibility of privatised firms making politically embarrassing high profits.

The question is ultimately one of where to draw the line in allowing the firm's costs to influence its regulated prices. The pure form of price cap — with prices set entirely without reference to the firm's costs — is likely to be neither efficient nor practical. However, the move towards cost based pricing has probably gone too far in the case of some jurisdictions, and regulated firms are likely to have few incentives to keep costs down.

One option for Australian regulators is to move in the direction of recent systems of regulation in the United States. Profit sharing and sliding scale regulation have been implemented in the United States in the past decade (Sappington and Weisman 1996). This type of regulation is a response to the incentive problems associated with rate of return regulation. Allowable prices are set partly exogenously to the firm (like price caps) and partly with reference to the firm's costs (as with rate of return regulation). A balance between incentives to minimise costs, and profit and risk sharing objectives, can be achieved in an explicit way. This would seem preferable to the system towards which Australian regulators are tending, which is one of setting prices on a cost basis, but for a specific period, and hoping that this period is long enough to give firms a strong enough incentive to keep costs down.

Yardstick regulation does not seem to have been relied on to any great extent in Australia or elsewhere. When price caps were being introduced, it was hoped that the revision process would refer to the prices and costs of comparable regulated firms (in other jurisdictions perhaps) as a guide to prices that an efficient producer could charge and remain viable. However, many regulated firms possess a degree of uniqueness which makes it difficult to compare performances. As a result, when determining prices, regulators have tended to look more at the firm's own costs

rather than those of similar firms elsewhere. Making comparisons with yardstick firms is an information intensive and expensive task, but if carried out systematically, it may enable a better balance between incentives and other objectives when prices are regulated.

Regulating quality

Whichever way a firm is regulated, the form of regulation will have an impact on the firm's choice of quality of product. Under rate of return regulation, a firm will have an incentive to 'gold plate' and offer an excessive level of quality. Under price caps, firms face the opposite incentive. It is often possible to reduce costs by reducing quality, so the firm will be able to increase profits by lowering quality (as long as the regulated price is unaffected) (Rovizzi and Thompson 1992). Privatisation will, if anything, sharpen these incentives, because the firm will be keener to pursue profits. If prices are to be regulated by some mechanism, it will be necessary for the regulator to pay attention to product quality.

Initially it may be relatively straightforward to monitor quality and to impose sanctions if quality is reduced. This has been the approach of most Australian regulators. The initial, preregulator level of quality is taken as a benchmark, and indicators of quality are developed. The firm is required to report on these indicators, and it may be required to maintain specific standards. Alternatively, quality may be included within the price cap formula, allowing the firm to charge a higher price if it achieves a higher quality of service. If not done directly, this can be done indirectly, as with airport regulation (see 'Investment incentives' below).

The quality monitoring approach supposes that the initial level of quality is optimal; this may or may not be the case. Whatever, the optimal level of quality will change over time, as incomes rise and customers are prepared to pay for a higher standard of quality, and as the cost of achieving a given level of quality changes with technological developments. It is difficult for the regulator to determine the tradeoff that customers are prepared to make between price and quality, because it will not have any observations on which to base its judgment. The regulator may be setting a quality standard that becomes increasingly inappropriate, which is a problem of all price regulation systems.

Investment incentives

It can be difficult to ensure that price regulated firms have the incentive to undertake an efficient level of investment. Some investment has the effect of

lowering costs; the firm will undertake such investment to the extent that it shares in the gains from lower costs.

However, much investment will not have this effect. Its primary effect is on the quality of product offered. An airport may build a new runway, which will result in reduced congestion that benefits users, airlines and their passengers. The airport itself may make no gains (Forsyth 1997). Investments in terminal capacity may have a similar result. Water companies can invest to improve water quality, and electricity distributors to improve the reliability of their networks.

The regulated firm will not wish to make these investments — regardless of how desirable they may be in overall efficiency terms — unless it can obtain some price tradeoff. This is sometimes recognised by regulators, which have been willing to allow higher prices conditional on investment. The regulator of airports, the ACCC (1999), recently permitted Adelaide airport to increase its charges if it builds new terminal capacity.

This is probably the appropriate response from the regulator, but it does have strong implications. It means that the primary decision maker for large investments becomes the regulator, not the firm. The regulator may even have to become proactive in encouraging the firm to make certain investments. This implies the regulator will be closely involved in the running of the firm, and it requires the regulator to be well informed about the firm and its markets. This is a long way from the relatively light handed regulation that price caps were intended to provide. It is difficult for a regulator to develop general decision rules for such cases; for example, most major investments in airports are one-off investments (such as new terminals or runway extensions) and the relevant parameters in each case are different from those of the next.

It is difficult for regulators to handle firms that make risky investments, such as those in research and development. A risky investment may yield no returns at all, or it may yield very high returns. If the regulator sees the high returns, and seeks to pass the gains on to consumers, the firm will have little incentive to make further high risk investments because any gains will be removed. This is a particular problem in industries that have high technology growth as a result of research and development, such as telecommunications.

Determining the regulatory basket

A common problem for regulators is that of determining which products should be subject to price regulation. Generally, products over which the firm has market power should be regulated, while those for which there is competition should not be

regulated. The borderline between these two groups can change quickly, especially in industries for which there is rapid structural change, as has occurred in telecommunications recently.

Problems can develop when a firm with market power introduces a charge, as happened recently with airports. Before privatisation, the price cap included a range of charges over which the airports have market power. After privatisation, some airports introduced a new charge (specifically a levy on fuel throughput) which falls outside the capped basket. Effectively, they were able to exercise market power by levying charges which users were unable to avoid. The extent to which regulated firms can do this weakens the effectiveness of regulation.

Achieving price flexibility

A desirable feature of price caps is that they are normally consistent with the choice of efficient price structures, and profit maximising firms have an incentive to price efficiently. However, efficient price levels may entail very large profits to the firm.

This would be the case with airports, which are subject to excess demand. Rationing prices would be extremely high, as would profits. There would also be a problem of investment incentives — why would an airport invest in new capacity, which would eliminate the excess demand or congestion, if it is able to charge high prices to ration inadequate capacity? The price cap approach thus breaks down. The regulator can impose price caps which mainly function to restrict revenues, but they must also impose some system of rationing demand. Supplementary mechanisms also exist. They can slot ration an airport, for example, and allow the rents from the capacity to be gained by the users. This is effectively what happens with the London airports, which have excess demand but are price capped (Forsyth 1997).

Final product and access regulation

Final product and access price regulation are, to a significant extent, substitutes for one another. If access price regulation of rail track is effective, for example, and if there is strong competition at the level of rail operations, then it will not be necessary to regulate rail operations. If final product regulation of airports is effective, detailed access regulation of the various airport facilities will be superfluous.

Australia is implementing a detailed access pricing regime alongside final product regulation. When these are operating effectively, regulators will need to determine to dispense with whether one or other form of regulation. If there is strong

competition in the nonmonopoly areas of an industry — for example, in electricity supply or rail operations — there may be sufficient competition to render final product regulation unnecessary. If it is difficult to determine the costs of parts of integrated systems — for example, the Telstra local loop — access price regulation can lead to inefficiency, and it may be preferable to rely on final product regulation. If the monopoly component is small relative to the final output — for example, the contribution of airport passenger terminals to the airlines' final products — it may be desirable to regulate access to the monopoly component to facilitate competition in the larger market. If there are economies of vertical integration, access price regulation will be difficult and final product regulation will be superior.

The best balance of access and final product regulation should emerge over time. It may be possible to relax access regulation of airport facilities (except for terminals) if regulation of airport outputs is effective. Regulation of electricity prices to retail consumers may even become unnecessary if supply is very competitive. At the moment it is too early to determine how effective the different regulatory regimes are going to be in particular industries. It is also possible that both forms of regulation will be desirable in particular industries, including the telecommunications industry.

3.5 Conclusions

Australia has been imposing final product regulation across a wide range of industries for a relatively short period. No major crises have developed, but difficulties or issues are becoming apparent. Perhaps four of these are of particular importance.

First, there has been a move (at least in some jurisdictions) away from price caps towards more cost based regulation, more akin to rate of return regulation. There is some case for sharing gains and risks with consumers, but moves made so far will reduce the incentives for efficient production. Arguably, the moves in this direction have gone too far and despite no obvious short term effect, performance in the longer term will be poorer.

Second, problems of quality regulation will probably become more acute. Regulators have been aware of the need to monitor quality, but they do not have any mechanisms for choosing an efficient level of quality in the longer term, when technology will change the price of achieving given levels of quality.

Third, the role of the regulator in deciding whether a firm should make investments is more important in several industries, especially those for which investment is a primary determinant of service quality. Regulators will become more closely

involved in investment decisions, and thus will need more detailed information about the firm and its markets. This implies an inevitable move away from the ideal of light handed regulation.

Finally, there is the issue of how much reliance on final product regulation and access regulation will be needed. To an extent that these are substitutes for one another, and this appears to be the case for several industries, it may be feasible to relax one or other form of regulation. This can only be determined over time. Some industries may perform best with only final product regulation, others with only access regulation, and yet other industries with both forms of regulation.

References

ACCC (Australian Competition and Consumer Commission) 1999, *Application to Pass through the Price Cap the Costs of a Multi-User Integrated Terminal at Adelaide Airport: Draft Decision*, Melbourne, May.

Department of Trade and Industry (UK) 1998, *A Fair Deal for Consumers: Modernising the Framework for Utility Regulation*, London.

Forsyth, P. 1997, 'Price regulation of airports: principles with Australian applications', *Transportation Research-E*, vol. 33, no. 4, pp. 297–309.

Office of the Regulator-General (Victoria) 1998, *2001 Electricity Distribution Price Review: Efficiency Measurement and Benefit Sharing*, Consultation Paper no. 2, Melbourne.

Rovizzi, L. and Thompson, D. 1992, 'The regulation of product quality in the public utilities and the citizen's charter', *Fiscal Studies*, vol. 13, no. 3, pp. 74–95.

Sappington, D. and Weisman, D. 1996, *Designing Incentive Regulation for the Telecommunications Industry*, MIT Press, Cambridge, Massachusetts.

4 Spot markets and independent system operators

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4.1 Introduction

This paper is divided into two parts. The first part briefly comments on practical issues related to access arrangements as regulatory instruments. The second part comments on the role of integrated system operators and spot markets in managing networks efficiently and facilitating downstream competition in retail markets.

Access regulation in gas and electricity provides for third party access to facilities such as pipelines, transmission and distribution networks. Access arrangements do not deal with all competition issues in these industries and are not an appropriate vehicle for managing safety and other technical matters.

Technical aspects of the gas and electricity networks are reflected in the access frameworks that have been adopted. No attempt has been made to generalise access regulation to other sectors.

4.2 Access arrangements — some practical issues

The development, use and administration of access arrangements as one part of a regulatory regime present a number of practical issues. The National Gas Code, for example, provides for regulators to approve nonbinding terms and conditions (including reference tariffs) for third parties to gain access to pipelines. An access arrangement does not override existing contracts, and pipeline owners can contract with a user on any terms and conditions. The regulator can enforce access arrangements through arbitration if agreement cannot be reached. However, an arbitrator can only enforce an approved access arrangement, and not redress any of its shortcomings.

Beyond initial approval, access arrangements give regulators limited powers to challenge inappropriate behaviour by a service provider. As a regulatory instrument access arrangements have limitations, particularly in their lack of flexibility and clarity.

An access arrangement is generally reviewed by the regulator every five years, which means that it may not cope with an industry that is evolving rapidly. This is a particularly important issue in a complex integrated network, although (as argued by a number of parties) it may be less of a problem for some relatively static or simple facilities. In the context of substantial structural reform, inflexibility of regulatory instruments is a problem because the arrangements need to evolve to achieve the objectives of reform.

This means that there is a potential alignment problem if regulators attempt to use access arrangements to address technical and safety regulation as well as economic issues. Access arrangements need to be compatible with independent technical regulation, but they are not a suitable substitute.

Amending the regulatory framework could deal with some of these issues. However, more important is the extent to which access arrangements can deal with reform issues of and by themselves. The lack of flexibility inherent in access arrangements makes them an unwieldy regulatory instrument, particularly for technical and safety regulation, but also as a framework for more dynamic developments such as the introduction of retail competition. Access arrangements are a necessary part of regulating a natural monopoly network but they are not sufficient to deliver competition upstream and downstream of a facility.

Access arrangements in electricity and gas markets should focus on providing access to substantial natural monopolies. This leaves technical, safety and broader reform issues to be resolved by other means. As retail competition is phased in, for example, the complexities of trading on and operating a network increase substantially. For retail competition to be effective, the reform program must directly address this issue. One way to manage this problem is through the introduction of an integrated system operator and spot market.

4.3 Integrated spot market and system operation

The Victorian and Australian electricity and gas industry reforms have been the subject of considerable debate, and some of that debate has specifically dealt with the role of spot markets and integrated system operators. Networks provide common services and, by definition, give rise to interactions between different users

of the network. Parts of the electricity transmission network, for example, are regularly run at full capacity, producing constraints in the south eastern Australian network. Thus a generator in region A can be constrained from physically transporting additional electricity to region B at certain times because the transmission link between the two regions is fully utilised. Even so, the constraint creates no necessary shortage of electricity in region B because the system operator can dispatch generation within each region to meet demand. Importantly, there is also no financial exposure on the part of any market participant because they can hedge any price differentials that arise. I will return to this issue as it has important implications for retail competition.

As has been observed, '[it is] difficult to define, adjust and enforce rights [in network industries] in a way that allows effective competition, [because] the capacity used or unused in any part of a system is a function of all the physical flows in the system' (Klein and Gray 1997, p. 104). When these interactions are substantial enough to impact on the physical flows across the network, it becomes increasingly difficult to manage the efficient and effective operation of a network through a simple (or nonexistent) set of rules for allocating and trading capacity rights through decentralised markets. Thus the need to optimise system operation becomes progressively more important as interdependencies between parties using the common network become more substantial. This interaction becomes increasingly complex as the number of new participants in the retail sector increases. Spot markets and integrated system operators allow such interactions to be managed more effectively.

The Victorian gas and electricity reforms are the culmination of a series of debates, before and after the authorisation of the access arrangements. Access arrangements and the market reforms reflect the nature of the Victorian gas and electricity systems, as well as the central reform objective that competition at all levels of the industries should, where possible, be introduced and encouraged through structural change.

The objective of reform should be to introduce, to the greatest possible degree, competitive markets in gas and electricity. This is a larger objective than introducing a framework that supports existing competitive markets upstream and downstream of a network. Access does not directly address the issue of sourcing supplies of gas or electricity, for example, or the issue of developing an effective risk management and settlements infrastructure to enable retail competition for any but the largest of customers.

To deal with some of these issues several initiatives were introduced as part of the reform of the Victorian energy markets,

- Multiple distribution areas were defined in gas and electricity to ensure that the industry was forced to document and deal with new relationships early in the reform process. Gas retail and distribution areas are noncontiguous.
- A gas release program was introduced to facilitate entry into retailing.
- Several generation firms based on single sites were created.
- Restrictions were placed on substantial producers of gas in the gas retail market.

4.4 Comparing the electricity and gas markets

In comparing the national electricity market and the gas market, one notices the high level of agreement in the south eastern States on the electricity market model as opposed to the gas model.

The national electricity market is based on a spot market run as part of an integrated system operator. The high voltage system, including the high voltage transmission system, is managed by the National Electricity Market Management Company. Generators and scheduled loads make bid offers to the company, which then dispatches by merit order (given the physical constraints on the system). A transmission constraint, for example, may mean it is not feasible to dispatch the next highest priced offer, so the National Electricity Market Management Company will dispatch to the next unconstrained highest bid.

The gas market has two market structures. Victoria has the 'market carriage' model, which is also based on an integrated spot market and system operator, VENCorp. Elsewhere, a system termed 'contract carriage' has been adopted. Under this system, the transmission network is managed under bilateral physical contracts between the pipeline operator and anyone who wishes to use the system. The latter system is described here as the 'decentralised' market. However, it should be recognised that the physical operation of a contract carriage system is centralised as the company that owns the asset manages the pipeline.

In the national electricity market, there was a logical progression from the initial vertical disaggregation of existing publicly owned businesses, to the introduction of an integrated system operator and spot market (integrated system operator) as a central part of the structural reforms. Two of the objectives of restructuring the electricity industry were to achieve high levels of capital efficiency (through efficient use of existing infrastructure and efficient investment in new infrastructure) and to introduce a market structure that facilitated retail competition. The market arrangements reflect these priorities. As a result of these structural reforms, competition in the generation and retailing of electricity is intense. There is

less evidence to suggest that an equivalent level of competition has developed in the gas market, where contestability has yet to be introduced. However, it is expected that competition will rapidly develop in Victoria once contestability is introduced in October 1999.

The developments in the electricity market have not been without controversy and the electricity arrangements are still being refined. However, in contemplating the areas in which the next round of reform benefits will emerge, it is worth noting that the electricity industry is moving towards the further integration of network externalities into the spot market, including transmission constraints and the dispatch of ancillary services.

4.5 Victoria's gas industry

An integrated system operator and spot market have been introduced into the reformed gas market in Victoria. This has given rise to a number of debates. One of the substantial issues revolves around whether the gas system exhibits sufficient network constraints to justify a relatively sophisticated market structure. The issue is not whether an integrated system operator is a good idea as such but whether the network has sufficient capacity such that the interactions between different users can be ignored or do they need to be centrally managed?

In this regard the Victorian gas system needs to be managed in an efficient manner. Unless transmission capacity is managed from day to day, there could be congestion in the network despite there being sufficient gas and capacity to meet maximum demands. This would not be a sensible outcome. Thus VENCorp has been created and charged with operating parts of the Victorian gas transmission system in an efficient manner.

One problem with a system based on a decentralised market in bilateral contracts for physical capacity is that capacity rights are likely to be conservatively defined so individual users do not breach the system's capacity as a result of changes in individual user flows across the network. It is difficult to see how such a mechanism would enable the markets in gas or electricity to reflect actual demand and supply at any given time and still meet demand efficiently. Contracts for physical rights will lead to underuse of capacity, or extraordinarily complex contracts, to ensure that tradeable rights are defined to meet all possible circumstances. They may become effectively untradeable in a meaningful fashion.

The question of interactions between network users is one reason that substantially more debate has emerged on the role of an integrated system operator in the gas industry than occurred in the electricity industry. The electricity network is meshed,

there are a relatively large number of suppliers into the network, and the transmission network can be constraining. Thus it is widely recognised that a spot market and centralised dispatch are necessary components of the reformed south eastern Australian electricity network.

The need to optimise the system has never been a real issue in electricity. The question was whether a market based on an integrated system operator and spot market would deliver a better outcome than that from central planning. The debate led to agreement that a market was the better solution.

In gas there is an argument that there is always sufficient gas stored in a pipeline to ensure a buffer against temporary imbalances between injections and withdrawals of gas. According to this argument, the transmission system does not need to be managed very closely.

There are two assumptions to this argument. The first is that the system of pipelines and gas storage facilities meets this criterion — that is, it does not matter whether gas is injected at a specific time (in the sense that gas will be delivered to meet demand) because there is sufficient storage available. However, the Longford to Dandenong pipeline is relatively short and does not provide a large reserve of stored gas, and thus it is not a substantial buffer against shortfalls and needs to be managed.

The second assumption is that it makes sense to treat storage in a pipeline as a benefit to the system through increased operational flexibility. A pipeline doubles as transport and storage by definition. Gas storage facilities, on the other hand, substitute for increased transmission capacity or demand side responses. Thus, there is some economically efficient level of storage, and an effective market will determine what that level should be. If a system has never operated efficiently, and capacity is not priced to market, it is difficult to see how that would be determined.

It may be plausible that the Victorian gas system is the only one in Australia that is sufficiently complex to need managing by an integrated system operator. The constraints on the system do not allow capacity to be effectively managed under a simple set of bilateral arrangements. However, how complex does a system need to be before this becomes an issue?

Take a system in which all gas flows must remain within predetermined physical capacity rights negotiated through bilateral contracts. These rights are determined at some point in time and remain in place for several years. Changes in the pattern of pipeline use can be accommodated if capacity rights are defined in such a way that they can be traded in decentralised secondary markets, or if the rights are

conservative enough that most (perhaps all) changes can be accommodated within existing capacity rights.

Clearly an either/or choice is likely to be less than optimal. Defining capacity rights conservatively enough to accommodate changes in pipeline use would lead to systematic underutilisation of the network. It would be costly and complex to define capacity rights in a manner that permits efficient trading through decentralised secondary markets such that the entire set of feasible injections and withdrawals can be accommodated.

In reality a combination of tradeable, conservative capacity rights could be used to deal with a subset of feasible injections and withdrawals at various points in the network. However, this solution is a tradeoff between underutilisation of the network and the costs (and feasibility) of defining a set of tradeable rights that could be managed through a decentralised market.

There is also another problem with this solution. Even allowing for efficient trade of capacity rights, this system may not accommodate a change to the efficient pattern of flows over the pipeline. The reason is that the trade in capacity rights is in no way linked to pipeline operations, so trades between players in decentralised markets may not result in feasible engineering solutions to transport gas to and from multiple locations.

The initial solution offered in Victoria was a system of locational prices and financial transmission rights, along with an integrated spot market and integrated system operator. This gave the market the information it needed and the means to manage capacity rights. However, after some debate, a simplified version was adopted (with the option to shift to firm tradeable transmission rights in the future). It retained the key parts of the solution to these problems: the integrated market and integrated system operator.

Ultimately, other gas networks may be sufficiently affected by network interactions to need more efficient management. If no persuasive cost–benefit case exists for introducing spot markets and integrated system operators into other gas networks, then the case for pursuing efficient operation is weakened. However, other than in Victoria, I am unaware of any rigorous analysis undertaken to test that proposition.

Nevertheless, some market arrangements may not optimise the use of a network, given the need to define capacity rights conservatively. Thus, if these systems can operate on a set of simple, inflexible rules it may be acceptable to underutilise a system. However, as the need for new capacity arises, regulators may need to be mindful of the operating practices of pipeline owners and how those practices may affect the need for additional capacity.

In addition, the value of a spot market in making it economic to bring even relatively small parcels of gas to market is likely to be significant, as is the opportunity to develop integrated financial markets in electricity and gas through the introduction of spot markets. The importance of this last point should not be underestimated. Efficient operation of a network is not the only significant argument for introducing an integrated spot market and integrated system operator.

4.6 Conclusion

The opportunity to reform electricity markets arose when it was recognised that physical contracts made trading more difficult, and that contracting could be organised using financial hedges facilitated by an integrated system operator and spot market. A transmission constraint in the electricity network referred to earlier in this paper is such a case. In the presence of an integrated system operator and spot market, a generator in one location can contract with another party at another location without being concerned that it may not always be able to physically deliver energy. The parties organise a financial contract and a hedge against price differentials that exactly duplicates a physical contract for delivery. While the market gets on with business, the integrated system operator can focus on operating the system efficiently.

The integrated system operator model formed the conceptual basis for VicPool, the New South Wales electricity market and ultimately the national electricity market. The model has been remarkably successful in delivering tangible benefits to consumers. The electricity spot market has facilitated the development of a market in energy trading, separate from the physical market for generating and distributing electricity. The resultant competition in wholesaling and retailing electricity has had a material impact on electricity prices and operating efficiencies in the generation sector.

This unbundling of the financial and physical markets has prompted a process whereby a large number of financial instruments have been developed to manage trading strategies in the electricity market. New players have been able to enter the market because electricity has become a commodity separable from the market for transportation. There are few barriers to new retail players entering the national electricity market.

An integrated system operator and spot market are necessary to maximise the opportunities for competition to develop in the gas and electricity markets. They have been successful in the electricity market and can be equally successful in the gas market. The economics of gas and electricity networks have developed

substantially over the past decade. The value of the integrated system operator model is becoming widely recognised and is likely to form the basis of future developments.

Reference

Klein M., and Gray P. 1997, 'Competition in network industries — where and how to introduce it', *Public Policy for the Private Sector*, Note 104, World Bank, Washington DC.

SECTION III

ASIA PRE AND POST CRISIS

5 Micro aspects of the Asian crisis

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'Anyone who claims to fully understand the economic disaster that has overtaken Asia proves, by that very certainty that he doesn't know what he is talking about.' Paul Krugman in 'Will Asia bounce back?' speech at Credit Suisse First Boston, Hong Kong, March 1998

5.1 Miracle or crisis?

This paper places micro aspects of the Asian economic miracle and financial crisis in a systematic framework. The direct involvement of government at the various stages of economic development has two distinctive effects: by acting as a guarantor of insurance provided to firms engaged in market transactions it promotes higher levels of specialisation and division of labour. This is believed to be one of the underlying forces of sustained economic growth in Asia — the so-called 'Asian economic miracle'. However, a government guarantee of private borrowings may also result in 'moral hazard' problems by inducing firms to take additional risks in investment and other business decisions. It is possible that the lack of a feedback mechanism, combined with higher than socially optimal levels of specialisation and division of labour, may make an economy vulnerable to external shocks. A financial crisis is only one such shock. This paper argues that an optimal level of government involvement exists at each stage of development; government can promote economic growth at an early stage of economic development, but it can also stifle innovation at a later, more mature stage of development.

Only about three years ago, it was fashionable to talk about the miracle of the Asian economies. Nowadays, it would be fashionable to talk about the Asian financial crisis. As usual, economists differ in their explanations of both the miracle and the crisis. At the risk of misrepresentation, I argue that these views can be classified as two distinct arguments.

According to the first view, a few economists — probably best represented by Krugman (1994) in his now famous *Foreign Affairs* paper, 'The myth of Asia's miracle' — argued that the so-called miracle was a myth. Krugman argued that the

high economic growth rate of Asia was impressive but not exceptional; it could be fully explained by an increase in labour and, in particular, capital (including human capital) inputs. In terms of total factor productivity, which is the driving force for long term economic growth, Asian economies are still lagging behind the West. Worse, the direct government involvement in the economy distorted markets and created 'crony capitalism' which is characterised by relationship based (family, relatives and so on) market transactions. Krugman predicted that the momentum of economic growth in Asia would sooner or later be exhausted, and that growth rates in the West and East would converge.

At the beginning of the financial crisis in 1997 it is understandable that Krugman saw the crisis as a form of punishment for 'crony capitalism'. He largely supported the International Monetary Fund's and World Bank's rescue programs which contained additional conditions on microeconomic restructuring.

Another group of economists, represented by Professor Jeffrey Sachs at Harvard, holds the view that Asian economies are fundamentally sound. He argues that the financial crisis should not be attributed to faults in micro structures or macroeconomic policies, but to a psychological panic, as has happened several times in the United States. Based on this belief, he criticised the International Monetary Fund's rescue program and argued that unconditional monetary injection was the best way to re-establish confidence. Apart from that support, he argued that we probably should do nothing other than wait for the recovery of confidence in the economy.

These two views represent two distinctive approaches: either denying the achievements of Asian economic growth and proving the inevitability of a financial crisis, or admitting the exceptional nature of economic growth in Asia and arguing the crisis is just bad luck.

My studies indicate that the economic miracle is real and sustainable and the crisis was avoidable. Existing economic models, especially models in the areas of transaction cost economics and the theory of the firm, are powerful enough to reconcile these seemingly irreconcilable approaches.

5.2 Where is the dividing line between the East and the West?

Industrial organisation economists have noted that a dividing line between a representative firm in the West (especially in the Anglo-Saxon tradition) and a representative firm in the East could be the structure of corporate governance.

Whether this difference is one of 'nature' or just of 'degree' is debatable. However, this does not affect the main conclusions in this paper.

At the risk of oversimplification, I argue that an arm's length contract is the medium of connection for market exchanges in the West, whereas personal relationships (or connections) — whether government with firms, firms with firms, or individuals with firms — serve as the medium to facilitate market transactions in the East.

Think about the bank–firm relationship. A bank has close ties with a potential borrowing firm, possibly as a result of past contacts or ownership links. In assessing the borrowing needs of a firm, and its ability to pay interest and principal, a bank will consider not only the firm's current debt servicing capability, but also its long term ability to repay, its connections with government, and various noncontractual levers the bank can use to extract repayment. The interest rate charged does not need to have a direct relationship to the intrinsic risk of the project.

Limitations on competition in a relationship system do not just give the financier power, but also strengthen the incentive to cooperate with the borrower. Studies of conglomerates in Japan, *Keiretsu*, and Korea, *Chaebol*, show that the principal banks went out of their way to help financially distressed borrowers. The absence of competition and disclosure in a relationship based system imply that there are no price signals to guide decisions.

By contrast, a firm in an arm's length system, can tap a wider circle of potential lenders because functional information is freely available and audited. Loans are contracted for a specific period, and the interest rate will be a competitive one that will compensate the lender for the time and the risk of a loan.

This indicates that the implicit nature of contracts in a relationship based system, as observed in the East, gives firms an incentive to at least partly internalise market exchanges. In an arm's length system, market competition implies that the relationship between firms is short run in nature and based on an explicit contract.

5.3 A transaction cost economics explanation of the Asian miracle

There are several versions of transaction cost economics. I will use Olivier Williamson's theory of the firm. A typical Williamson 'story' is that there are two different types of investment — namely, relationship-specific investment and general purpose investment. Adam Smith's pin factory story explains that relationship-specific investment is superior in performance from a purely technical point of view. Therefore, the degree of specification of contracts could influence

productivity. However, given imperfections in contracting, relationship-specific investment may place one party at a disadvantage under some unforeseeable and uncontracted circumstances *ex post* (that is, after the two parties sign the contract). General purpose investment may be adopted (at the cost of some productivity) to prevent this scenario.

One possible solution to this problem in the Anglo-Saxon model is to merge the two firms and internalise this 'externality'. However, mergers create their own costs in the form of agency costs, for example, information distortions, the weakening of incentives, and so on.

Alternatively, a third party could be used to guarantee the transaction in the case where one party has the incentive to default. Who has the credibility and administrative power to act as a guarantor? Asian economies provide examples. Governments in China, Indonesia, Malaysia, and Singapore, are directly involved in business, and act explicitly or implicitly as a guarantor. In the more liberal Asian economies, some conglomerates, such as *Chaebol* in Korea and *Keiretsu* in Japan, (with background government support) provide 'guarantees'.

In theory, the involvement of a third party can lead to the first best solution, because it captures the productivity advantage of 'specialisation' without the cost of writing an explicit contract and the possible agency costs of two firms' merging.

In addition, the involvement of government provides 'insurance' (or more precisely, over insurance) to firms. According to the studies of Lio (1996), insurance promotes the evolution of economic structure from autarky to the division of labour.

This is because market exchange is more risky than autarky since the former relies on the matching of buyers with sellers. In the absence of insurance, an economy may remain in autarky to avoid taking risks. Insurance undoubtedly promotes movement to a market economy, but there are credibility problems in establishing a privately owned insurance company. If the government acts as an insurer, credibility problems may be largely alleviated. The end result is that the involvement of government speeds up the process of specialisation and the division of labour, which further increases productivity (following Adam Smith's pin factory argument).

Productivity gains are the outcome of specialisation and the deep division of labour. They cannot be fully captured by the concept of total factor productivity used by Professor Krugman. This mechanism is regarded as the foundation of the industrial revolution in the late eighteenth and early nineteenth centuries in the West (Shi and Yang 1996). This mechanism could also be the foundation of Asia's economic miracle. Development mainly occurred through deep specialisation, the division of

labour and the establishment of market exchange to replace self-sufficient autarky. It was not due to purely the adaptation of new technology.

However, the involvement of government in providing a guarantee for transactions has serious flaws that increase the vulnerability of an economy. One can identify at least three mechanisms.

The first has been identified by Professor Krugman as the problem of 'moral hazard' and occurs in an economy where asymmetric information prevails, including in the West. This is a well documented phenomenon and needs no further explanation.

The second, 'the lack of a feedback mechanism' is more important. In the West, 'moral hazard' increases the probability of failure, whether in investment, personal health insurance, driving habits, and so on. A higher than usual failure rate is a signal to a firm — say, a private insurance company — to change its insurance policy to protect its interests. For example, an insurance company keeps records of clients' vehicle accident claims and adjusts ratings accordingly. Being aware of the existence of this dynamic cross-checking mechanism, drivers take extra care. This dynamic perspective, to some extent, alleviates the 'moral hazard' problem.

This feedback mechanism would be weaker in a relationship based economy. The existence of 'crony capitalism' is based on artificial barriers to entry and non-technology based monopoly power. For instance, a person who is responsible for a risky investment may be the son of the minister in charge of that industry. In other words, the insurer and the insured are close relatives. One might question the effectiveness of this dynamic cross checking mechanism.

The third mechanism is due to the risk associated with specialisation and the division of labour. A government guarantee provides a form of insurance that allows firms to overspecialise: the higher than socially optimal level of specialisation and division of labour may increase the overall risk of market transactions. This can be illustrated using a simple mathematical model. Suppose the probability of failure in one market transaction is q and N persons are selling the same product. The probability of failure to exchange one type of good is q^N and the probability of a successful trade is $1–q^N$. A representative individual buys m types of goods from the market. Therefore, the probability of all successful market transactions, or the reliability of an economic system, is $R=\prod_{i=1}^{m}(1-q^N)$. In a symmetric setting, this equals $(1–q^N)^m$. However, given a population size of M, where $M = (m+1)N$, the reliability of an economic system is $R=[1–q^{M/(m+1)}]^m$. R is a decreasing function of m, indicating that the reliability of an economic system is

negatively related to the number of goods purchased from the market — a good indicator of the degree of the division of labour.

So far we have established a common core for the explanation of both the economic miracle and the financial crisis in Asia. In summary, direct government involvement in economic transactions can either promote specialisation and the division of labour and increase productivity, or increase the overall vulnerability of the economic system. The optimal degree of government involvement is a tradeoff between its positive effects — providing insurance to facilitate market exchange, promoting specialisation and the division of labour, and enhancing productivity — and its negative effects — creating a 'moral hazard' problem; lacking a feedback mechanism to correct 'moral hazard' and lowering the overall reliability of an economic system.

This tradeoff can be illustrated by the familiar marginal benefit–marginal cost diagram (figure 5.1) in which the horizontal axis measures the degree of government involvement and the vertical axis measures the monetary value of benefits and costs. The shape of the marginal benefit and marginal cost curve follows the usual economic explanations.

The curves shift in a systematic way during the various stages of economic development. Historical evidence seems to indicate that government involvement at the early stages of economic development, starting with autarky, has significant positive impacts in promoting specialisation and the division of labour, with moderate costs. This results in high optimal levels of government involvement.

At later stages of economic development, where a sophisticated market network has already been established, a government's promotion function becomes insignificant and its costs (in terms of an increase in overall vulnerability) become significant. Thus, the optimal level of government involvement becomes smaller than that in earlier stages of development (see figure 5.2.)

Figure 5.1 **Marginal benefit and marginal cost of government involvement**

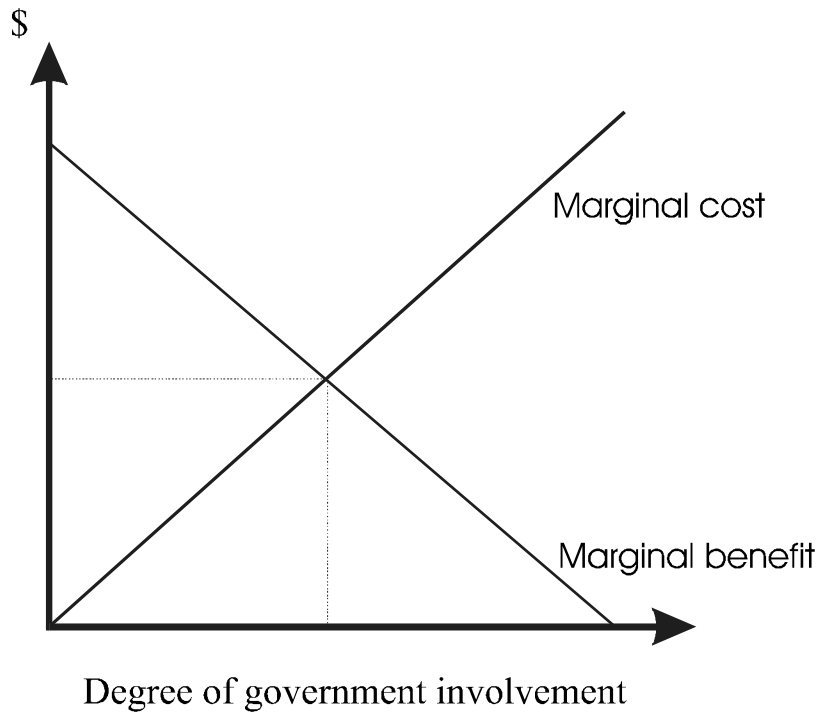
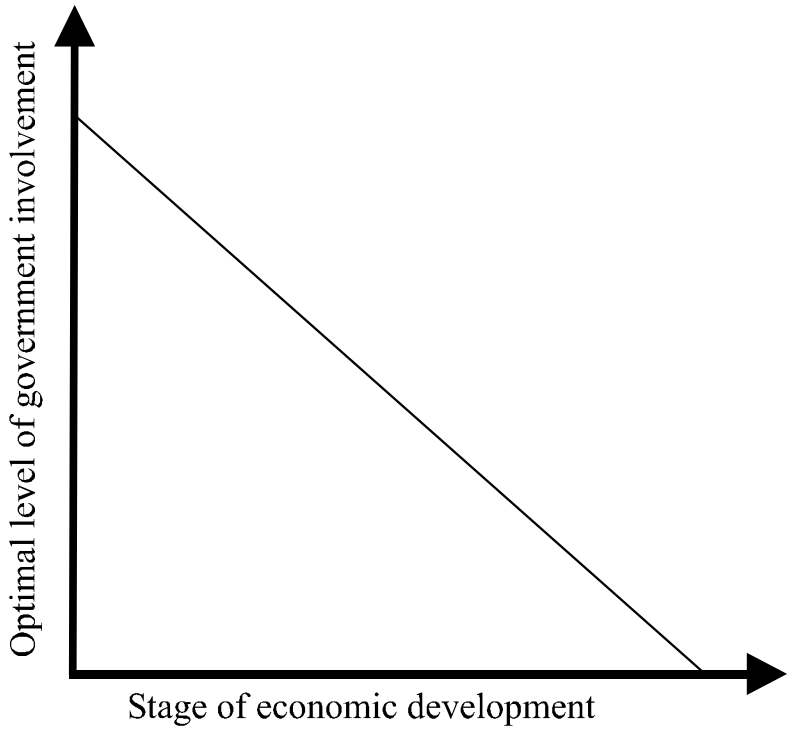


Figure 5.2 **Optimal level of government involvement**



5.4 Concluding remarks

In this paper, a uniform framework was presented to explain both the economic miracle and the financial crisis in Asia. There was no attempt to provide a full explanation for these complicated phenomena. If 20 per cent of the facts have been explained and further studies encouraged, then the objective of this paper has been fulfilled.

References

Lio, M. 1996, 'Three essays on increasing returns and specialisation', PhD Dissertation, National Taiwan University and Monash University, Taipei.

Krugman, P. 1994, 'The myth of Asia's miracle', *Foreign Affair*, vol. 73, no. 6, pp 62–78.

Shi, H. and Yang, X. 1995, 'A new theory of industrialisation', *Journal of Comparative Economics*, vol. 20, pp. 171–89.

6 'Perspiration' versus 'inspiration' in Asian industrialisation

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6.1 Introduction

This paper examines trends in and determinants of total factor productivity in 28 manufacturing industries in Indonesia over the period 1975–93.[1] The reforms of the mid 1980s appear to have resulted in a significant acceleration of total factor productivity growth. Among the interindustry determinants of total factor productivity growth, trade policy and orientation, domestic competitive pressures and ownership factors are singled out for scrutiny. The trade regime and one measure of domestic competition emerge as consistently important explanatory factors.

Before being pushed aside by the current crisis, total factor productivity growth (TFPG) and its determinants were one of the most studied and debated issues in Asian economic development. In part, this debate was triggered by Paul Krugman's famous 'myth' paper (Krugman 1994) which, in the author's words, triggered a veritable 'cottage industry' of research on the subject. This paper and the detailed empirical research on which it drew, challenged the notions that the extremely rapid East Asian economic growth was particularly difficult to explain, and sustainable much beyond the current phase based on catch-up and rapid input growth. If it could be shown that such growth was primarily input driven (that is, by factor augmentation), then the rate of economic growth would be expected to decelerate

[1] This paper primarily draws on a recently completed doctoral dissertation by Aswicahyono (1998). It is impossible to compress complex methodological and empirical issues into a journal length format and the reader is referred to the original source for details.

We are grateful to Indonesia's Central Bureau of Statistics (BPS, Badan Pusat Statistik) for access to tapes of the annual Industrial Statistics (Statistik Industri) upon which much of the empirical analysis in this paper rests, and to seminar participants at the Australian National University for helpful comments on earlier drafts.

sharply in line with the slower expansion of the labour force, human capital and investment.

Although conceptually straightforward, the issue of TFPG and its determinants is enormously complex analytically and empirically. One illustration of this proposition is the wide range of figures available for many countries purporting to estimate the same phenomenon. These variations not only occur across countries, as would be expected, but also within countries, over time and across sectors. The results are highly sensitive to the assumptions made and to data quality, particularly of estimates of the capital stock. Moreover, apart from the general issue of data reliability, many of the estimates are highly aggregated and therefore explain little about what is happening in an economy, and whether the problem (if there is one) of low total factor productivity (TFP) is an economywide phenomenon or resides in particular sectors.

The Asian literature has primarily focused on Japan and the four newly industrialising economies, of which all have quite long periods of industrialisation and good data bases. The next tier of East Asian economies has been studied much less intensively. However, the experience of these economies also warrants attention, and in some cases their data bases and industrial histories permit such an examination. In this context, Indonesia is of particular interest for a number of reasons. First, until the current crisis, it experienced three decades of continuously rapid industrialisation — the first such occurrence in its history. Second, over this period the country had a particularly interesting economic policy history. After the initial liberalisation of the late 1960s, there were pronounced policy swings in the 1970s (financed by the oil boom) towards dirigisme and intervention, but from the early 1980s back to a more liberal and international orientation. It is therefore of particular interest not only to estimate TFPG in aggregate, but to track these numbers episodically, to determine whether the policy regimes do affect the overall story. A final attraction of the country is that a reasonably comprehensive, accurate and disaggregated industrial data base has been available from the mid 1970s. One can thus be fairly confident that variations in TFP growth over time and across industries mean something.

The primary purpose of this paper is to examine the relatively neglected issue (within the TFP literature) of the determinants of TFP growth over time and across industries in Indonesia. First, the following section is a brief sketch of the country's industrialisation and policy regime, a summary survey of the TFP literature, and an explanation of our major hypotheses concerning TFP growth determinants. We then explain our data base and highlight some methodological issues in section 6.3. Section 6.4 presents the main empirical results, including both an overview of aggregate TFP trends and an analysis of interindustry variations in TFP growth.

6.2 Background to the study

This section briefly discusses and analyses the course of Indonesian industrialisation, reviews the pertinent literature on TFP, and develops our major hypotheses.

Indonesian industrialisation

Indonesia constitutes an unusually interesting case study of third world industrialisation, owing to its fluctuating fortunes, its diverse policy regimes, and the episodal nature of its development.[2] By the mid 1960s, it was one of the least industrialised of the large developing countries, and well behind Asia's other giants, China and India. However, from 1967, it began to industrialise extremely rapidly, following the adoption of more liberal economic policies under the Soeharto regime. For the next three decades, until the crisis which erupted with unexpected ferocity in mid 1997, the industrial sector grew at more than 10 per cent per year in almost every year. There was therefore a remarkable industrial transformation over this period — a transformation in aggregate production, its scale, the range of goods produced, the structural change within industry, its international orientation, and levels of commercial and industrial competence. One of the major questions to be addressed in this paper is whether there was a commensurate increase in TFP.

It is crucially important to understand the policy regimes adopted over this period. Despite a broadly consistent commitment to market oriented principles and sound macroeconomic management, there were quite distinct episodes in industrial policy and development.[3] We later ask whether variations in TFPG are discernible over these periods, so it is useful to identify them.

(a) *Rehabilitation and recovery* (1967–72). Rapid growth was achieved by 1968 and maintained until 1982. Growth was propelled by principally the adoption of liberal economic policies and macroeconomic orthodoxy, combined with large volumes of international aid and foreign investment.

(b) *Oil boom* (1973–82). The quadrupling of international oil prices was the principal engine of growth over this period. Indonesia managed the oil boom much more successfully than most other developing country oil exporters

[2] The general literature on Indonesian industrialisation is still relatively sparse. Recent books include Hill (1997) and Sato and Pangestu (1997). Poot et al (1990) provide a detailed study of the period through to the mid 1980s. The most detailed Indonesian language analysis is Thee (1997).

[3] For further elaboration on these episodes see, for example, Bhattacharya and Pangestu (1993) and Hill (1996).

(see Gelb, A. and Associates 1988), mainly through reasonably effective macroeconomic and exchange rate management, and the recycling of much of the windfall gains into physical infrastructure and agriculture. Industry grew rapidly, although the policy environment was much less conducive to efficiency: an array of trade barriers was increasingly erected, investments in ambitious and uneconomic state enterprises commenced, and the regulatory and licensing regime increased in complexity.

(c) *Recession and adjustment* (1983–85). Falling oil prices, gradually in 1982-83 then abruptly in 1985-86, produced an immediate and effective macroeconomic policy response, resulting in fiscal contraction and devaluation. However, reform did not extend to the microeconomic environment as quickly, especially in the areas of trade policy and the state enterprise sector.

(d) *Liberalisation and export orientation* (1986–96). The second round of oil price declines in the mid 1980s triggered a much more effective government response, which took the form of increasingly comprehensive and decisive microeconomic reforms, affecting trade, foreign investment, banking and regulatory policies. Combined with a continuing sound fiscal, monetary and exchange rate framework, Indonesia for the first time experienced genuine private sector and export led industrialisation. By the mid 1990s rampant corruption and rapidly rising, short term external debt were threatening to undo the gains from these reforms, but the benefits were readily evident for at least the first five to eight years (which coincides with our period of analysis below).

There may be minor quibbles concerning the exact years chosen in this schema, but these episodes are broadly accepted in the literature. As explained below, data limitations preclude an analysis of trends in the first subperiod and the last three years of the fourth, but otherwise it is possible to track closely the effects of the reforms.

TFP literature

Economists have long been interested in measuring TFP and its growth. Serious analytical research on the subject began in the United States in the 1930s, based on the twin strands of production function analysis and national income measurement. Early research concluded that TFPG was an important source of economic growth, accounting for about half of the total — a result which was later to be challenged in a seminal article by Jorgenson and Griliches (1967). In an historical note on the subject, one of the key researchers later observed, ‘All the pioneers of this subject

were quite clear about the tenuousness of such calculations and that it may be misleading to identify the result as "pure" technical progress' (Griliches 1996, p. 1328). The empirical results are sensitive to conceptual and empirical issues, including the choice of functional form, the method of sectoral aggregation, capacity utilisation, the measurement of capital and labour services, and the selection of deflators. We will return to some of these issues in the empirical analysis.

Like growth theory, work on TFP was somewhat dormant for almost two decades until it was revived by the World Bank's (1993) East Asian miracle study, of which the empirical underpinnings were provided by researchers associated with the World Bank. Then it was popularised in dramatic fashion by Krugman (1994) who, although not providing any fresh empirical evidence, became arguably the most widely cited commentator on the East Asian economic development before the crisis. Krugman brought TFP analysis centre stage, by arguing that there was nothing 'miraculous' about rapid East Asian growth, that it could be accounted for quite simply by equally rapid rates of factor augmentation — labour force, investment and human capital. In recent years there has been an extraordinary amount of research on the topic.[4]

Most of this literature has focused on the Asian newly industrialising economies. Singapore is often singled out as the clearest apparent case of low TFPG, particularly in the 1970s. The emphasis on Singapore was initially based on a PhD dissertation later published as Tsao (1985). (However, subsequent research (Rao and Lee 1995), using mainly 1980s data, has challenged these conclusions.) Several cross-country studies include other Asian economies, but their record has rarely entered the mainstream debate to the same extent, and there are few detailed, disaggregated country case studies of those economies. Given our focus on Indonesia, and that the newly industrialising economies have been well documented, it will be useful to briefly summarise some of the main results from Indonesia's South East Asian neighbours (excepting the special case of Singapore). These are reported in table 6.1.

Several conclusions stand out, including some that apply to other TFP studies. There is no necessary correlation between TFP and economic growth. Chen (1997) asserts that Indonesia and Thailand have generally been 'productivity driven economies', and all available estimates suggest that TFPG has been positive. There is a general consensus that TFP accounted for about one quarter of economic

[4] It is not possible, obviously, to cite all this literature. Several useful surveys have been compiled. See for example, Chen (1997), Drysdale and Huang (1995), and Dowling and Summers (1998). It is perhaps invidious to single out individual references, but widely cited authors in the field include Kim and Lau (1994), Lau (1998) and Young (1995).

growth in Indonesia during the 1970s and 1980s (with one exception). Indonesia also exhibits the lowest dispersion in the estimates of the TFP contribution to growth. Productivity increases are much less evident in Malaysia and the Philippines. (The Philippines had little growth of any kind until recently.) However, the results are widely dispersed. Malaysia in particular shows widely varying estimates, with the results apparently being especially influenced by the different capital shares used in weighting capital growth.

These figures give only very broad clues to Indonesia's comparative ranking. A detailed sectoral disaggregation, an analysis of the performance during major episodes, and an identification of key determining factors are necessary to understand the numbers.

For interindustry studies of TFPG in developing countries more generally, the pioneering empirical study is Krueger and Tuncer (1982), who examined sources of growth in 18 two digit manufacturing industries in Turkey over the period 1963–76. They particularly noted the link between the trade regime and TFP, finding that the latter grew more slowly when the trade regime was more stringent. Nishimuzu and Robinson (1986) were the first to test empirically the link between TFPG and trade orientation in developing economies, for 13 manufacturing sectors and four countries from the late 1950s to the late 1970s. They found rather strong support for the hypothesis that import substitution/export expansion regimes were negatively/positively correlated with TFPG. Bonelli (1992) reached broadly similar conclusions in a study of Brazilian manufacturing over the period 1975–85. Chen and Tang (1990), in their study of Taiwanese manufacturing over the period 1968–82, drew attention to the impact of the trade regime through the opportunity it presents for firms to exploit economies of scale. Kawai (1994), and contributors to the special issue of *Developing Economies* (December 1994) on trade liberalisation and growth in Asia, extended these results, showing that trade liberalisation had a positive impact on TFPG in most cases. Where data permitted, the authors also showed that increased foreign investment flows and stronger domestic competitive pressures had positive effects on TFPG, whereas the presence of State owned

Table 6.1 **Selected studies of TFP growth, South East Asia**

Country	*Author(s)*	*Publication year*	*Period*	*GDP growth*	*TFP growth*	*TFP cont.*	*Rank*
Indonesia	World Bank	1993	1960–89	6.30	1.25	19.9	1
	Kawai	1994	1970–90	6.20	1.50	23.8	1
	Nehru and Dhareswar	1994	1960–90	6.30	0.20	3.0	1
	Bosworth et al.	1995	1960–94	3.40	0.80	23.5	3
	Drysdale and Huang	1995	1962–90	6.70	2.10	31.3	1
	Sarel	1996	1978–96	4.74	1.16	24.5	3
	Average				1.2	21.0	
	standard deviation				0.6	9.6	
Malaysia	World Bank	1993	1960–89	7.00	1.08	15.4	3
	Kawai	1994	1970–90	6.70	1.60	23.8	2
	Nehru and Dhareswar	1994	1960–90	7.00	–0.20	–2.6	3
	Bosworth et al.	1995	1960–94	3.80	0.90	23.7	2
	Drysdale and Huang	1995	1950–90	6.00	–0.45	–7.5	4
	Sarel	1996	1978–96	4.54	2.00	44.1	1
	Average				0.8	16.1	
	standard deviation				1.0	19.0	
Philippines	Kawai	1994	1970–90	3.60	–0.70	–19.6	4
	Nehru and Dhareswar	1994	1960–90	3.90	–0.80	–21.3	4
	Bosworth et al.	1995	1960–94	1.20	–0.40	–33.3	4
	Drysdale and Huang	1995	1950–90	4.90	0.20	4.1	3
	Sarel	1996	1978–96	0.19	–0.78		4
	Average				–0.5	–17.5	
	standard deviation				0.4	15.7	
Thailand	World Bank	1993	1960–89	7.10	2.50	35.2	2
	Kawai	1994	1970–90	7.00	1.90	27.1	3
	Nehru and Dhareswar	1994	1960–90	7.10	0.10	1.3	2
	Bosworth et al.	1995	1960–94	5.00	1.80	36.0	1
	Drysdale and Huang	1995	1950–90	5.80	1.70	29.3	2
	Sarel	1996	1978–96	5.24	20.03	38.7	2
	Average				1.67	27.93	
	standard deviation				0.82	13.75	

enterprises had the opposite effect. In addition to these industry level studies, a number of rich firm level analyses, while broadly supporting the above results, inject a note of caution for drawing sweeping industrywide conclusions.[5]

[5] Examples include Tybout and Corbo (1991) on Chile, Handousa, Nishimuza and Page (1986) on Egypt, Sjoholm (1997) on Indonesia, and Fan (1999) on China.

Hypotheses

Drawing together the literature on TFP and Indonesia's industrial experience and policy regimes, we are now in a position to formulate some hypotheses concerning expected TFPG in Indonesian manufacturing over time and across industries. Much of the TFP literature, especially that which focuses on East Asia, is confined to aggregate time series estimates of TFPG. These are useful as a first step, but they invite the obvious question of why such variations occur, both over time and across industries. We focus on the three components driving TFP growth — efficiency, economies of scale and technical progress — and the three mechanisms through which the economic environment affects TFPG — competition (both domestic and foreign), widening of the market, and knowledge accumulation and spillover.

The first hypothesis (the most obvious and least important) is that trends in aggregate TFP can be expected to follow the business cycle: high growth in gross domestic product per capita can be expected to result in high TFPG, and vice versa. This follows from the well known Verdoorn's Law. Such results also reflect inevitable imperfections associated with TFP measurement. In particular, as a measure of the residual, TFP measurement captures business cycle effects, such as higher profits during periods of strong growth.

Second, openness to international trade is presumed to affect TFP growth positively. The channels through which this influence operates are greater competitive pressures (assuming openness embraces not just free trade for exporters but also import liberalisation), knowledge spillovers, and the opportunity to exploit scale economies.

Third, domestic competitive pressures are hypothesised to have a similar effect as openness to trade — that is, it is anticipated that more intense pressures will result in accelerated TFPG. The behavioural theory underpinning this connection draws on the theory of managerial behaviour (that is, managers may 'maximise' or 'satisfice', depending on the commercial environment) and 'X-efficiency'.

Fourth, ownership is presumed to affect TFPG, although the relevant literature does not always provide clear guidance. We focus on two ownership variables — State and foreign. The variable could go either way in both cases. The general presumption is that State owned enterprises will affect TFPG negatively, both because the incentive structure for managers of these firms is inimical to efficiency, and because governments tend to burden these firms with noncommercial objectives. However, it is possible that the latter — to the extent that such objectives include an explicit technological mission (as has been the case for some of the large Indonesian State owned enterprise sector) (Hill and Thee 1998) —

could generate a positive result. Various implicit and nonmeasured subsidies for State owned enterprises could also complicate the empirical analysis.

The presence of foreign firms would be expected to trigger higher TFPG, because they would be a vehicle through which more advanced technologies would be introduced into the host economy. This is especially the case where the domestic human resource base is strong and explicit government programs aim to tap into the foreign partners' superior technology. However, some of the literature has argued that foreign firms may be associated with slower TFPG, to the extent that they introduce frontier technology (and thus future growth will be slower) or if the gap between foreign and domestic partners is so large that catchup factors via domestic spillovers and absorption are minimal.

6.3 Database and methodology

Before proceeding to the empirical results, it is necessary to explain briefly our data base, and some of the key methodological approaches and assumptions.

First, the data.[6] Indonesia has an unusually rich industrial data base since the mid 1970s. Previously and especially through to 1970, it was poor. But since 1975, Indonesia's Central Bureau of Statistics — Badan Pusat Statistik — has conducted a comparatively reliable survey of all manufacturing firms with 20 or more employees, excluding those in the oil and gas processing industry. The resulting publication, *Statistik Industri*, is released in summary form annually, while detailed firm level data can be obtained from Badan Pusat Statistik in electronic form. Since the late 1980s, two series have been released: the comprehensive *Statistik Industri* series and a summary version which covers just a few key variables (known as the backcast series). The latter arose because it was discovered in the course of conducting the mid 1980s decennial census that underenumeration was becoming a serious problem. Badan Pusat Statistik decided to correct this problem by 'backcasting' the history of establishments found to be missing at the time of the census. Fortunately, the omissions do not substantially affect either reported aggregate industrial growth rates in the national accounts (because the key statistical officers were able to compensate accurately for the missing firms) or the major attributes such as ownership, size and sectoral shares (because the omitted firms were subsequently revealed to be distributed across these variables more-or-less in proportion to the enumerated firms). The data used in this study 'marry' these two sources, combining the strengths of both. In what follows, we employ the backcast series to generate relevant totals, but use the more detailed *Statistik Industri* to

6 See Aswicahyono (1998) chapter 4 for a detailed discussion of data sources and issues.

provide the more detailed components. Output data are provided in current nominal prices, and these are deflated by the relevant wholesale prices indexes, which are mostly available at the four-digit classification.

Among the key factor inputs, capital is as always the most difficult to measure. Intermediate inputs are classified (with aggregate percentages by value in parentheses) into energy (6 per cent), raw materials (81 per cent) and other (13 per cent) for each industry. Relevant deflators are constructed in a number of ways. For energy, price data are available for electricity and the other major sources of fuel. For raw materials, a composite material input price deflator is constructed for each industry, based on the shares of the major items reported in input–output tables. For other inputs, a number of specific indexes are calculated. In total, price indexes for 19 types of intermediate inputs are calculated for the three major groups. A composite raw material index is then calculated, both weighted and unweighted, to determine whether the results are sensitive to aggregation methods.

The *Statistik Industri* data classify labour into production, nonproduction and family workers. The latter group is small — just 1 per cent of the total. The first two groups are crude proxies for unskilled and skilled workers respectively, given that the average wage of nonproduction workers is considerably higher. Total labour inputs are aggregated into a simple index of labour quantity for each industry, with value shares of each type of labour being used as weights for quality. This common procedure is justifiable in the Indonesian case owing to its competitive labour markets which feature high mobility, few institutional constraints and minimal regulation (Manning 1998). Unfortunately, industry level data on hours worked and education levels of employees are not available, so it is not possible to develop more sophisticated measures of human capital inputs.[7]

The capital stock is conventionally estimated using the perpetual inventory method. This requires a gross investment series, an asset price deflator, a depreciation rate, and a benchmark capital stock. In Indonesia's case an investment series is available, but there is known to be underreporting. An alternative might have been to calculate an investment ratio from the *Statistik Industri* data, and to apply it to the backcasted value added data. However, this approach would mean that other useful data in the backcast series are not used (that is, employment and intermediate inputs), and the presence of 'lumpy' investments may tip the ratio upwards. Instead, we adopt an intermediate approach, by regressing the investment series on the variables that appear in both data sources, and use the parameters from the regression to predict the investment series for the backcast data. This method has intuitive appeal,

[7] See Timmer (1999), who incorporated human capital variables in his analysis of TFP, but at the cost of a much more aggregated unit of analysis (six industrial sectors, as against the 28 analysed here).

because the independent variables on which the investment series is regressed obviously have some relationship to the investment value. The equation is then used to predict the 'missing' (that is, nonexistent) investment series in the backcast data. Next, the series is deflated using the domestic and imported goods wholesale price index, because this is heavily weighted by imported machinery (which accounts for about 60 per cent of manufacturing investments according to the *Statistik Industri* investment series). Finally, a quality adjusted capital series is produced, in which the individual series are combined with weights calculated on the basis of relevant value shares of each of the five types of capital (that is, land, buildings, machinery, vehicles and other).

A methodological issue in the measurement of TFP concerns the choice between the growth accounting and econometric approaches. This study uses the former approach, for its simplicity and the flexibility of its assumptions: for example, it implicitly permits the assumption of flexible functional forms, such as translog production functions, which are manifested in the use of different value shares of inputs for different time periods. Another choice is that between the use of value added or gross output as a measure of production. Owing to the problems of separability between inputs, and the associated problems with value added deflators, gross output is used.

6.4 Empirical results — an overview

We present here the major empirical findings from the study, discussing the aggregate TFPG results before examining their determinants. Our primary data source for the dependent variable is TFP growth of 28 industries over the period 1976–93, which thus forms a panel of 504 observations.

Figure 6.1 and table 6.2 show trends in aggregate TFPG in Indonesian manufacturing. Over the period 1976–93 as a whole, real value added grew annually by 12.7 per cent and input growth rose by 10 per cent, resulting in TFPG of 2.7 per cent annually, or 21 per cent of total output. This finding is close to the average of the percentage contribution found in aggregate TFP studies for Indonesia reported in table 6.1. While inputs were by far the most important source of growth, Indonesian industrialisation over this period was no 'myth' in the Krugman sense, especially following the mid 1980s reforms.

In addition, several specific results clearly stand out. First, TFP growth correlates significantly with output growth. TFP growth is always procyclical — a result that confirms Verdoorn's Law, and probably also reflects business cycle effects on profits and thus on TFP (but which conceptually has nothing to do with TFP).

Second, there is an apparent lag in the investment response to the business cycle, which has flow-on effects to the TFP results. Despite the growth slowdown in the early 1980s, for example, investment continued to expand strongly, much of it in the public sector and related to the then fading oil boom. Thus, TFP was sharply negative over this period. Conversely, TFP grew strongly in the second half of the 1980s, in response to accelerating output growth but an initially subdued investment recovery.

Third, the policy environment has a pronounced effect on TFP growth. The contrast is particularly sharp between the 'prederegulation' period of 1976–83, and the 'deregulation' period of 1984–93 with negative growth in the former and strongly positive growth in the latter. The difference in the contribution of TFP to growth is even more striking. During the oil boom and recession period up to 1983, TFP contributed to industrial growth negatively overall, and for this period was positive only twice. By contrast, from 1984 TFP contributed to over one third of industrial growth. The variance was also lower during the deregulation period, indicating that TFP grew less erratically. Thus, regardless of the caveats which have to be attached to studies of this type, the results overwhelmingly suggest that the policy environments, particularly the increasingly bold liberalisations from 1984, are a central element in explaining patterns of TFPG over time. They also clearly point to a substantial policy reform dividend.

One could extend this analysis in various directions, including an examination of sectoral trends, a decomposition of between and within sector changes and sensitivity analysis. Space limitations preclude this analysis (Aswicahyono 1998, pp. 187–260). But it may be useful to mention briefly three key findings.

Figure 6.1 **Annual fluctuations of TFP growth, 1975–93**

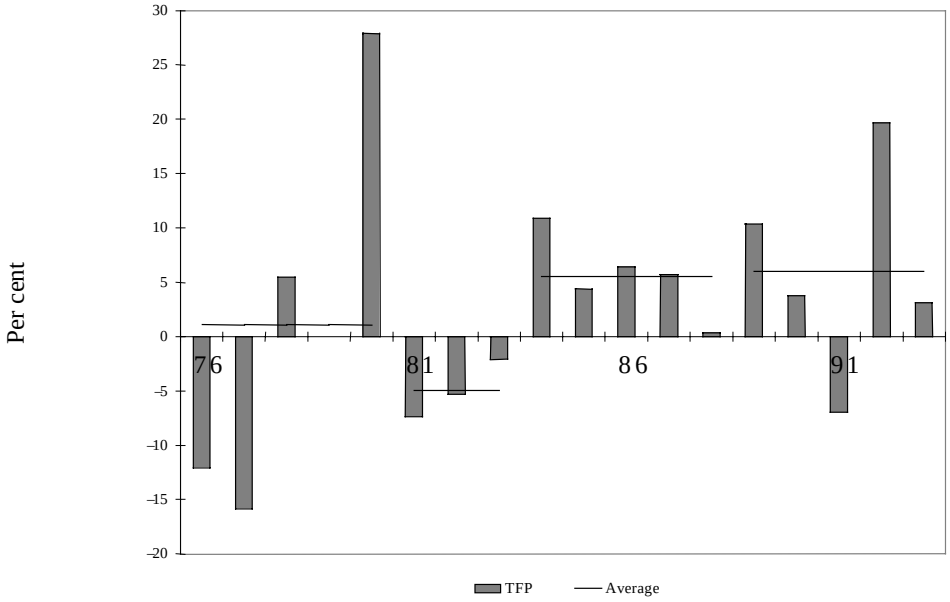

Table 6.2 **Weighted average TFP growth, 1976–93**
Per cent

Period	*TFP*		*VA growth*	*TFP/VA*	*Capital growth*
	Growth	*Variance*			
1976–80	1.1	295	9.2	12	7.8
1981–83	–4.9	9	6.9	–72	13.4
1984–88	5.5	16	13.5	41	8.7
1989–93	6.0	89	19.1	31	14.7
1976–93	2.7	117	12.7	21	10.9

One finding is that the results are not particularly sensitive to the value shares used to weight the growth of inputs. Unlike some studies, where TFPG has switched sign, our results do not differ much if alternative assumptions are used. The conclusions that TFPG and its contribution to industrial growth, were both considerably higher after reform also continue to hold. Another important finding is that the relative importance of 'within sector' TFPG and 'reallocation effects' changes considerably over time. The former is found to be large and negative in the pre-reform period, and is pulled up by only the positive reallocation effect over these years. That is, there was a strong push into capital intensive, heavy industry over this period, which pulled resources into these uneconomic activities. By contrast, within sector TFPG was strongly positive in the reform period. It

accounted for virtually all the increase from 1984, and more than one third of the growth of value added was derived from just productivity improvement within industries. Finally, there was considerable convergence of TFP levels over this period, with most above average TFP industries (in terms of levels) in 1975 recording below average TFP growth, and vice versa. In a simple equation regressing initial TFP levels on subsequent growth rates, the coefficient is negative (and significant at 10 per cent).

Analysing the determinants

We now turn to the major part of the paper, and examine these interindustry variations in TFPG. They are large, so are they random or systematic? Does something in the commercial policy environment shape these results? To return to the earlier hypotheses, one may expect several factors to influence these patterns.

(i) *Exposure to international trade*. We use two variables: export and import data relative to domestic production, which indicate the extent to which a given industry is involved in international trade; and effective rates of protection, which measure the extent to which an industry is insulated from foreign competition. The incorporation of trade data is a straightforward process. Trade data from Indonesia's input–output tables of 1975, 1980, 1985, 1990 and 1993 are used; for years in between, a linear interpolation is assumed. The inclusion of effective rates of protection data is more complex. Various estimates are available throughout the period under study, but there is no set of consistently measured numbers. Owing to this difficulty, the TFPG–effective rates of protection nexus is considered separately in the following analysis.

(ii) *Domestic competition*. This is measured for each industry by four firm concentration ratios, and by an 'instability' (or turnover) index of market shares. Both variables are calculated from the annual firm level industrial surveys.

(iii) *Ownership variables*. These are measured as a percentage of foreign and state owned firms in each industry's output, for which data are available in the annual industrial surveys. Joint ventures are treated in a manner described in Aswicahyono and Hill (1995).

We now consider these variables, analysing each before presenting integrated regression results. We are hypothesising that the determinants of interindustry TFPG take the following form:

TFPG = f(TO, ERP, CR4, HHI, AII, SH[f], SH [g])

The variables are defined in the following paragraphs. The first two are trade variables, the next three are domestic competition variables, while the last two are ownership variables.

Trade

Following Nishimuzu and Robinson (1986) and others, we incorporate the impact of trade policy by examining the relationship between various components of demand (that is, trade orientation [TO]) and productivity growth. Later we also consider the relationship between trade policy interventions and productivity. For each industry, changes in total demand are decomposed into their major constituent elements — that is, domestic demand expansion (DD), export expansion (EE) and import substitution (IS). The decomposition is further disaggregated into the major time periods, 1975–80, 1980–85, 1985–90, 1990–93.[8] (Results are presented in Aswicahyono 1998, table 6.5).

How do these various patterns in the sources of demand growth affect TFP growth? To answer this question, we compare the TFP performance of sectors with different sources of demand growth. There are three sources of demand, as noted above. However, sectors do not usually rely on just one source. More commonly they combine various sources — that is, domestic demand and export expansion (DE), domestic demand and import substitution (DI), and export expansion and import substitution (EI). It is therefore possible to classify the 28 industrial sectors into six exhaustive categories according to the source of output growth:

- Group D: DD (86–93) > DD (76–85)
- Group E: EE (86–93) > EE (76–85)
- Group I: IS (86–93) > IS (76–85)

and the combination of two types of source of growth:

- Group DE: DD (86–93) > DD (76–85) and EE (86–93) > EE (76–85)
- Group DI: DD (86–93) > DD (76–85) and IS (86–93) > IS (76–85)
- Group EI: EE (86–93) > EE (76–85) and IS (86–93) > IS (76–85).

Thus, for example, group E comprises sectors where the share of export expansion in output growth (EE) during 1986–93 was higher than that during 1976–85. In other words, export expansion in this group became a more important source of growth. Other groups are defined analogously.

[8] Note that the periods differ very slightly from our 'policy episodes' identified above, as dictated by the availability of input-output data.

Table 6.3 provides a comparison of TFP growth among the groups. It is clear from the table that sectors that rely more on export expansion in the second period have a superior performance in terms of TFPG, compared with those that become more domestic oriented or rely more on import substitution strategies. Sectors in the E group improved their average TFPG from –0.4 per cent during 1976–85 to 3.4 per cent during 1986–93. Where the sectors combined the E and D strategies, the improvement in TFP growth is still positive, although much lower than that of the sectors that followed the E strategy exclusively. Combining D and I strategies is evidently the 'worst' strategy, with TFPG deteriorating from 2.3 per cent to –0.9 per cent. Thus, these results are consistent with our *a priori* reasoning. They provide clear presumptive evidence that the trade liberalisations from the mid 1980s, by inducing firms to look outwards, positively affected TFP performance.

Table 6.3 **Trade strategy and TFP growth**

Group	*Number of sectors*	*$DD_{86–93}$ minus $DD_{76–85}$*	*$EE_{86–93}$ minus $EE_{76–85}$*	*$IS_{86–93}$ minus $IS_{76–85}$*	*TFP(%) (Average)*		*$TFP_{86–93}$ minus $TFP_{76–85}$*
					76–85	*86–93*	
E	10	–37.4	52.1	–14.6	–0.4	3.4	3.8
DE	7	6.3	14.8	–21.1	0.5	1.9	1.4
EI	8	–30.2	14.3	15.9	1.0	1.4	0.4
D	2	24.5	–13.0	–11.5	1.7	0.8	–1.0
DI	1	2.3	–12.7	10.4	2.3	–0.9	–3.1

Note: No sector chose to rely on import substitution (Group I) exclusively.

Source: See text.

Domestic competition

We follow the approach in the industrial economics literature (see, for example, Baldwin and Gorecki 1994)[9], and identify three measures of domestic competition. Two are static measures of seller concentration and record the size distribution of firms at particular points in time. These are the four firm concentration ratio (CR4) — which measures the sales of the four largest firms in an industry as a percentage of total industry sales — and the Herfindahl index — which is defined as the sum of the squared shares for the relevant variable of each firm in an industry. (We subsequently drop the Herfindahl index (HHI) from the analysis, because it generates similar results.) These are supplemented by a measure that reflects the dynamics of competitive pressures over time. We choose the absolute instability index (AII), which is the absolute value of the change in market share of each

[9] See Bird (1999) for a detailed analysis of competition and regulation policies in Indonesian manufacturing industries since the mid 1970s.

incumbent firm between two points in time. The value of the index ranges from zero to one. The higher the value of the index, the more unstable are market shares and thus the greater are the competitive pressures in an industry. Formally, it is defined as follows:

$$AII_t^j = \sum_{i=1}^{n} \left| ms_{i,t} - ms_{i,t-1} \right|$$

where:

$i = 1....n$ incumbent firms, for industry j; and
$ms_{i,t}$ = the market share of firm i in the industry in period t.

The results indicate a generally declining trend in the concentration index and an increasing instability index (see Aswicahyono 1998, table 6.7; Bird 1999). As with trade orientation, we are particularly interested in probing the nexus between changes in competitive pressures and TFP performance. Therefore, we classify the 28 manufacturing industries into the following categories:

Group C+S+: CR4 (84–93) > CR4 (75–83) and AII (84–93) < AII (75–83)

Group C+S-: CR4 (84–93) > CR4 (75–83) and AII (84–93) > AII (75–83)

Group C–S+: CR4 (84–93) < CR4 (75–83) and AII (84–93) < AII (75–83)

Group C–S-: CR4 (84–93) < CR4 (75–83) and AII (84–93) > AII (75–83)

The meaning of these four groups is interpreted as follows. Industries falling into the group C+S+ are those that have become more concentrated (that is, an increase in the concentration ratio) and display lower turnover, or instability (that is, a lower instability index). These indicators both unambiguously point to reduced competitive pressures in the industry. At the other end of the spectrum are the industries falling within the group C–S–, which are those that have become more competitive according to both measures — that is, a lower concentration ratio and a higher instability index. The other two groups exhibit ambiguous trends, in the sense that the indicators are moving in different directions. The same approach is adopted for the other measure of concentration, the Herfindahl index: four groups of industries may be identified, representing the various combinations of Herfindahl index and absolute instability index.

The TFP performance can now be compared among groups (table 6.4). There is clearly a positive association between the instability index and TFP growth. Industries that experienced increased instability in market shares (that is, an increasing absolute instability index) show an improvement in TFP between the predereguation and deregulation periods. Thus, according to this measure,

increased competition leads to higher TFPG. By contrast, the association between concentration and TFP performance is less clear, and it is difficult to reach any firm conclusion. Perhaps 'Schumpeterian' influences are at work here, with larger firms reaping efficiency gains from economies of scale, and therefore being able to outcompete smaller ones. The data suggest the possibility that moderate levels of concentration and unstable market shares may be a good environment for TFP growth. But more work needs to be done, and one certainly would not want to advocate such an approach in policy advice. It also needs to be emphasised that movements in the concentration indicators are much smaller than those in the instability index[10], and therefore one needs to be cautious in drawing firm inferences from the concentration results.

Table 6.4 **Degree of competition and TFP growth**

Group	*Number of sectors*	*$CR4_{84–93}$ minus $CR4_{75–83}$*	*$HHI_{84–93}$ minus $HHI_{75–83}$*	*$AII_{84–93}$ minus $AII_{75–83}$*	*TFP (%) (Average)*		*TFP_{84-93} minus $TFP_{75–83}$*
					75–83	*84–93*	
C+S-	6	0.04	0.0	0.2	-0.7	2.53	3.18
C–S–	19	–0.13	–0.1	0.1	0.1	2.06	1.92
C–S+	2	–0.13	0.0	–0.1	2.7	1.56	–1.15
C+S+	1	0.06	0.0	0.0	9.1	1.61	–7.48

Source: See text.

Ownership

As noted above, the ownership categories (seven in total, including the various joint venture combinations) are collapsed into three ownership groups: private (P), government (G) and foreign (F). The 28 industries are classified according to the change in the relative importance of each type of ownership, and TFP performance is then compared among them. The following groups are identified:

Group P: P (84–93) > P (75–83)
Group G: G (84–93) > G (75–83)
Group F: F (84–93) > F (75–83)
Group PG: P (84–93) > P (75–83) and G (84–93) > G (75–83)

[10] The industry wide statistics for the three measures over the four time periods are as follows:

	1975–80	1981–83	1984–88	1989–93
CR4	0.51	0.50	0.45	0.44
HHI	0.13	0.13	0.11	0.12
AII	0.23	0.21	0.25	0.34

Group PF: P (84–93) > P (75–83) and F (84–93) > F (75–83)
Group GF: G (84–93) > G (75–83) and F (84–93) > F (75–83).

Thus, for example, group G covers industries in which the share of government firms during 1984–93 was higher than that during 1975–83. Other groups are similarly defined.

The relationship between TFP performance and ownership structure is presented in table 6.5. Our results are a good deal less clear cut than for the first two sets of variables. The results seem to suggest that government ownership plays a positive role in TFPG. However, the results are really only important in, and are dominated by, one sector — rubber products. Similarly, high TFP growth in the F sector is shown in just two industries — leather products and transport equipment. The only convincing relationship is that between positive TFPG and the increased importance of private firms during 1984–93. It is beyond the scope of this paper to explain these mixed results. But several possible explanations may be offered. First, ownership is a slippery empirical concept in Indonesia, and the dividing lines between the three groups are often quite obscure. Second, the foreign presence manifests itself in many ways, of which some are unrelated to equity investments. Licensing is the most common example, particularly in investment decisions undertaken before the late 1980s foreign investment liberalisation. Finally, the data on State owned enterprise performance need to be assessed cautiously in view of the many implicit subsidies these firms receive, not least their general tendency to be located in industries that receive above average protection.

Table 6.5 **Ownership structure and TFP growth**

Group	*Number of sectors*	*$P_{84–93}$ minus $P_{75–83}$*	*$G_{84–93}$ minus $G_{75–83}$*	*$F_{84–93}$ minus $F_{75–83}$*	*TFP (%) (Average)*		*$TFP_{84–93}$ minus $TFP_{75–83}$*
					75–83	*84–93*	
G	1	–3.0	5.1	–2.1	–5.64	–0.63	5.00
P	11	19.9	–7.3	–12.5	–0.15	2.68	2.83
F	2	–14.1	–5.5	19.6	1.73	4.46	2.73
PG	8	7.9	3.9	–11.8	0.14	1.88	1.75
GF	2	–34.5	1.8	32.7	0.50	0.87	0.37
PF	4	9.5	–13.8	4.3	3.73	1.11	–2.63

Source: See text.

Regression results

Following the separate examination of the relationship between each factor and TFP performance, we now proceed to an integrated econometric analysis of TFPG. Table 6.6 reports ordinary least squares estimates of the determinants of TFPG for our

panel of 28 manufacturing industries over the period 1976–93. First, TFPG is regressed on trade related variables (excluding the protection variable), then the competition and ownership variables are progressively added. Another equation is estimated which includes the protection variable separately. The reason for initially excluding the protection variable is that it may be argued that the change in the level of protection, not the actual level of protection, induces firms to increase their productivity. Therefore, ideally, one would want data on changes in the effective rate of protection over time. Unfortunately, as noted, although estimates of protection in Indonesian manufacturing are available over time, they have not been prepared in a methodologically consistent manner. We do later attempt a calculation based on changing levels of protection, but owing to the uncertainties involved, it seemed preferable to keep them out of this regression analysis.

Table 6.6 **Determinants of TFP growth, 1976–93**

Variable	*1*	*2*	*3*	*Elasticity evaluated at means value*
Trade				
EE	0.31	0.30	0.28	0.92
	(8.17)*	(7.55)*	(7.38)*	
IS	0.32	0.33	0.33	0.06
	(5.80)*	(6.02)*	(6.11)*	
Competition				
AII		0.09	0.09	1.87
		(2.74)*	(2.70)*	
CR4	0.06	0.06	2.08	
	(3.35)*	(3.32)*		
Ownership				
DF			0.03	0.01
			(0.74)	
DG			0.07	–0.03
			(1.29)	
Constant	–0.00	–0.06	–0.05	
	(–0.58)	(–4.25)	(–4.07)	
R^2	0.14	0.18	0.19	

a t-ratios are given in parentheses. Significance levels (one tail test) are * 1 per cent.

A number of results are evident from the regression analysis. First, they are reasonably robust, in the sense that the magnitude, sign and significance test do not change much when additional variables are added to the model. Second, both trade related variables, EE and IS, are positively related to TFPG and are statistically significant. That is, the growth of demand, regardless of its source, results in higher TFPG. This presumably reflects the influence of scale economies and technical progress resulting from higher investment levels. However, note the last column of the table, which reports the elasticity evaluated at mean values. The much higher

value for the EE variable indicates that TFP growth responds to export expansion more strongly than to import substitution.

Third, examining domestic competition, there is a significant and positive sign for the instability index (absolute instability index), suggesting that competition — in the sense of 'turnover' — creates a positive environment for TFP growth. Conversely, the significant and positive sign for the CR4 variable seems to contradict this conclusion. However, as noted above, the sign of the concentration variable is expected to be ambiguous owing to the conflicting forces at work — the dangers of anticompetitive behaviour versus 'Schumpeterian efficiency' and the benefits of scale economies.

Finally, both the ownership variables produce insignificant results. While this is puzzling, it probably arises for the reasons mentioned above, to do with accurate identification of the ownership groups, and reliable measurement of State owned enterprise performance.

The same regression equations were run for the two subperiods, 1976–83 (that is, prederegulation) and 1984–93 (deregulation). The results, not presented here, reveal the superiority of the export oriented strategy. In particular, the coefficient of the EE variable remains about the same between the two periods, but the t-ratio almost doubles (2.92 to 5.66). By contrast, in the second period, the coefficient of the IS variable declines to about one third of its value for 1976–83 (from 0.48 to 0.18), and the t-ratio also falls. The results of the other variables remain broadly similar to those reported in table 6.6.

TFP and protection

Finally, owing to the absence of methodologically consistent protection estimates over time, we examine separately the relationship between TFP performance and the trade policy regime. There are four major published studies of protection for the years under study here (that is, 1975–93). These are World Bank (1981), Pangestu and Boediono (1986), Fane and Phillips (1991) and Fane and Condon (1996). We choose the first of these as being representative of the trade regime for the period 1976–83, while the latter two studies cover the period 1984–93. These three studies are also reasonably comparable in terms of assumptions and methodologies (the latter two employ an identical framework). They still differ on some key issues (for example, the treatment of nontraded inputs), but Warr (1992) has undertaken some recalculations which improve their comparability. On this basis, it is therefore possible to compare protection levels and TFP growth approximately in the two major subperiods.

The results are presented in table 6.7. In the first period, eight industries received above average (actually very high) protection, but that protection 'resulted' in slightly negative TFPG. By contrast, the 20 sectors that received below average protection exhibited positive (but still modest) TFPG. Thus, unless it could be proven that an infant industry phenomenon was present, or large and positive externalities, these results challenge the efficacy of the trade strategy pursued over this period. Turning to the second period, the results may appear to refute these conclusions. While industries with above and below average protection both registered positive TFPG, the more protected industries actually recorded the strongest TFP performance. However, the latter results are of much less significance because the trade regime mattered less by then. The average level of protection had fallen sharply, the dispersion of nominal and effective rates had declined, there was less reliance on nontariff barriers, and exporting industries were operating in close to a free trade environment. Thus, in analysing the second period, overall TFP performance matters more than interindustry variations according to the level of protection.[11]

Table 6.7 **ERP level and TFP growth, 1976–83**

	No. of sectors	*ERP average*	*TFP average*
1976–83			
TFP > Average	8	275	–0.3
TFP < Average	20	48	0.8
1984–93			
TFP > Average	11	91	4.0
TFP < Average	17	24	0.9

Source: See text.

Finally, it is important to consider the impact of changes in the level of protection because, as noted above, many argue that changes (not levels) are a more important arbiter of TFP performance. We examine this issue by comparing protection levels in 1975 (that is, taking them to be approximately representative of the 'pre-reform' period) and 1987, when the reforms were well underway. In the case of TFP, we select growth over the period 1989–93, to allow for a lagged impact of the mid 1980s trade liberalisation. In total, 19 industries experienced a reduction in the level of protection between these periods, while nine experienced an increase (generally very modest). Of the 19 industries for which there was a decrease, all but four recorded positive TFPG during 1989–93. (For two of these four, the decrease was

11 Note that the estimates of protection used in Table 7 for the second period are somewhat overstated owing to the fact that no allowance is made for various duty drawback schemes which placed exporters on a free trade footing (Fane and Condon 1996).

negligible — just –0.1 per cent per year.) Average annual TFP growth for these industries was 2.7 per cent. Among the nine industries to receive higher protection, four recorded negative TFP growth and the overall average was 2.0 per cent. This suggests that a reduction in the level of protection contributes to accelerated TFP growth.

We also regressed the TFP growth rates on the change in effective rates of protection ('DERP' — that is, the effective rate of protection in 1987 minus that in 1975). The results, which are corrected for heteroscedasticity, are shown in table 6.8. As expected, the coefficient for DERP is negative and significant, lending further weight to our conclusion concerning the positive impact of reduced protection on subsequent TFP growth. Nevertheless, the low R squared does underline the limited explanatory power of these results.

Table 6.8 **Regression result: TFP growth and change in protection**[a]

Variable	*Coefficient*
DERP	–0.007**
	(–2.293)
Constant	1.783**
	(2.587)
R square	0.11

[a] t-ratios are given in parentheses. Significance levels (one tail test) are ** 5 per cent.

6.5 Conclusions

This is mostly a positive story of wide ranging policy reforms paying dividends. The reforms of the mid 1980s led to a significant and quick acting acceleration of TFP growth in the manufacturing sector. Indonesia before the crisis was certainly not a story of 'perspiration' driven growth, as is sometimes characterised in the literature on East Asia by Krugman and others. Moreover, the commercial policy environment clearly mattered not only in the broad but also in explaining intersectoral variations in TFP growth. In particular, the trade policy environment — the sales orientation of industries and the protection they receive — is shown to affect TFP performance. These variables seem consistently important explanators. A measure of domestic competition (market share instability) also appears to be a significant and positive determinant.

These results need to be interpreted with caution. First, our database is generally adequate for this exercise, but the measurement of the capital stock poses problems. Second, the low R squareds in our econometric analysis, while common in these

studies, indicates that a good deal of the variation in TFP growth remains unexplained (which is partly a problem of dealing with any 'residual' measure, and of sorting out 'pure' TFP and business cycle effects). Third, we are dealing with market prices, which therefore reflect distortions in the policy regime and elsewhere. Consequently, an increase in measured TFP is not necessarily socially desirable. (However, in Indonesia's case, the major reforms of the 1980s render this limitation much less serious). Fourth, the relationship between reform and TFP performance is inevitably complicated by lags and adjustments, especially where TFP growth is embodied in new capital investment. Thus, while the reforms seem clearly to have pushed firms towards a higher TFP growth trajectory, this is necessarily in the realm of 'persuasive conjecture'. Finally, some of our variables — particularly ownership — do not have the expected signs and/or significance. On the basis of firm interviews and much general observation, our suspicion is that the presence of foreign and Government owned firms do have an impact on TFP performance (positively and negatively respectively). But, possibly for reasons advanced in the previous section, the statistical results do not detect these influences.

It also needs to be pointed out that our reference point is industry. Ideally these industry studies need to be supplemented by firm level analysis, not simply firm observations from industrial survey data, but longitudinal case studies of firms over a reform period.

Finally, how can this positive story of accelerating TFP growth be reconciled with Indonesia's catastrophic economic collapse since 1997?[12] Our story refers to only the non-oil manufacturing sector, but most economywide studies of TFP in Indonesia point in the same direction as ours. There is no link between the Krugman 'myth' (although it was not applicable to Indonesia anyway) and the current crisis. That is, the origins and nature of the two phenomenon are unrelated. Krugman was arguing that the rate of economic expansion in East Asia would gradually decline as input growth slowed down. (As he observed in 1998, 'the perspiration theory predicts a gradual loss of momentum, not a crash'). The crash of 1997-98 was mainly to do with financial markets, exchange rates, the behaviour of short term debt and mobile capital, and political disturbances, as major analyses of the period now reveal.[13] Our story underlines the tragedy of Indonesia's current economic crisis, because the Soeharto regime presided over effective and far reaching economic policy reforms in the 1980s which, as shown here, produced significantly positive results.

[12] Indonesia's economy contracted by 13.7 per cent in 1998, about twice as much as the next three most affected East Asian economies, Korea, Malaysia and Thailand.

[13] See, for example, McLeod and Garnaut (1998), World Bank (1998), and Arndt and Hill (1999).

References

Arndt, H. and Hill, H. (eds) 1999, *Southeast Asia's Economic Crisis: Origins, Lessons, and the Way Forward*, Institute of Southeast Asian Studies, Singapore.

Aswicahyono, H. 1998, 'Total factor productivity in Indonesian manufacturing', 1975–93, Unpublished PhD thesis, Australian National University, Canberra.

Aswicahyono, H. and Hill, H. 1995, 'Determinants of foreign ownership in LDC manufacturing: an Indonesian case study', *Journal of International Business Studies*, vol. 26 no. 1, pp. 139–58.

Baldwin, J. and Gorecki P. 1994, 'Concentration and mobility statistics in Canada's manufacturing sector', *Journal of Industrial Economics*, vol. 42, no. 1, pp. 93–103.

Bhattacharya, A. and Pangestu, M. 1993, *Indonesia: Development Transformation and Public Policy*, Part of series on Lessons of East Asia, World Bank, Washington DC.

Bird, K. 1999, 'Industrial concentration and competition in Indonesian manufacturing', Unpublished PhD thesis, Australian National University, Canberra.

Bonelli, R. 1992, 'Growth and productivity in Brazilian industries: impacts of trade orientation', *Journal of Development Economics*, vol. 39, no. 1, pp. 85–109.

Bosworth, B., Collins, S. and Chen, Y. 1995, Accounting for differences in economic growth, paper presented at conference on 'structural adjustment policies in the 1990s: experience and prospects', Institute of Developing Economies, Tokyo.

Chen, E. 1997, 'The total factor productivity debate: determinants of economic growth in East Asia', *Asian-Pacific Economic Literature*, vol. 11, no. 1, pp. 18–38.

Chen T. and Tang, D. 1990, 'Export performance and productivity growth: the case of Taiwan', *Economic Development and Cultural Change*, vol. 38, no. 3, pp. 575–85.

Dowling, M. and Summers, P. 1998, 'Total factor productivity and economic growth — issues for Asia', *Economic Record*, vol. 74, no. 225, pp. 170–85.

Drysdale, P. and Huang, Y. 1995, 'Technological catch-up and economic growth in East Asia', *Economic Record*, vol. 73, no. 222, pp. 201–11.

Fan, X. 1999, 'How Spillovers from FDI differ between state and collectively-owned enterprises in China', Unpublished PhD thesis, Australian National University, Canberra.

Fane, G. and Condon, T. 1996, 'Trade reform in Indonesia, 1987–95', *Bulletin of Indonesian Economic Studies*, vol. 32, no. 3, pp. 33–54.

Fane, G. and Phillips, C. 1991, 'Effective protection in Indonesia in 1987', *Bulletin of Indonesian Economic Studies*, vol. 27, no. 1, pp. 105–25.

Gelb, A. and Associates 1988, *Oil Windfalls: Blessing or Curse?*, Report for the World Bank, Oxford University Press, New York.

Griliches, Z. 1996, 'The discovery of the residual: a historical note', *Journal of Economic Literature*, vol. 34, no. 3, pp. 1324–30.

Handousa, H., Nishimuzu, M. and Page, J. 1986, 'Productivity change in Egyptian public industries after 'the opening', 1973–1979' *Journal of Development Economics*, vol. 20, no. 1, pp. 53–73.

Hill, H. 1996, *The Indonesian Economy since 1966: Southeast Asia's Emerging Giant*, Cambridge University Press, Cambridge.

—— 1997, *Indonesia's Industrial Transformation*, Sydney; Institute of Southeast Asian Studies, Singapore.

Hill, H. and Thee, K. (eds) 1998, *Indonesia's Technological Challenge*, Institute of Southeast Asian Studies, Singapore.

Jorgenson, D. and Griliches, Z. 1967, 'The explanation of productivity change', *Review of Economic Studies*, vol. 34, no. 3, pp. 539–64.

Kawai, H. 1994, 'International comparative analysis of economic growth: trade liberalisation and productivity', *Developing Economies*, vol. 32, no. 4, pp. 373–97.

Kim, J. and Lau, L. 1994, 'The sources of economic growth of the East Asian newly industrialised countries', *Journal of the Japanese and International Economies*, vol. 8, no. 3, pp. 235–71.

Krueger, A. and Tuncer, B. 1982, 'Growth of factor productivity in Turkish manufacturing industries', *Journal of Development Economics*, vol. 11, pp. 307–25.

Krugman, P. 1994, 'The myth of Asia's miracle', *Foreign Affairs*, vol. 73, no. 6, pp. 62–78.

Lau, L. 1998, 'The sources of East Asian economic growth', in Adams, F. and Ichimura, S. (eds), *East Asian Development: Will the East Asian Growth Miracle Survive?*, Praeger, Westport, pp. 41–68.

McLeod, R. and Garnaut, R. (eds) 1998, *East Asia in Crisis: from Being a Miracle to Needing One?*, Routledge, London.

Manning, C. 1998, *Indonesian Labour in Transition: an East Asian Success Story?*, Cambridge University Press, Cambridge.

Nehru, V. and Dhareshwar, A. 1994, *New Estimates of Total Factor Productivity Growth for Developing and Industrialised Countries*, Policy Research Working Paper 1313, International Economics Department, World Bank, Washington DC.

Nishimuzu, M. and Robinson, S. 1986, 'Productivity growth in manufacturing', in *Industrialisation and Growth: a Comparative Study*, Oxford University Press, New York, pp. 283–308.

Pangestu, M. and Boediono 1986, 'Indonesia: the structure and causes of manufacturing sector protection', in C. Findlay and R. Garnaut (eds), *The Political Economy of Manufacturing Protection Policy in ASEAN and Australia*, Allen and Unwin, Sydney, pp. 1–47.

Poot, H. *et al* 1990, *Industrialisation and Trade in Indonesia*, Gadjah Mada University Press, Yogyakarta.

Rao, B. and Lee, C. 1995, 'Sources of growth in the Singapore economy and its manufacturing and service sectors', *Singapore Economic Review*, vol. 40, no. 1, pp. 83–115.

Sarel, M. 1996, 'Growth and productivity in the ASEAN economies', paper presented to a conference on *Macroeconomic Issues Facing the ASEAN Countries*, Jakarta.

Sato, Y. and Pangestu, M. (eds) 1997, *Waves of Change in Indonesia's Manufacturing Industry*, Institute of Developing Economies, Tokyo.

Sjoholm, F. 1997, 'R&D, international spillovers and productivity growth', *Lund Economic Studies*, no. 63, Lund University, Lund.

Thee, K. 1997, *Industrialisasi di Indonesia: beberapa kajian* [Industrialisation in Indonesia: selected writings], LP3ES, Jakarta.

Timmer, M. 1999, 'Indonesia's ascent on the technology ladder: capital stock and total factor productivity levels in Indonesian manufacturing, 1975–95', *Bulletin of Indonesian Economic Studies*, vol. 35, no. 1.

Tsao, Y. 1985, 'Growth without productivity: Singapore manufacturing in the 1970s', *Journal of Development Economics*, vol.18, pp. 25–38.

Tybout, J. and Corbo, V. 1991, 'The effects of trade reforms on scale and technical efficiency: new evidence from Chile', *Journal of International Economics*, vol. 31, pp. 23–250.

Warr, P. 1992, 'Comparative advantage and protection in Indonesia', *Bulletin of Indonesian Economic Studies*, vol. 28, no. 3, pp. 41–70.

World Bank 1981, *Indonesia: Selected Issues Of Industrial Development And Trade Strategy*, Annex 2, Foreign Trade Regime, Washington DC.

—— 1993, *The East Asian Miracle: Economic Growth and Public Policy*, Washington DC.

—— 1998, *East Asia: the Road to Recovery*, Washington DC.

Young, A. 1995, 'The tyranny of numbers: confronting the statistical realities of the East Asian growth experience', *Quarterly Journal of Economics*, vol. 110, no. 3, pp. 641–80.

7 How did small and medium enterprises in Taiwan survive the crisis?

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7.1 Introduction

Taiwan has been less affected than other East Asian countries during the recent crisis. We can examine this outcome from various perspectives. At a microeconomic level, labour market rigidities, the over concentration of markets, and influential state owned enterprises have retarded the flexibility and upgrading of industries. However, such microeconomic features are not an important ingredient of Taiwan's economy. Taiwan's industrial policy, although favouring the development of large enterprises, has not discriminated strongly against small and medium sized enterprises (SMEs). In the early period of its economic development during the 1950s and 1960s, Taiwan was abundantly endowed with labour. Without much in the way of advanced technology and capital, micro-businesses (living room factories) began with labour intensive products, such as knitting and handicrafts, and the successful ones grew into SMEs. The offspring of existing firms have been another source of SMEs. The dominance of SMEs has been a unique feature of Taiwan's industrial organisation.

SMEs in Taiwan, by increasing their efficiency and flexibility, and raising their competitiveness, have been able to successfully coexist and compete with large enterprises. Being efficient and flexible, the SME sector has been able to adjust its competitive edge (or niche) in times of change. Needless to say, some of its members have grown into larger companies, while more have vanished.

Since the mid 1980s, Taiwan's pace of economic liberalisation has increased (Schive 1995). This has been accompanied by industrial restructuring. It is widely held that liberalisation threatens existing domestic industries with increased competition, but efficiency and welfare gains have outweighed the losses. The SME sector, which is largely comprised of vulnerable businesses in terms of size and

shock absorption capacity, has survived the days of rapid liberalisation. The East Asian financial crisis was another test of the sector's ability to deal with difficulties and challenges. The hypothesis that a well developed SME sector is conducive to Taiwan's relative strength was demonstrated again during the East Asian crisis.

Traditional SMEs are not only small and family owned, but have little to do with science or technology. However, in an information age with fast growing, high technology industries, some SMEs have actively responded to new technologies and have played an important role in their development (Hu and Schive 1998). This new challenge is still evolving and gaining momentum. The prospects of SMEs surviving these pressures may be gauged by their technological capacity and their capacity to become knowledge based industries — that is, how have Taiwan's SMEs responded to the pace of technological progress? And how likely are SMEs in Taiwan to survive the information technology age?

This paper will examine how Taiwanese SMEs responded to one of the challenges of the 1990s — namely the East Asian financial crisis. However, a highly related topic — SMEs' response to Taiwan's liberalisation of the mid 1980s — will first be discussed. The restructuring of SMEs since 1990, in response to developments in information technology and opportunities arising from the development of global logistics, is then examined.

7.2 SMEs and the liberalisation in the mid 1980s

In the 1980s, the Taiwanese economy was confronted by several problems: mounting trade surpluses, upward pressure on the exchange rate, escalating excess savings, and the rising cost of labour and land. In response, Taiwan removed most foreign exchange controls, lowered import tariffs, relaxed import restrictions and opened the domestic services market to foreign competition. The resulting pressure on SMEs, who were mainly engaged in export businesses, was intense. Meanwhile, Taiwan had grown from a capital-poor to a capital-rich economy as a result of the high level of excess savings. With over two decades of rapid industrialisation of its export sectors, Taiwan's industrialists had developed a strong international network and have accumulated international management skills and technological capacity.

One may conclude that pressure from both external and internal market forces has triggered the transition of SMEs in Taiwan, which quickly adjusted to the new business environment in the mid 1980s. They reacted by increasing automation, improving product quality, shifting to the production of higher value added goods, employing foreign labour and relocating traditional manufacturing overseas.

There is abundant evidence that verifies the adaptability of Taiwanese SMEs during the transition period. Further, five of Taiwan's major export industries — foods, textiles, plastic products, machinery and electronics — exhibited a clear trend towards the increased use of automatic machinery after 1987.[1]

Accordingly, manufacturers were able to increase production while using less labour, implying a gain in productivity. Between 1987 and 1991, employment in the manufacturing sector fell by 16 per cent, while the manufacturing production index posted 14 per cent growth. Automation helped reduce production costs, but upgrading product quality was no less important in maintaining export competitiveness. With two export price indexes — the unit export price index (expressed as total export value divided by export volume) embodying a quality factor and the commonly used export price index net of quality factor — we can calculate a quality index. An empirical study using this index has confirmed the hypothesis that increases in product quality were significant (Schive 1995).

Before the 1980s, foreign direct investment was mainly the domain of large corporations. In the mid 1980s, Taiwanese SMEs, equipped with their skills, business relations, and capital, were attracted to lower production costs in South East Asia and mainland China. Taiwan's SMEs were experienced in low skilled and labour intensive operations, and they went abroad to capitalise on neighbouring countries' abundant labour. However, the absence of *de facto* control of outward investment and the introduction of free foreign exchange operations also facilitated outward investment by Taiwanese firms, and SMEs in particular.[2]

Most of the earlier outgoing investments to South East Asia were from traditional manufacturing industries such as textiles, electronics, electrical appliances, paper products, printing, chemical products, metal products and nonmetallic products. Later, services such as trade, banking and insurance, and wholesale and retail were destined for Hong Kong and Singapore, as were some capital intensive industries such as petrochemicals and steel.

Instead of eroding the domestic manufacturing base, outward investment was a first step in globalising local enterprises. Indeed, a survey of 4056 manufacturers that invested abroad showed that 59.6 per cent maintained their level of investment in Taiwan, while 24.3 per cent planned to expand domestic business operations (Ministry of Economic Affairs 1994). The firms most likely to reduce or eliminate operations in Taiwan were manufacturers of ready-to-wear garments, leather, wood

[1] For details, see Schive (1995).

[2] There were 1800 Taiwanese investment projects, totalling US$8 billion, in mainland China and ASEAN countries between1988 and 1990. The average value per project indicates that most were made by SMEs.

materials and rubber products that had completely lost their comparative manufacturing advantage in Taiwan.

As Taiwanese based firms moved their factories overseas they created demand for capital and intermediate goods from Taiwan, and they had a significant impact on the pattern of Taiwan's trade. Given growing investment in South East Asia and mainland China, Taiwan's trade with these economies has been expanding rapidly since the mid 1980s. Taiwan has also become an important exporter of capital and intermediate goods to neighbouring economies, which in turn produced goods for the United States. At the same time, Taiwan's exports have also quickly switched from traditional labour intensive products to capital and technology intensive ones since 1987.

At a company level, Taiwan's trade with ASEAN has displayed an increasingly complementary relationship. Intra-industry trade coefficients suggest an intensification of vertical or horizontal integration between Taiwan and ASEAN countries (Council for Economic Planning and Development 1992).

In summary, Taiwan's SMEs took actions that had been uncommon elsewhere in the world as the economy restructured in the mid and late 1980s. Their adaptability meant they survived the transitional challenge.

7.3 SMEs in Taiwan and the East Asian financial crisis since 1997

The impact of the East Asian financial crisis on Taiwan has been latent and relatively mild. From a macroeconomic viewpoint, economic growth declined moderately from 6.8 per cent in 1997 to 4.8 per cent in 1998. The growth rate for 1999 is expected to climb to 5.1 per cent or even higher. The misery index, measured by the combination of the unemployment and inflation rates, rose by only 0.8 of a percentage point to 4.4 per cent in 1998, and remained considerably lower than that in the rest of East Asia.

From a microeconomic viewpoint, signs of a slowdown have been detected, yet the resilience of the economy has been apparent. The number of startup companies posted was higher in 1997 than that in the previous year, and did not show a significant fall in 1998 (table 7.1). At the same time, the number of companies that expanded their capital base was higher in 1997 than that in the previous year, and did not show a significant fall in 1998. The number of closures, or dissolutions, in 1997 was a bit higher than that in the previous year, yet about the same level as other precrisis years. Similar developments were observed in plant operations

(table 7.2). The largest export sector (information and high technology industries) continued to expand its share of total exports — up from 45.8 per cent in 1996 to 48.6 per cent in 1997, then up by a smaller margin to 49.9 per cent in 1998.

The exodus of traditional export production, pressed by a sharp appreciation of the New Taiwan (NT) dollar in the latter half of the 1980s, implies a shift in Taiwan's comparative advantage to more technology and capital intensive production. Such a development is deemed desirable for an economy, such as Taiwan's, that is actively pursuing technological upgrading. More recently, the information electronics industry has invested heavily overseas, in response to cost pressures from competitors (table 7.3). Given that the majority of the traditional exporting industries and, to some extent the information industry, are composed of SMEs, the SME share of Taiwan's total exports has been declining.

Table 7.1 **Births and deaths of companies in Taiwan, 1986–98**

	Existing companies[a]		*New companies*[b]	
	No.	*Capital*	*No.*	*Capital*
	'000	*NT$b*	*'000*	*NT$b*
1986	281	1661	27	76
1987	317	2037	33	143
1988	400	2483	41	271
1989	361	3102	40	343
1990	373	3640	37	277
1991	395	4240	46	356
1992	427	4922	57	672
1993	464	5570	52	392
1994	493	6232	56	470
1995	527	7145	54	424
1996	546	8225	44	480
1997	565	9537	44	479
1998	583	11107	37	443

Table 7.1 **Births and deaths of companies in Taiwan, 1986–98 (continued)**

	Capital expansion[c]		*Closure and dissolution*[d]	
	No.	*Capital*	*No.*	*Capital*
	'000	*NT$b*	*'000*	*NT$b*
1986	13	160	4.8	17
1987	17	190	6.6	22
1988	22	229	7.9	28
1989	14	316	8.6	62
1990	14	475	111.9	151
1991	16	547	12.3	155
1992	16	594	15.0	141
1993	16	425	19.2	153
1994	11	169	18.5	125
1995	22	584	20.3	135
1996	18	772	25.3	162
1997	22	1062	30.0	197
1998	17	814	24.2	173

a Number of companies that still operate, total capital of these companies. **b** Number of new entrants, total capital of these new companies. **c** Number of companies that sought capital expansion, total capital of these companies. **d** Number of companies that exited, total reduction in capital due to their exit.

Source: Company registration statistics of the Ministry of Economic Affairs.

Table 7.2 **Plant activity, 1986–98**

	Existing plants[a]		*New plants*[b]	
	No.	*Capital*	*No.*	*Capital*
	'000	*NT$b*	*'000*	*NT$b*
1986	60	3139	13	34
1987	69	3292	11	37
1988	78	3519	10	50
1989	86	3691	8	47
1990	92	3902	7	46
1991	84	4446	7	53
1992	101	5491	7	75
1993	96	6083	7	82
1994	95	6985	7	86
1995	97	8430	7	92
1996	98	9211	5	85
1997	99	10892	6	128
1998	98	13201	6	131

Table 7.2 **Plant activity, 1986–98 (continued)**

	Capital expansion[c]		*Closure and dissolution*[d]	
	No.	*Capital*	*No.*	*Capital*
	'000	*NT$b*	*'000*	*NT$b*
1986	7	116	2.9	-
1987	9	130	2.2	-
1988	9	158	3.7	-
1989	6	153	4.3	-
1990	6	294	7.5	-
1991	6	369	4.9	-
1992	5	806	7.0	-
1993	6	460	4.7	90
1994	6	353	6.9	91
1995	7	492	6.0	66
1996	7	383	5.3	51
1997	7	500	2.9	40
1998	7	618	6.8	77

a Number of plants that still operate, total capital of these plants. **b** Number of new entrants, total capital of these new plants. **c** Number of plants that sought capital expansion, total capital of these plants. **d** Number of plants that exited, total reduction in capital due to their exit.

Source: Ministry of Economic Affairs (1998).

Table 7.3 **Location of Taiwan's production of information electronics**
US$million (per cent)

	Output	
	1995	*1996*
Domestic	13587 (72.0)	16414 (67.9)
Overseas	5284 (28.0)	7760 (32.1)

Source: Institute for Information Industry, *MIC.*

With their accumulated experience, technology and management skills, SMEs have extended the life cycle of traditional export industries by establishing manufacturing bases overseas. Vertical integration, a characteristic of SMEs in Taiwan, is no longer limited to only a domestic network. The overseas links between domestic (parent) SMEs and overseas subsidiaries have strengthened. This development has two implications. First, Taiwan has become even more closely related to South East Asia and mainland China, who have hosted most of Taiwan's overseas manufacturing. Second, the growing network has facilitated the development of global logistics, which will be discussed later in this paper.

During the financial crisis, Taiwan's dollar devalued less than the currencies of most other East Asian economies. This eroded the competitiveness of Taiwan's exports. However, the impact on price competitiveness has not been as serious as

originally expected. First, a currency devaluation benefits exports only to the extent of value added domestically. Second, SMEs in Taiwan could maintain their price competitiveness through overseas subsidiaries, which also benefited from the depreciation of East Asian currencies. Third, nonprice competitiveness (including flexibility, international vertical integration and scope economies) remained strong for Taiwanese industry, particularly for information electronics which used the above factors to offset the disadvantage of higher currency values. A study shows that for every 10 per cent increase in South East Asia's (other than Taiwan's) share of the US market, there is only a 1.4 per cent decline in Taiwan's market share.[3]

Other factors that contributed to the strength of SMEs in Taiwan are technological competitiveness and the management of global logistics. In the next section we will discuss how SMEs perform in research and development, and how they remain technologically competitive by forming strategic alliances with multinational companies. Then, we will show that global logistics are not the domain of large enterprises only.

7.4 SMEs in Taiwan and changing technology

It is believed that technology based industries will be the mainstay of Taiwan's economy in the next century. The SME proportion of the high technology sector, and the SME share of value added manufactured products, indicates that SMEs occupy a stable and important position within the sector (table 7.4). During 1993–95, the proportion of SMEs in the high technology sector, for example, exceeded 90 per cent for all but the aircraft and component parts industry (whose sample size may be too small to reflect the real picture of the industry).[4] However, the value added share of SMEs varied among different industries during this period. In industries such as data storage and processing, video and audio electronics, communications equipment and electronic components, SMEs accounted for 30 to 40 per cent of value added of the industry. In the medical instrument and equipment industry, only SMEs were present, and this was also the case for other precision equipment until 1995. In the pharmaceutical manufacturing and electro-optical and optical instrument industry, SMEs accounted for around 70 per cent of value added.

3 Chen (1997) indicates that there were about 2000 items, defined by six digit harmonised system codes, that are commonly produced products in Taiwan and ASEAN countries.

4 The largest aircraft manufacturer producing equipment for the indigenously developed fighter project was not in the sample. Many makers of aircraft and component parts were classified as being in the machinery industry, which was the producer's main product classification. Thus, one should be careful in the interpretation of this industry's data.

The history of the aircraft industry dates back to the 1970s when the Aerospace Industry Development Center repaired American warplanes during the Vietnam War. Then the Indigenously Developed Fighter project invited companies to participate in the local aircraft parts industry. The development of the SME aircraft component makers is a typical illustration of their remarkable adaptability, flexibility and efficiency in Taiwan.[5] The aircraft industry demands a high degree of product reliability, much higher than for those industries in which Taiwan used to have an advantage (machinery and electronics). New entrants to the industry require not only advanced technology, but also credibility (built via international certification of quality control, inspection, documentation and years building a good reputation).

SMEs spend slightly less on research and development — in terms of research and development expenditure share relative to value added share — than spent by larger companies. It follows that SMEs are less (but not significantly) technology intensive than their larger counterparts. The only exception is the aircraft and component parts industry, in which SMEs' research and development share was significantly larger relative to their value added share. With technological assistance from the Industry Development Center and government, the industry became high value added, but not high profit. However, the industry did attract a lot of new entrants, of which most were medium sized companies. Currently 75 firms are registered with the aerospace industrial association.

Although 'disadvantaged' in terms of research and development spending, SMEs are more active and productive in research and development personnel and patent applications (table 7.4). Expenditure on the latter is an even larger percentage than expenditure on personnel, which is a promising indicator of the efficiency in SME research and development activity. Indeed SMEs have always accounted for more than half of patent applications in all industries except video and audio electronics (and they still have a 48.6 per cent share in that industry). Research and development intensity is not significantly correlated with scale, but it is correlated with industry type (Schive and Wu 1989). This finding is more interesting and significant than the previous one.

[5] The flexibility of SMEs allowed new manufacturers to enter the aircraft component parts industry. One combustion chamber maker for example, used to make plastic window blinds. Without large machinery for punching holes, the SME did the job manually.

Table 7.4 **SME share of high technology industries**

per cent

Sector	*Year*	*R&D expenditure*	*R&D personnel*	*Patent applications*	*Value added*	No. of enterprises	
						Share	*No.*
Pharmaceutical manufacturing	1993	63.0	66.6	87.6	66.8	97.3	524
	1994	65.9	62.1	–	69.9	97.1	515
	1995	65.9	–	–	67.8	97.7	528
Data storage and processing	1993	27.7	58.4	70.8	33.6	91.2	785
	1994	23.0	31.4	–	27.9	90.9	847
	1995	32.8	–	–	30.0	92.7	985
Video and audio electronics	1993	25.1	49.6	48.6	34.1	93.7	805
	1994	30.0	33.6	–	41.3	94.0	849
	1995	26.0	–	–	27.0	93.4	861
Communications equipment	1993	53.0	48.3	86.7	40.7	92.6	349
	1994	35.0	46.1	–	36.0	93.1	375
	1995	37.2	–	–	41.1	92.9	395
Electronic components	1993	23.7	40.5	59.2	27.1	93.7	2168
	1994	22.6	38.0	–	26.7	93.4	2197
	1995	15.3	–	–	22.3	93.6	2503
Aircraft and component parts	1993	34.2	23.2	100.0	5.0	62.5	8
	1994	30.4	54.8	–	1.3	60.0	10
	1995	100.0	–	–	29.3	80.0	15
Electro-optical and optical equipment	1993	56.5	74.3	91.3	69.1	98.3	941
	1994	56.3	68.8	–	68.6	98.7	925
	1995	58.2	–	–	71.3	98.9	944
Medical instrument and equipment	1993	100.0	100.0	100.0	100.0	100.0	113
	1994	100.0	100.0	–	100.0	100.0	115
	1995	100.0	–	–	100.0	100.0	129
Other precision equipment	1993	100.0	100.0	100.0	100.0	100.0	80
	1994	100.0	100.0	–	100.0	100.0	73
	1995	23.3	–	–	46.3	98.7	77

Source: Small and Medium Enterprise Administration (1998).

Venture capital and SMEs

Two factors are crucial to the prosperity of technology oriented SMEs. One is innovation — that is, how and where to obtain new sources of technology and maintain technology superiority. The other is how to find capital to commercialise innovations, which is often a more difficult challenge for SMEs. Here, venture capital can play a key role.

When an innovator has an idea or a new technology, they often find it difficult to obtain financing because the project can involve high risks. Moreover, today's knowledge based, high technology businesses often have few physical assets that can be used as collateral for loans. Thus venture capital is an important financing source for SMEs. Venture capitalists not only have capital but also have knowledge of how to make an investment, and operating experience. They pick up competently researched and high payoff projects, and at the same time can mitigate risks. By nature, SMEs receive the lion's share of venture capital funding because well established large companies are able to obtain funds from the capital market and through regular bank loans. Therefore, the performance of venture capital markets is a window through which to observe the growth of technology oriented SMEs.

Taiwan's venture capital industry was established in the early 1980s with the stipulated aim of fostering the development of high technology industry. Today, 94 per cent of venture funding is invested in high technology industries. In 1984, the first venture capital firm was jointly established by Acer and Continental Engineering, both of which had been high performers in their own industries in Taiwan. During the same year, Taiwan Semiconductor Manufacturing (a joint venture between the government, Philips Electronics and other private investors) was established. Today Taiwan Semiconductor Manufacturing has become the world's leading integrated circuit foundry manufacturer.

Foreign venture capital firms were also invited to form joint ventures with domestic firms. As the number of venture capital firms grew, the total capital in the venture capital market increased (table 7.5). This indicates the success of the recipients of the capital and the screening capability of such firms, not to mention the general environment in favour of such a development. By 1990, the number of venture capital firms had increased to twenty, from one in 1984, and further to 120 in 1998. Over the fifteen years, a total of NT$66 billion (about US$2.6 billion) in venture capital was invested, of which NT$15 billion (US$600 million) comprised reinvested earnings. The money was invested in 900 domestic projects and 600 overseas projects, with an average project value of NT$46 million (US$1.9 million), and thus induced total capital formation of NT$560 billion (US$22.4 billion). When a successful venture capital recipient grew large, such as Taiwan Semiconductor Manufacturing, it would move from venture capital to the capital market for its main funding source.

Table 7.5 **Growth of venture capital firms in Taiwan**

	1984	*1985*	*1986*	*1987*	*1988*	*1989*	*1990*	*Up to 1990*
No.	1	1	1	3	3	4	7	20
NT$ billion	0.2	0.2	0.8	0.6	1.5	1.9	3.6	8.9

	1991	*1992*	*1993*	*1994*	*1995*	*1996*	*1997*	*1998*	*Up to 1998*
No.	2	2	3	1	6	13	25	48	120
NT$ billion	1.6	1.2	1.8	1.1	4.0	6.8	17.1	23.8	66.4

Source: Taipei Venture Capital Association (1998).

The performance of Taiwan's venture capital, in terms of earnings, has been impressive since its establishment in 1984. Except for three of the first four years when losses occurred, earnings per share (with a face value of NT$10) were around one quarter of one NT dollar each year between 1988 and 1993. Since 1994, annual earnings per share have grown to over one or even to two dollars per share (table 7.6).

Table 7.6 **Annual earnings per share** NT$

	1984	*1985*	*1986*	*1987*	*1988*	*1989*	*1990*
Average of total	0.12	–0.66	–1.47	–1.23	0.26	0.24	0.04
Average of top 10	0.12	–0.66	–1.47	–1.23	0.26	0.28	–0.03
Average of top 20	0.12	–0.66	–1.47	–1.23	0.26	0.24	0.04

	1991	*1992*	*1993*	*1994*	*1995*	*1996*	*1997*
Average of total	0.30	0.25	0.30	1.33	2.00	1.57	1.81
Average of top 10	0.66	0.67	0.20	2.04	3.81	3.28	6.33
Average of top 20	0.30	0.30	0.32	1.48	3.03	2.50	4.34

Source: Taipei Venture Capital Association (1998).

Table 7.7 **Sectoral distribution of venture capital**

	1995	*1996*	*1997*	*Cumulative to 1997*
	%	*%*	*%*	*NT$m*
PC and peripherals	30.40	30.52	21.57	26.7
Software	4.26	2.86	5.01	17.3
Consumer electronics	8.76	8.48	12.24	22.0
Semiconductors	22.92	27.83	15.77	24.7
Communications	7.39	8.75	4.64	17.2
Advanced sensing	0.00	0.00	0.35	13.4
Pollution control engineering	0.35	0.80	0.00	20.5
Precision and automation	1.05	3.43	6.25	18.5
High materials	1.41	2.16	0.26	18.9
Specialty chemicals and pharmaceutical manufacturing	0.64	0.59	0.27	21.8
Medical	0.64	0.03	1.19	20.4
Aerospace	0.52	0.50	0.40	28.8
Resource development	1.00	0.00	0.05	51.5
Electro-optical	5.50	6.22	12.23	24.3
Biotech	0.20	0.34	2.64	31.6
Science and technology services	0.04	0.17	0.46	17.7
Other technology	1.82	0.94	7.18	34.2
Venture capital	2.23	1.74	3.27	29.8
Traditional industry	11.85	4.62	6.21	21.9
Total	100.00	100.00	100.00	23.7

Source: Taipei Venture Capital Association (1998).

Sectoral analysis shows how venture capital follows trends and develops niche industries. A total of nineteen industries received venture capital funding (table 7.7). Surprisingly, traditional industry obtained a share of this capital, although no tax incentives were provided for investment or innovations. The high technology

industries targeted were personal computers and peripherals, semiconductors, consumer electronics, communications, electro-optical and software. The precision and automation industry and biotech industry seem to be on the rise, yet data for three years are too few to come to any significant conclusion.

The lifecycle of a company, in terms of technology development, has a bearing on venture capital, and vice versa. Contrary to popular perception, venture capital plays only a minor role in funding basic innovation (that is, the seeding stage). About 9 per cent of capital accumulated to 1997 went to the seedling stage and 16 per cent went to the start-up efforts of companies (table 7.8). The majority (about 50 per cent) of the money went to the next stage of a company's life when it begins to commercialise its innovation — that is, the expansion stage — in building fixed assets, working capital, manufacturing, marketing and sales. About 25 per cent of venture money in 1997 went to the mature stage, which is the period when the company approaches its peak. Very little (about 1 per cent) ended up in the restructuring (or shakeout) stage. From the distribution among different stages of a company's life, the major role of venture capital in high technology SMEs is to identify winners and help them expand. Venture capital is not long term capital as it leaves successful investments to seek new ventures.[6]

Table 7.8 **Venture capital and the life cycle of companies**
per cent

	1995	*1996*	*1997*	*Up to 1997*
Seeding	7.9	10.1	4.1	8.5
Start-up	13.3	17.8	24.1	15.9
Expansion	49.2	55.2	49.3	48.1
Maturity	24.2	16.2	21.2	26.2
Restructuring (shakeout)	5.2	0.7	1.3	1.3
Total	100.0	100.0	100.0	100.0

Source: Taipei Venture Capital Association (1998).

6 Zider (1998) notes 'Venture capital is not long term money. The idea is to invest in a company's balance sheet and infrastructure until it reaches a sufficient size and credibility so that it can be sold to a corporation or so that the institutional public equity markets can step in and provide liquidity.' Zider estimates 80 per cent of capital goes to the expansion stage, implying that venture capital in Taiwan has been playing an equivalent, if not more active, role to help starting business.

Global logistics — a challenge for business of all sizes

Competition and the pursuit of growth forces companies to look constantly for better business practices that improve efficiency. With the help of new technologies, economic pressures and opportunities are driving rapid changes in the logistic business (transportation, transhipment and warehousing of materials, components and finished goods). To be precise, two industries — e-commerce and express package transportation — are developing a wide variety of increasingly sophisticated logistics options to enable companies to meet their production, transport and inventory needs. Moreover, when the fragmentation of production goes beyond national boundaries, global logistics become a major concern of business — that is, how to reduce production cycle times throughout the value adding chain of production, distribution and delivery of goods and services.

In line with globalisation, consumer demand is becoming more sophisticated and differentiated, which makes market adaptation increasingly important. As a result, the approach to global strategy has been changing. There is an increasing trend towards build-to-order, just-in-time management, materials resource planning, and total quality management. In the coming age of information technology and speed, will SMEs survive?

Taiwan's manufacturing sector before the mid 1980s comprised mainly SMEs, larger firms, and foreign firms. Original equipment manufacturing was a feature of SME activities. After the restructuring of the mid 1980s (as described earlier) SMEs grew, mastered technologies and became capable of undertaking original design manufacturing. They also correctly gauged the trend towards outsourcing and downsizing by multinational companies. Since the early 1990s, via its development as a regional operations center, Taiwan has extended its capacity beyond the development and manufacturing of products to logistics. This has lengthened the value adding chain in Taiwan during the past decade (Figure 7.1).

We can draw the implications of global logistics for SMEs. Before the mid 1980s, multinationals based in Japan and the United States invested in and purchased finished products from Taiwan to take advantage of its low cost, skilled labour, while providing Taiwan with intermediate goods and raw materials. After the mid 1980s, most traditional production, which no longer enjoyed a comparative advantage in Taiwan, moved to other South East Asian countries and China via outward investment. In this stampede, SMEs became transnational companies, providing intermediate goods and raw materials to subsidiaries in host countries, and selling finished goods to buyers in the United States. Since the mid 1990s time defined competition has driven firms of all sizes and nationalities to develop global logistic operations to retain their competitiveness. The survival technique of

Taiwanese firms, including SMEs, is to form a strategic alliance with a multinational corporation that has access to superior markets and technology. The supply chain created may extend to firms in South East Asia and mainland China at the same time. In this way, Taiwan forms a synergy with Japanese and American multinationals, and with ASEAN and China. The result is a lengthened supply chain, with Japanese or American firms at the one end (as the international marketers of Taiwanese products made from materials and intermediate goods) and other Asian countries at the other end (figure 7.2). The extension of the network since the mid 1980s reflects changing business conditions due to technological developments, marketing skills and time defined competition.

Figure 7.1 **Changes in local business operations**

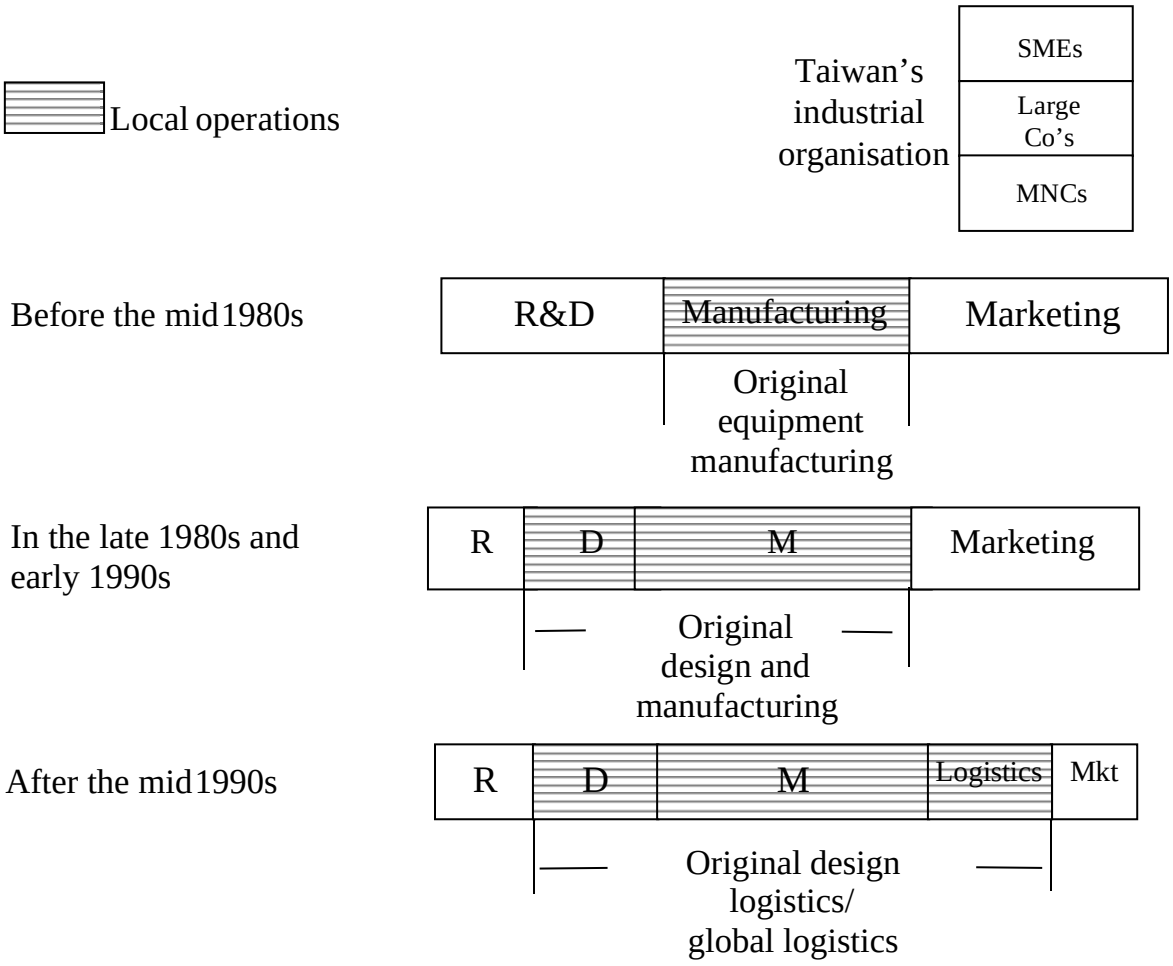
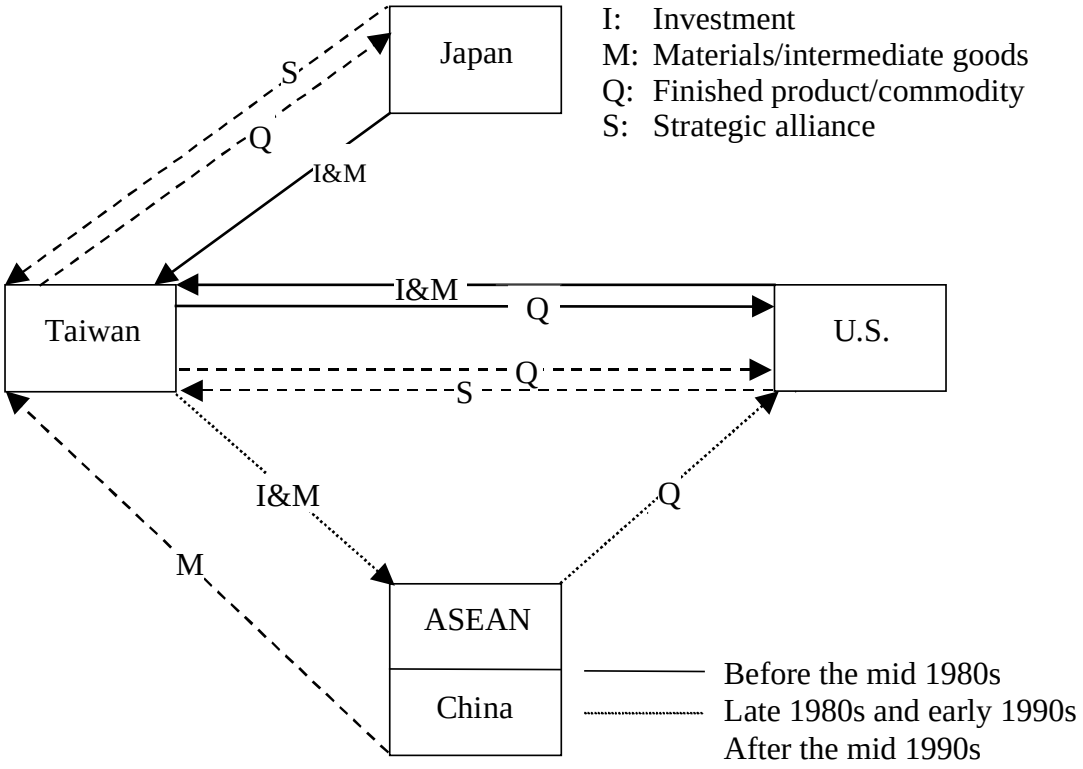


Figure 7.2 **Global logistics in action**



As part of its global logistic operations, Taiwan negotiated international procurement agreements with multinational firms to secure sales in the mid 1990s (table 7.9).[7] In this respect, SMEs in Taiwan and overseas Taiwanese owned SMEs also contributed to this new development. Table 7.10 shows that SMEs in Taiwan have a similar role to that of non-SMEs in large Taiwanese companies' procurement, and a role less significant with foreign based multinationals. Despite purchases being diluted at a regional level, overseas Taiwanese SMEs still provide goods for large Taiwanese firms and multinationals.

Table 7.9 **International procurement by multinationals**
US$ million

	1996	*1997*	*1998*
United States	5620	9150	13404
Japan	1690	1556	1262
Europe	572	712	939

Source: Ministry of Economic Affairs.

[7] Multinational firms that have strategic alliances with Taiwanese firms include A&A, Actebis, Apple, Compaq, DEC, Dell, Fujitsu, Gateway, Hitachi, HP, IBM, ICL/WINTOP, Intel, NEC, Mitsubishi, Nokia, Philips, Sharp, Siemens and Unisys.

Table 7.10 **Taiwan based SMEs and procurement by large Taiwanese firms**
per cent of total procurement

	Domestic purchase from		*International purchase from*	
	SMEs	*Other sources*	*Taiwan based SMEs*	*Other sources*
Tatung	45	55	12	88
Acer	52	48	10	90
Philips (Taiwan)	30	70	8	92
Motorola (Taiwan)	20	80	1	99

Source: Survey by Council for Economic Planning and Development.

At the same time, global logistics has changed the traditional practice of vertical integration being only within a country to it being beyond a country's borders. Taiwan has tremendous two-way flows of trade in semiconductors and office automation products with both ends of the chain (namely Japan and the United States on the one hand, and ASEAN and mainland China on the other) (table 7.11).

Table 7.11 **Global integration of Taiwan, 1998**
US$ million

	Automatic data processing machines and accessories		*Semiconductors, ICs and micro-assemblies*	
	Imports from	*Exports to*	*Imports from*	*Exports to*
Total	5102	22 050	16 258	10 971
United States	438	8629	3287	2245
Japan	1488	1765	3877	1223
Hong Kong	106	1790	681	2786
South Korea	817	128	1604	587
Singapore	403	411	903	1182
ASEAN[a]	1228	680	3265	989
Malaysia	367	226	1649	504
Philippines	366	311	1192	226
Thailand	443	132	392	226
China	227	–	194	–

a Including Malaysia, Indonesia, the Philippines and Thailand.

Source: Ministry of Finance (1999).

7.5 Conclusion

SMEs in Taiwan's manufacturing sector have shown resilience in the face of severe turmoil. Far more importantly, SMEs have not been absent from the growing high technology or knowledge based industries which will be the backbone of Taiwan's industry in the coming century. Further, in an age of information technology the competitive edge of a company or an industry is no longer limited to cost, but also relates to capability of design, delivery and sourcing, both locally and overseas. Global logistics have become a weapon to penetrate markets, to grow and to survive. Taiwanese SMEs have become an indispensable segment of the chain of such modern business operations. SMEs not only survived the fading financial storm, but will survive well into the twenty-first century in Taiwan.

References

Chen, P. 1997, *Impact of the Southeast Asian Currency Crisis on Taiwan's Industries and Policy Response*, Paper presented at the Ninth Seminar of High Ranking Bank Managers, Banking Institute of the Republic of China, Taipei, Taiwan (in Chinese), November 21.

Council for Economic Planning and Development 1992, *Bilateral Relations between Taiwan and ASEAN*, Taipei, Taiwan.

Hu, M. and Schive, C. 1998. 'The changing competitiveness of Taiwan's manufacturing SMEs', *Small Business Economics*, vol. 11, pp. 315–26.

Ministry of Economic Affairs 1994, *Manufacturing Investment Survey*, Taipei, Taiwan (in Chinese).

Ministry of Finance 1999, *Monthly Statistics of Exports and Imports, Taiwan Area, The ROC*, Taipei, Taiwan, January.

Schive, C. and Sze-Hwa, W. 1989, *Determinants of Industries' R&D: Analysis on the Emerging Automation Industry*, Research paper prepared for the Advisory Division of Science and Technology, Taipei, Taiwan (in Chinese).

Schive, C. 1995, *Taiwan's Economic Role in East Asia*, Center for Strategic and International Studies, Washington DC.

Ministry of Economic Affairs 1998, *White Paper on Chapter*, Small and Medium Enterprise Administration, Taipei, Taiwan (in Chinese).

Taipei Venture Capital Association 1998, *Venture Capital Report*, no. 19, Taipei, Taiwan.

Wang, J. 1998, *SMEs Role in High-Tech Industry*, Research report prepared for the Small And Medium Enterprise Administration, Ministry of Economic Affairs, Taipei, Taiwan (in Chinese).

Zider, B. 1998. 'How venture capital works', *Harvard Business Review*, November–December, pp.131–9.

SECTION IV

MARKET POWER MEASURES

8 Market power measures and their uses: where's the costs?

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8.1 Introduction and overview

The task assigned to me for this paper was to 'review recent developments and future directions in a particular area of the industrial organisation literature' (perhaps in the context of my own contributions). Thus I will set out my views on important aspects of industry analysis, particularly with respect to the cost side of market power measurement and interpretation, and its role in regulatory guidance.

The related issues of how to model and measure market power, and to interpret and use the resulting indicators, are crucial for many questions about industry structure today. These questions are important because market power indicators may be used to facilitate an understanding of technological and market structure. Perhaps even more importantly, they are often used for regulatory guidance, particularly about what reforms should be implemented to counteract potential market power.

The questions I raise may generally be categorised as 'what, why and how' questions — what are we measuring, why are the resulting measures (and their uses) important, and how are we to interpret these indicators. There are various perspectives, as there should be, on how these questions may be answered, but they are often buried under complex analytical models that sometimes have a shaky conceptual basis. In particular, the measurement and evaluation of market power are typically based on the concepts of profits and marginal costs. However, the appropriate measurement and interpretation of these crucial concepts are often overlooked to some extent.

More specifically, my view on modelling and measuring market and technological (production) structure — and in particularly market power and its implications for regulation — is that important insights can be gained from different types of demand structure analysis, such as a game theory perspective about strategies and

competition. However, to find a relevant structure for empirical analysis (and normative guidelines), we need more explanatory and predictive content than is possible to obtain from such models. Careful treatment of costs is particularly critical for the motivation, construction and use of market power measures.

This suggests that we should go back to the basics of supply and demand. We learn early in our economics training that we need both 'sides' of this relationship represented carefully for any market interaction, to understand and interpret what is happening, and particularly to determine what should be happening. However, in many applications we tend to forget this, or at least finesse it, so that interpretation of the resulting measures is lacking.

Much of the focus of the industrial organisation literature, particularly with respect to market power, tends to be on the (output) demand side. The emphasis is on how the demand structure can be characterised. For imperfectly competitive markets this involves determining the form of the output demand function facing individual firms, and the extent of interdependence of output choices among firms in an industry, often with an emphasis on strategic behaviour.

When this is used as the basis for measurement of market power it implies that such power is characterised by the deviation between output price (p_Y, where Y denotes output) and marginal revenue (MR), which implies a corresponding gap between p_Y and marginal cost (MC). That is, because MR equals MC in equilibrium, only the demand structure needs to be represented to determine the extent of markups (p_Y/MC) or market power.

However, the interesting patterns evident in the 'real world' when evaluating production structure and market power will be a result not only of demand, but also of supply. Output (price and quantity) decisions are based on not only market demand conditions facing a firm, but also their technological or cost foundations. Thus, for appropriate interpretation of market power measures, we need to focus on the cost structure underlying measured marginal cost.

This is an equally important, but often neglected, 'piece of the puzzle' that raises questions about the role of a full production (cost) structure model for representing the marginal cost that is relevant for the analysis of technological and market (production) structure and resulting market power. It highlights the importance of developing a clear conceptual basis as a foundation for our models, before focusing on fancy analytical manipulations to generate and use market power measures. It suggests that we need to consider carefully the appropriate definitions of such crucial components of the analysis as 'profits', 'costs' and 'market power'. It also emphasises that the interpretation of measures depends on these definitions — for example, if p_Y does not equal MC, what does this really mean? What are the

implications of moving from this to normative conclusions of what 'should' be? Is having p_Y equal MC really the goal, or 'good'? What marginal cost is relevant?

Again, how does the cost structure fit in here? The interpretation of measures based on the demand side depends on the definitions and measurement of profits (profitability) and total, marginal and average costs. It is particularly important to distinguish marginal cost from average cost, because profitability depends on the latter rather than the former. However, the deviation between marginal and average costs (MC≠AC) may be due to various cost economies resulting from short run fixities (fixed or 'sunk' costs), cost side interdependencies (scope economies, input complementarities), scale, technical change or other biases, external effects (internalised through vertical or horizontal integration or multiplant economies), or even market power on the input side.

This brings us back to the general questions posed above: what is important to measure to understand what is going on, and to provide policy prescriptions if we think they are needed? Why are these measures important? Why do we interpret them as we do? How do we measure and use them as appropriately as possible?

Thus, the 'recent developments' that are the focus of this paper have to do with the measurement of market power via the market demand structure combined with a serious treatment of the critical second blade of the scissors — the supply (cost) side. This is the direction I think such analysis has to go to be applicable and justifiable.

Along the way we also need to carefully consider associated questions: what does 'market power' mean? What is 'bad' about it? How is it based on both pricing behaviour and marginal costs? (Such analysis has implications for interpreting profits that arise from a difference between prices and average costs, and concentration that might be driven by a deviation between marginal cost and average cost.) How do cost economies driving the marginal cost–average cost relationship affect interpretation of markups? What may be the role of fixed or sunk costs and other cost structure aspects (particularly for regulatory guidance)? Hopefully, answering such questions will at least lead to more emphasis on the cost side of the market power 'equation' that has to do with the price–marginal cost gap.

8.2 To pursue this further

Industrial organisation economists have long been interested in concentration and market power issues. Most models of market power link profitability, concentration and price–cost margins in some manner, although these concepts are not necessarily directly related. Their connection fundamentally depends on the marginal cost–

average cost relationship and other aspects of costs, which are often assumed to be of a restricted form. However, for the most justifiable construction and use of these measures, one must relax many of these restrictions, which requires incorporating more technological and behavioural structure into the analysis.

'Old' structure–conduct–performance (SCP) models are typically of the form $\pi = \alpha + \beta H + \Sigma_i \gamma_i z_i + \varepsilon$, where π is a measure of profitability, H is a concentration ratio (typically a Herfindahl index), and the z_i are any other variables affecting π. Two initial questions that are often finessed in this specification are how profitability is defined (as true economic profits, based on marginal cost, or as average cost), and what the appropriate z_i variables may be (given the lack of an underlying structural model). Overall, the focus in such a model is on some type of evidence of profits, and estimating the 'impact' of concentration on this π through the β parameter, where a positive and significant β indicates noncompetitive conduct and market power.

It has been shown[1] that this type of model is related to those that more explicitly concentrate on the price–cost margin (or markup), given that the markup can be written as a function of H (concentration). However, the structure–conduct–performance approach faces serious conceptual and econometric problems. The behavioural model is not directly specified, for example, although it would seem that concentration and profitability are jointly determined (endogenous).

Even more importantly, the (at least implicit) dependence on marginal cost raises issues. It is not clear how the cost components are defined here, partly as a result of the lack of a structural model. Distinctions between marginal cost and average cost that may arise in response to short run rigidities or technological efficiencies such as scale economies, for example, are not recognised. This severs the direct link between profitability and the markup. In turn, it raises questions about how market power is appropriately defined. Should it be in terms of profitability or concentration or price margins? What is 'bad' and 'good' here?

The 'new' empirical industrial organisation (NEIO) models also rely on the notion that a price (to marginal cost) margin is the basis for determining market power, but these models add more structure to represent joint determination of concentration and profits. This is in the spirit of Stigler's statement (1964, pp. 44–61, quoted in Azzam and Anderson 1996, p. 96) that 'If we adhere to the traditional theory of profit maximising enterprises, then behaviour is no longer something to be assumed but rather something to be deduced'.

[1] Cowling and Waterson (1976, pp. 275–86), among others.

However, the emphasis tends to be on only the output demand (market) structure. Studies in the new empirical industrial organisation tradition — which focus on econometric estimation of structural models in which estimation of conduct is based on observed price, output and cost data — typically result in estimation of a price–cost margin. This is often expressed in the form of a Lerner index $(p_Y–MC)/p_Y$, which is equal to zero if the market is 'competitive', but is significantly different from zero if 'market power' prevails. The information embodied in such a measure is equivalent to that contained in the markup measure p_Y/MC, which varies around one instead of zero.

The estimated 'conduct' (or margin) is therefore more directly linked to behavioural factors in this literature. However, it is primarily based on estimation of the output demand structure. This results since the p_Y–MR gap implies the p_Y–MC deviation by the optimisation equality of MR equals MC. So $MR = p_Y(1–1/\eta) = MC$ (for the monopoly case) implies that $p_Y/MC = 1/(1–1/\eta)$ (where η is the demand elasticity $\partial \ln Y/\partial \ln p_Y$ so $1/\eta$ is the inverse elasticity derived from the $p_Y(Y)$ dependence, $\partial \ln p_Y/\partial \ln Y$). Thus profitability (or at least the markup) depends ultimately on the *elasticity of output demand*.

For oligopolistic models this may be slightly adapted to incorporate market interdependence (to some extent, because this does not allow for strategic behaviour) via a conjectural variations approach, resulting in the expression $MR = p_Y(1–\theta_j/\eta) = MC$ (where $\theta_j = dY/dy_j(y_j/Y)$ is the conjectural elasticity; Y is industry and y_j firm output; and $\theta_j/\eta = 0$ if the market is 'competitive'). In such a model one can try to identify the difference between market and firm demand by distinguishing θ_j and η empirically. Then the estimate of θ_j can be used to represent 'market power'.

Such a model is often specified empirically using a supply relation such as $p_Y = (\theta_j/\eta)p_Y + MC + \varepsilon$, where ε is an error term and θ_j may be assumed to be a constant, a function of factor prices (or exogenous variables more generally?) or a function of concentration. This elasticity does not necessarily imply anything about strategic behaviour, but it does provide information about whether firms are price takers, which is typically the primary question underlying specifications of market power.

The bottom line is that a new empirical industrial organisation perspective can provide an indirect estimate of the price–cost margin $p_Y/MC = 1/(1–\theta_j/\eta)$, rather than basing analysis on observed (average) price and cost data. However, this is founded on parameters that represent market demand for the product and a measure of conjectural variations, so it still finesses information on the crucial cost structure characteristics underlying a relevant specification (measurement) of costs,

particularly marginal cost compared with average cost. Note that recognition of this limitation suggests that output supply behaviour should be represented within a full model of supply and demand decisions if the resulting estimates are to account for the full technological and behavioural structure. Only within such a model can we generate information on rigidities, substitution patterns, technological (use, scale, scope and so on) efficiencies, and other factors determining the cost base.

An understanding of such cost structure characteristics is critically important to really perceive what is going on in the market, and to justify the measurement, interpretation and use of markup or 'market power' measures. If a gap between marginal cost and average cost results, which may be true for a number of reasons, estimated markups may not imply excess profits or market power 'abuse', but rather rigidities or efficiencies embodied in the technological structure (such as those mentioned above). If interpreted as market power (with the implication that it should be the case that p_Y equals MC), this results in misleading analysis and, potentially, policy guidance.

That is, cost economies may result from various short–long run, input–output based and internal–external technological characteristics. All of these factors affecting the technological, behavioural and market (or overall production) structure have important implications for the measurement and interpretation of marginal cost. However, limited cost specifications are often relied on for estimation. Constant returns to scale (so MC equals AC and there is no difference between short run and long run), for example, or even fixed proportions, are still quite typical assumptions. It is even more common to ignore input interactions and output compositional or interaction effects (because only one aggregate output is represented).

Cost structure aspects that are often ignored for marginal cost (and average cost) estimation are short run fixities (utilisation, short run 'scale' effects, utilisation biases or substitution patterns), scale economies, input specific economies (scale and other types of biases), 'buying power' (oligopsony — whether this is bad or good depends on perspective), output jointness (scope/specialisation economies) and external economies (spillovers, agglomeration effects or internalisation through integration).

Intuitively all (or at least some) of these production characteristics may be important for understanding the cost structure and implications for market power measures and their uses. Most are recognised in some form in standard industrial organisation and intermediate microeconomics texts. But the question is how to model and measure such effects. A full discussion of implementable models in this realm is beyond the scope of this paper, but we can at least indicate how the impacts

of these types of structural characteristics may be used to estimate a cost function specification of the technological and behavioural structure.[2]

Crucial aspects of the cost structure may be modelled by a detailed cost function specification constructed using a restricted (or variable) cost function VC(•) with the associated cost expression TC = VC(•)+FC, where VC = VC(**Y**,**p**,**r**,**x**…), where **Y**, **p**, **r** and **x** are vectors of outputs, variable input prices, external factors and fixed factors (although other cost determinants such as adjustment costs can also be incorporated as arguments of the function), and FC = $\Sigma_k x_k p_k$ represents fixed (internal) costs.

If short run fixities exist, say for capital (x_K), optimal x_K levels will not be consistent with observed data (or Shephard's lemma). Instead $-\partial VC/\partial x_K = Z_K \neq p_K$ (or $\partial \ln TC/\partial \ln x_K = \varepsilon_{TCK} \neq 0$), where Z_K is a cost side version of the true economic marginal (or shadow) valuation of x_K, determined by the variable input cost savings possible by an incremental increase in the x_K stock. If x_K is at its equilibrium level then the inequality becomes an equality, or $Z_K = p_K$, so this expression may be used to solve for the long run desired level of input x_K, x_K*.[3]

However, when disequilibrium or subequilibrium prevails, this will result in short run usage differing from full capacity levels, utilisation fluctuations, and utilisation biases based on substitutability with the fixed input (overuse of substitutes relative to their long run levels, and underuse of complements). This will obviously affect marginal cost measurement ($\partial TC/\partial Y = \partial VC/\partial Y = MC^S$ from the definition of fixed cost, where the superscript S denotes short run, so $\partial \ln TC/\partial \ln Y = MC^S/AC$), because short run marginal costs will provide the basis for decision making. Thus, measured 'scale' effects will be based on short run behaviour, which if not recognised could lead to misleading analysis.

Long run scale economies will also affect the relationship between MC and AC; where $\partial \ln TC/\partial \ln Y = \varepsilon_{TCY} = MC/AC$ for a long run specification it will fall short of (exceed) one if cost economies (diseconomies) exist. Thus MC will not be well approximated by measures of AC (and thus by implication a price-marginal cost gap will not represent profitability) if ε_{TCY} does not equal 1. It is worth emphasising that this must represent the full long run response; with short run fixities this

[2] For more details about such cost function based measures, discussion of other related models and issues, and extensive references to this literature, see Morrison Paul (1999).

[3] For one example of the incorporation of such fixities into measurement of economic performance, see Morrison (1993, pp. 45–60).

measure may explicitly capture long run adjustment via the relationship: $\varepsilon^{L}_{TCY} = \varepsilon^{S}_{TCY}+\varepsilon_{TCK}\varepsilon_{KY}$ (where $\varepsilon_{KY} = \partial \ln x_K^*/\partial \ln Y$).[4]

In addition, input specific economies may be important for representation and interpretation of the technological and behavioural relationships underlying the overall cost and production structure. Scale biases exist, for example, if $\varepsilon_{jY} = \partial \ln v_j/\partial \ln Y \neq \varepsilon_{TCY}$. (Scale changes affect inputs differently, so nonhomotheticity or size economies exist; again this must be a long run elasticity.) It is even more likely the case that utilisation biases will prevail, which is represented by $\varepsilon_{jK} = \partial \ln v_j/\partial \ln x_K \neq \varepsilon_{VCK}$ because variable inputs will have different substitution or complementary relationships with x_K. Other biases and interactions such as those associated with technical change (non-neutral technical change, or technical change biases) may also have important implications for the analysis of production processes. Such biases and interactions are all represented as second order effects, so a model capturing such effects is necessary for analysis of these impacts.

Also for inputs, 'buying power' may be an important aspect of costs facilitating competitiveness. Note that this implies some type of market power in the factor markets, which raises questions about whether this is beneficial or harmful. (Consumers of the product may perceive this as a 'good', and producers of the input may perceive it as 'bad'.) This would occur, for example, if volume discounts are available, so $p_j = p_j(v_j)$ is endogenous: the more you buy the lower the price. In this case Shephard's lemma again collapses (as for fixed inputs, although for a different reason). It is thus necessary to measure the marginal factor cost (MFC, or shadow value) rather that the average factor cost (AFC, or observed price), to assess the impacts of such input market structure (where the gap between p_j or AFC_j and MFC_j or Z_j will depend on $v_j \bullet \partial p_j/\partial v_j$, because $MFC = \partial p_j(v_j)v_j/\partial v_j = p_j+v_j \bullet \partial p_j/\partial v_j$).

In terms of outputs, output composition or jointness may be an important determinant of costs. In particular, scope (or specialisation) economies may allow more (less) diversified firms to produce more cheaply. Such relationships involve output composition and interactions, and thus are represented by second order output effects; scope economies can be defined as $SC = [\Sigma_m TC(Y_m)–TC(\mathbf{Y})]/TC(\mathbf{Y})$, which depends on $\partial^2 TC/\partial Y_m \partial Y_n$. Of course, representing such effects requires a model (and data) that distinguishes different components of the output vector. This causes some problems with the notion of representing output market power, because

4 See Morrison (1992, pp. 381–93) for an empirical example of this distinction between short run and long run 'scale' economies.

it implies that some overall notion of price exceeding marginal costs must be developed.[5]

Finally, external economies may be important cost determinants. Representing these types of economies requires some quantitative measure of the underlying external factors, which can then be incorporated into the cost function as arguments or determinants of costs. Such factors could include spillovers from public good aspects of research and development, human knowledge (information, high technology) or public capital, or from general demand or supply side agglomeration effects (thick markets).[6] It is also possible that such effects could be associated with internalisation of economies via integration (multiplant, vertical or horizontal). These types of impacts may be modeled using fixed effects (say, for firms) or multilevel cost functions, for example.

Again, if any of these cost economies exist, interpretation and use of cost measures (particularly marginal cost or profits) that ignore them will be seriously problematic. Many issues arise that cannot be addressed within the more limited models, including the need to consider the long term viability of the industry when short run rigidities prevail (so marginal costs based on variable costs are low, but long term production feasibility requires covering costs incurred from investment in stock assets). There is also a need to evaluate whether efficiencies are driving underlying observed market patterns, such as the increasing size of firm/plant (from the different types of potential cost economies mentioned).

If the measured p_Y/MC markup is high because MC is low as a result of cost economies, this could imply that something 'good' rather than 'bad' is occurring. This is especially true because cost economies imply that AC is higher than MC, so the firm may not be generating excess profits (which one would think is the fundamental characteristic of an abuse of market power). Instead, the economies achieved may be reflected in output and input prices, benefiting consumers and input suppliers.

If cost economies, and thus efficiencies, are driving observed cost patterns this could mean output prices are lower (rather than higher) than would be the case with smaller firms, and less concentration exists in a market. This situation ultimately benefits consumers. It could also be the case that input suppliers fare better, especially if larger or more diversified enterprises require high utilisation levels to

5 See Catherine J. Morrison Paul, 'Market and cost structure in the US beef packing industry: a plant level analysis', forthcoming in the *American Journal of Agricultural Economics*, for an application of this reasoning.

6 See, for example, Morrison Paul and Siegel (1999, pp. 272–90) for a treatment of thick markets, and Morrison and Siegel (1998, pp. 30–45) for a model of the impact of knowledge factors.

maintain efficient production levels. Workers may also generate returns from the associated technological and market patterns if the resulting product and thus employment market are strong. In addition, the firms would be expected to 'profit' from such structure, although this does not necessarily mean large (long run economic) profits.[7]

The main consideration is not only choosing how to measure and interpret marginal cost (and thus the implied markup) but also determining how these measures relate to true or effective 'market power' and 'profitability' in both the short term and long term. Potential cost efficiency aspects (cost/resource savings) must be carefully modelled, measured and interpreted for appropriate measurement and use of market power indicators, especially for regulatory guidance. Again we have to ask, what are the driving forces for observed integration, consolidation and concentration, and what are their consequences? This is not necessarily 'back to Demsetz'; I am not saying that 'big' is good or bad in any particular industry, just that these issues must be addressed to motivate, interpret and use market power measures effectively.

Even if efficiency is a major factor underlying the prevalence of large firms and concentrated industries, other serious regulatory problems may need to be addressed. There may be technical (or X-) inefficiencies or redistributions (unions?) from reduced competitiveness that may not be optimal, for example. If technical inefficiencies exist, no-one benefits because excessive resources are used to generate product — that is, there is less of a 'pie' to divide.

8.3 Examples — meat packing and electricity generation

I am not trying to provide a general answer, but I do have an example — the United States meat packing industry. I have undertaken some studies of this industry in the past few years, motivated by serious policy concerns about concentration and consolidation. Such policy issues have been raised in the United States since the late 1800s, but recently concentration again rose dramatically after a number of years during which the trend was the reverse, stimulating further concern. This industry is also interesting because the primary issue is about input rather than output market power. The 'little guy' here is the calf and cow producer, rather than the purchaser (who is typically a major wholesaler or retailer).

[7] This should be clear to any economist, but it is worth emphasising that economic profits (particularly in terms of long run profit flows) may differ substantially from accounting profits, and definitive estimates of the former are required for any type of normative guidance.

In my studies I used data at different levels of aggregation and with alternative demand structure bases. But in all cases I incorporated into the model, and thus into the resulting measures and interpretation, a detailed characterisation of various aspects of the cost structure. I allowed for short run capital fixities and thus utilisation choices (and adjustment costs when using aggregate time series data), and a broad range of interactions among inputs, outputs and technological factors (such as non-neutral technical change and scale effects, and the potential for scope economies).

Overall, I have found that increasingly large and diversified plants (and firms) in the meat packing industry — and resulting concentration patterns — seem to be driven by associated cost efficiencies. Little evidence of output or input market power emerged from any of the studies. In fact, utilisation issues seem to cause cattle prices to be higher than would otherwise be the case. Given that maintaining high throughput levels is important to effectively use large plants, the cost savings due to more efficient use of the plants counteracts any supply characteristics indicating oligopsony power; firms are willing to pay relatively high marginal prices for (cattle) input.[8]

Consideration of other industries also raises questions along these lines. The electricity industry has generated policy attention in most countries, including Australia. Again, a question that is particularly crucial when evaluating the extent of market power and its (harmful?) consequences is what types of cost economies underlie the existing market structure patterns. Especially in this case, measurement and interpretation issues would be likely to involve the capital intensive nature of the industry and the resulting necessity to invest in vast equipment networks. The resulting short run fixities ('sunk costs') may contrast with long term viability.

Perhaps there are good reasons for this industry having been considered a 'natural monopoly' in the past. Perhaps not. But it is certainly important to construct a detailed representation of the cost structure to evaluate production processes and produce justifiable, and beneficial, policy recommendations.

Many other industries are also experiencing (or characterised by) high concentration and increasingly large firms and plants. One only needs to open a newspaper (in almost any developed country) to find stories about firms opening large plants, consolidating, or otherwise expanding their size and diversity. In reverse, downsizing and specialisation have prevailed in some industries. Both these trends

[8] In addition to the implications that detailed, if complex, specifications of the cost structure seem critical for estimation and application of market power measures, the results indicated that specification of the demand structure, and the level of data aggregation, were empirically less consequential.

could potentially have efficiency motivations, although whether such motivations — or increasing the power to charge high prices and generate excessive profits — is behind the trends observed is a subject for empirical investigation and requires a serious look at the cost structure.

8.4 Conclusion

The aim of this paper has been to encourage more thought about what types of cost economies may be important to model and measure when applying new empirical industrial organisation models to questions of market power and regulatory guidance. Hopefully, I have highlighted the importance of studying the cost structure before interpreting profit and marginal cost measures representing market power. Care in developing the conceptual basis for such representation, and for the use of resulting measures, provides a more solid foundation for the common use of quite complex analytical models to represent the demand structure. Without this foundation, the application of such complicated models to analyse market structure and power seems at least limited, if not moot.

References

Azzam, A. and Anderson, D. 1996, Assessing Competition in Meatpacking: Economic History, Theory, and Evidence USDA Packers and Stockyards Programs, GIPSA-RR, vol. 96, no. 6, May, Washington, D.C., USA.

Morrison, C. 1993, 'Investment in capital assets and markup behaviour: the US Chemicals and Primary Metals Industries in Transition', *Journal of Business and Economic Statistics,* vol. 11, no. 1, pp. 45–60.

Morrison, C. 1992, 'Unraveling the productivity growth slowdown in the US, Canada and Japan: the effects of subequilibrium, scale economies and markups', *Review of Economics and Statistics*, vol. 74, no. 3, pp. 381–93.

Morrison, C. and Siegel, D. 1998, 'Knowledge capital and cost structure in the US food and fiber industries', *American Journal of Agricultural Economics,* vol. 80, no. 1, pp. 30–45.

Morrison Paul, C. 1999a, *Cost Structure and the Measurement of Economic Performance,* Kluwer Academic Press:Boston, Massachusetts, USA.

Morrison Paul, C. 1999b, 'Market and cost structure in the US beef packing industry: a plant-level analysis', forthcoming in the *American Journal of Agricultural Economics.*

Morrison Paul, C. and Siegel, D. 1999, 'Scale economies and industry agglomeration externalities: a dynamic cost function approach', *American Economic Review*, vol. 89, no. 1, pp. 272–90.

Stigler, G. 1964, 'A theory of oligopoly', *Journal of Political Economy*, vol. 72, pp. 44–61, as quoted by Azzam, A. and Anderson, D. 1996, *Assessing Competition in Meatpacking: Economic History, Theory and Evidence*, USDA/GIPSA-RRm, Washington, DC, pp. 96-6.

SECTION V

INFLUENCE OF REGULATION ON TELECOMMUNICATIONS COMPETITION

9 Telecommunications industry: price benchmarking evidence on competition

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Productivity Commission

9.1 Summary

The purpose of this paper is to present evidence obtained from international price comparisons on the current extent of competition in the Australian telecommunications industry.

Ideally, prices will reflect efficient investment and production. This will not always be achieved because telecommunications markets depart from the perfectly competitive model. In the telecommunications industry, prices are partly determined by market conditions and the regulatory environment. Consequently, relative prices are indicators of the relative strength of competition, the effectiveness of regulation aimed at promoting competition, and price (or rate of return) controls.

Benchmarking provides a basis for establishing price relativities and a notion of the 'ideal' level and structure of prices. It is not possible to identify possible 'best' price outcomes for Australia because many factors have to be taken into account. However, the study results indicate what better practice may achieve.

9.2 The benchmarking study

In March this year the Productivity Commission published a report on an international benchmarking study of the performance of telecommunications incumbents in selected OECD countries. The carriers benchmarked are listed in table 9.1.

Table 9.1 **Carriers used for the price comparisons**

Country	*Carrier*
Australia	Telstra
Canada	BC Tel, Stentor
Finland	Telecom Finland (now Sonera), Finnet
France	France Telecom
Japan	NTT, KDD
New Zealand	TCNZ (Telecom Corporation of New Zealand)
Sweden	Telia, Tele2
United Kingdom	British Telecom
United States	AT&T, Nynex, PacBell

The countries selected for analysis are generally among the better performing countries with relatively low prices according to previous OECD comparisons. Therefore, Australia's relative position among all OECD countries (and possibly among other non-OECD countries) can be expected to be better than its position among the countries studied.

The price outcomes of residential and business consumers were the principal basis of performance comparison. The measure used was the price of telecommunications services relative to the general price of goods and services in each country. This index was derived by costing a fixed neutral basket of services, then using purchasing power parity (PPP) exchange rates to convert the prices into a common currency (US dollars). Details of the method are presented in box 9.1.

9.3 Price comparisons

Australia's price performance is good relative to that in the benchmarked countries (which are among the better performing). Nevertheless, the best performing countries — Finland and Sweden — have prices 20–40 per cent lower (on a purchasing power parity basis) than those in Australia (table 9.2). The results of the price comparisons are shown in figure 9.1.

The gap between Telstra's prices and those in the best performing countries is generally consistent over all residential and business services, not withstanding differences in the level of indirect taxation. The main exceptions are business mobile services, which are close to the benchmark.

The price gap is *prima facie* evidence of market power. However, the price performance difference could be explained by measurement error and differences in costs. Consequently, it is necessary to eliminate other factors affecting price relativities.

Measurement errors are one possible reason for the price differences. However, sensitivity testing involving extensive changes to the assumptions did not substantially change either the price gap or Telstra's position among its peers. The Commission concluded that the results were robust and not subject to measurement error.

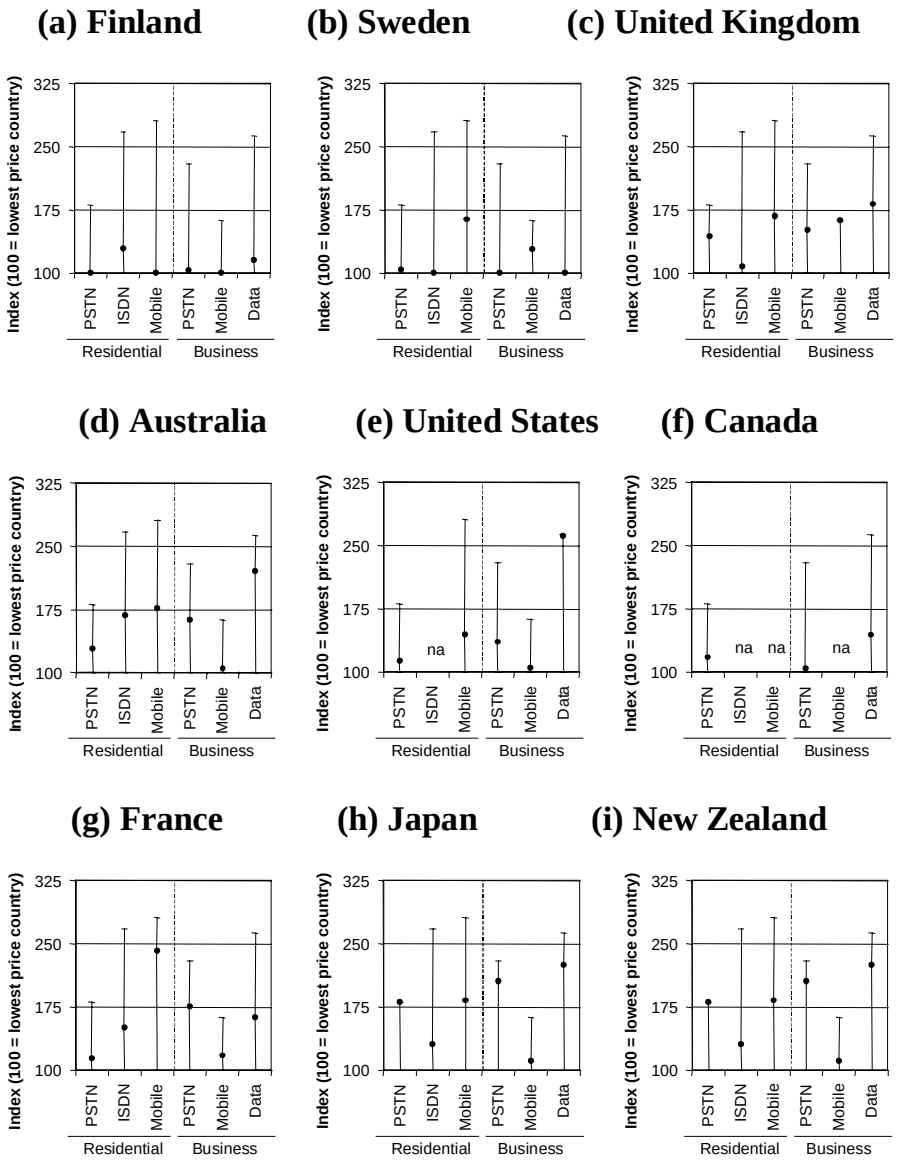
Table 9.2 **Relative prices of Australian telecommunications services, February 1998**

Service	*Country with lowest prices*	*Ranking of Australian prices* [a]	*Amount best prices are below Australian prices*	*Amount Finnish prices are below Australian prices* [b]
			%	%
Residential services				
PSTN [c]	Finland	6 of 9	23	23
ISDN [d]	Sweden	6 of 7	41	24
Mobile	Finland	5 of 8	44	44
Small and medium business services [e]				
PSTN for small business	Finland	7 of 9	40	40
PSTN for medium business	Finland	6 of 9	39	39
ISDN for small business	Sweden	6 of 7	43	32
ISDN for medium business	Sweden	4 of 7	46	35
Mobile for small business	Finland	3 of 8	14	14
Mobile for medium business	Finland	3 of 8	5	6
Data services for business				
Leased lines	Sweden	6 of 9	63	63
X25 (packet-switched)	New Zealand	6 of 8	52	48
Frame relay	Sweden	6 of 7	46	22
Large business services	Sweden	4 of 6	47	43

a A ranking, for example, of 6 of 9 for Australia's prices for residential PSTN services means Australia has the sixth lowest prices out of the nine countries included in the particular comparison (given all the specified assumptions). **b** Finland is used as the benchmark because its prices, overall, were the lowest. **c** PSTN is public switched telephone network. **d** ISDN is integrated services digital network. **e** The business comparisons are simple averages of comparisons for businesses of various sizes with a variety of patterns of demand for telecommunications services.

Source: Productivity Commission estimates.

Figure 9.1 **Summary of price comparisons, February 1998**[a]



a The data underlying the charts express the service price for each country as an index relative to that of the least expensive country. The price in the least expensive country corresponds to an index of 100. The bars represent the range of prices among all the selected countries for the particular service. For each country, each dot indicates how much more expensive the price of the service is compared with that of the lowest-priced country. Australia's PSTN price, for example, falls approximately in the middle of the range of prices represented by the bar. Where necessary, price differences have been averaged to provide a basis for aggregate comparisons. **na** Data not available for this service.

Data source: Productivity Commission estimates.

Box 9.1 **Price comparison method**

Price information for many individual services was aggregated into indexes to provide a practical means of comparing price performance. Each price index was based on the expenditure over one year on a defined 'basket' of telecommunications services purchased by a representative user at February 1998 prices.

OECD demand assumptions were used as a starting point for the baskets, which were developed further following consultations with Telstra and Eurodata.

Demand assumptions

- Each basket or sub-basket specifies a distribution of calls made at different times of the day or week and over different distances.
- Although generally representative of use patterns, the baskets do not reflect actual use in any particular country (so as to ensure that comparisons are as neutral as possible).

Discounting plans

- Prices used in the comparisons are intended to reflect the actual cost to the user. The specified baskets of services were priced in each country using the lowest priced discount plan that was widely available in the relevant market and consistently offered by the incumbent(s) in that country.
- Plans involving limited destinations, periods or targeting narrowly defined groups were not used, because there is no information on their market shares or the extent of their use.

Taxes

- Indirect taxes imposed by governments differ among countries, so influence the relative prices of services in those countries. The indirect taxes associated with the production of telecommunications services, such as value added taxes, were included because the aim is to compare the telecommunication cost for the consumer.

Currency conversion

- OECD measures of Purchasing Power Parity (PPP) exchange rates current at February 1998 were used for the conversion of prices to reflect the cost of telecommunications relative to the general cost of goods and services in each country.

Ignoring productivity for the moment, possible sources of cost differences include:

- quality of service;
- technology;
- input costs;
- scale disadvantages, particularly economies of density; and
- government interventions that prevent efficient pricing and that require uncompensated non-commercial activities that are not undertaken in the other countries, or do not incur the same net cost.

An examination of these cost factors, as summarised below, indicated that they were unlikely to account for the measured price differences.

- *Quality of service*. An examination of the levels of service provided indicated average performance for Australia. Finland and Sweden had lower local and long distance call failure rates, Sweden had higher call seizure rates and Finland provided more payphones per head of population.
- *Technology*. The countries were chosen because they have mature telecommunications industries employing current technology.
- *Input costs*. General price differences of inputs might have been expected. However, the use of purchasing power parities which compare the telecommunications prices to other goods and services in each country would largely account for these differences.
- *Scale disadvantages*. This is a contentious issue, with analysts reaching different conclusions. Australia has a low overall population density. However, it is highly urbanised and the overall per line basis may be quite favourable. These economies are not considered to be significant in the long distance market, which is regarded as potentially the most competitive market.
- *Government intervention.* This is another contentious and intractable issue. It is impossible to say which services an efficient Telstra would continue to provide in the face of effective competition and in the absence of the universal service obligation. There are also difficulties in determining Telstra's costs so as to estimate the net revenue shortfall from the interaction of the price caps and the universal service obligation. Current estimates suggest that the resultant cost disadvantage relative to the costs of other benchmarked countries is significantly smaller than the price gap.

Offsetting any cost disadvantage is a considerable tax difference that favours Telstra. Indirect taxation in the countries with the lowest prices exceed 20 per cent, whereas taxation in Australia (imputed from input–output tables) is approximately 4 per cent.

9.4 What do the price comparisons reveal?

The existence of the price gap and the elimination of other factors that possibly affect price relativities are evidence of the extent of Telstra's market power. In a more competitive or effectively supervised environment, Telstra's prices would be closer to those of the countries with the best price performance.

Typically, market power is associated with inefficiency and profit taking. Where governments intervene, the price gap also indicates the effectiveness of their implemented policies. In the current circumstances of regulatory change, the effectiveness is also likely to depend on the length of time for which policies have been in place.

Financial performance and productivity are linked with prices. As noted by Ergas, Ralph and Sivakumar (1990), comparative rankings of carriers in terms of prices charged and the rates of return earned are broadly indicative of comparative technical efficiency. High levels of financial performance require high productivity or high prices in the absence of such efficiency. In an industry that is not fully competitive, incumbents have some leeway to be less than fully efficient and to set prices to compensate or earn above normal profits.

Productivity differences

Productivity — broadly defined as the quantity of outputs per unit quantity of inputs — is driven by technological innovation, responsiveness to demand and efficiency in the use of resources. These factors, although substantially under the control of industry participants, are indirectly affected by market disciplines from competition and regulatory incentives aimed at encouraging efficient production.

Carriers with a high level of productivity are in a position to provide services to customers at relatively low prices and to earn a satisfactory financial return. The incumbent carrier's market power, among other factors, affects the extent to which consumers and shareholders share in the benefits of high productivity.

It can be demonstrated that relative differences in productivity between countries are equal to the relative difference in financial performance divided by the relative difference in the ratio of output and input prices (Waters II and Street 1998).

In the absence of appropriate input price indexes, indicative estimates of differences in productivity may be obtained by assuming that telecommunications input prices (when converted at PPP rates) are the same across all the countries studied (see

box 9.2).[1] Indicative estimates based on this assumption are presented in tables 9.3 and 9.4. Although rudimentary, the estimates suggest a significant variation in relative productivity among the countries studied.

The indicative estimates of Telstra's relative productivity are consistent with the (June 1996) assessment of the then Telstra Chief Executive that Telstra was not yet at world's best practice in terms of operating expenses per access line: 'We make no secret that we are 35 per cent from where we ought to be' (Meredith 1996).

This situation does not necessarily imply a lack of effort by Telstra or the Commonwealth Government to improve productivity. The situation arises as a result of past policies, and it may reflect the time required to bring about internal change in an orderly way. Further, scale diseconomies could explain some of the difference in productivity.

There is a significant correlation between the indicative estimates of productivity and the differences in prices shown in table 9.3. The simple correlation between relative prices and the indicative measure of relative productivity is –0.78, with the relative productivity tending to be greater in countries with the lowest prices.

This correlation provides some evidence that the relative price differences for the countries studied largely reflect productivity differences. This implies that customers of telecommunications services generally benefit from higher levels of competition and regulation aimed at maximising competition and encouraging efficiency.

[1] To the extent that this assumption does not hold exactly, the estimates would be subject to some error and potential bias. Consequently, some differences in estimated total factor productivity may be attributable to variations in the ratio of telecommunications input prices to the PPP rates (PPP rates being equal to the cost, in local currency, of a standardised general basket of goods and services). Bias in the indicative estimates may arise if the variation in the relative prices of some inputs are correlated with productivity — that is, where productivity is low, input prices are high, and vice versa.

Box 9.2 **Calculation of indicative productivity estimates**

Total factor productivity (TFP), for an enterprise may be estimated as the quantity of output (Q) per unit of quantity of input (I), with quantities measured by appropriate indexes.

The quantity index for outputs may be estimated by the revenue (R) earned from the output divided by a price index for output (P_O). Similarly, the quantity index for input is equal to expenses (E) incurred in producing outputs divided by a price index for inputs (P_I).

Therefore:

$$TFP = Q/I = (R/P_O)/(E/P_I) = (R/E)/(P_O/P_I).$$

See Waters II and Street (1998) for a recent discussion of the links between price indexes, financial performance and productivity.

Estimates for revenue (R), expenditure (E) and output prices (P_O) are available for each country. Input prices (P_I) may be approximated by assuming they are proportional to the PPP exchange rate for that country. Given this assumption:

$$(P_{I_i}/PPP_i) = k \text{ for each country (i)}$$

$$(P_{O_i}/P_{I_i}) = (P_{O_i}/PPP_i)/(P_{I_i}/PPP_i) = (P_{O_i}/PPP_i)\ /k$$

In percentage change (%Δ) form this implies:

$$\%\Delta\ (P_{O_i}/P_{I_i}) = \%\Delta\ ([P_{O_i}/PPP_i]\ /k) = \%\Delta\ (P_{O_i}/PPP_i)$$

In which case, %Δ TFP for country (i) (compared with a 'base' country) is given by:

$$\%\Delta\ TFP_i \cong \%\Delta\ (R/E)_i/(P_{O_i}/PPP_i)$$

If P_{I_i} is proportional to PPP_i for all countries, then the substitution of (P_{O_i}/PPP_i) for (P_{O_i}/P_{I_i}) does not affect the estimates of %Δ in TFP. However, exact proportionality is unlikely to hold. Consequently, the estimates should be treated as indicative only.

Profit taking

Indicative productivity estimates for financial performance are presented in table 9.4. There is a significant positive correlation between financial performance, as measured by sales margin before interest and tax, and prices overall. The simple correlation between the prices and financial performance is 0.41 (0.84 excluding Japan), with financial performance tending to be lower in countries with the lowest prices.

Table 9.3 **Indicative estimates of productivity differences, 1997–98** [a, b]
Per cent

Country	*PPP adjusted price differences*	*Indicative productivity differences*
Finland[c]	–34	+31
Sweden	–29	+11
Canada	–17	+16
United States	–12	–3
United Kingdom	–2	–6
Australia	Base	Base
France	0	–13
New Zealand	+29	–8
Japan	+34	–41

a These estimates are indicative only because the Commission could not obtain a robust index of input prices. **b** Financial performance is measured by sales revenue divided by expenses, where expenses exclude interest and company tax. **c** Countries listed in order of increasing PSTN prices.
Source: Productivity Commission estimates.

This correlation suggests a link between prices and financial performance. However, care has to be exercised when analysing financial performance. The range of services provided and level of capital investment taking place at a particular point in time may differ, for example. Further, differences in the cost of capital or managerial performance may also affect financial performance.

Table 9.4 **Prices and financial performance, 1997–1998**
Per cent

Country	*Price differences*	*Index of financial performance differences* [a]
Finland[b]	–34	–14
Sweden	–29	–21
Canada	–17	–4
United States	–12	–14
United Kingdom	–2	–8
Australia	Base	Base
France	0	–13
New Zealand	+29	+18
Japan	+34	–20

a Financial performance is measured by sales revenue divided by expenses, where expenses exclude interest and company tax. **b** Countries listed in order of increasing PSTN prices.
Source: Productivity Commission estimates.

This finding should not be used to infer from the relative prices of an individual incumbent that their financial performance is inappropriately high. Although Telstra's return on capital may appear to be high, it is difficult to judge whether it is higher than a business with similar risk.

The above indicative estimates suggest that high prices in the countries studied tend to be associated with both high financial performance and poor productivity in relative terms. If measurement error and differences in external factors are relatively small, then the analysis also suggests that weaker competitive disciplines or less effective regulatory supervision prevail in countries with higher prices.

The existence of productivity levels below those in other countries which also have lower prices suggests ineffective supervision in sectors of the industry that are not competitive, ineffective competition in those that are potentially competitive, or both. However, the regulator may not be responsible for ineffective supervision; the regulator's powers may be inadequate for the purpose, or prescribed regulatory processes may cause delays and scope for gaming.

Inefficient price structures

Inefficient pricing is mainly a function of constraints on the industry preventing a rebalancing of prices to reflect costs. The other main problems are the possibility of arbitrage preventing efficient price discrimination and anticompetitive conduct. Research by the Commission (Albon, Hardin and Dee 1997) and Access Economics (1998) indicates significant pricing efficiency gains from rebalancing. This suggests that rebalancing prices to be more reflective of costs could have benefits — which could be partly manifested as price reductions.

9.5 How are cost structures and market power likely to affect competition?

Before judging what prices reveal, it is useful to examine cost structures and the basis of market power to identify the scope and potential for competition. Where there are economies of scale and scope, prices usually reflect demand conditions as well as costs structures and market power. Common and joint costs must be allocated across consumers with different demand characteristics, and often across multiple services. If this is done efficiently, costs are recovered in a way that least distorts demand from that which would occur if prices were set at the short run marginal cost of efficient production.

Government price controls also affect pricing and prices. However, ideally they should not impede efficient pricing.

In Australia there has been a proliferation of pricing schemes to differentiate services and efficiently recover costs. Although price discrimination signifies the existence of market power, it does not necessarily imply abuse of market power.

Indeed, price discrimination is usually required to efficiently recover common and joint costs.

The following analysis is drawn primarily from appendix B of the Commission's (1994) benchmarking study report.

Cost structures

Many empirical studies of the cost of production have revealed economies of scale and scope in the provision of telecommunication services (although the magnitude and pervasiveness of these economies are disputed). It is more significant that some sectors of the telecommunications industry, such as local voice services, display *economies of density*. These arise because most of the cost of providing local services, and the local component of other services, is common as a result of indivisibilities in practical supply.

Unit costs for mobiles and data transmission markets are also likely to vary with the density and distribution of population. However, there is no evidence on whether the distribution of Australia's population causes higher average costs in these markets.

Ovum (1998) examined the impact of geography and density in Australia relative to other countries. Ovum concluded that these factors may be influencing the relative prices to some degree, but the overall impact is unlikely to be large. It was argued that Australia is highly urbanised with greater densities in inhabited areas than broad aggregates (population divided by land mass) indicate. Ovum noted, for example, that over 55 per cent of the population lives in the five largest cities, compared with 20 per cent for Sweden and approximately 8 per cent for both the United States and the United Kingdom.

Ergas, Ralph and Sivakumar (1990) also noted that population densities in inhabited parts of Australia where there is at least one inhabitant per 8 square kilometres are not significantly lower than in the inhabited parts of Canada and the United States. Also, the distribution of subscriber loop lengths in Australia is not very different to that in the US network.

Diseconomies of density in some areas of the country affect the cost of the Australian universal service obligation, which (together with Telstra price sub-caps) results in the underrecovery of costs. The cost of the universal service obligation is industry funded and ultimately reflected in telecommunications prices in Australia.

The universal service obligation cost has been capped at $253 million to determine the contribution of carriers other than Telstra, which is approximately 1.3 per cent of industry revenue. Telstra bears any costs above the $253 million. It recently claimed that the net cost of providing a universal service to rural and remote areas is $1.8 billion. However, Gibson Quai and Associates (1999) and Ovum (1998), who were engaged by the Australian Communications Authority to investigate the matter, estimated a range of possible costs that are much lower.

Most other countries have universal service obligation requirements, but they vary in scope. (These costs are borne by industry in all of the benchmarked countries.) Price relativities are affected to the extent of disparity between the universal service obligation cost in Australia and that in the other countries studied. In particular, cost differences could partly explain price differences between Australia and the countries with the lowest prices.

As noted earlier, there may be some moderate economies of scale and scope, but these are disputed. Regardless of the extent of any economies in telecommunications, these effects do not appear to be significantly reflected, in price differences among countries. Research has revealed only a weak link between these factors and observed price differences. The OECD (1990), using a cross-country sample, examined whether low aggregate line densities were correlated with higher prices. The correlation was not found to be significant: the R-squared between the two was 0.01. When an index of urbanisation was also included as an explanatory variable, the overall R-squared increased to 0.2.

Historically, there were considerable diseconomies in switching. However, current computerised switching has eliminated, the diseconomies of scale that were present in mechanically switched networks. There may even be significant economies of massed reserves in switching facilities and network utilisation.

Overall, there may also be economies in activities such as billing and customer service. Again, these are disputed. These can be offset, for example, by organisational diseconomies associated with size.

Dynamic factors

The telecommunications industry is a very dynamic industry. Moreover, the rate of change in the industry has accelerated over the past two decades with the rapid reduction in the costs of microelectronics and the increased variety of information technology, multimedia content and other uses this has fostered.

Prices are also affected by technological developments that reduce costs. These developments usually decrease costs and broaden the services on offer. The extent to which these cost savings are passed on to consumers depends on the extent of competition, the effectiveness of regulatory incentives to invest efficiently and the effectiveness of price or rate of return controls. Falling prices may not necessarily signify effective competition.

Where technological change results in substitutes, the scope for competition may be increased. Some developments may also reduce barriers to entry. That said, new developments often require large scale investment and risk. These risks are more easily borne by incumbents with a high degree of information about the existing (substitute) market. Where economies of scale exist, a 'first mover' advantage may arise, which delays the onset of competition.

The cost benefits previous of technological development have not been fully passed on to consumers. However, this may be less likely to occur with the liberalisation of markets and the appearance of participants that operate globally.

Market power

Market power is a critical issue in the telecommunications industry because it is multilayered, with incumbents providing services ranging from infrastructure to information. This layered structure is important because companies occupying niches in the higher layers depend on the services of companies in lower layers. Companies in higher layers risk having the rewards of their innovation and investment appropriated by carriers who own the 'bottleneck' facilities on which they rely.

There is a history of government involvement and retail price supervision in the industry, indicating that governments have long been concerned about market power. They have intervened in the market through regulation and ownership to prevent excess profits and to establish incentives for the industry to provide services efficiently.

Retail controls on prices have taken the form of limiting overall price increases on a broad basket of prices. Governments have also placed limits for price increases on particular services, so as to satisfy social objectives and target market power. Further, they have introduced incentive regulation to redress inefficiency and encourage dynamic efficiency.

More recently, governments have liberalised telecommunications markets and some have encouraged competition by mandating access to 'bottleneck' facilities, where

competition is unlikely to occur. This has necessitated the relaxation of retail price controls where they distorted interconnection charges. Where past price supervision produced and entrenched price distortions (usually to achieve social objectives), governments have had to take steps to rebalance prices so they were more reflective of costs.

Incumbents are considered to have market power. This power is derived from mainly demand side economies. One network with complete coverage makes a telecommunication service cheaper for consumers by eliminating a need for duplicate subscriptions. Moreover, it may not be easy to entice subscribers away from an existing network, unless a competing network:

- offers the same or a better 'universe' of subscribers; and
- more than covers the inconvenience of the change.

This network externality provides an incumbent carrier with a significant first mover advantage where it is able to refuse to interconnect an entrant with its existing subscriber base at 'reasonable' prices.

Even where there is interconnection at reasonable prices, the 'lumpy' and irreversible nature of investment can constitute another significant barrier to entry (Dixit and Pindyck 1994). If an incumbent carrier has more capacity than necessary to meet current demand, it has strong incentives to engage in predatory pricing in any entered market.[2] This suggests that entry is most attractive where demand is unmet or markets are expanding. This has been the case historically.

9.6 What do prices reveal about competition?

In this section, the implications for potential competition of relative prices and price structures are discussed. Two principal voice markets are examined — the national long distance and local markets.

Long distance services

National long distance voice markets are generally considered to be potentially open to facilities based competition if participants are able to access the local loop. Another important condition is carrier preselection.

[2] Nevertheless, it is extremely difficult for an outside observer to distinguish between predatory pricing and the efficient response of an incumbent to an increase in competition.

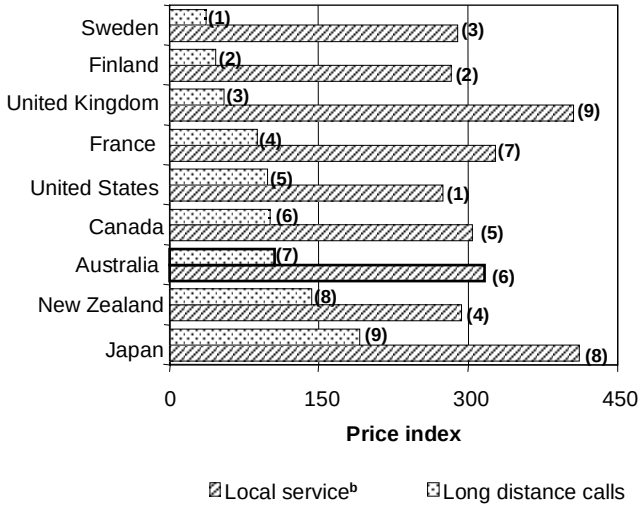
Given competition and the removal of distortionary price controls, prices would be expected to converge to the cost of efficient supply of the service. To examine whether this is the case, the Commission compared local service (customer access and call) prices and long distance service (call) prices.

A common definition of local calls was established in order to generate separate international price comparisons for local and long distance calls. According to this definition, calls up to and including 27 kilometres in distance are local calls and those beyond 45 kilometres are long distance calls.

Relative price levels in the benchmarked countries are shown for local and long distance residential voice markets separately in figure 9.2. (The countries are ordered by prices in the long distance market.) These price relativities reveal that long distance service prices in the countries with the lowest overall prices are around 40 per cent lower than those in Australia. There is less difference in local service prices, which are around 10 per cent lower in Finland and Sweden.

Falling prices in the Australian long distance voice market is *prima facie* evidence of competition. However, the high prices relative to those in other countries indicate that this competition may not be delivering prices that reflect efficient production and pricing.

Figure 9.2 **Relative local service and long distance PSTN prices for residential customers, February 1998**[a]



[a] Figures in parentheses represent the ranking by price of each country relative to the other nine countries in the sample for each service. [b] Local call service includes customer access charges, local call charges and internet call charges.

Data source: Productivity Commission estimates based on Eurodata (consultant) data.

Access charges that are above efficient cost are a possible impediment to achieving lower prices from competition. However, if these charges are related to existing local charges, there may not be much scope for lowering them. The overall local service price gap between Australia and the best performing countries appears to be small (10 per cent).

It must be noted that the incumbent local loop provider in Australia, Telstra, does not appear to be as efficient as local loop providers in the countries with the lowest long distance prices. Further, the local service price difference is not commensurate with the productivity difference.

If prices are insufficient to earn a normal rate of return in the local market, Telstra will be compelled to earn higher than normal rates of return in other areas (such as the long distance market) to cover the cost of capital for the business as a whole. Further, Telstra has strong incentives to resist reductions to interconnection charges as a means of limiting the extent of price competition it faces in the long distance market.

Even with efficient interconnection charges, competition could be muted. There is scope for competitors to 'price follow' an incumbent that is unable to lower prices and strongly compete, particularly if those competitors have higher productivities.

There is also the possibility that the high prices have attracted inefficient entry where standalone costs are higher than an incumbent with economies of scope.

The implication is that competition in the long distance market could be impeded by interconnection charges that are about right but too high for Telstra, given its current level of productivity. The imperative is for local service interconnection charges to reflect efficient costs that promote competition and incentives for Telstra to address any local service inefficiencies.

The link between prices, productivity and profitability also has implications. Profitability will be compromised unless the interconnection charge reductions exceed the reductions made possible by productivity and pricing efficiency gains.

Local services

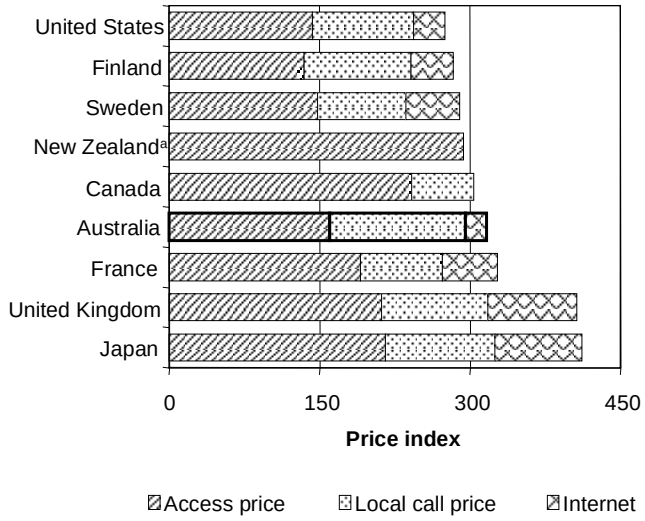
Further insight into the implications of relative prices for competition may be obtained by examining the structure of local service prices. The charges for customer access, voice calls and calls to internet service providers are shown in figure 9.3.

Finland's customer access prices are 16 per cent lower than those in Australia. This suggests that customer access prices, on average, are above the cost of efficient provision and pricing. The call prices, including calls to internet service providers, are 5 per cent lower in Finland.

Only small adjustments to the balance between customer access prices and to local call prices may be required, on average, to redress any pricing inefficiency. The ratio of the customer access to call price is approximately 1:1.0 in Australia, and 1:1.1 in Finland.

The existence of economies of density suggest there would be significant differences in the cost of providing customer access across Australia. Ideally prices should reflect such large differences in customer access costs. However, many countries (including Australia) have social and equity objectives that they consider more important than a singular focus on efficiency and the encouragement of competition.

Figure 9.3 **Local service price comparisons for residential customers, February 1998**



a Local calls are free of charge in New Zealand.

Data source: Productivity Commission estimates.

Given significant cost differences in providing access across Australia, and the uniform revenues that result from the universal service obligation, cross-subsidisation of local services is required. Revenue from either customer access prices in low cost areas or prices for other services is being used to meet any revenue shortfall in high cost areas.

With cross-subsidisation, competition could be expected to emerge in the low cost areas where the incumbent is pricing significantly above costs to recover revenue shortfalls in high cost areas.

There is some competition in local services, principally from Cable and Wireless Optus in cable services. However, significant investment by other wireless and optic fibre providers has not emerged in central business districts, where the economies of density are most favourable to low cost provision. Consequently, widespread facilities based competition in the local loop appears unlikely in the foreseeable future, given the low level of entry into potentially profitable parts of the market.

Unbundling the local loop to allow interconnection at any technical feasible point may assist.[3] While unbundling would increase the regulatory burden on the incumbent(s), it would at the very least ensure that all possibilities are open. However, any local market competition facilitated by a decision to unbundle would only produce efficient prices if interconnection charges were efficient.

In the absence of competition, lower local call prices will be achieved through scrutiny that ensures interconnection charges with reference to the cost of efficiently applying the best available technology.

References

Access Economics 1998, *Review of Price Controls on Telstra*, Canberra.

Albon, R., Hardin, A. and Dee, P. 1997, *Telecommunications Economics and Policy Issues*, Productivity Commission Staff Information Paper, AusInfo, Canberra.

Dixit, A. and Pindyck, R. 1994, *Investment under Uncertainty*, Princeton University Press, Princeton.

Ergas, H., Ralph, E. and Sivakumar, S. 1990, *Reforming Australian Telecommunications: A Review of Issues and Options*, Monash Information and Communications Technology Centre Working Paper, Monash University, Melbourne.

Gibson Quai and Associates 1999, *ACA USO Forward Looking Technologies Study*, Draft Position Paper, Australian Communications Authority, http://www.aca.gov.au/issues/index.htm (accessed 25 February 1999).

Meredith, H. 1996, 'Blount and to the point on sale', *Australian Financial Review*, 28 June, pp. 6.

[3] Interconnection access to local loops is often mandated. There is also a requirement to 'unbundle' local loops so entrants can choose the point of interconnection that suits their needs.

OECD 1990, *Performance Indicators for Public Telecommunications Operations*, Information, Computer and Communications Policy series, Paper 22, OECD, Paris.

Ovum 1998, *An Assessment of Telstra's Access Undertakings*, Report for the Australian Competition and Consumer Commission, mimeo, Melbourne, June.

Productivity Commission 1999, *International Benchmarking of Australian Telecommunications Services*, Research Report, Ausinfo, Melbourne.

Waters II, W. and Street, J. 1998, 'Monitoring the performance of government trading enterprises', *Australian Economic Review*, vol. 31, no. 4, pp. 357–71.

10 Effects of regulation on telecommunications competition

Brian Perkins
AAPT

10.1 Introduction

The telecommunications industry is slowly being been opened up to competition and struggling towards deregulation. However, the industry still has a long way to go. The incumbent, Telstra, remains majority owned by the Commonwealth Government, and this continues to have a significant effect on the regulatory environment in which the industry competes.

The telecommunications industry has seen a major shift in its regulation/ competition model over the past eight years. Between 1991 and 1997, regulation determined the scope and intensity of competition in the industry, but since July 1997, the situation has reversed and competition (or arguably the lack of it) is driving the rate at which deregulation is occurring.

In the following comments I will attempt to explain this reversal. First, I provide a brief overview of the process by which we arrived at the current regulatory environment.

10.2 Historical overview

From a shaky beginning in 1988 under the then Communications Minister, Senator Gareth Evans, competition in telecommunications has made giant strides. It is sometimes easy to forget that it is less than a decade since Telstra (then Telecom Australia) OTC and AUSSAT were the only providers of telecommunications services to the Australian community.

From 1984, my company, then called AAP Reuters Communications, attempted to provide competition to the three Government owned carriers as a provider of leased lines to business, using its own earth stations and leased AUSSAT transponder

capacity. To say it enjoyed limited success is probably overstating its achievements. Competition was very limited before 1991.

10.3 *Telecommunications Act 1991*

The 1991 telecommunications legislation heralded the beginning of less limited competition in Australia, with two fixed networks, three mobile carriers and an unlimited number of service providers.

It was a 'carriers' world' under this Act. Service providers were seen as only resellers of carriers' services; they were not expected, or encouraged, to establish their own networks in competition with the two fixed network carriers. Consequently, service providers faced huge obstacles in establishing themselves as switched network operators. Obtaining interconnection at all, much less at a reasonable price, was a daunting task.

Despite these obstacles, switched service providers emerged and provided some competition to Telecom and Optus. The Government was unprepared for (although I believe quite pleased with) wider competition from 'switched' service providers.

AAP Reuters Communications metamorphosed into AAPT in 1991, and established itself as the first switched service provider in the country and the first competitor to Telecom. As a service provider, AAPT had little assistance from the 1991 legislation in establishing itself as an alternative operator to the duopolists, Telecom and Optus, despite establishing a network comparable with that of Optus. Being a service provider under the 1991 Act was a very different matter from being a carriage service provider under the 1997 legislation.

10.4 *Telecommunications Act 1997*

This Act heralded the introduction of open competition in Australia. However, one of the myths about the 1997 regime was that the Government intented to deregulate the industry. The industry was significantly reregulated because the Government's objective was to increase competition.

The success of the liberalisation program is evidenced by the current existence of around 30 carriers, 120 carriage service providers and around 750 internet service providers — a major change in the scope, but not necessarily the intensity, of competition in less than ten years.

It is unfortunate that the level of competition, despite a considerable increase in the number of operators in the industry, has not increased proportionately. There are many reasons for this, but primarily the 1997 Act has not enabled the Australian Competition and Consumer Commission (ACCC) to support competition as the Government intended.

In the 1997 legislation the Government set out to ensure that the new telecommunications regulator, the ACCC, had the powers to undertake two main functions:

- ensure that anticompetitive behaviour, especially by the incumbent, was dealt with expeditiously; and
- ensure that new carriers and carriage service providers would be able to access the encumbent's infrastructure, networks and services expeditiously and at reasonable cost.

The result was two major additions to the *Trade Practices Act 1974*. I will first focus on these telecommunications specific additions to the Trade Practices Act (parts XIB and XIC) and discuss how they have affected competition in the industry.

10.5 Part XIB of the Trade Practices Act

The addition of part XIB to the Trade Practices Act was designed to enable the ACCC to act 'expeditiously' to control anticompetitive behaviour. Unsurprisingly, part XIB has not achieved its purpose. It has lowered the threshold for determining anticompetitive behaviour but there is little evidence that anticompetitive behaviour is under control. While the ACCC has the powers to determine what is anticompetitive behaviour, unfortunately the legal process involved in curbing such behaviour (the issuing of competition notices) is slow and ineffective.

Currently the ACCC has four notices against Telstra in relation to its processes and charges for transferring customers between carriage service providers. AAPT made the original complaint in August 1997. Notices were issued in September 1998, and reissued in December 1998. The matter is still before the courts and the behaviour in question continues despite the high penalties the court may ultimately award.

The Government has recognised the problem with the administration of part XIB and recently amended the Act in two ways.

- There is now a private right of action; it is no longer necessary to wait on the issue of a competition notice by the ACCC before private litigation can commence.
- The competition notice regime has been altered to allow two types of notice to be issued — part A and part B.
  - Part A notices, which have no evidentiary standing, are designed to be issued as soon as the ACCC has 'reason to believe' that a carrier or carrier service provider is engaging in anticompetitive behaviour.
  - Part B notices, which are prima facie evidence of anticompetitive behaviour, are expected to take rather longer to be issued (similar to the current notices).

The question is whether part A notice provision will be sufficiently robust to withstand the inevitable legal challenge it will attract when applied.

10.6 Part XIC of the Trade Practices Act

A major concern of the Government in formulating the 1997 legislation was that Telstra, in particular, had demonstrated during 1991–97 that it would use its market power to deny competitors (especially smaller ones) access to its facilities and services. To address this problem the Government introduced a telecommunications specific access regime into the *Trade Practices Act 1974*, part XIC. This provided a process for access seekers to gain access to the facilities and services of access providers.

The procedure requires access seekers to attempt to negotiate commercially for access to the required facilities or services. If, after a reasonable time, access seekers are unsuccessful in achieving satisfactory results, they may request arbitration by the ACCC.

No arbitration has yet been completed. The longest running case — *AAPT versus Telstra in relation to PSTN interconnection* — has been ongoing for seven months and is only now nearing the draft determination stage. Final determination may take a further three months. If Telstra appeals to the Australian Competition Tribunal, final resolution may take a further 12 months, then there is the possibility of a legal appeal.

Currently the ACCC has 16 declared services under arbitration. I do not believe that the Government envisaged that the 'arbitration safety net' in the legislation would become the primary access resolution mechanism. Obviously something has gone wrong with commercial negotiations as the preferred access process. The probable

reason for the high level of disputation in the industry is that commercial negotiation is unlikely to be effective when one player has virtually all of the market power and information on costs and customers.

Fortunately, the Government has recognised that delays in granting access best serve the interests of the access provider, usually the incumbent, and has introduced the concept of an interim determination the ACCC may make at any time during arbitration proceedings. Interim determinations will reduce the incentive for an access provider to delay arbitration because little commercial advantage accrues. It may also result in access providers becoming amenable to commercial negotiations.

10.7 Access to information

In our experience, negotiations with Telstra in particular are dogged by a lack of information regarding its cost structure. Until recently, the ACCC suffered from the same problem but, as a consequence of a major research project, it is now in a better position to assess Telstra's costs of providing and operating its public switched telephone network. Telstra's competitors have yet to gain access to this information.

A recent amendment to the Trade Practices Act will hopefully address this information asymmetry and provide a more equitable database for access seekers to conduct negotiations with access providers. The approach preferred by many in the industry would be to 'ring fence' Telstra's upstream and downstream to provide greater visibility of its network costs and internal transfer pricing arrangements. Attempts to persuade the Government to adopt this form of financial separation of Telstra's businesses have been unsuccessful.

Status of competition

The Government launched the 1997 Act with a great deal of fanfare. It created high expectations in the industry and among users that the new regime would result in competition in all areas of the market — long distance, mobile and local service.

Unfortunately, many of these expectations have not been met. Despite strong competition in long distance rates (both national and international), mobile and local call prices have experienced almost no change in the two years since the introduction of the Act. Mobile call charges, in particular, are astronomical compared with equivalent fixed network charges. Today fixed network call charges to the United Kingdom or the United States are around 20 cents per minute, while calls to mobiles start at around 35 cents per minute for an equivalent local call and

at about 56 cents per minute for a long distance call. Obviously, something is wrong with competition in the mobile market and corrective action is needed.

Similarly, in the local call market, competition is in its infancy and prices will not fall until there is stronger competition. If, as expected, AAPT and other carriers enter the market using either Telstra's copper network (soon to be unbundled by the ACCC), or some of the new technologies now available (LMDS, CDMA and satellite), local call prices should fall rapidly, similar to what has occurred in long distance prices.

The current regulatory regime, while purporting to be supportive of competition, has not lived up to stakeholders' expectations. The recent changes to the Act have resulted from the Government's recognition of the high level of frustration and disappointment in the industry. The Government had expected that Telstra would bow to its intentions, but Telstra did not and still does not. Further, the Trade Practices Act has not proved to be sufficiently robust to ensure that the ACCC is able to control Telstra's market behaviour in the desired way.

The future of competition

The past two years have been extremely difficult for all of Telstra's competitors. Telstra has used every means to give itself competitive advantages, and has used its market power to prevent the growth of competition, especially for mobile and local services. Despite losing market share in long distance services, Telstra continues to post record profits.

There are indications that things will change for the better for consumers. Competition in calls to mobiles from the fixed network has just begun and competition in the local call market is scheduled to take off before the end of 1999. Thus, for the first time, competition will be present in all major markets in Australia.

Despite the many difficulties we have faced over the past two years, I am hopeful that the worst of our legislative problems are behind us. The Trade Practices Act has been strengthened considerably and we are now looking to the ACCC to create a fairer competitive environment. I believe it is willing and able to do this.

A reduced need for strong industry regulation is unlikely in the near future, and a strong regulatory regime will probably be needed for some years. This is not what the Government intended when it launched the 1997 Act, but it appears to have little choice if it wishes to promote stronger competition in all market segments.

11 Discussant

Tom Amos
Australian Telecommunications Users Group

11.1 Introduction

I would like to set the scene for the demand side, emphasising regulatory arrangements, and set out what users expect of telecommunications providers.

The first telephone company started in Melbourne in 1880 and for seven years operated in a free market without any regulation. In 1887 the Victorian Government, which at that stage operated a telegraph service, decided the competition was a threat to the future of telegraph provision (because it would erode its monopoly) and nationalised it. The industry has since been in the government sector for over a hundred years. Telecommunications is thus seen by users as a government service — that is, a utility.

Two or three false attempts at deregulation occurred in the late 1980s. One was the Review of Structural Arrangements, which set out the basis of current regulations. The facilities, competition and services issues will come into focus as I develop my argument. I will discuss them later because the *Telecommunications Act 1997*, as it is currently structured, does not encourage (from the user viewpoint) the duplication of facilities.

11.2 Current situation

From a user perspective, the industry has a number of significant players. The Australian Telecommunications Users Group is probably the only local player in the market from the consumers' side. The Australian Competition and Consumer Commission is the safety net regulator of the 1997 Act. The Telecommunications Industry Ombudsman manages user complaints and looks at service providers, while the Australian Communications Authority looks after technical regulation. There are two types of regulation — regulation which sets out industry guidelines and commercial arrangements, and technical regulation, which is largely overlooked and is where changes are currently occurring. The Australian Communications

Industry Forum and Australian Communications Access Forum were two industry bodies set up by the industry to regulate (or self-regulate) the industry. The Australian Competition and Consumer Commission is now heavily involved, which indicates that self-regulation may have not been best for the industry.

Why did users want deregulation, or in this case, reregulation of telecommunications? Overseas prices were falling relative to the consumer price index, and quality and service indicators were increasing. When this happened in the mid to late 1980s in the United States (particularly until the mid 1980s), particularly, the incumbent's revenues increased because the range of services expanded. It was apparent that competition could create better user services and that access to these services would increase. More importantly, the regulatory regime that delivered those things could deliver choice.

New Zealand is nearer to Australia than the United States and was the main or early leader in telecommunication reform. New Zealand has had no regulatory intervention, so Telecom New Zealand increased in strength and the market share of competitors today is still quite small. The United Kingdom has had a high level of intervention — much more than under Australia's 1997 Act — and there have been some disadvantages, particularly with respect to preselection. Market outcomes are still reasonably slow, although they are starting to occur. The United States has had intervention via the Federal Communications Commission and the courts, but it is a very litigative environment. There have been successful long distance service rate reductions, and competition for local access or the local exchange call area has just started but has been stalled by the incumbents for around a year and a half by aggressive court action. Thus, no overseas model seems to be easily related to Australia.

New technology is forcing the telecommunications market open, and users look at new technologies as a way of enabling markets. From a user's perspective, Australia is at the forefront of deregulation, but probably ahead on reregulation. Some numbers from the Australian Telecommunications Users Group's benchmark database show what different markets are doing and trends that are emerging (see appendix IIa). I think the key issue is that competitive markets tend to have double digit rates of growth compared with noncompetitive markets. The question is whether we are experiencing that growth here; the answer is that we still need to check because other issues have clouded measurement.

Competitive and noncompetitive markets are reacting differently with respect to how business tariffs are adjusting. When competitive markets are started correctly, tariffs decline after a number of years. We would expect that trend to occur to here.

Similarly, for residential services we would expect a 10–15 per cent price decrease. These benefits depend on a proper regulatory environment being developed.

11.3 Demand drivers and outcomes

Why do people want telecommunications? What does the market deliver? Consumers want simplified access to information and a greater availability of applications. These are key drivers for business; effectively, they express a desire for independence. Telecommunications is not what it used to be. Telecommunications was a service, but it has now become a business tool. Users want (according to a survey of nearly 200 Australian Users Telecommunications Group members) cost based services and less delay in providing those services. From the Australian Telecommunications Users Group viewpoint, the regulatory environment needs to be procompetitive to deliver those services.

Users need unimpeded choice of provider and end-to-end competitive service provision, not partial competitive service provision. They need competition benefits that are passed through to them, not captured by providers as technological innovation benefits. They also need regulatory certainty of what is going to be provided and certainty of delivery from their service provider. Some guaranteed service level (particularly given the customer services guarantees now in place) must be available to the user.

The environment we have is essentially due to the 1997 Act. The Minister for Financial Services and Regulation recently inserted additional tests and made other changes to the Australian Competition and Consumer Commission and *Trade Practices Act 1974*. These additions are important in ensuring the outcomes that users require. The commission is the safety net for the industry: it is now the regulator, as Austel was in the past. The essential elements still remain — no limit on the number of carriers and all carriers to contribute to the universal service obligation. The powers and immunities have been reduced or extinguished, and there is an unbundling of services. These fit into an environment that delivers competitive advantages and outcomes to users.

But is it deregulation or reregulation? I agree with Brian Perkins of AAPT that it has been reregulation. We need regulation to stop some of the incumbents going to outright regulatory gaming. Competition has increased, which is the key outcome from a regulatory environment. It has delivered choice, less expensive services, a wider range of products and the ability to take up new technologies without losing the utility of the existing technology set. These are important issues if you are trying

to add a demand side flavour to your regulatory environment. Unfortunately, they seem to be lost when you start looking at a $15–$20 billion industry.

Existing carriers have gone to a more customer focused outlook over the first two years of this environment. They have searched for niche opportunities and have tried to make their charges easier to understand. But it is almost impossible to understand what a charge is, and bundling has become a large part of user services. It is impossible to get a price list in any meaningful form, even though they have just been placed back on the internet. From a user perspective, what other industry does not have a published price list? We have continuous renaming for the same services, 15 or 20 names for the same products, and we up to 10 million flexi plans if you are in the residential area (each with a unique product and name). We have not yet dealt with a lot of issues — all part of the regulatory gaming issue — and the access monopoly has been retained.

We are interested because telecommunications is at the cutting edge of business. Telecommunications 15 years ago was run by the office clerk, or the building manager. Today it is a core part of business, part of the essential fabric of any successful business. The stock market and other industries look at telecommunications as essential to operations. Data rates double every two years or sooner. Voice services continue to grow (at 4 per cent per year) but are metamorphosing into other things. We are seeing great penetration of telecommunications services: over 20 per cent of homes will be essentially internet based, or have access to the internet by 2000, and 45 per cent of the population already own mobile phones.

Looking at overseas trends we see a drop of 20 per cent in local access service charges over the next five years and a drop of at least half again on long distance charges. I agree with Brian Perkins that we are not near cost based pricing yet. We see mobile phone charges coming down to equal fixed phone service charges within five years, and perhaps sooner with as entrants come into the market. These entrants are the drivers of business opportunities and the reason prices are falling. Technology has changed the band width and distance mix. No longer can someone say, ‘I am living over here. It costs more.’ Band width is now immaterial: once in place, it is of marginal significance.

Bundling has been used to stop that problem, and the benefits are being passed on to consumers. Services are being rebundled and put into access prices. They are being reset so you cannot see the long distance and local components. Regulatory gaming by incumbents is one reason for rebundling. These are issues that drive the need for regulation, and they are not being addressed in the marketplace from a user viewpoint. Over the next five years I believe that you will see hundreds of per cent

growth in some services. This will require dramatic changes in the market, and will not occur unless there is competition. For this reason, the Australian Telecommunications Users Group requires changes in regulation — to ensure that innovation is captured by users rather than suppliers. Reregulation has had an impact, but an open market with an imbalance between the suppliers could result in a new monopoly, and no choice for consumers at the residential level.

We see a doubling of call patterns. Australian users use the telephone and other services at about one half to one third, of the intensity of use in the United States or the United Kingdom. Use is lower because prices have been higher, and there is a perception of telecommunications (as a government monopoly) being expensive. Business had a similar view, except it has already enjoyed a large reduction in costs as a result of differential pricing. But there is still a long way to go.

Important issues are cost containment, reliability, flexibility, scalability and the customer service guarantee that goes with services and is being inserted into legislation. To capture these we have to look into the services and what regulation can deliver. The problem is where is the margin taken from the user of a service? Users can choose to provide a service, use a service anywhere up or down the value adding tree, or buy a service. They can outsource the total service to a carrier or a service provider, or choose to buy a copper line and add value themselves.

The problem of lack of choice within the user community relates to the regulatory environment, and the fact that people can no longer provide facilities. They can choose the bottom end of the curve, where lower prices are unable to be achieved because the incumbent carriers have been withdrawing services. They have been stopping services that were previously available, such as copper, and moving their value adding towards the top of the chain. Regulation cannot stop that process, and attempts to do so would be stopping competition. More importantly, it is moving the cost towards the user and value away from them.

Users want to buy services from people and they need a competitive environment for purchasing. They want to manage what they use, but they do not wish to control their services in-house. They would rather buy bundled discounts from carrier service providers and the services they want individually. Thus they would like to buy at a discount and know what services comprise. They would also like price lists (at the moment, there are none) and service performance standards to go with the price lists.

Lastly, and most importantly, the next frontier for the Australian Telecommunications Users Group is portability — that is, the ability of firms to choose and keep their number set so they can buy a service from someone else and move their numbers to the new service provider. This is called complex portability

(which is four years overdue and still being delayed). To return to where we started, we have liberalised, partially privatised and allowed the incumbent, and then the incumbents, to capture the past. They have captured history in the ground, they have captured service provision and they have captured access.

Our regulatory rules have evolved over a long period to protect the Government's position. The 1997 Act was drafted so no additional facilities could be readily built. The intention was for carrier service providers compete — that is, retail competition, not wholesale competition. The intention was to have no resellers and no switch resellers, yet they sprang up because people could add value. As Brian Perkins identified, the same error was made in 1992.

It is not a level playing field and there is still a need for rules. We have to overcome one hundred years of privileges, and we do not see the regulatory environment changing quickly. Unfortunately, we see the need for more rather than less regulation. We would rather have a competitive market based system, but one player has such a large start and overseas experience is little guide.

11.4 Industry scoreboard

In the spirit of Alan Horsley, the head of the Australian Telecommunications Users Group, I will put up a scorecard. After six years Telstra still owns 99 per cent of access services. Facilities competition has been discouraged. We have a social price for our access services, not a real price; this price is hard to understand. We have just been through a universal service obligation inquiry where we had a $1.8 billion universal service obligation claimed, and $300 –400 million of actual costs. We do not know the final answer but we believe the claimed cost is five or six times out from the reality. We are having trouble understanding the real costs of providing services, and how the monopoly and the services can be put into a framework that delivers that information.

We still have high priced local and national calls despite some competition, and we have massive profits at a time when we have had commercially disastrous decisions such as the pay television network (where around $3–4 billion was lost). We have market distortions as a result of the power of one large player. We do not have cost related interconnection charges, although the Australian Competition and Consumer Commission is examining this system. We have withdrawal of services, and the reduction of copper to provide new services. We have new monopolies that have been granted in recent periods, such as the Foxtel monopoly. We have substitution of products — that is, a carrier offering three or four products in the same area,

which are all close substitutes at different prices. We have an ongoing billing issue and no visibility of the wholesale retail mix — a great scorecard so far.

11.5 Suggestions

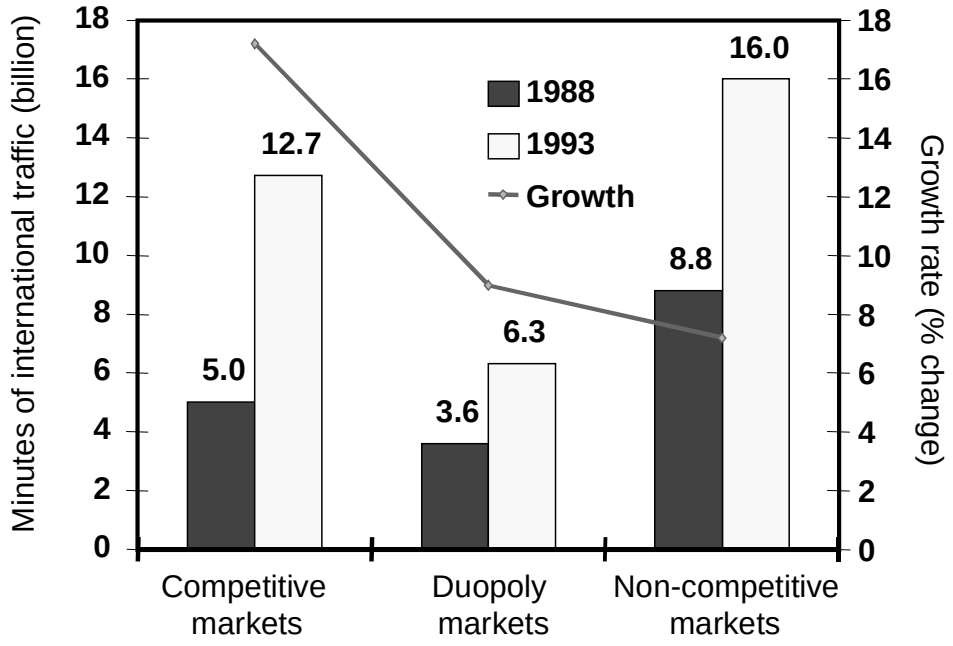
The Government has given the Australian Competition and Consumer Commission additional powers and allowed them to test for market power, to essentially look for impropriety. We would hope those powers will be used effectively and soon. The Australian Telecommunications Users Group would like to see roll out conditions in some of the new licences and for some of the new products. Products are announced, not delivered. It is essentially a gaming issue. We would like to see growth of competition, and a test and review by someone with the ability to do so. Carrier performance standards should be reviewed above and beyond what is being done by the Australian Communications Authority (which is doing a good job but is understaffed).

We need access for everybody (not just one or two industry players) and complex portability. These characteristics will not happen without regulation. We need sustainable user outcomes and services for users. We need the Australian Competition and Consumer Commission to be an important regulator (because delay on reform will cascade). It is important that the commission become timely and use its powers. We in the Australian Telecommunications User Group see the next frontier as portability (and I think the Australian Competition and Consumer Commission see it also) because that will make more choice available. The Australian Communications Authority and the Australian Competition and Consumer Commission have major roles in introducing it. We also see that telecommunications is like all other industries; it is not special.

Finally, we see history as a good guide. In 1880 the industry started in Melbourne as an open industry. It was taken over by the Government monopoly of the day and it has taken a hundred years to put it back into some sort of open competition. We think it could take another 10–20 years to get to a fully open market if the rules are relaxed. It is not going to happen quickly. So while the market adjusts to what is sustainable, a guiding hand is required for this to happen in a reasonable time. We see choice as the real weapon of competition, and equal access as the hardest part of choice. The regulatory environment should encourage innovation that is captured by users, not by the companies that provide the service. Finally, we think cost based pricing is the only thing that is going to uphold a regulatory environment that works.

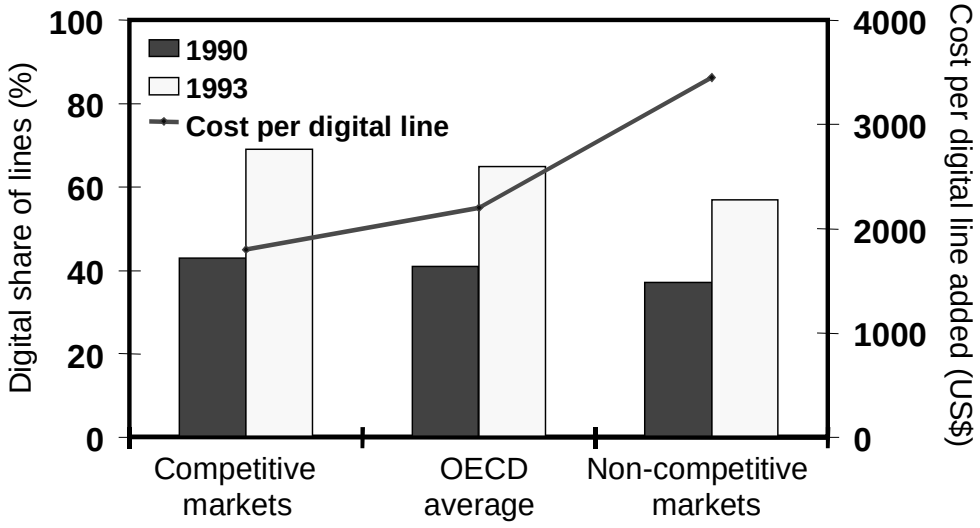
Appendix IIA: Industry Data

Figure 11.1 **International traffic**



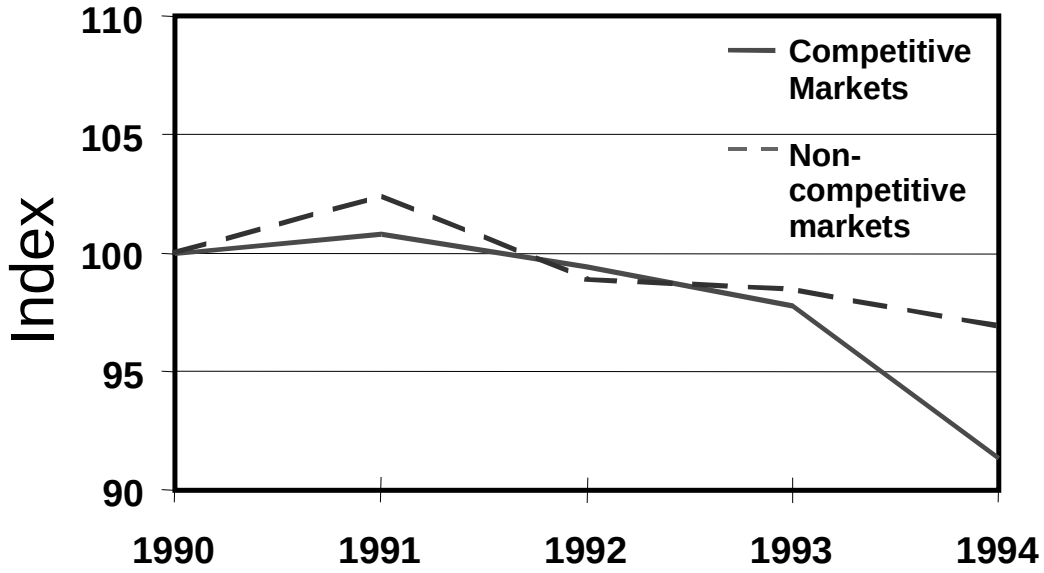
Data source: ITU World Telecommunications Indicators Database.

Figure 11.2 **Digitisation**



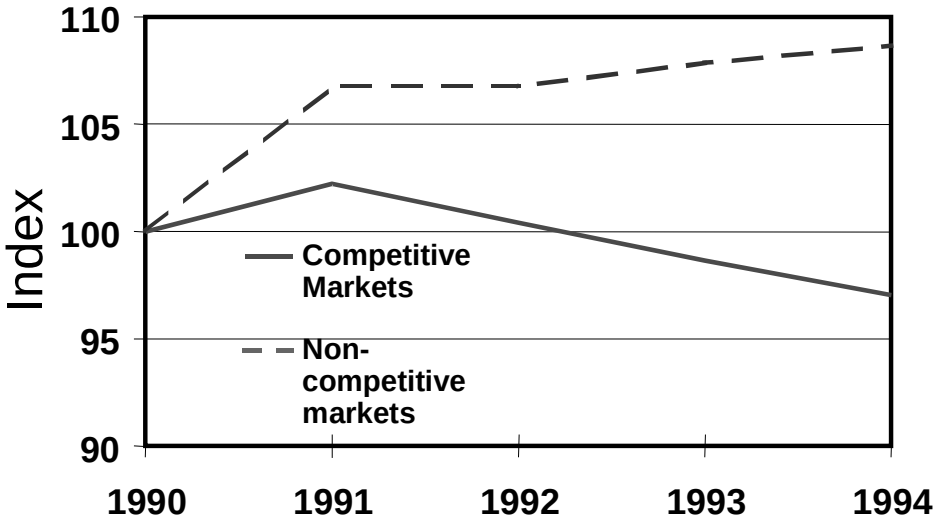
Data source: ITU World Telecommunications Indicators Database.

Figure 11.3 **Business tariff basket**
(1990=100)



Data source: ITU World Telecommunications Indicators Database.

Figure 11.4 **Residential tariff basket**
(1990=100)

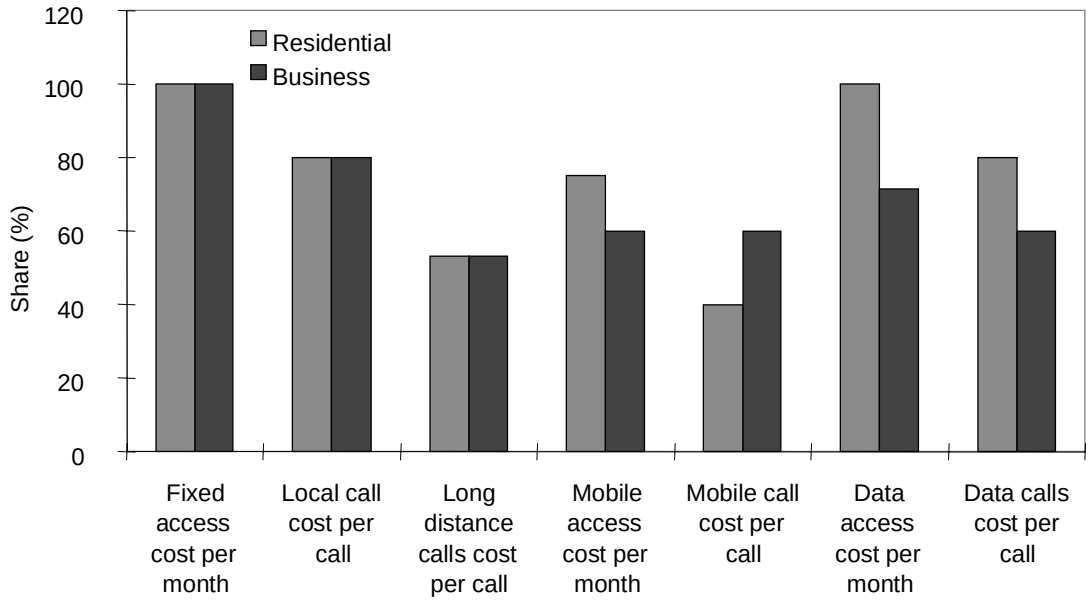


Data source: ITU World Telecommunications Indicators Database.

Table 11.1 **Market growth**

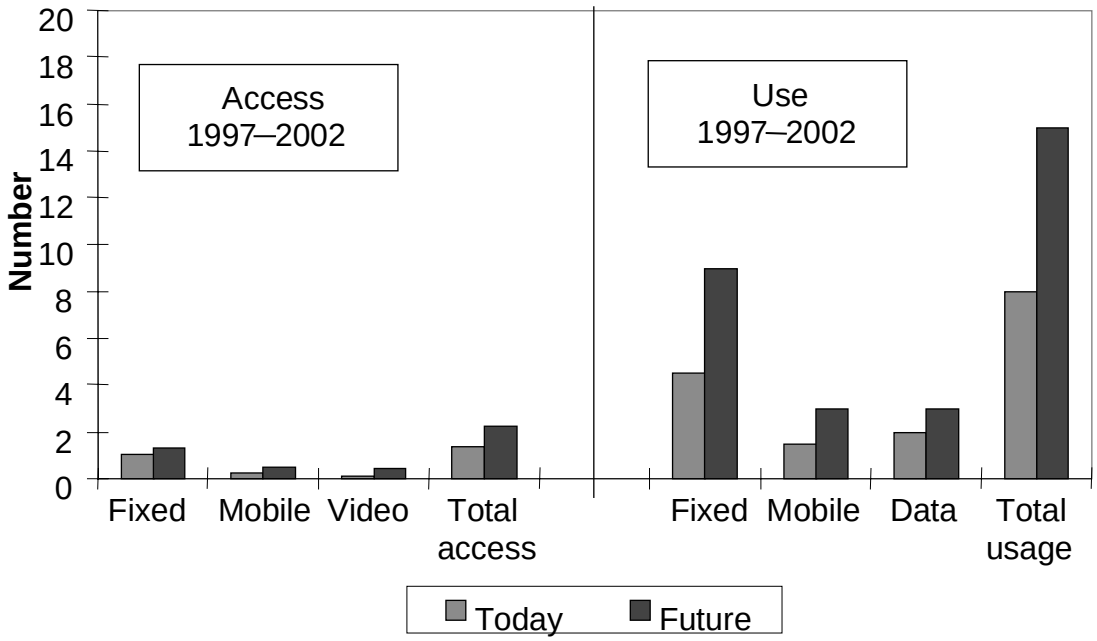
Category	*Revenue 1997 (A$billion)*	*Revenue 2002 (A$billion)*	*Five year growth %*
Fixed access	1.5	2.3	49
Fixed use — local calls	3.4	6.5	92
Fixed use — long distance calls	5.3	6.1	15
Mobile access	1.1	1.3	19
Data access	1.0	1.9	93
Data calls	0.8	2.1	153
Video access (that is, pay television)	0.4	1.6	306
Connection fees	0.1	0.2	35
Other (value added services)	0.0	0.2	256
Total	**16.8**	**26.4**	**56**

Figure 11.5 **Future service cost**



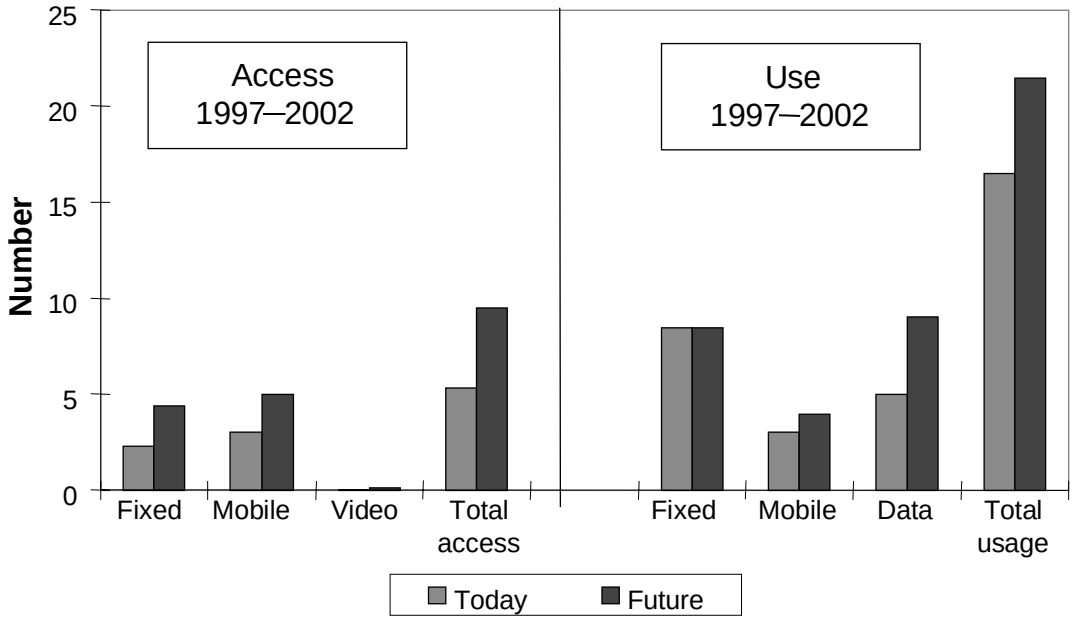
Data source: Research by Amos Aked Swift Research (1997).

Figure 11.6 **Residential changes**



Data source: Research by Amos Aked Swift Research (1997).

Figure 11.7 **Business changes**



Data source: Research by Amos Aked Swift Research (1997).

12 Alternative competitive models

Rob Lomdahl
Telstra

12.1 How customers benefit from competitive models

I will start this paper with a quote from Melbourne's *The Age* (Schiesel 1999, p. 2) copied from the *New York Times*:

> In a dingy warren of cables and wires in New York city, phone calls are starting to look a lot like pork bellies.
>
> There, in his cramped office above the Pulse Nightclub, Alex Mashinsky, 33, has created an electronic trading floor for telephone services that resembles an international market for traditional commodities.
>
> Communication carriers from around the world, including AT&T and Nippon Telegraph and Telephone, link to the website for Mr Mashinsky's company, Arbinet Communications, to trade unused long-distance telephone minutes from New York to every corner of the globe. On Friday, a minute to Israel sold for as little as 8.4 cents while a minute to Hong Kong cost as little as 4.6 cents.

The article then describes how this situation came about. Following the 1984 break-up of AT&T, hundreds of new long distance companies emerged. Many leased communications capacities from other companies, and of those, few have experienced consistent growth in profits. In other words, those that followed a resale model of competition have not experienced consistent profit growth.

The article then states:

> Drawing from that experience, new companies like Quest, Level 3 Communications, Global Crossing, IXC Communications and the communications units of Williams' companies and Enron, two energy giants, have been founded and financed on the logic that owning physical assets is essential. Each of the companies is building a new fibre-optic long-distance network, some in the US and some globally. Combined, the first three have raised or borrowed more than US$10 billion (A$15 billion) over the last three years, mainly to build their new networks.

The article continues to describe how this new capacity in investment has changed the competitive landscape and created a new predicament.

> … the new carriers' predicament [is that] their investments are alleviating the very scarcity that made the original business plan so attractive. The problem is not that a glut of bandwidth has been created. However, the big profits in the industry are migrating away from the raw bandwidth and towards the applications that use it.

How do we interpret the article? I believe that it is arguing that the most successful competitive markets in the United States, and internationally, are those in which there has been large scale investment. This investment has created additional capacity that is providing customers with real choices, driving down prices and generating innovative uses for communications capacity. Two important additional points are that first, the long distance markets in which this has occurred are subject to relatively little regulatory intervention; and second, the outcomes have been very good for the industry, creating high rates of growth and a dynamic culture.

12.2 Reregulation and rebadging

Many of the papers that have been presented at this conference suggest that Australia has not deregulated, rather that it has been reregulated. The representatives of the Australian Telecommunications Users Group and AAPT have, I believe, argued that the current regulatory framework is inadequate and that further regulation is required (or the regulator needs to take a more activist role).

Brian Perkins of AAPT also pointed out some of the potential for conflict that exists between majority government ownership of the largest communications company and government's role in regulating the industry. I believe most of the industry support his argument that this conflict should be removed.

Chris Sayers for the Productivity Commission presented a wealth of useful information, although I take issue with some of its interpretation and conclusions. He did not discuss one important point from the Productivity Commission's benchmarking: that is, the finding that the best practice countries are Sweden and Finland.

The key characteristics of the Swedish and Finnish models of competition are open entry to the market, and, perhaps more importantly, minimal regulatory interventions in the market. If Sweden and Finland have minimal regulation, then Australia (in the opinion of the industry speakers today) could be heading towards the other end of the spectrum — extensive regulation.

The counter proposition against further regulation, supported by *The Age* article quoted above, is that a model of competition based around regulated resale of incumbent carriers' services will not produce the goods for business, customers or

the industry in the long run. This is because such a model will discourage the investment that drives innovation, better services and greater value for customers. Extensive regulation necessarily creates uncertainty and incentives for investment in regulatory processes, rather than in developing new services for customers. Promoting regulated resale leads to simply the rebadging of services, with limited long term benefits to consumers.

It is useful to briefly review the extent of regulation in Australia. I think there is significant evidence that Australia is among the more regulated open, competitive regimes in the world.

The Australian telecommunications regime includes tough anticompetitive conduct rules. The threshold for taking action against a carrier with market power has been recently reduced. Third parties have the right to take action against Telstra. The Australian Competition and Consumers Commission (ACCC) has extensive, potentially overlapping powers to gather and publish information. Special record keeping rules have been established. The ACCC has powers to give directions over access negotiations, and it has been granted new powers to mediate and access negotiations.

Telecommunications prices are extensively regulated, with regulation of residential access, local calls, STD, IDD and fixed to mobile calls. There is a mandatory requirement to notify the ACCC of price increases in certain services such as mobiles, connections, line rentals, domestic lease lines and so on. There is also a legislative obligation to offer untimed calls. Pay phone calls are price regulated. We cannot impose or alter a charge for directory assistance services without the approval of the Minister for Communications and the Arts.

Services can be declared through a number of mechanisms. Declaration means that carriers are required to give competitors access to services, and the ACCC has powers to determine access prices through arbitration. In addition, carrier and carriage service providers have a number of standard access obligations. The ACCC has special powers to issue interim determinations on access arbitrations. The Minister may become involved by setting out principles for establishing access pricing. There are also additional carrier-to-carrier access obligations.

Telstra has obligations to provide certain services to end users, including a public number database, an itemised billing service, operator services and directory assistance. Preselection and number portability are mandated. There is also an extensive range of consumer regulation including the universal service obligation, customer service guarantees and reporting requirements.

This is an extensive list of regulation. It is certainly significantly different from the Finnish and Swedish systems which have been held up by the Productivity Commission as examples of best practice countries.

12.3 Contestability in telecommunications

I would like to comment on Tom Amos's point that access — that is, the link between customer premises and the first exchange — is inherently a monopoly.

An interesting book (Mueller 1997) published on the early history of telecommunications in the United States puts a contrary argument. Milton Mueller traced the development of local telephony in the United States in the early part of the century. He argues that there was extensive competition for access for a good part of the early history of telephony in the United States. Customers in the early days of telecommunications competition in the United States had a choice of access providers and were used to multiple telephones on their desks and in their homes. This may seem an odd idea but it may not be too different from the current situation: today, business people are used to having separate business, fax, mobile and internet contracts.

Mueller argues that regulatory and commercial suppression of competition in access may have harmed customers. He points out that independent telephone companies targeted lower income groups, increasing the spread of telephony and resulting in many innovations. He goes on to argue that current technological developments, such as mobiles, will reduce barriers to market entry and the development of access competition.

12.4 Observations on competition in Australia

I would like to make some observations on the Australian market. Competition is certainly taking off most strongly in the central business districts of the capital cities. This is where the most competitive offers, the toughest service standards and the lowest prices are being experienced.

It is where competitors are offering two-day or three-day turnaround on new services and access to advanced communications. This is good for users and for the industry. However, it is important to understand that this competition is taking place because companies are investing. The central business district of Sydney is now being described as a 'fibre farm' because so many competing optical fibre networks are being put into place.

It is interesting in this context to understand the source of investment in Australian communications. Telstra's (1998) investment in noncurrent assets was around $3.3 billion over the year to June 1998, while Cable and Wireless Optus invested $800 million (Optus 1998) and AAPT (1998) invested $62 million. These figures exclude many of the new carriers, but the drivers of capacity in telecommunications infrastructure are Cable and Wireless Optus and Telstra. On these figures, AAPT appears to have been taking a resale based route into the future. It is important to understand this context when examining AAPT's remarks on supporting a model of further regulation.

Investment in mobiles will be a major area of investment, and therefore a driver of competition in Australia. In the United States, new entrants' investments have produced significant results for customers. There is also a resulting increase in substitution between traditional fixed telephony and mobiles. The Australian move to make spectrum available to competitors is certainly on the right track for encouraging investment and generating real benefits for users.

12.5 Consumer gains from cost reductions and productivity improvements

Increased competition will bring further price reductions on top of those that have already occurred. The flow on from Telstra's productivity gains to lower prices is an important, but untold story.

Access Economics in its review of price controls in August 1998 (carried out for the Commonwealth Government) concluded that Telstra has overall, passed on productivity gains to consumers. In other words, the gains from Telstra's cost cutting have accrued primarily to customers. These cost reductions have been substantial. Telstra over the last three years has cut its staff from 77 000 people to around 50 000, which translates into a substantial reduction in costs.

Most recently we have seen some substantial examples of price reductions in international calls. Telstra has cut its headline international call rates substantially, and competitors have responded with robust cuts of their own. In keeping with the opening theme of this paper, I would argue that the downward trend in international pricing has occurred as a result of open market entry and significant investments in international communications capacity.

12.6 Comments on the Productivity Commission's benchmarking

I would like to make a few final points about the Productivity Commission's benchmarking. It is important to recognise that the Productivity Commission's study is based on an OECD basket of consumption rather than an Australian consumption basket. The Productivity Commission (1999, p. 111) notes that the OECD basket may not reflect Australian conditions, and that:

> The Australian basket had a much smaller proportion of very short long distance calls, less than three kilometres, and a correspondingly larger proportion of medium distance calls. This may reflect the relatively lower population densities of Australian urban regions.

There appears to be some contradiction in the stance taken by the Productivity Commission on the question on population density and the effect on costs. A statement in the Commission's report notes that Australia has relatively low population density, infering that this affects the pattern of consumption. On the other hand, we have seen the influence of population density dismissed.

When you use the Australian pattern of demand, the ranking of Australian prices for a basket of residential services goes from being sixth to the third best behind Sweden and Finland. On that basis, which the Productivity Commission says reflects Australian conditions, we stand scrutiny with the best in the world.

Much academic work clearly shows a strong relationship between population dispersion and the costs of telecommunication services. I will not go into that here.

12.7 Concluding remarks

It seems the questions are how to achieve the best outcome for Australian consumers in the long run, and how to achieve the greatest innovation, choice and improved services. My central proposition is that more of the same approach will not provide the best outcome. Nor will increasing Australia's heavily regulated regime to one which is even more regulated. I think that the challenge is to sort out some of the contradictions between the forms of regulation that we have in Australia.

A union colleague commented recently that they think that untimed local calls are one of the agents that preserve monopoly in Australia. There is an argument that the interaction between social and consumer regulation in Australia does have a significant effect on competition.

The universal service obligation, for example, means that satellite services can be provided relatively cheaply in many locations in Australia. However, once you add some of the obligations that go with the standard telephone service, it is a much less economic proposition, and the potential for competition is reduced.

Requirements to meet voice delay standards and provide power supplies, emergency contacts and billing information in particular forms affect the fundamental economics and thus reduce the potential for competition. The Commonwealth government has made some positive moves in addressing distortions caused by pricing and allowing price rebalancing. Regulatory relief that promotes long run consumer outcomes should be supported.

My overall conclusion is that I think that some of the other papers presented in the telecommunications session are on the wrong track. Further regulation will not deliver the kinds of benefits that users in many markets in the United States have seen. In my view, we need to encourage investment to achieve long run consumer benefits in choice, innovation and price.

References

AAPT 1998, *AAPT Telecommunications Annual Report 1998*, Sydney.

Mueller, M. 1997, *Universal Service: Competition, Interconnection and Monopoly in the Making of the American Telephone System*, MIT Press, Washington.

Optus (Cable and Wireless Optus) 1998, *Annual Report to Shareholders*, Sydney.

Productivity Commission 1999, *International Benchmarking of Australian Telecommunications Services*, Ausinfo, Melbourne.

Schiesel, S. 1999, 'Digital takes communications into commodity-trading arena', *The Age*, 'Business' section, 12 July, p. 2.

Telstra 1998, *Annual Report*, Melbourne.

13 Discussant

Joe Dimasi
Australian Competition and Consumer Commission

It is important in looking at the history of telecommunication reform to remember that what we have now was only introduced in July 1997. We need to focus on what reform has achieved over that time. There has been a lot of discussion about the scheme and how it works, so let me set out the essentials. Under the scheme the Australian Competition and Consumer Commission (ACCC) as the competition regulator — alongside the Australian Communications Authority, which has responsibility for some of the technical regulation — can determine which services are declared. We can arbitrate disputes for declared services and accept assess undertakings. We also have a number of functions under the *Telecommunications Act 1997*, including number portability and arbitration of number portability. There is also a range of functions under part XIB of the *Trade Practices Act 1974* involving competition notices and other matters.

When the Telecommunications Act was introduced in 1997, the ACCC was required to look at the services that were available to existing carriers. There were not too many, as Brian Perkins of AAPT mentioned. The ACCC, when it assumed the regulatory function, deemed a number of services as declared so the foundation rights of access (which were established before 1997) were continued under the new regime and made available to new carriers. These included access to the public switched telephone network, digital global system for mobile communications and the APS analogue mobile system networks, as well as access to some other services. We have declared additional data and transmission services — such as the integrated services digital network (ISDN) and transmission between capital cities (with the exception of the Melbourne–Canberra–Sydney link) — because we felt that there were a number of alternative options for that facility.

We have before us a decision on unbundling the local loop and access to local calls, which is due to be finalised in a matter of weeks. The draft report on that decision has already been released. We have not declared every service that we have examined. We will keep an eye on mobile roaming, for example, but we did not declare those services because there were alternative providers. We directed the

Australian Communications Authority to require number portability and issued guidelines on the pricing approach we would take in arbitrating disputes in number portability.

Critically, on the matter of interconnection charges, a new entrant before July 1997 faced an originating and terminating charge of around 4.5 cents a minute for the central business district and metropolitan areas during peak times. We made a determination, (effected in July 1997) that reduced that charge to 2.8 cents a minute. In rejecting Telstra's undertaking, we recently made some observations about pricing where we suggested that the price would be closer to 1.73 cents, or within the range of 1.73 cents to 2.53 cents a minute. If we compare the 4.5 cent peak time central business district and metropolitan price, that would be closer to 1.0 cent a minute. Thus, 4.5 cents is down to about 1.0 cent. The determination also includes a component for the access deficit, and depending on what decisions are made, could have a further effect on price.

The potential impact of those decisions is significant. However, that is an observation about pricing; it is not a direction or a decision that has flowed through directly or fully into pricing. Arbitration, if that is relevant, or a further undertaking decision could be the mechanism through which it may flow. And we do have arbitrations in front of us. Brian Perkins of AAPT mentioned 16; I think there are 17.

That brings me to a point about international comparisons. The work of the Productivity Commission is extremely useful because we are hearing claims and counterclaims about where the regime is headed, what it is achieving, and its success or otherwise.

Part of the answer is to examine what the Australian regime is achieving compared to the rest of the world. I guess the main limitation — which seems necessarily so at the moment — is that the work done so far cannot capture changes in play. Chris Sayers from the Productivity Commission said that the next round is going to be published fairly soon, which will be welcome. But again, that will make comparisons only up to last June. Getting the comparisons up to date will be an important challenge, and one that I think will be useful for all of us.

It is also important to attribute some of the differences in pricing. Chris Sayers pointed to the regulatory scheme as being a potential source of difference. That is an interesting proposition and one which we would like to see further tested. Some of the results presented pose questions about who are the better achievers, and whether better achievements relate to those which are the most deregulated or those closest to the competitive model. What do the results mean for the regulatory schemes? I

think further work in this area would be useful, particularly given the different time frames over which various schemes have been introduced. Certainly, the impacts of the different approaches are not clear.

Some of the work on the Australian schemes has involved a lot of foundation work which is still to be reflected in formal decision making. I guess it will probably be another couple of years before we will be able to tell. Robert Kerr recounted yesterday the comment of a twentieth century Chinese premier who, when asked what he thought of the French Revolution, said 'It's too soon to tell.' Perhaps two years is too little time for judging, given the changes that we are talking about, and the potential impact on the telecommunications industry.

SECTION VI

RAIL ACCESS ARRANGEMENTS

14 Effective competition on rail: practical issues

Fred Affleck
General Manager Corporate Affairs National Rail Corporation Limited

14.1 Overview

Competition policy reform applied to rail infrastructure has not achieved its aims, at least not so far. Achieving competitive access is less and less an issue in the rail sector. For vertically integrated rail owners (those in all but one State) the issue is how to achieve a regime that will limit competition and protect above rail revenue. For vertically separated rail owners, the issue has become how to maximise revenue from their monopoly assets. For standalone rail operators, the issues are crystallising around how to do business with monopoly owners.

This scenario is made more intense by several other factors including:

- the persistence of vertical integration (except in New South Wales and most of the interstate track), contrary to the declared intention of competition policy reform that control of infrastructure a 'natural monopoly' should be separated from competitive above rail operations;
- privatisation of vertically integrated track owners, with its intensified focus on the bottom line;
- the cumbersome processes available to access seekers who find they cannot gain access at reasonable prices and conditions. This is not a criticism of the access regimes in place; it is simply the nature of the 'playing field', which is tilted in favour of track owners, and strongly in favour of those who are vertically integrated;
- the lack of an integrated land transport policy aimed at ensuring real competition between rail and road, which makes track owners unable to compete effectively for revenue ultimately sourced from the end users of transport. This is driving rail infrastructure into a poverty trap in which resort to monopoly pricing could become an irresistible temptation;

- the lack of investment in rail infrastructure in most States and on the interstate track, which detracts from the value being received by access users, and intensifies the unwillingness of owners to commit to warranting service quality.

Real competition is occurring only where there has been vertical separation of infrastructure from operations, as in New South Wales. However, even for vertically separated track owners, it is clearly proving difficult to find ways to simulate a competitive market for infrastructure services, because they do not directly interface with the end users of transport who ultimately determine the value of the infrastructure service.

In practical terms, this scenario means that New South Wales and the interstate system are the only fields with scope for genuine competition for major vertically separated rail operators — like National Rail and FreightCorp. The potential for undue attention to be given to one or more of these markets is obvious. Perhaps more important is that only in New South Wales and on the interstate system, are actual and potential consumers of rail transport beginning to see benefit from rail related competition policy reform.

14.2 Rail's new competitive and regulatory environment

Until 1995, all railways in Australia were 'vertically integrated'; that is, the entity which owned the track also owned and operated the trains with its own personnel, and equipment standards, operating rules and procedures were self-regulated. The law prevented, or severely constrained, use of the track by other train operators.[1] Enactment of competition policy reforms in 1995 — embodied in part IIIA of the *Trade Practices Act 1974* — changed this fundamentally.[2]

Many train operators now doing business in Australia are solely 'above rail' service providers. Most of these businesses operate trains and terminals with their own employees and equipment. Like truckers, they use rail 'highways' owned by others.[3]

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[1] The National Rail Corporation Ltd was the first exception to this pattern, because it was required to use others' track, at least until (as was planned) the interstate track was transferred to a new company. Access to this National Rail owned track by competing train operators was envisaged and is a requirement of the National Rail Shareholders Agreement. However, it was assumed that the owner of the track would be a vertically integrated railway.

[2] For explanation of the competition policy reforms, see National Competition Council (1996).

[3] Examples of the above rail operators are Toll Rail, Specialised Container Transport (SCT), Patrick Stevedores (which provides freight services in the Melbourne/Adelaide/Perth corridor using mainly resources provided by the vertically integrated rail entities Australia Southern

But the analogy with truckers ends here. The roads are a 'public good' accessible to all. Truckers need only register their vehicles to obtain access to the roads when and where they wish to operate, provided they use vehicles of standard design and adhere to the legal limits for mass, dimensions and speed, hours of work for employees, and the like. There is no commercial relationship between truckers and road infrastructure providers.

For rail operators, who are competing with truckers, the competitive and regulatory environment is much more complex. Rights of competitive entry are constrained by State based regulation (both economic and technical) and relationships between rail infrastructure owners and rail operators are subject to negotiated commercial contracts.

Commercial 'access' to rail infrastructure takes the form of 'train paths', which are defined by 'entry' times, 'transit' times, limits on train dimensions (length, height and width), axle mass and maximum speeds. Paths are provided by infrastructure owners in return for access fees which generally comprise a rate per unit of train mass and distance (gross tonne kilometres), and sometimes also a flat 'flag fall' charge. While virtually all track access contracts are subject to strict confidentiality, a representative charge at present is $3.00–$3.50 per thousand gross tonne kilometres.

In return for track access fees, access providers supply a service comprising use of the track, train control (the United States term is 'dispatching'), and signalling (or other means of train separation, for example, train orders). Contracts are generally for a fixed number of years and contain provisions for risk transfer and other conditions.

14.3 Overview of current access arrangements

Competition policy is a matter of federal law in Australia. However, since its origins the rail industry has been largely owned and regulated by State governments. Unfortunately, as new national competition laws and structures have developed, these State based structures and regulations have also persisted. The resulting marriage of State based structures with the new competition policy has created a regulatory Jekyll and Hyde. This 'mixed' environment includes the following main features.

Railroad and Freight Victoria), Northern Rivers Railway, Great Northern Railway, Silverton Tramway and Austrac.

- Rail businesses providing interstate freight and passenger services are (without exception) 'above rail' operators which obtain the right to use track infrastructure by paying fees to track owners, consistent with the principles of the national competition policy.
- Government owned 'vertically separated' operators provide most rail services in New South Wales, paying fees to a State Government owned track provider.

So far so good, but the following features also apply.

- In all States other than New South Wales, in defiance of the principles of the national competition policy, rail service providers remain 'vertically integrated' with State Government owned rail operators. New entrants must therefore hire track from the incumbent rail system with whom they aspire to compete.
- The interstate track system, joining State capitals and a number of heavy manufacturing centres, is owned and/or controlled by a mixture of 'vertically separated' and 'vertically integrated' entities, the latter being attached to State owned rail operators.
- Commercial conditions of access, including pricing policies, vary significantly between track owners. No rail service provider currently has a long term contract for track access across the whole national system.
- Competitive entry of new rail operators to provide intrastate rail services is unregulated by any regime sanctioned by the *Trade Practices Act 1974*, as provided for by the national competition policy.
- Only New South Wales has a regime facilitating entry by new players in intrastate rail operations. Several States have regimes which go some way towards this, but there is only one 'vertically separated' intrastate rail freight provider outside New South Wales, and that is on track owned by a customer.
- Every State has a 'rail safety regulator', which is responsible within its own borders for certifying that rail operators and owners (including those which are State Government owned) conform with agreed standards for equipment, procedures and competencies. Manufacturers, maintainers and other service providers must also obtain rail safety certification.
- Given that there is no national rail safety regulator, train operators on the interstate network must obtain safety certification from the regulator in each State and Territory where they wish to operate.
- Control of track and operations are still provided by organisations largely divided along State borders, so technical standards and operating procedures are also similarly differentiated along these same borders. Procedures and

infrastructure to facilitate their use (for example, signalling systems and associated operating rules) other differ within states.

- Infrastructure based constraints on train lengths, other dimensions, axle mass limits and speeds also differ substantially between States and between corridors, largely dictated by the historical legacy of the operations of State based rail carriers and track engineers.

Operating a successful business in this maze of contradictory structures and regulations is not simple. National Rail is so far the only organisation which has successfully established its operations across the whole national railway system, and that success was possible because it did so before much of the complexity described above came into existence.

14.4 Framework for track access

Above rail operators need access to track on terms and conditions that will enable them to operate viable and growing businesses. The essential components in achieving this are:

- a market for their services;
- an access regime that gives them a right to negotiate in a user friendly environment. The operation of the regime will be affected, in practice, by organisational structures, particularly whether the access provider (the track owner) is separately owned and controlled (vertically separated) from the owners of commercial above rail operations;
- a contract for access; and
- safety certification from a rail safety regulator.

The main focus in this paper is on the first three items.

The market

The market for transport is diverse, and a rail organisation looking to protect and build its business has a range of potential opportunities, including:

- new movements that can be served by road and/or rail. These can range from very large (for example, movements totalling one million or more tonnes per year from a major new mine) to relatively small (say a small mine producing only 200 000 tonnes per year). Competitors will be road transport and other rail operators, including a vertically integrated rail entity which owns the track;

- existing movements by road, where a freight owner is looking for an alternative for economic or environmental reasons. The competition will be road transport and other rail operators, one of which may be the vertically integrated entity which owns the required track; and
- existing movements by rail (for example, an integrated logistics service on the national system, or single commodity traffic on a low volume 'branch line'). Both road and rail competitors are relevant.

None of these opportunities can be neglected, and in my company none are. From the viewpoint of the potential customers, none wishes to be disadvantaged by not being able to call on the full range of competition to reduce their logistics costs.

The Productivity Commission (1999, pp. 20–3) has suggested that it may be impractical or unwarranted for shippers of freight from locations on 'low volume regional railways' to have competition readily available to them. That is not what shippers are telling us, and many are actively looking for lower transport costs. In some cases, the future existence of their businesses depends on achieving lower cost transport.

Freight owners usually want to make decisions about transport alternatives without delay. A freight contract with certainty of prices and conditions may be required as support for project finance. Or freight owners may simply want to obtain the benefits of cost savings as quickly as possible.

The train operator is under pressure to quote a price as soon as possible. The first step is to develop an operating plan that makes efficient use of train and terminal assets. There may also be a need to place orders to purchase or design and build rollingstock, spur lines, unloading plant and the like. Informed estimates of track access costs, terms and conditions will need to be made.

The train operator must then approach the track owner for access, being aware that road and rail competitors are probably also talking to the potential customer (for whom time is of the essence).

Access regimes

Without an access regime, the track owner may turn away a train operator, or offer terms and conditions that make the operating plan unviable. This is most likely to

occur where the track is owned by the train operator with which the newcomer is competing — a situation which applies in every State except New South Wales.[4]

Track access regimes are a compromise between opposing interests. Potential access seekers want quick access, negotiated under conditions of secrecy, at a price that will enable them to compete successfully with incumbent rail operators and road based alternatives. The track owner, on the other hand wants to obtain an assured commercial return on assets, and as far as possible transfer financial and other risks to the access seeker. Where the access provider is part of a larger vertically integrated rail entity, there will be pressures to protect the interests of the incumbent operator which may stand to lose business to the new entrant.

Overlaying the framework, and colouring the concerns of access seekers and users is the fact that rail track owners are monopolists. This word is used in a factual not a pejorative sense. But the economic power of track owners has made it difficult for both large and small rail operators to negotiate access. Access regimes have not successfully addressed this inescapable fact.

Access regimes can take one of several forms, although at the time of writing, no regime in place in Australia was legally enforceable under the national competition policy.[5] In practical terms, train operators would like access regimes to have the following features, which would eliminate most opportunities in existing State based regimes to exercise the power of monopoly:

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[4] Access is likely to be especially difficult where it is being sought from a vertically integrated rail organisation. The national competition policy aimed to address this situation, which is perfectly described by the National Competition Council (1996, p. 6): 'complex problems arise if a business which operates essential infrastructure also has a commercial arm in upstream or downstream markets. The business will … have incentives to increase the prices of using its infrastructure. But beyond this, it might discriminate against its upstream or downstream competitors by offering them access to its infrastructure only on unfavourable terms and conditions. Worse still it could deny them access altogether... In these situations, one public policy response is to restructure the industry. This would involve separating the parts of the industry where competition is feasible from those parts where it is not'. In spite of the problem, which is very real, this public policy response has been applied in only New South Wales.

[5] To be useful in providing a framework for negotiation (and arbitration), an access regime may be made legally binding by one of the following processes. First, on application to the National Competition Council by an access seeker, the service provided by specified infrastructure may be 'declared' if it meets a number of criteria — for example, the service must be of 'national significance', and 'essential' (that is, it could not be duplicated at reasonable cost). Second, on application to the National Competition Council by a State or Territory, a regime created by state or territory legislation may be certified as being 'effective' by a State Premier, giving it status to override the national access regime. Third, an infrastructure owner may apply to the Australian Competition and Consumer Commission, or to a State based competition tribunal, for acceptance of a pre-emptive access 'undertaking', which specifies the terms and conditions for competitive access.

- a process to handle requests for negotiation of access fairly and without undue delay. This must include a requirement for the access provider to supply adequate information on the infrastructure service available, cost structures and quality performance measures/targets;
- pricing guidelines which contain clear criteria for floor and ceiling prices, allow for minimal price discrimination, account for all government subsidies in the revenue base of the access provider, and provide for periodic independent review of key price variables (for example, rates of return);
- transparent prices or an obligation on an independent regulator to ensure that all price agreements conform with nondiscrimination rules;
- vertical separation of ownership and/or control of infrastructure and above rail operations;
- in the absence of vertical separation, effective 'ring fencing' of the access provider from its associated above rail operator, to ensure probity in all aspects of its relationships with access seekers (including processing and storage of confidential information) and the negotiation of terms and conditions that do not unfairly discriminate in favour of the incumbent;
- balance in the scope of contract terms, to ensure the access provider cannot exert monopoly power over access seekers (including appropriate two-way indemnities and warranties, and two-way commitments to performance measures and objectives);
- contracts for track access that give sufficient security of tenure of train time-paths to enable rail operators and their customers to enter into binding transport contracts, with terms commensurate with commitments to capital investment and commodity sale contracts (that is contracts for a minimum of 15 years, with options for renewal);
- independent, consistent, transparent and expeditious arbitration and appeal processes; and
- an independent and transparent periodic review process, occurring at intervals of five years or more often.

These features are not all present in the State based regimes now in use, or in the terms and conditions that apply on the interstate systems. The power of monopoly is still producing a lack of balance in access contract negotiations. Train operators' main concern with track access regimes are discussed below.

Weak 'ring fencing' safeguards

A serious deficiency in access regimes is the weakness of 'ring fencing' to prevent the leakage of confidential information across the notional boundary between the infrastructure owner and the train operator in vertically integrated railways. This is a more serious concern for train operators as control of more infrastructure is placed in the hands of vertically integrated and privatised rail entities. Privatisation of vertically integrated rail organisations has occurred in South Australia and Victoria, and is proposed for Western Australia.

Damage to the interests of a competing train operator can occur if there is leakage of confidential information on freight volumes, operating plans, or equipment specifications, or merely if a rival train operator discusses business with an existing customer of the incumbent train operator. The usual response is to offer to cut the rate to cut out the potential competitor.

Standard arrangements for 'ring fencing' include a legislative requirement to protect confidential information and (in most cases) fines for breaches of this requirement. However, they do not include the opportunity for legal action to recover losses suffered as a result of leakages. The Western Australian regime now before the National Competition Council specifically excludes such tort actions. This is a serious weakness where a strongly profit driven private corporation will be entrusted with the responsibility of ensuring fair treatment of its competitors.

Weak arbitration and regulation

Effective arbitration and regulation are vitally important to the proper functioning of the system. Only New South Wales passes the simplest of tests of effectiveness in this area. The New South Wales Independent Pricing and Regulatory Tribunal (IPART) is empowered to act as both regulator and arbitrator for competitive access issues affecting rail and other types of infrastructure. Queensland has its Competition Authority and Victoria has the Regulator General. In other State and Territory jurisdictions, access regimes do not provide for:

- *an independent regulator.* The regulator is a State administrative or policy advisory body — for example, the Director General of Transport in Western Australia. In the Northern Territory it is proposed that regulatory powers be shared between the equivalent positions in both South Australia and the Northern Territory. The multiple policy and administrative duties of these offices also detracts from their ability to provide a consistent direction to the exercise of regulatory powers;

- *continuity in arbitration.* The ability to select a different arbitrator for each case means that consistency in the principles applied to arbitration decisions will be a matter of chance. Coupled with the prospect of large legal costs and lengthy delays, this element of chance will weaken the confidence of access seekers in the arbitration process.

No requirement for 'fit-for-purpose' service from infrastructure

No access regime contains any enforceable clause about the service provided by rail infrastructure, in return for access fees, being 'fit-for-purpose' or performing to a specified standard. Access regimes only require that access seekers be provided with certain information at the commencement of negotiations. They do not (but should) require this information to include fit-for-purpose standards of performance and measures of actual performance. Information on price, fit-for-purpose standards of performance and measures of actual performance are complementary. They are equally important if the aim of a regime is to ensure the interests of both provider and user are addressed. In terms of the content of the terms and conditions, monopoly track access providers are also able to avoid committing to supply a 'fit-for-purpose' service. They require only that a price be negotiated.

While most regimes also require the track corridor and timetable path to be specified, the word 'service' implies the infrastructure owner is providing more than mere access to a physical asset at a specified time. The standards to apply to the quality of service should be required in access contracts. These standards would be the subject of negotiation, with lower standards (which usually involve lower costs of supply) being traded against reductions in price, or vice versa.

Performance standards should apply reciprocally. This touches on an important issue for the industry — that is the poor quality of some assets in use above rail. In a media release by a large freight forwarder, the recent plea for higher standards of operational performance by train operators indicates the need for both parties to accept performance obligations (FCL Interstate Transport Services 1999). Reciprocal performance obligations are an increasingly common feature of contracts between rail operators and their customers. For National Rail, the majority of contracted revenue is subject to these terms.

Lack of requirements for pricing transparency

Access regimes do not require that prices, terms and conditions be open and transparent. Infrastructure owners, supported by policy in most jurisdictions, state that the opportunity must be available to access providers to extract revenue from

users that the market will bear. Some regimes contain weak assurances that 'access seekers can expect to pay similar prices to their competitors' (National Competition Council 1999, p. 11), but this is not supported by the openness of mechanisms for ensuring fair treatment for rival operators.

The opportunity for price discrimination arises only because rail access providers are monopoly providers of infrastructure, unlike the providers of competing road infrastructure. Without posted prices, there is potential for unfair (or economically inefficient) price discrimination. This is significantly aggravated where the access provider is vertically integrated with a competing rail operator (as in most cases in Australia). Such integrated operators naturally expect to receive favorable treatment from their colleagues, and access seekers naturally expect that they sometimes receive it (with no way of verifying the contrary).

The opportunity for price discrimination also disadvantages train operators against rivals in other modes, and is limiting the potential for competition between train and road transport operators. Road transport operators are not subject to price discrimination in respect of road infrastructure: a 'posted price' is available to all potential users of public roads in the form of a fixed vehicle registration fee and fuel excise.

Access regimes should require the infrastructure owner to provide information on the prices charged to other current users of similar time paths in the corridor (including the vertically integrated rail operator, if any). This will enable the proponent to assess quickly the cost of access, and whether the owner of the infrastructure is exploiting its position as a monopolist to impose excessive/unfair price discrimination.

So what is the solution? Is one needed? Rail's competitors on the road network pay a standard posted price for infrastructure access regardless of time of day, day of week, location of corridor or type of commodity. Why should rail operators be required to do businesses in a much more complex and uncertain environment? Rail reform will be permanently handicapped if regulation of rail becomes continually more complex.

Pricing guidelines do not recognise the effect of community service obligation support

Where community service obligation support is paid to one rail operator, the probability of competition is greatly reduced. Some rail operators on low volume rail networks are subsidised by community service obligations; this occurs even in New South Wales where the incumbent operator is vertically separate from the

track owner. In effect, the incumbent rail operator has a 'fighting fund' which is not available to potential competitors. The main requirement for government financial support is that the operator be below rail not above rail. The major costs requiring subsidy on low volume networks are those for sustaining track and related infrastructure. Above rail assets are very mobile and relatively low volumes can be carried efficiently.

Paying community service obligation financial support to the track infrastructure owner would preserve competitive neutrality among potential above rail train operators. To enable communities and industry served by low volume regional networks to benefit from competition between rail operators, governments should pay community service obligation subsidies to infrastructure owners, and to train operators.

Lack of effective regimes in all States

No State or Territory has an access regime that is legally binding by 'declaration' of the National Access Regime, by certification as 'effective' (thus overriding the National Access Regime), or by a binding 'undertaking' to the Australian Competition and Consumer Commission or a State regulator. A particular concern, Victoria has not sought to have the National Competition Council certify a regime for its intrastate rail system as being 'effective', creating uncertainty about the terms and conditions to apply.

Western Australia has applied for certification but several months are expected to elapse before this is achieved. Queensland has opted to establish its own competition watchdog[6] and the track owner, Queensland Rail, is seeking it to approve an 'undertaking'. The Northern Territory and South Australia have jointly applied to the National Competition Council for certification of a regime to apply to only the track from Tarcoola to Alice Springs (and northwards when the rails are extended to Darwin). Only New South Wales has a regime that functions 'normally', and formal certification of it as 'effective' appears to be close. However, aspects of the regime as it would apply to coal transport in the Hunter Valley are still in dispute in the courts. South Australia has a regime created by State legislation for its intrastate track, but has made no attempt to have it certified as being 'effective', leaving the way open for a declaration by an operator which believed the national regime was more appropriate.[7]

6 The Queensland Competition Tribunal.

7 This would require the service to which access was sought to meet the 'essential service', 'national significance' and other criteria. There are some unusual provisions in the South Australian regime.

As for the national track system, which provides an essential service of national significance to National Rail and others, the Australian Rail Track Corporation has stated that it is seeking to gain approval by the Australian Competition and Consumer Commission for an 'access undertaking'. However, there is no evidence that a process for approval has begun, and there has been no consultation with users on its possible content.

So what is the practical effect of this confused situation on rail operators? Gaining access to the intrastate track is effectively not possible in Western Australia and Queensland, and the process for gaining it is likely to be uncertain or difficult in Victoria. It should be less uncertain in New South Wales and South Australia. Access to system providing infrastructure service for interstate transport has not been denied or constrained, but there are no legally binding pricing guidelines or other terms and conditions. This is increasing the difficulties experienced by operators in negotiating long term contracts with the Australian Rail Track Corporation and the Rail Access Corporation of New South Wales.

Proposals to protect 'developmental' railways

The concept of protection has been introduced with the proposed access regime for the Tarcoola–Alice Springs railway, and (when completed) its proposed extension to Darwin. The vertically integrated owners of this railway will be able to compete on the remainder of the interstate network against other train operators who will be unable to compete in this corridor.

The arguments for protection of the investment in new infrastructure are well known, and are addressed in South Australian and Northern Territory application for certification of their proposed regime for this corridor. They are not consistent with the national competition policy and will threaten the integrity of the whole edifice if applied to important parts of the network. There are few corridors, intrastate or interstate, where the owner of the infrastructure could not argue for protecting its investment in infrastructure against the risk of revenue leakage to competitors. This case will become more prevalent as the private sector becomes involved in rail infrastructure investment.

Access contracts

The contract provides the basis for a commercial relationship between track user and provider. The list of contents of the contract is open for negotiation, but standard terms would include:

- terms and rights of renewal or extension;

- train paths (generally set out in readily amendable annexes);
- pricing, including escalation;
- quality assurance; and
- warranties, indemnities and other risk sharing provisions.

As with any contract, the issues are driven by the competing interests and relative economic power of the parties. Overlaying this contest of interests is an essential fact: the access regime is aimed at promoting the interests of the users of the transport service. In other words, the regime is aimed at enhancing competition for the market.

Negotiations for track access are often protracted, reflecting the difficult financial circumstances of the parties and the novelty of the commercial relationships embodied in track access agreements. Negotiations between National Rail and the Australian Rail Track Corporation for example, have been underway for 18 months, with access in the meantime continuing on a month-to-month basis. The situation of other Australian Rail Track Corporation customers in the east-west corridor is the same. The issues are not identical, but negotiations between National Rail and the Rail Access Corporation of New South Wales have continued for a similar time. Neither negotiation is close to completion.

The time required to negotiate access is seriously out of step with the 'rhythm' of commercial demands by rail customers, giving competitors (incumbent rail operators and road transport) an inherent advantage over rail competitors requiring track access.

Against this background, rail access seekers/users are becoming frustrated with their inability to change the position of track owners in areas that vitally affect their business interests. In summary, track users' concerns with the positions adopted by track owners are their:

- reluctance to commit to financial incentives for quality service delivery, or to enforce quality assurance on track users;
- unwillingness to expand the operating envelope (increased limits on trains dimensions, mass and speeds) except at additional cost to operators, where the extra costs incurred by track owners are nil or minimal;
- reluctance to facilitate operators' initiatives to reduce train operating (for example, driver only operation);
- unwillingness or inability to reduce their cost structures in the face of continually falling revenue yields faced by rail operators;

- desire for total flexibility in price discrimination between existing and new track users;
- desire for absolute security for income streams;
- unwillingness to provide security of tenure over train paths, or to accept flexibility in capacity usage, in both the short and long term; and
- desire for an excessively high level of risk transfer, including imposition of onerous operating and equipment specifications not required by safety regulators.

Quality assurance

Access providers are reluctant to commit to financial incentives for adherence to quality standards. Most operators are willing to have these operate reciprocally, but it has been impossible to find agreement on measurement parameters or standards. The problem is underpinned by the substandard condition of the track in some areas, and by the lack of available funding to bring the track up to a condition at which quality performance can be warranted.

A related issue is the poor performance of some train operators, who frequently fail to stay within their contracted paths, causing delays to other operators. Breakdowns of poor quality equipment, for example, frequently block the track and cause delays to other operators. Rail customers have expressed frustration at these unnecessary delays (FCL Interstate Transport Services 1999). No penalties are imposed for such delays, and other train operators and their customers bear the costs.

On the other hand, some track owners have refused to install precision, in-motion weighing equipment which will detect rollingstock overloading, wheel defects and overheated axle bearings, which are failure risks. Installation of this equipment would also provide a greatly enhanced ability to charge access fees on accurate weights.

14.5 Expanding the operating envelope

Train economics have greatly improved in the past four years, through the operation of longer, faster trains and by implementation of driver only operation. It is widely acknowledged that these changes are needed to make rail more competitive against road transport.

However, track access providers have tended to discourage these initiatives, by imposing fee surcharges on longer trains, and by being reluctant to facilitate operating procedures and rule changes required for driver only operation.

Few cost reductions by access providers

Rail rates are continually falling under pressure from road based competition and competition among rail operators. However, track access providers have continued to demand that fee levels increase each year to ensure a growing revenue base for their asset based businesses.

Rail access providers appear to be under little pressure to reduce costs. Rail operators have reduced above rail costs by half or more, and have reduced their exposure to access costs by improving gross to net ratios. There is a need for more cost reduction by access providers. In National Rail's case, total above rail costs declined by 52 per cent between 1991–92 to 1997–98, while track access costs declined by only 40 per cent over the same period.

Security of access to train paths

The Productivity Commission (1999, pp. 152–5) has commented on the allocation of train time paths, including proposals for auctioning train time paths. Given that access users have long term businesses to operate (with substantial uncertainty already affecting major parts of their business) and contractual commitments to meet, train operators have not been enthusiastic about proposals that would involve transferring some train paths to others who bid, but could not necessarily sustain, higher access prices.

It is true that auctioning of time paths would provide signals about the value placed on paths by actual and potential users. However, the practical difficulties, some of which are mentioned in the Productivity Commission Report, are a powerful argument against the auctioning approach.

- Where a new train path is needed to serve a new customer or a new market, it will be rare that any more than one operator is in a position to bid for it. In the Australian context, where customers are few and opportunities for new business are infrequent, only one operator is likely to have the prospect of secure new revenue requiring a new time path.
- For existing time paths, long term business relationships and contracts rely on continuing access to the path at a stable price. To place this on sale by auction

would disrupt these relationships, and most operators displaced from a path by an auction process would most likely be forced out of business.

- There are strong interactions between time paths on the network, both vertically (between time paths on the same track) and horizontally (between time paths on adjacent sections of track, which are administered by different access providers). The practical difficulties of coordinating the auction of a continuous path across a whole corridor (for example, Sydney–Perth) would make an auction impossible.
- Rail cannot compete with road and coastal shipping if it must secure access to infrastructure under such tenuous conditions.
- The proposals for auctioning time paths appear to be on hold, and it is to be hoped they will remain so.

14.6 The one-stop shop

Likely outcomes from a 'one stop shop' for rail access are not well understood. There would be a new role for the Australian Rail Track Corporation as 'middleman' for access to infrastructure used for interstate rail operations in New South Wales and Western Australia. Interstate rail operators in these States would purchase through the middleman, but (it is understood) the State based authorities would continue to provide all functions involved in providing access (including train control and management of track maintenance).

This recipe comes from a misconception of the issue, and would create more problems than it would solve.

- Pricing would be shrouded in two layers of secrecy and confidentiality instead of the current single layer. Opportunities for unfair price discrimination would double.
- Negotiation of train time paths would be conducted through intermediaries, leading to many delays and the probability of an unsatisfactory outcome.
- Provisions for indemnities and warranties would be made more complex; in particular, the ability of the middleman to enforce performance warranties on behalf of the access user is questionable.
- The inclusion of performance measures for quality service delivery by the middleman would become doubly difficult, because it would at best have a limited ability to affect the quality of service provided by the actual access providers.

- Day-to-day management of train paths (a large and complex task involving frequent communication between the contracting parties at present) would be complicated by interposing a middleman. It would be too easy for the ultimate access provider to 'pass the buck' to the middleman, who would be unable to address the detailed operational issues that arise every day.

For all of the above difficulties and others, National Rail and other rail operators have a strong preference for continuing to deal with the real access providers directly, both when negotiating contracts for access and when managing the ongoing use of access. The problems in dealing with several entities to obtain access are minor compared with the above list.

References

Media release, FCL Interstate Transport Services 1999, *'Major rail customer slams rolling stock'*, 14 May.

Media release, National Competition Council 1999, *The WA Access Regime for Rail Services*, Issues Paper, Melbourne.

—— 1996, *The National Access Regime: A Draft Guide to Part IIIA of the Trade Practices Act*, Melbourne.

Productivity Commission 1999, Progress in Rail Reform, Draft Report, Canberra, March.

15 Rail privatisation: lessons from the United Kingdom

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15.1 Rail privatisation

Given the current interest in, and plans for, rail and urban public transport privatisation in Australia, a study of the United Kingdom's experience may suggest some pitfalls to avoid. While Australian rail systems have followed a different growth path from rail in the United Kingdom, and while the form of rail privatisation in Australia differs significantly from that in the United Kingdom, the need for care with the architecture of the privatised system (and particularly the need to structure incentives so as to bring about the desired behaviour) makes a study of UK rail privatisation worthwhile from a policy perspective.

In *The Visible Hand*, the business historian Chandler (1977) documents the tendency for nineteenth century American firms to internalise transactions formerly carried out through markets. The typical firm in the more capital intensive industrial sectors responded to the opening of a national market and innovations in production technology by developing a strategy of vertical integration. Such a strategy, argues Chandler, replaced market contracting by managerial coordination, enabling the firms to economise on transaction costs. Privatisation and contracting out in the 1980s and 1990s has stood this pattern on its head. In some cases, notably in the UK rail industry, formerly vertically integrated producers have switched from internal or administrative coordination to market based contracting.

UK rail privatisation is characterised both by horizontal separation (that is, the separation of an organisation by product — in this case, into freight and passenger services — and/or by geographic area — notably Virgin Rail's franchise on the West Coast mail line) and by vertical separation (the separation of an organisation by function — in this case, Railtrack and the train operating companies).[1] The

[1] Some writers have argued that British privatisation represents a return to a past era of privately owned railways. This argument is only partly correct. Railways in the pre-World War I era were

potential benefits and costs of structural separation in the rail sector have been examined closely.[2] Structural separation, it has been argued, may improve performance by promoting competition both within the rail sector and between rail and other modes. This may also facilitate regulation of the natural monopoly elements of the rail industry. However, separation also imposes costs, including: high transition costs (that is, the costs of moving from a vertically integrated to a structurally separated railway); loss of economies of size, scope and density; possible lack of coordination between separate service providers; misspecification in contracting and problems with incentive structures; complications of timetabling, capacity management and inter-availability in ticketing; high transaction costs incurred by train operators and track providers planning long term investment; and, last but not least, the cost of regulating the privatised industry.

The privatised rail system in the United Kingdom may be viewed as a web of contracts or, to use the former Rail Regulator's phrase, a 'regulatory and contractual matrix' *(Modern Railways* 1997a, p. 696). The Rail Regulator refers to a set of legal documents — contracts, licences, leases — which 'stitch together' the vertically and horizontally separated rail industry, thereby establishing legal rather than managerial relationships between its various parts. If this matrix is to work efficiently and effectively, contractual relationships (including those relating to Railtrack, the train operating companies and the Office of Passenger Rail Franchising) and the incentive structures contained within such contracts, must encourage appropriate behaviour. Arguably, at least in some cases, they have failed to encourage effective and efficient behaviour, to the detriment of the industry's performance.

This paper focuses on the 'regulatory and contractual matrix', as well as on the incentive structures designed to encourage efficient and effective performance. Various problems are discussed, including:

- contractual relationships involving Railtrack, as well as the structure of track access charges and the apparent lack of incentive for Railtrack to provide additional capacity in the event of traffic growth;
- the nature of, and flaws in, the contractual relationships between the Office of Passenger Rail Franchising and the train operating companies; and

vertically integrated enterprises, owning their own track and stations, and having their own engineering capabilities. They had to agree to terms and conditions when they ran over each other's tracks, just as they coordinated ticketing and other commercial arrangements through the Railway Clearing House system. However, the scale of contracting between railway was limited relative to that required under today's privatised system.

[2] See Productivity Commission (1999), Kessides and Willig (1995, p. 58) and King (1997).

- shortcomings in the liability regime, which determines who pays what when someone is to blame for a breakdown in performance.

We begin with a brief sketch of rail developments in the post-World War II era and the rationale underlying privatisation.

15.2 The nationalised rail system: diminishing expectations — 1945 to 1993

Despite the prevailing view after World War II that nationalisation coupled with investment in modern technology would restore rail's health and profitability, and despite substantial investment in infrastructure and rolling stock in the 1950s and early 1960s, British Railways continued to lose substantial sums (Welsby and Nichols 1999, p. 55).

Competition from road affected rail's passenger and freight business. Private car registrations increased from two million in 1950 to over 20 million by mid 1995. Car use rose from 26 billion vehicle kilometres in 1950 to 362 billion in 1996 — a 14 fold increase. Meanwhile, rail passenger traffic declined from 100 million rail journeys in 1950 to 80 million in 1996 (*Rail* 1999b, p. 53). The volume of rail freight hit a post war high of 294 million tonnes in 1953, thereafter falling steadily to 100 million tonnes in 1996–97. Rail, which now accounts for 6–7 per cent of freight movements in the United Kingdom, carries about one third of the tonnage handled in the mid 1950s, despite the transport task having roughly doubled in size (Glover 1997b, pp. 802–3). Rail's failure to adjust to the dynamic changes in passenger and freight markets led to the deterioration of its long run financial performance.

The scale of losses incurred in the late 1950s and early 1960s forced a new approach to rail. The Beeching Report (British Railways Board 1963) recommended closing branch lines and abandoning many stopping services — steps that temporarily improved British Railways' finances but failed to provide a lasting solution (Joy 1998b, p. 27).

While the *Transport Act 1968* recapitalised British Railways and introduced a local passenger service subsidy program, the financial performance of the passenger rail system continued to cause concern. The nub of the problem according to Joy (1998b, p. 32), lay in failings of the passenger network: intercity passenger trains could hardly be considered profitable if they failed to generate the cash needed to fund their replacements.

Railway finances were back in the spotlight in the early 1980s. The Serpell Inquiry (1983), set up to examine British Railways' deteriorating financial position, raised yet again the contentious issue of reducing network size to cut back the deficit. Following a public outcry at the prospect of further route closures, immediate plans for downsizing the network were abandoned (Joy 1998b, p. 32).

Parallel changes in British Railways' management structure, replacing the previous regions (that is, eastern region and southern region) with a small number of business units responsible for developing identifiable market segments (that is, InterCity and Network Southeast), coupled with favourable economic circumstances, led to an improvement in financial performance over the period 1983–89.[3] In hindsight, sectorisation may be seen as a necessary precursor to privatisation.

15.3 Privatisation: rationale and alternative models

Welsby and Nichols (1999, p. 58) argue that British Railways' relatively strong financial performance in the late 1980s — with InterCity moving into profit, subsidies for London commuter services declining, and the heavy haul freight business generating large cash surpluses — made it possible to believe that a 'core' railway could be transferred to private ownership without the need for a subsidy. Privatisation was seen as a way of banking improvements already made, and of promoting technical and allocative efficiency. Whereas the British Railways Board argued that the railway should be privatised as a single entity, believing that the loss of economies of scale would more than outweigh gains to be made by disaggregating ownership, government was not convinced. Attention thus focused on the most appropriate form of privatisation.

Joy (1998b, p. 40) notes several ways in which privatisation might have been implemented. The government might have chosen a Landlord Company Model, characterised by several competing vertically integrated railways, each operating an open access regime. This would have required detailed access regulation. Alternatively, the government might have adopted a Three Network Model, dividing British Railways into three businesses. Two (InterCity and Freight) were potentially viable, while the third (the 'social railway') would have required a continuing subsidy. A further alternative (considered but rejected), the so-called Slot Bidding Model, would have had potential users bid for track access slots in the same way that landing slots are auctioned at some airports.

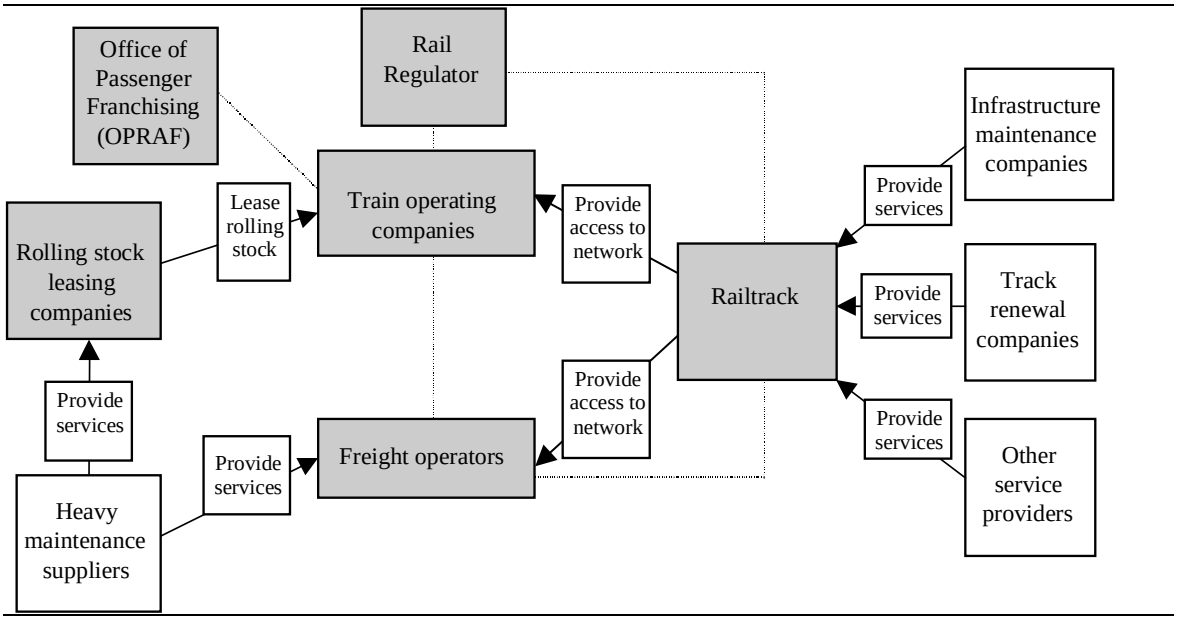
[3] Between 1983 and 1988–89, subsidy to the passenger railway was approximately halved in real terms, InterCity moved into profitability and the subsidy for London commuter services rapidly declined (Welsby and Nichols 1999, p. 57, Joy 1998b, pp. 37–8).

15.4 Structure of the privatised rail system — the main players

With the coming into force of the *Railways Act 1993*, the restructuring of the rail system could begin. Privatisation was undertaken with extreme haste. As Tom Winsor (the incoming Rail Regulator) noted, the *Railways Act 1993* was rushed through Parliament and contains many imperfections.[4] Moreover, the contracts, licences and leases which underpin the privatised railway were developed in great haste to meet a political objective.

What are the essential elements of the privatised system?

Figure 15.1 **The pre-Strategic Rail Authority privatised rail system**



Data source: Adapted from Kain (1998, p. 249).

The architecture of the rail system has been completely transformed. The principal change is the separation of ownership of infrastructure (track, signalling and stations) and train operations.

Welsby and Nichol (1999, pp. 61–2) note that the new railway architecture not only separates asset ownership from train service provision, but also outsources work previously undertaken in-house:

> This switch, from a vertically integrated company operating with a command style management culture to an industry comprising a large number of companies buying

[4] Winsor (1997, p. 696) notes that the bill underwent 1435 amendments (almost all from government) in its passage through Parliament, with some cornerstone sections of the bill being entirely rewritten at a very late stage.

and selling goods and services between each other, would clearly take time. It would also involve a substantial volume of legal work to create contracts where informal internal arrangements had previously been sufficient. Internal transactions had to be put on to a contractual and pricing basis that would be recognised by potential purchasers and could be used by them as a basis for valuing the new companies.

Joy (1998b, p. 40) argues that the privatised rail system, by separating the infrastructure from train operations, and by banning vertical integration into train operations by Railtrack without the approval of the Rail Regulator, has limited the possible exercise of monopoly power.

15.5 Railtrack

Railtrack owns and manages rail infrastructure including 39 000 kilometres of track, the signalling system and around 2500 stations and 90 depots. All except fourteen stations have been leased, and all maintenance work is undertaken by contractors.

Railtrack's access charges for franchised passenger services are made up of fixed and variable components:

- long run incremental costs — that part of the fixed charge which indicates the long run costs imposed on Railtrack in delivering the total access rights of a train operator;
- apportionment of common costs — the remainder of the fixed charge (designed to recover the rest of Railtrack's costs at subzonal, zonal or national level) which is apportioned among train operators on the basis of budgeted passenger vehicle miles for subzonal costs and budgeted passenger revenue for zonal and national costs;
- track use charges — charges that reflect the short run effects on maintenance and the renewal costs of running trains of different types over different distances; and
- traction current charges — charges that recover the costs of electric current and reflect the distance covered and type of equipment. They vary geographically and over time.

Over 90 per cent of the aggregate charge to train operating companies is invariant to the level of track use. That is, the charge does not vary either with the number or type of trains run or with passenger revenue. Only track use and traction current

charges directly vary with use, and these average only 9 per cent of total track access charges.[5]

Rail access charges were reviewed in 1994–95, which led the Rail Regulator to reduce the level of charges by 8 per cent and introduce a CPI-X per cent charging regime.

Railtrack currently earns £2 billion annually from track access charges — a sum considered sufficient by the Rail Regulator to maintain the infrastructure and renew life expired assets in 'modern equivalent form', as well as provide an adequate return to investors.[6]

Arguably, the structure of access charges is flawed. First, the pricing signals sent to the train operating companies do not reflect the opportunity cost of track use, especially in peak hours and where track 'bottlenecks' exist. Second, the present charging regime offers no incentive to Railtrack to provide additional capacity in the event of traffic growth.

What effect does the current structure of track access charges have on the behaviour of the relevant players? The typical train operating company incurs over 90 per cent of its rail access charges irrespective of the number and type of trains it runs, or of the amount of passenger revenue it earns. In effect, it pays a high fixed charge for the privilege of accessing Railtrack's railway. The flip side is that Railtrack charges the train operating companies a low price for additional train paths. Not surprisingly, those companies have responded by running frequent short trains, partly because frequent services are a marketing plus, but also to occupy as many train paths as possible so as to keep out competitors. Williams (1999, p. 294) observed:[7]

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[5] According to the Office of the Rail Regulator, track use charges comprise 3 per cent of total track access charges and traction current charges comprise 6 per cent; (Office of Rail Regulator 1994, p. 13, *Modern Railways* 1998, pp. 799–800, and *Modern Railways* 1999a, pp. 92–3).

[6] In everyday terms, a modern equivalent asset equates to 'better and more capable, probably at the same or lower cost'. It does not mean replacing like with like: the modern equivalent of a Morris Minor is not another Minor (*Modern Railways* 1999b, pp. 114–7).

[7] See also Modern Railways 1999g, p. 454). As the Productivity Commission (1999, pp. 152-3) notes, there are three broad approaches to pricing:

- posted prices — posted prices are non-negotiable and define precisely the prices, terms and conditions under which operators can gain access to the tracks;
- negotiated prices — terms and conditions reached following commercial negotiations between the track authority and the train operator; and
- auctioning mechanisms — potential operators bid for segments of track, train schedules or packages of train schedules … the access provider optimises the allocation of slots subject to the size of the bids, their feasibility and the cost of service.

> Even on the old Southern Region, where all the platforms at the major stations were lengthened in the 1950s and 1960s to take 12 coaches, a 12 car train is now a much more unusual sight. Stand on Clapham Junction in the morning and evening peak and you will see six and even four and three coach trains trundling into and out of Waterloo and Victoria.

The structure of Railtrack's access charges appears likely to change. In its 1999 Network Management Statement, Railtrack proposes to include a larger variable component (about 30 per cent) in its charges to reflect more accurately the costs of running more trains (*Modern Railways* 1999e, pp. 324–9). An appropriate pricing structure should iron out the problem with a minimum of fuss.

Second, it has been argued that the present charging regime does not encourage Railtrack to provide additional capacity in the event of traffic growth. The level of Railtrack's investment depends on access charges set by the Regulator and on the performance payment regime under which Railtrack is rewarded when infrastructure performance improves and penalised when it deteriorates. However, while Railtrack has an incentive to maintain the condition of existing infrastructure, there is no contractual incentive to provide additional capacity in the event of traffic growth. Given that the operators of both passenger and freight services are forecasting major expansion of their businesses, and that healthy growth in both passenger and freight traffic was in fact achieved in 1997 and 1998, the lack of incentives to invest in new capacity may present major problems.

Railtrack is seen as a reluctant spender when it comes to investing in network upgrading, and it is suspected of being more interested in cutting demand than in expanding the system (*Modern Railways* 1999b, pp. 114–7, and 1998, p. 799). Prior to 1998, the regulatory arrangements that applied to investment in the network had a major flaw; Railtrack could say that it intended to spend money on this or that improvement, but there was nothing that anybody — the Rail Regulator, the train operating companies, the Government — could do about it (*Modern Railways* 1997a, p. 551).

To date, Railtrack has opted for a regime of posted prices. Whilst an auctioning system would certainly pose problems, it should solve the peakhour track problem. *Modern Railways* (1999a, pp. 92-3) has suggested a 'path based' charging regime, arguing that the transfer of a substantial proportion of track access charges to a per path basis should reward both efficient operation and investment in new capacity. The article suggests that if Railtrack charged a variable cost of £570 per path on a hypothetical North Coast Main Line (rather than a cost of £115, which equates to that currently charged on actual main lines), annual access charge for two extra peak trains each way would amount to £830 000 — a charge likely to encourage Railtrack to run the railway to the limit and perhaps warrant further investment.

Concerns regarding the provision of additional capacity led to the imposition of condition 7 in Railtrack's Network Licence. The condition:

- obliges Railtrack to maintain, renew and develop the network 'in accordance with best practice' as well as publish detailed plans, which become enforceable obligations;
- provides the Rail Regulator with powers of investigation and enforcement if Railtrack fails to deliver on the agreed expenditure programs; and
- explicitly obliges Railtrack to consult with train operating companies and funding bodies and to meet their expectations where these are reasonably practicable (see *Modern Railways* 1999b, p. 115).

The effect of condition 7 is seen in Railtrack's 1999 Network Management Statement which proposes a £27 billion program of investment to accommodate a 30 per cent growth in passenger miles (as well as a substantial increase in freight tonnage) by 2009 (*Modern Railways* 1999f, pp. 324–9).

In *Investment in the Enhancement of the Rail Network* (1996), the Rail Regulator noted that it may sometimes be appropriate for Railtrack to seek contractual assurances regarding future income streams — either from individual train operating companies or from the Office of Passenger Rail Franchising before investing in new capacity (Office of Rail Regulator 1996). The Rail Regulator has also noted the value of partnerships between Railtrack and train operating companies in enhancing the network. According to its 1999 Network Management Statement, Railtrack now envisages three types of network enhancement:

- commercial projects, which are expected to yield a commercial rate of return (with the costs being recovered from additional network charges negotiated with those train operating companies benefiting from the investment). In most cases Railtrack is willing to assume market risk through a revenue sharing agreement;
- partnership projects, for which Railtrack is prepared to finance part, but not all of the capital cost. Railtrack will seek an appropriate rate of return on funds invested; and
- contractor projects, in which Railtrack is not prepared to accept any commercial risk, but may be willing to fund the costs of construction (either wholly or in partnership), recovering its costs and standard rate of return through access charges (*Modern Railways* 1999d, pp. 244–6; *Modern Railways* 1999f, p. 326).

In general, the length of current train operating company franchises (predominantly seven years) works against partnership projects for the long term enhancement of infrastructure, although several train operating companies have argued that such investment warrants an extension of their franchise.

The case of the West Coast Main Line refurbishment is of particular interest. The West Coast Main Line has four tracks (two fast and two slow). While Virgin Rail holds the franchise for West Coast Main Line express services, other train operating companies and freight operators use sections of the line (Silverlink, and English, Welsh and Scottish). Under the West Coast Main Line Passenger Upgrade 2 deal between Virgin Rail and Railtrack, an additional £650 million is to be spent upgrading the route for a 140 mile per hour, tilt train operation. Railtrack will pay for the enhancement through a revenue sharing arrangement with Virgin. But this creates a problem. Once the line is upgraded, only tilt trains will be able to run at the projected speed, and Virgin's twelve tilt trains an hour each way will occupy a high proportion of track capacity. Only two paths an hour each way will be available for other operators, and then only if they have tilt trains capable of 140 mile per hour speeds. Other operators will be forced to use the slow tracks, putting them at a serious competitive disadvantage (Ford 1999b, pp. 391–3).

15.6 Train operating companies

The privatised passenger system was based on bids to operate franchised services over a defined part of the network in return for a subsidy (or in the case of the Gatwick Express, the payment of a premium). The level of subsidies is expected to decline over time. As with Railtrack, the contractual relationships and incentive structures relating to the train operating companies appear flawed in important respects.

Franchises were awarded for periods of five to fifteen years, in a market in which it was known that competition will be gradually introduced from 1 April 1999. The interests of franchisees and the Government clearly differ. A franchisee will be interested in obtaining as long a franchise as possible; the longer the term of the franchise, the greater the opportunity to create barriers to entry (brand loyalty) that will deter potential competitors at the time of franchise renewal. At least in the initial round, the Government was interested in awarding short franchises; Government hopes of reducing the subsidy bill depended on competition between bidding companies and on the subsequent threat of losing a franchise (Welsby and Nichols 1999, p. 65).

Competition was to be the driving force in the privatised rail industry. Not only would there be competitive bidding for franchises, but successful franchisees were to compete with others in an open access regime. However, potential franchisees demanded greater certainty, persuading the Rail Regulator and the Office of Passenger Rail Franchising that open access by passenger train operators would add

a significant risk premium to the initial franchise bids. As a result, the Rail Regulator declared that competition would be introduced gradually.

The rules for competition are known as the Moderation of Competition guidelines. Competition is to be introduced in three stages.

- *Stage 1* (1995–April 1999). Each train operating company nominated the flows it regarded as 'material' to its business.[8] No competition was permitted on flows so nominated. Thus, Stage 1 gave train operating companies almost complete protection against 'cherry picking'.
- *Stage 2* (April 1999–2002). Train operating companies are exposed to somewhat greater risks of competitive entry. Competitive services are allowed, providing they do not operate on flows that make up more than 20 per cent (in aggregate) of an existing train operating company's material income.[9]
- *Stage 3* (post 2002). There is to be a full review of policy in 2002. No-one is sure of the changes likely to occur after 2002.

The matrix of contractual relationships relating to the passenger railway includes those between the Office of Passenger Rail Franchising and the various train operating companies, and between Railtrack and individual train operating companies.[10] Interestingly, there is no provision for contractual links between the various train operating companies. The lack of such a link makes for complexity in the liability regime. Not only are there flaws in contractual relationships between the various players, but there also flaws in the monitoring system and the structure of incentives.

Given that most passenger services lose money, not just on an average cost but often on a short run marginal cost basis, franchise agreements must be structured to prevent profit taking either by running down service levels or, where some degree of monopoly power exists (for example, London commuter services), by raising prices. Service specifications were designed to ensure that essential elements of the rail service were protected by contract (Welsby and Nichols 1999, pp. 65–6).

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8 Initially a 'material' flow was any point-to-point journey that made up more than 0.2 per cent of total revenue. Lower thresholds were adopted for the more diverse businesses, such as CrossCountry.

9 Train operating companies have reacted by removing point-to-point journeys where competition appears unlikely from their protected core; thus, they have been able to protect their potentially competitive flows more effectively (*Rail* 1999a, p. 33).

10 The contractual relationship between Railtrack and the train operating companies is explored in Joy (1998, p. 43).

Franchise agreements not only specify a minimum service requirement, but also acceptable levels of punctuality, cancellations, crowding on commuter trains, and the requirement to undertake customer satisfaction surveys. The requirements are enforced by a financial penalty/reward system and, in extreme cases, by the threat of loss of the franchise. As commentators have noted, the specification of outputs is much tighter under private than under public ownership.[11]

Clearly, if franchise contracts penalise train operating companies for poor performance, there have to be accurate measures of such performance. Both the Office of Passenger Rail Franchising and Railtrack continually monitor performance. Part B of the commercial code known as the Track Access Conditions obliges Railtrack to accurately monitor train performance. Railtrack records when a train passes specified monitoring points, and compares these times with when the train should have passed that point. It notes when trains are cancelled and why delays or cancellations have happened (that is, it attributes blame).

Arguably, the monitoring system is flawed. Train operating companies are required to run trains punctually and reliably. A commuter train is punctual if it arrives within five minutes of the scheduled time, and a long distance train is punctual if it arrives within ten minutes. However, until recently there were fundamental flaws in the measurement of punctuality: trains operating on Sundays and bank holidays were excluded from the calculations; off-peak commuter trains were also excluded; train operating companies were able to declare certain days void (that is, exclude them from the performance statistics); the system did not monitor late running at intermediate stations; and some train operating companies 'padded' their timetables on the approaches to the terminal station so as to minimise late arrivals (Knight 1999, pp. 26–7; *Modern Railways* 1997b, pp. 560–1). Given the exclusions, train operating companies might be expected to achieve at least 90 per cent punctual running. However, Welsby (1998, p. 160) noted that a number of operators failed to achieve this benchmark, and performance actually deteriorated between 1997 and 1998.

Data relating to 'reliability' also appear flawed. A train is deemed to have run if it completes 50 per cent of scheduled mileage. Once again, Sundays and bank holidays are excluded and operators are able to exclude 'void' days.

The Office of Passenger Rail Franchising operates a 'structured response' to underperformance. Failure by a train operating company to meet a threshold (for any parameters in its franchise agreement) over a four week period leads to it being 'called in' to explain its failure. If the company is called in three times over a three

[11] See Welsby and Nichols (1999, p. 66), Winsor (1998b, p. 364) and Glover (1997a, p. 561).

year period it is 'in breach' of its franchise agreement. Under section 55 of the *Railways Act 1993*, the Office of Passenger Rail Franchising has a duty to prevent or rectify any breach of a franchise agreement. It may issue either a provisional order (instructing the train operating company to achieve, say, an x per cent level of punctuality over y periods) or a final order (which may involve a heavy fine or, in extreme cases, loss of a franchise).

How is blame assigned if 'things go wrong' with rail services? Rail operations can go wrong in many ways. Some things are clearly attributable to Railtrack: points may fail; a length of rail may break; and leaf fall (a perennial problem in the south of England) may bring trains to a stop. Other things may be attributable to trains operated by an individual train operating company: the engine pulling a passenger train may fail or axle boxes may overheat. Where the fault clearly lies with Railtrack, the company will be compensated by Railtrack. But what if the fault lies with a train operating company? It seems reasonable that if that company's train causes disruption to trains of other companies, that it should compensate those other companies. However, the contractual matrix has been set up so the individual train operating company do not have contractual relationships with each other when it comes to problems relating to infrastructure. So far as each company is concerned, Railtrack is responsible for everything that goes wrong except for those that are the company's responsibility areas under its contract. Thus if one company's train fails, causing losses to other companies, the first company will pay compensation to Railtrack which will pass it on to the affected companies (Winsor 1998, p. 149; *Modern Railways* 1997c, p. 696).

In summary:

- the contractual relationship between the various players (the Office of Passenger Rail Franchising, Railtrack and the train operating companies) in the privatised rail system is flawed;
- the benchmarks used to measure performance (critical aspects for obtaining the right balance between risk and reward) are flawed. Railtrack's infrastructure performance benchmarks have been set relatively low, as have the train operating companies benchmarks for reliability and punctuality; and
- the liability regime — which sets out who pays what when someone is to blame — has some important shortcomings. Paradoxically, the lack of a contractual relationship between train operating companies complicates the liability regime.

The structure under which the train operating companies receive fare and subsidy income, while leasing their assets on a medium term basis from rolling stock leasing companies and Railtrack, leaves them free of the burden of funding a capital intensive business but also leaves them shouldering much of the risk. Track and

leasing charges are invariant with respect to passenger revenue and the level of subsidy, so train operating companies bear all fluctuations in revenue. Moreover, as Welsby and Nichols (1999, p. 67) note, contractual commitments mean that train operating companies have little opportunity to save costs by changing output levels. With fixed charges for rail access and rolling stock accounting for about two thirds of total costs, fluctuations in revenue around planned levels pass straight through to profits and losses. If revenues exceed expectations, efficient franchises will be highly profitable. If revenues fall short of expectations, losses will be incurred. The lack of asset backing to cover any substantial borrowing means that train operating companies may not be able to withstand a prolonged revenue shortfall.

Welsby (1998, p. 160) notes, the train operating companies were intended to be the spearhead of commercialism of the railways and the figureheads of the privatised industry. In reality, they have the least certain future of any of the major players, they are the most heavily regulated, and they are overshadowed in terms of corporate weight, market power and resources by companies that provide them with the essential tools to do their commercial job.

A disillusioned industry correspondent has expressed the point much more sharply and concisely:

> …the very notion of the franchise is a rather ridiculous one. The train operators have incredibly limited scope and are necessarily short term in their views. They run trains which they do not own to schedules they do not determine on tracks they do not control at prices partly fixed by the government. (quoted in Kain 1998, p. 263)

15.7 Rolling stock leasing companies

British Railways' rolling stock was sold to three leasing companies. At the time of privatisation, almost all passenger vehicles were leased for terms of four to eight years. There was no competition between rolling stock leasing companies in respect of the existing leases. Competition should develop when leases are renewed and/or when the growth in demand for rail passenger services creates a need for new rolling stock.

The administered prices for rolling stock leases were high enough to deliver very strong cash flows to these companies, enabling them to fund investment in new vehicles. However, Welsby and Nichols (1999, p. 63) note the risk, in the absence of any obligation to invest, that the rolling stock leasing companies will manage their affairs with a view to short term cash maximisation.

This concern led the former Rail Regulator, John Swift, to set up an inquiry into the companies' operation and possible regulation. The Regulator suspected that

companies were managing their affairs with a view to short term cash maximisation, and failing to take a positive and proactive approach to the provision of future rolling stock needs. However, the problem with investment in rolling stock is complicated by the relatively short term franchises held by the train operating companies and by the fact that many of the franchises will be renegotiated around 2002-03. With a standard franchise length of seven years, the acquisition lead time (around two years) and the high cost of new rolling stock militate against rolling stock lease or purchase other than at the commencement of a franchise (Kain 1999, p. 256).

There are two obstacles to leasing new rolling stock halfway through a seven year franchise. First, the chosen rolling stock leasing company cannot be sure, if the franchise changes hands after a few years, that the new owner (or any other train operating company) will want its trains. Thus, the residual risk is high and must necessarily be reflected in the rental charged. Second, it costs money to introduce new types of rolling stock; depots have to be modified, and maintenance staff and drivers have to be trained. Connex claims that it incurred £500 000 in start up costs before its Gatwick-Rugby service carried its first passenger (*Modern Railways* 1999c, p. 228).

The seeming unwillingness of rolling stock leasing companies to bear the risks of speculative rolling stock orders, coupled with the train operating companies reluctance to invest in new stock as a result of the relative shortness of their franchises, poses problems for the privatised rail system.

Who will order the new equipment needed to sustain industry growth? One possibility is that franchise extension will be tied to commitments to introduce new rolling stock. Another possibility is the underwriting of additional investment by the Office of Passenger Rail Franchising (now the Strategic Rail Authority) through its powers under section 54 of the *Railways Act 1993* (*Modern Railways* 1999c, p. 228).

15.8 The freight railway

The volume of rail freight hit a post war high of 294 million tonnes in 1953, thereafter falling steadily to 154 million tonnes in 1980 and 100 million tonnes in 1996-97. When rail was privatised it was carrying about one third of the tonnage handled in the mid 1950s, despite freight transport task having roughly doubled in size (Glover 1997, p. 802–3).

Prior to privatisation, British Railways' rail freight business was split into three components:

- Trainload Freight, which operated a profitable business focusing on the haulage of bulk materials in trainloads;
- Railfreight Distribution, which operated the loss making wagon based services hauling containers and general cargo (including the Channel Tunnel services); and
- Parcels, which operated the Red Star express parcels service using passenger trains and mail trains for the Post Office.

Consultants advised the government to split trainload freight into three businesses, based on broad geographic regions (Joy 1998b, p. 41; and Welsby and Nichols 1999, pp. 64–5), but the winning bidder for all three trainload franchises (English, Welsh and Scottish) saw potential synergies and recombined them into a single business.

English, Welsh and Scottish was also successful in its bid to operate trains for the Post Office and the Channel Tunnel freight services, thus the outcome of the attempt to create rail competition for freight was a railway with only two significant players — English Welsh and Scottish and Freightliner, the management buyout team that successfully bid for the domestic container transport business. (Heaton 1997, pp. 566–70; Welsby and Nichols 1999, p. 65; *Modern Railways* 1999e, pp. 265–9).

An open access regime exists for rail freight, leading Joy (1998b, p. 40) to observe that 'contestability within rail freight operations rests on there being a sufficient number of other approved operators to offer competitive solutions … without any particular operator having any advantage in access charges unrelated to cost differences.' Entry has been limited to specialist operators hauling in-house loads of aggregates and bulk minerals.

As Joy (1998b, p. 41) notes, freight covers the marginal infrastructure costs it imposes on a railway which has a capacity determined by passenger needs. The Rail Regulator has published a set of principles for freight access pricing, focusing on the setting of maximum (standalone cost) and minimum ('direct' cost) prices in an environment in which most freight users' charges will be negotiated within these limits (Joy 1998b, p. 42).

Within the constraints posed by the availability of freight paths, English, Welsh and Scottish and Freightliner have expanded the freight market since privatisation. There has been a 40 per cent increase in freight tonne kilometres since 1995, with freight traffic expected to achieve another 12 per cent volume increase this year. Railtrack's 1999 Network Management Statement is based on accommodating

15 per cent in traffic growth for each of the next five years (*Modern Railways* 1999f, p. 324; *Rail* 1999b, pp. 32–4).

The most serious constraint facing rail freight is access to key paths on the rail network. Paths on the both the East Coast and West Coast main lines are scarce. Capacity on West Coast main line following its £2.2 billion upgrade (see above) will be extremely scarce. Current plans envisage the establishment of a new freight corridor from the Channel Tunnel to Scotland via the lesser used Midland main line, the Settle and Carlisle line (saved from closure in the late 1980s), and the Carlisle–Dumfries–Kilmarnock line.

15.9 Conclusions

The switch from the State owned British Railways — a vertically integrated provider of rail services operating with a command style management culture — to a privatised, vertically and horizontally separated industry comprising a large number of companies contracting with each other implied a major shift from managerial to market coordination. Not only was the legislation underlying rail privatisation (the *Railways Act 1993*) rushed to meet political objectives, but the contracts, licences and leases which underpin the privatised railway were developed hastily. For this reason, as well as others, the contractual matrix which emerged contained numerous flaws.

We have focused on several problem areas. To begin with, the structure of Railtrack's access charges appears flawed. First, the pricing signals sent to the train operating companies do not reflect the opportunity cost of track usage, especially in peak hours and where track 'bottlenecks' exist. The train operating companies have responded by running frequent short trains, partly because frequent services are a marketing advantage but also because they want to occupy as many train paths as possible to keep out potential competitors. Second, while there are incentives to maintain existing infrastructure, there is no contractual incentive to provide additional capacity in the event of traffic growth. Concerns about the provision of additional capacity led to the imposition of condition 7 in Railtrack's Network Licence. Railtrack's 1999 Network Management Statement suggests that the organisation is now willing to think about network development proactively.

The contractual arrangements and incentive structures relating to the train operating companies also appear flawed. First, there are flaws in the contractual relationship between the Office of Passenger Rail Franchising, Railtrack, and the train operating companies while, paradoxically, the lack of contractual relationships between the individual train operating companies makes for complexity in the liability regime.

Second, the benchmarks used to measure performance are flawed: Railtrack's infrastructure performance benchmarks have been set relatively low, as have the train operating companies' benchmarks for reliability and punctuality. Third, the liability regime (which sets out who pays what when someone is to blame) has some important shortcomings.

Some problems have also arisen with respect to the rolling stock leasing companies. The unwillingness of these companies to bear the risks of forward rolling stock orders, coupled with the train operating companies reluctance to invest in new stock (given the relative shortness of their franchises and the high rentals charged) poses problems for the privatised rail system. Who will order the new equipment needed to sustain industry growth?

Perhaps the most important constraint facing the freight railway is access to key paths in the rail network. Both English, Welsh and Scottish and Freightliner are growing their businesses. However, paths on the East Coast and West Coast main lines are scarce. In the absence of investment in the upgrading of the rail network, the growth of rail freight could be constrained.

More fundamentally, the privatised system needs to be rebalanced. While the Government has shifted risk to the private sector, and above all to the train operating companies, the ability of these companies to respond to the market is limited in important respects. The Rail Regulator controls rights and terms of access to infrastructure. The privatised rail industry is subject to greater regulation than the publicly owned railway it replaced.

The UK experience with rail privatisation suggests that the design of rail access regimes, the setting of access prices, and the provision of incentives to encourage an efficient and effective rail system need careful attention. While Australian rail systems have followed a different growth path from that of rail in the United Kingdom, and while the form of rail privatisation in Australia significantly differs from that in the United Kingdom, the need for care with the architecture of the privatised system, (particularly the need to structure incentives so as to bring about the desired behaviour) makes a study of UK rail privatisation worthwhile from a policy perspective.

References

British Railways Board 1963, *Reshaping British Railways*, The Beeching Report, London.

Chandler, A. 1977, *The Visible Hand,* Belknap Press, Cambridge, Massachusetts.

Ford, R. 1999a, 'Direction — the political imperative', *Modern Railways*, January, pp. 37–39.

—— 1999b, 'West Coast — der Tag looms', *Modern Railways*, June, pp. 391–3.

Forsyth, P. and Trace, K. 1999, 'Promoting efficiency in Australian railways: an exploration of the options', Paper presented at the 1999 Industry Economics Conference, Melbourne, 12–13 July.

Glover, J. 1997a, 'Franchise Performance', *Modern Railways*, September, p. 561.

—— 1997b, 'What future for Railfreight?', *Modern Railways*, December, pp. 802–3.

Heaton, J. 1997, 'The enterprise culture', *Modern Railways*, September, pp. 566–70.

Joy, S. 1998a, 'Regulating access to rail infrastructure', in Arblaster, M. and Jamison, M. (eds.), *Infrastructure Regulation and Market Reform: Principles and Practice*, Australian Competition and Consumer Commission and Public Utility Research Center, University of Florida, Canberra, pp. 130–49.

—— 1998b, 'Public and private railways', *Journal of Transport Economics and Policy*, vol. 32, no. 1, pp. 27–49.

Kain, P. 1998 'The reform of rail transport in Great Britain', *Journal of Transport Economics and Policy*, vol. 32, no. 2, pp. 247–66.

Kessides, I. and Willig, R. 1995, *Restructuring Regulation of the Railroad Industry: Public Policy for the Private Sector*, World Bank, Washington, DC.

King, S. 1997, 'National competition policy', *The Economic Record*, vol. 73, no. 222, September, pp. 270–84.

Knight, S. 1999, 'Removing the fudge from railway performance', *Rail*, 24 March–6 April 1999, pp. 26–7.

Modern Railways 1997a, 'Regulatory Reform – 3: Swift's finest hour', September, p. 551.

Modern Railways 1997b, September, pp. 560–1.

Modern Railways 1997c, November, p. 696.

Modern Railways 1998, 'Railtrack in a spin' December, pp. 799–800.

Modern Railways 1999a, 'Incentives to run a better railway', February, pp. 92–3.

Modern Railways 1999b, 'Infrastructure provision', February, pp. 114–7,

Modern Railways 1999c, 'Franchises - renegotiation may not mean extension', April, p. 228.

Modern Railways 1999d, 'Felixstowe upgrade', April, pp. 244–6.

Modern Railways 1999e, 'Confidence in freight', April, pp. 265–9.

Modern Railways 1999f, 'Railtrack's Network Management Statement, 1999', May, pp. 324–9.

Modern Railways 1999g, June, p. 454.

Office of the Rail Regulator 1994, *Railtrack's Track Access Charges for Franchised Passenger Services: Developing the Structure of Charges — a Policy Statement*, London.

—— 1996, *Investment in the Enhancement of the Rail Network*, London

Serpell Committee 1983, *Railway Finances*, Report of a Committee chaired by Sir David Serpell, London.

Productivity Commission 1999, *Progress in Rail Reform*, Draft Report, AusInfo, Melbourne.

Rail 1999a, 'Rails to be relaid through the peak?', 7–20 April, pp. 32–34.

Rail 1999b, 24 March–6 April, p. 53.

Welsby, J. 1998, 'On track for the millennium', *Modern Railways*, March, p. 160.

—— and Nichols, A. 1999, 'The privatisation of Britain's railways: an inside view', *Journal of Transport Economics and Policy*, vol. 33, no. 1, pp. 55–76.

Winsor, T. 1997, 'Regulatory reform: simplification and streamlining', *Modern Railways*, p. 696.

—— 1998a,'Performance and liability — 1: General Principles', *Modern Railways*, June, p. 149.

—— 1998b, 'Performance and liability — 2: through the looking glass', *Modern Railways*, June, p. 364.

—— 1998c, 'Strategic Rail Authority', *Modern Railways*, October, p. 652.

—— 1999, 'Monopoly power', *Modern Railways*, January, p. 13.

Williams, A. 1999, *Modern Railways*, April, p. 294.

16 Rail access and rail reform

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16.1 Introduction

Rail has long posed difficult policy issues for Australian governments. Ward (1965, p. 13), in his history of Australia, comments that 'Governments can be heartily damned because the railways constantly drain the public purse and, more cogently, because lack of official foresight long ago saddled the country with three different railway gauges'. These two issues dominate virtually all discussion of rail: problems relating to profitability and the development of a national transport system. They are the main issues emphasised in Treasurer Costello's reference to the current Productivity Commission (1999) inquiry into *Progress in Rail Reform*.

The causes of these concerns relate to decisions made in the past, often the distant past. Australia after 1850 was developed with great optimism and at high rates of growth. The policy mindset of the time was that demand (from migrants and increased prosperity) would grow to justify supply decisions. State governments assumed a central role as an agent of development and especially of decentralised development: 'What government could do was to encourage people to make one choice rather than another, by making one financially more attractive. They helped rural settlement by irrigation, by building roads and railways and by subsidising the production of some products … They aided industrial decentralisation by freight concessions on the railways' (Shaw 1944, pp. 194–5). In retrospect we realise many of these development decisions were poorly judged. As we have come to understand our climate and the impact of development on our soils and water, it has become clear that the vision of a densely populated country with intensive farming is probably inappropriate for most areas of the country.

The initial approach to development had some logic. Much of the benefit from rail development accrued through increased land values, and the attempt to internalise these benefits involved either the American approach of making land grants to rail

developers or allowing the State (through its capacity to tax increased land values) to develop the rail system.

The failure of the vision would not have caused major concerns except that these investments have had long lived consequences. Infrastructure such as roads, water and irrigation systems, and railways have project lives of over fifty years. Once infrastructure is in place, the economic, social and political analysis changes. Fixed costs become sunk costs and calculations on whether to maintain an existing facility depends on marginal considerations. At the same time, 'sunk' infrastructure attracts interest group support from resident and regional interests, as well as from the industry, and these hinder subsequent reform.

The development of the National competition policy provided a framework that should make it easier for States to overcome some of these difficulties.

- A national policy makes it easier for a jurisdiction to act because each can argue that the reform decision was not their decision but stems from a national agreement.
- The policy attracted bipartisan support when it was signed, so governments have a defence to charges that such reforms are politically motivated.
- Financial payments to States that comply with the policy provide both an immediate incentive and a budgetary justification for reform.
- The structure and interlocking design of the implementation stages create a momentum for reform which would be difficult to stop.
- Some key reform stages involve tests where competition (not the status quo) is the starting point against which alternatives are considered.

Competition policy as embodied in the Competition Principles Agreement provides four broad elements that may be applied to rail: competitive neutrality, structural separation, legislative review and third party access. This paper concentrates on all elements but legislative review.

A central issue for policy reform involves choosing which of these tools is appropriate in any particular case. The purpose of this paper is to consider the role of the tools provided by the Competition Principles Agreement for the rail industry.

16.2 Rail — the background

Rail in Australia became a predominantly government concern from the 1850s. The industry grew strongly until the 1920s because it was superior to water and animal transport systems, but gradually gave way to private motor vehicles as public

investment in roads grew. At their peak, the Australian State railways were massive undertakings constituting some 20 per cent of total gross capital formation (public and private) in the economy in 1900. Rail debt then amounted to some 60 per cent of total public debt.

Butlin, Barnard and Pincus (1982, p. 260) argue that part of the reversal of this trend arose because '[After 1910] criteria were relaxed drastically in investment planning as well as in output and price policies. In the interwar years price concessions proliferated in response to the growth of highly organised pressure groups, especially rural'. Lines were built even where revenue was expected to be less than three quarters of operating costs, and even then revenue targets were not met. At a best interpretation, much of Australian investment in rural rail occurred on the assumption that revenues might cover 'marginal cost' and generate development externalities that would justify the initial investment.

Butlin, Barnard and Pincus (1982, p. 261) also argue that the railways effectively lobbied to protect rail through regulatory devices and to hinder the growth of competing services such as urban bus services. The railways tried to capture alternative modes of transport, which sometimes involved control of other modes of transport through proposals for greater 'transport co-ordination'. Butlin, Barnard and Pincus reinterpret this phrase as 'restraint of competition'.

History also suggests that governments have long struggled with the issue of managing railways. Butlin, Barnard and Pincus (1982) comment:

> Victoria had pioneered the system of confining ministerial writ to general matters of policy (p. 260) [which we now see as an important feature of corporatisation];
>
> Victoria led in experimenting with an arrangement [whereby] the Treasury was to compensate the railways for loses caused by Parliament or the Minister (p. 264) [which we might now term community service obligation payments];
>
> [The New South Wales view as put by the Valuer-General was that] in the long run it is perfectly immaterial whether [some department] made a profit, so long as the State as a whole is able to balance its accounts (p. 264);
>
> [The relevant Victorian minister argued that] the chief reason against operating railways at a loss is the slackening in efficiency (p. 265).

Victoria was not blameless in this exercise. Victorian firms were given preference in railway contracts, even when they bid 50–60 per cent above prices bid by interstate firms.

Much rail investment thus seems to have depended on broad developmental externalities for its justification. The analysis behind these expected external benefits was weak and exaggerated. In addition, the revenue estimates turned out to

have been inflated. The optimism of development was such that rail track grew from 19 000 kilometres in 1900 to 46 000 kilometres by 1935; employment over the same period grew from 46 000 to 167 000. The reversal of this trend is such that rail track in place is still at the 1935 level, while employment has fallen to around 38 000.

The current situation

The Productivity Commission (1999) report on rail reform evaluates the current system. It provides a convenient classification of the characteristics of the Australian networks (table 16.1). 'Network independence' is taken to mean that a rail system is not significantly interconnected with other rail systems, so urban rail systems and bulk commodity lines, for example, are differentiated. The 'Intermodal competition' findings emphasise that road and water transport are good substitutes for rail in most applications. The 'Rail competition' characteristic illustrate owners' limited use of competition for rail markets and the equally limited use of track access arrangements which allow different operators to compete on the same rails. 'Commercial operation' judgements relate to whether the operations of the lines are commercial. The only clear case, in the Commission's view, relates to the high volume regulated routes which specialise in bulk commodities such as coal and iron ore.

Table 16.1 **Characteristics of Australian railway networks**

Characteristic	*Urban passenger*	*High volume regional*	*Low volume regional*	*Interstate*
1. Network independence	Mostly	Mostly	No	Yes
2. Intermodal competition	Yes	No	Yes	Yes
3. Rail competition				
– For the market	Some	Limited	No	No
– Between train operators	No	No	No	Yes
4. Commercial operation	No	Yes	Uncertain	Uncertain

Source: Productivity Commission (1999, table 2.6, p. 21).

The above table provides a summary of the current situation in the rail industry. The following section will take this as substantially describing the industry and considers what is the appropriate use of competition policy as a reform tool within that framework.

16.3 A taxonomy of reform

King and Maddock (1996a) provide a basic framework for the analysis of reform of industries that may be considered candidates for possible access regulation. The approach depends on drawing a clear distinction between a facility constructed with a natural monopoly technology that a particular supplier may use, and the extent to which that facility is essential for firms to operate in a particular final market. To take an example from another industry, a gas pipeline may be a natural monopoly technology but the energy that it provides may compete with other technologies such as electricity in the final energy market, so ownership of the pipeline does not confer market power in the product market.

In this view, the existence of a natural monopoly technology in the hands of a particular producer does not imply a problem with competition in the product market. A main concern with much of the analysis of railways has been the overemphasis on the technologies and an insufficient focus on product markets.

We propose that policy makers should consider a simple two-way matrix (table 16.2) when evaluating whether to impose an access regime on an industry and when deciding what type of regime to impose.

Table 16.2 **A taxonomy of monopolies**

Essential to compete in market	*Natural monopoly technology*	
	Yes	*No*
Yes	Essential facility	Regulatory monopoly
No	Convenient facility	Competitive facility

Source: King and Maddock (1996a, p. 32).

The definitions used in the matrix are:

- *essential facilities.* If a facility employs a technology that meets natural monopoly tests and is essential to compete in a market, then it should be considered appropriate to use a legislative access regime along the lines established in part IIIA of the *Trade Practices Act 1974*;
- *regulatory monopolies*. These are cases of monopoly provision where the technology involved does not meet the criteria of a natural monopoly but is still essential for production of some downstream service. Policy issues may or may not arise, depending on the reasons for there being only one producer. If the reason is another regulatory decision, such as an environmental restriction or

other similar policy action, then the 'regulatory monopoly' may warrant the introduction of an access regime. If there is such a restriction, a policy judgement is needed on whether it is better to remove the restriction and allow entry, or to retain the restriction and develop an access regime. If the monopolist has a first mover advantage, but entry is possible, then it may be best to take no action. A further alternative involves the use of policy to accelerate the development of alternative infrastructure. This seemed to be the underlying strategy in telecommunications reform whereby Optus was protected from subsequent entry on the condition that it rolled out infrastructure in opposition to Telstra. Likewise in the gas industry in Victoria (and perhaps other States), the development of facilities in competition with existing infrastructure was seen as a device to promote competition to a powerful incumbent. The development of the national electricity grid is another example, as is the broad policy of mutual recognition between the States;

- *convenient facilities.* This is situation that we feel applies most frequently with rail: there is a natural monopoly technology but it is not essential to serve a market. Rail services may be produced under a natural monopoly technology but they operate in a broader transport market that is also served by a range of alternative technologies. It may be convenient for freight forwarders and other to have access but it is not essential. This will be discussed in more detail below; and
- *competitive facilities*. The technology in these cases is not a natural monopoly, and the product is not essential to serve a market.

Definitional issues

The analytical framework above assumes that we are able to make two difficult judgments — one related to technology and the other to markets. It is difficult to establish that the conditions of a natural monopoly are present in particular cases, but the presence of large fixed costs and low variable costs mostly serve as an adequate proxy. The actual phrase used in part IIIA of the Trade Practices Act — 'that it is uneconomical for anyone to develop another facility to provide the service' — is clearly inadequate because the terms 'uneconomical', 'anyone' and 'another' produce contentious interpretations.[1]

However, market tests have proven even more contentious. Most market definitions depend on consideration of substitution in demand and supply, pricing and other behaviour, as well as the purpose of the analysis. These tests are difficult to apply

[1] See chapter 5 of King and Maddock (1996b) for an extended consideration of these issues.

when considering whether to allow access to what has been an integrated process: there has been no competition and there often are no prices.

The wording of the part IIIA (s44G[2][a]) does not help: 'that access … to the service would promote competition in at least one market … other than the market for the service'. This has led the National Competition Council to use *a priori* evaluations of 'functional markets' to distinguish between the market for the service and the other market in which competition would be promoted; that is, somehow they have to establish that there are two markets. The Ergas test that they have used asks whether the functional layers can be separated and whether different assets are used in each stage. If both questions are answered in the affirmative then the National Competition Council has argued that they are separate markets. Thus the council found that the hard-stands at Sydney airport are in a different market from various other services at the airport, and that above rail and below rail services are provided in different markets.

Such distinctions are difficult to make. The difficulty of defining functional markets where none exist was important in the Hamersley/Robe decision in the Federal Court. The National Competition Council position that underpinned Robe's approach was that the Hamersley rail facility could be treated as being separate from its other activities. Access to the rail would thus promote competition in those other markets. The court decision appears to mean that this definition of 'functional markets' where none exists has failed its first major legal test. The functional approach may allow us to define separate functional stages, but is clearly not enough to define separate functional markets.

16.4 Where does rail fit?

Rail mostly appears to meet the weaker natural monopoly technology test suggested above. It will generally not be desirable to build two parallel sets of railway lines, although both BHP and Hamersley have built parallel lines in the Pilbara and Robe obviously seriously considered establishing its own. Returning to the classification suggested by the Productivity Commission, this section considers the appropriate policy judgment based on the taxonomy developed earlier.

A difficult issue in the public policy debate concerning intermodal transport involves the extent to which competing modes face different effective tax regimes, generate different externalities, and so on. The advantage of using the national competition policy as a starting point is that it requires governments to develop neutral regimes where public and private businesses are in competition. Governments can thus be expected to provide an efficient taxation environment

within which intermodal competition can occur. Alternatively, in the absence of any clear resolution of the extent to which road and rail compete 'fairly', the most appropriate policy approach is to treat them as if they do compete (see Ng [1983] for a treatment of the theory of the third best).

Urban passenger transport

In the Productivity Commission's analysis, urban passenger transport generally operates independently of other rail networks. This facilitates case-by-case policy making. Urban rail passenger systems face strong competition from other modes of transport, particularly private vehicles, and are not profitable. 'In Queensland, the average government payment (subsidy) per urban rail passenger journey is over five times the average fare paid by passengers' (Productivity Commission 1999, p. 22).

The analytical framework would thus suggest that urban passenger transport is a convenient facility — that is, that it would not be socially desirable to duplicate the tracks and that it may be convenient for others to use them, although this is not essential for competition.

Given that the competitive pressure from other modes is so strong that rail is uncompetitive, it may not be appropriate for rail to operate in such an environment. A policy decision to maintain the urban rail passenger system thus hinges on a policy judgment that social benefits exceed the losses incurred. The starting point of policy is then to evaluate the cost of continuing to operate the system against the social benefits being generated. Probably the best way of determining the least subsidy required would be to put the service to tender (as the Victorian Government has done) and then judge whether this cost is less than the social benefits. Thus, a key reform issue is how to impose pressure on the operators to operate a system with the least subsidy. Corporatisation, strong business plans, incentives linked to reductions in required subsidy, and so on — all should be considered essential elements of any reform package. Whatever the approach under competition policy, States are obliged to undertake a rigorous analysis of any public firm that is in competition with private firms, and to make any subsidy transparent as a community service obligation payment.

High volume regional transport

The high volume regional rail lines are mainly dedicated to specific commodities handled in bulk, such as coal and iron ore. The Productivity Commission analysis suggests that they are mainly separate from the general rail networks, face no intermodal competition, and are profitable. This would mean that they are 'essential

facilities' and thus it is appropriate to evaluate them in terms of part IIIA of the Trade Practices Act.

The application of part IIIA is subject to numerous difficulties. The National Competition Council has tended to the view that rail track is in one market and rail haulage over the track is in another. Thus it follows that access to the service provided by rail track will promote competition in the market for rail haulage. Some governments and owners have facilitated this interpretation by separating their enterprises vertically into track access corporations and rail haulage companies. The case is far less clear when owners do not make such a separation.

Low volume regional transport

The low volume regional systems, which can be termed intrastate systems, generally face strong competition from other modes of transport. Again, they have a natural monopoly technology that is not essential to operate in the relevant transport market, and thus should be classified as a convenient facility. This means that it may be convenient for others to access the facility but the use of Part IIIA would generally not be appropriate.

Given that road transport can impose competitive pressure on intrastate rail, there is probably no need to regulate this rail system at all. The key policy issues are for State governments to determine the appropriate mechanisms to induce the managers of rail systems to operate them as efficiently as possible. Evidence from the sales of Tasrail and V/Line Freight suggests they can be operated commercially without subsidy. The fact that the Victorian and Tasmanian systems operated at a loss in public hands but at a profit in private hands suggests that management and operational contracts had been poorly designed.

Interstate transport

The interstate network appears functionally similar to the intrastate networks — that is, subject to strong intermodal competition and of uncertain profitability. The Commission reports that only about 14 per cent of the net tonne kilometres of freight transported in Australia in 1994–95 were carried by rail, compared with 24 per cent by road and 62 per cent by sea. The gradual decline in rail relative to road (in particular) has been evident for half a century, with rail having fallen from 32 per cent of total freight tonne kilometres in 1950 to 24 per cent in 1960 (Butlin, Barnard and Pincus 1982, p. 284). Road and rail split the land freight task on the Melbourne to Perth route approximately 40:60, while the split is 70:30 on most other long distance routes. Further, there has been some downward movement in

rail prices as if in response to the competitive pressures (although, under government ownership, accumulating losses and a failure to cover even operating costs, are alternative indicators of competitive pressure).

This would suggest that there is no particular reason to support the promotion of competition by using an access regime, because the competition from other modes has proven effective in shifting volumes from rail. Accordingly, if owners wish to implement access regimes — for example, by splitting track from above rail operations, then this may be a sensible tool for ensuring better management of their facilities but it should be understood as simply a management tool.

16.5 Conclusion

It seems essential to consider the separate characteristics of rail systems in the process of designing rail reforms. Much of the current infrastructure was developed in public hands on the basis of inappropriate investment appraisal. The investment analysis was falsified by underestimation of the potential for other forms of transport infrastructure to compete with rail. In terms of pro-competitive reforms, probably not much needs to be done. Rail suffers from an excess of competition.

The principal manifestation of the competitive pressure on rail is the large accumulated and ongoing deficits of the sector and its failure to provide an adequate return on investment. Pro-competition reform is designed for monopolists setting prices too high in the search for excess profits. This is clearly not the problem with rail. In general this means that access regulation via part IIIA of the Trade Practices Act is not the appropriate tool to use in rail reform.

The failings of rail seem to be those of most loss making public enterprises. The fact that these enterprises lose money debilitates their financial controls: it makes it hard to resist other loss making initiatives; it reduces the search for additional revenues; and weakens policy control.

The solution to the problems of rail lie in the organisational and incentive structures, rather than in the absence of market pressures. Owners may choose to impose access regimes on their entities, possibly by establishing separate track access entities, but well managed rail operators would already have such regimes in place if access could generate increased revenues. If contracting out services was the most effective way of running a railway, then again the rail companies would already have taken this step. To the extent that government owned railways did not pursue these routes for increasing revenues and controlling costs, government control has been deficient.

The persistent failure of policy makers to impose adequate controls no doubt has its basis in history. Railway departments were powerful entities and large employers in most States. At their peak, they constituted some 20 per cent of total gross capital formation (public and private) and employed over 5 per cent of the total workforce, of which much was outside the capital cities. The interesting question is why it has taken so long for policy departments in State governments to address the clear failures in managing their rail enterprises.

References

Butlin, N., Barnard. A., and Pincus, J. 1982, *Government and Capitalism*, Allen and Unwin, Sydney.

King, S. and Maddock, R. 1996a, 'Competition and almost essential facilities: Making the right policy choices' *Economic Papers*, vol. 15, no. 3, pp. 28–37.

—— 1996b, *Unlocking the Infrastructure: the Reform of Public Utilities in Australia*, Allen & Unwin, Sydney.

Ng, Y. 1983, Welfare Economics: *Introduction and Development of Basic Concepts*, Macmillan, London.

Productivity Commission 1999, *Progress in Rail Reform*, Draft report, AusInfo, Canberra.

Shaw, A. 1944, *The Economic Development of Australia*, Longman, Melbourne.

Ward, R. 1965, *Australia: A Short History*, Prentice Hall, Sydney.

APPENDIXES

A Contributed paper sessions

Access issues

Ergas, H., Makinson, T. and Small, J., 'The consistency of regulated rates of return'.

Freebairn, J., 'Access to and pricing of meteorological services'.

Ralph, E., Little, I. and Wong, E., 'Regulation and the convergence of telecommunications and publishing'.

Competition policy

Jones, E., 'The Howard Government's industry policy'.

Moran, A., 'Property rights and competition policy'.

Plunkett, H., 'The impact of competition policy reforms on rural and regional Australia'.

Microeconomic response to the Asian crisis

Hu, M., 'The evolution and adaptability of SMEs: the case of Taiwan'.

Kim, J., 'Korean crisis and macroeconomic and microeconomic adjustment'.

Kun-Wen, L., 'Effects of government policy on Chinese industrial structure'.

Regulation and cost issues

Byron, N., 'International liner shipping: a preliminary assessment of part X of the TPA'.

Ergas, H., 'TSLRIC, TELRIC and other forms of forward-looking cost models in telecommunications: a curmudgeon's guide'.

King, S., 'Does structure dominate regulation? The case of an input monopolist'.

Ralph, E., 'The regulation of monopoly'.

Rail access arrangements

Forsyth, P. and Trace, K., 'Promoting efficiency in Australian railways: an exploration of the options'.

Zhao, Y., Jomini, P. and Chan, C., 'Impact of rail characteristics and policy changes on the productivity of Australian railways'.

Utility regulation

Davis, K., 'Asset valuation, cost of capital and access pricing in the Australian gas industry'.

Kaur, K. and Chapman, D., 'Draft statement of principles for the regulation of transmission revenues'.

Division of Labour

Ke, L., 'Division of labour, specialisation and the violation of property rights system: a general equilibrium analysis'.

Shi, H., 'Division of labour, coordination and underemployment'.

Smyth, R. and Lo, D., 'Theories of the firm and the relationship between different perspectives of the division of labour'.

Performance, innovation and industry structure

Bhattacharya, M. and Bloch, H., 'Adjustment of profits: evidence from Australian manufacturing'.

Bloch, H., 'Does foreign trade substitute for domestic competition policy?'

Rogers, M., 'The influence of diversification and market structure on the R&D intensity of large Australian firms'.

Industrial structures in Asia

Liu, M., 'Democratic transition, import protection and trade liberalisation: a political economy approach to the case of Taiwan in the 1990s'.

Min, B., 'Post crisis prospects for Korean banks' monitoring of business groups'.

Ray, D., 'The Krismon and Indonesia's industrial technological challenge'.

Telecommunications

Binder, M., ‘International telecommunications market regulation’.

Ergas, H., Makinson, T. and Small, J., ‘International benchmarking of telecommunications: measurement choices’.

Hardin, A. and Ergas, H., ‘Depreciation in telecommunication economic cost models’.

Market structure and the firm

Forsyth, P., ‘Airline deregulation in Australia: a medium term assessment’.

Prentice, D., ‘A differentiated products model of the demand for Portland cement’.

Valenzuela, R., ‘Downsizing and firm performance in Australian enterprises: evidence from IBIS and the 1998 organisational restructuring survey’.

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