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Competition Policy and Railway Investment – Project Summary

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Competition Policy and Railway Investment – Project Summary [1]

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Abstract: *This project sought to examine the impacts of National Competition Policy (NCP) on investment in Australian general freight and passenger railways, and more generally to assess the rationale underlying NCP and related economic reforms applied to Australian railways. It does not appear that NCP and related reforms have yet had a negative impact on investment. Indeed, vertical separation may have improved investment, at least that being sourced from the public sector. However, there are some intrinsic issues associated with the application of economic regulation which could in the future retard investment, and with the predominantly public sector origin of much of recent investment. In particular, the case for economic reform seems to be weakly made: there are few rents of the type economic regulation can moderate in the logistics chains served by rail in Australia, and there seems only limited scope for sustainable competition in the above-rail task.*

The aim of this project was to examine the effects on railway investment of Australia's National Competition Policy (NCP). This investigation was undertaken within a broad context of developing a detailed understanding of the interaction between the economics of Australian railways and the economics of regulation. The project produced:

- Five working papers (three more are in the process of completion).
- Two articles accepted for publication in refereed journals (two more are currently with referees).
- Five conference papers.
- A one-day symposium on railways and competition policy.

All of the working papers will be sent to journals for publication in due course. A book focussing on the economic regulation of railways and railway economics from an Australian standpoint is also in the process of development. During the course of the project, the author also provided advice to the Productivity Commission in its report on road and rail pricing, attending seminars in Perth and Canberra at the invitation of the Productivity Commission.

Overview

Thus far, the effects of economic regulation[2] on railway investment appear to be limited. Conceivably, regulation of prices (or revenues) could restrict earnings and thus lead to fewer funds available for investment. However, only on the coal chains and the South-West Main in Western Australia (WA) do the revenue caps on Australian railways actually bite. Elsewhere, prices for third party access are far below those which would breach revenue or price ceilings. Where the caps do influence pricing, discussions with stakeholders indicate

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1 This report is a summary of the approach and outcomes of research carried on in 2005 and 2006 by Nick Wills-Johnson while a Research Fellow in the Planning and Transport Research Centre (PATREC) at Curtin University of Technology. The research was facilitated by a generous grant from WestNet Rail Pty Ltd and the Australian Railroad Group Pty Ltd. All papers and presentations are or will be available at www.PATREC.org .

2 Economic regulation of Australian railway infrastructure commenced 1996 following enactment of Part IIIA of the *Trade Practices Act 1974*.

that this has yet to adversely affect investment on the affected lines. However, railway investment has long planning horizons, and some of these lines (notably in WA) have only recently felt the effect of their ceilings. Thus, it may simply be too early for effects to be felt.

Whilst it has yet to influence the quantum of investment, stakeholder consultation suggests that regulation has caused some investment to occur later than it otherwise would have. In the coal chains in particular, temporary increases in demand were regarded as being more permanent by regulators than the railway concerned believed was the case, and the railway took the regulator to court to avoid the resultant revenue caps being enforced. The outcome was successful for the railway concerned, but had it not been, investment might have been delayed.

Beyond this specific case, there is evidence to suggest that the use of DORC and GRV[3] methodologies may slow investment. Guthrie, Small and Wright (2006) presents a model suggesting that, where the cost of investment is falling, the use of a DORC methodology provides an incentive for regulated firms to delay investment longer than is socially optimal to avoid future asset revaluations due to a concern that the current, more expensive, investment will be devalued in subsequent asset revaluations.

The decision to vertically separate some Australian railways into their above and below-rail components was not a direct consequence of the 1993 *Hilmer Report*, nor a requirement of NCP in 1995 National Competition Policy (NCP). However, the decision to apply the NCP to railway infrastructure was made on the same rationale provided by the *Hilmer Report* for electricity and gas, that it could allow competition to develop in the part of the industry not characterised by natural monopoly. Not all railways in Australia were vertically separated, and even among those where it has occurred, the industry has undergone some vertical re-integration (the takeover by Pacific National (PN) of Freight Australia in Victoria and ATN in Tasmania) and some horizontal aggregation (ARTC's takeover of NSW track and QR's takeover of ARG's above-rail operations).[4]

In principle, vertical separation might lead to efficiency losses, poorly co-ordinated investment and game-playing between above and below rail entities. With regard to Australian railways, efficiency losses do not appear to have been a significant issue (Wills-Johnson, 2007) and whilst industry consultation suggests there have been some cases of delay in investment, on the whole vertical separation does not appear to have been a major issue preventing investment in Australian railways. In fact, vertical separation might have assisted investment.

Railway infrastructure represents a substantial sunk cost. For private investors, this is an issue, but for government it can be a positive factor. By investing in the below-rail infrastructure only, government can insure that its investment is not affected by future inefficiencies elsewhere in the railway, or even by the railway operation becoming insolvent. Where the below-rail part of the railway is separated from the above-rail part, targeting investment in this manner is easier for government. There is some evidence in Auslink and smaller regional incentive schemes funded by State Governments that vertical separation has

3 DORC = Discounted optimised replacement cost; GRV = gross replacement value.

4 In both of these cases, PN has sought to divest the track component of the investment or obtain major government support to maintain it, suggesting vertical integration is not universally or automatically desirable for railways which are able to make the choice.

provided governments with more confidence in the ability of the rail system to usefully employ funding for below rail investment.
Vertical separation may have provided more scope for public investment in railways, but its original intent was to open the above-rail sector to competition. Findings from research undertaken during the project suggest there is limited scope for such competition to emerge. Except at the fringe, it seems more likely that Australia might see 'double-marginalisation', in which prices would be higher and output lower as the longer-term result of separation than would occur with the retention of a vertically integrated monopolies. Contestability may for a time deliver results similar to competition in the market, but as the industry consolidates, major players might also adopt a 'live and let live' approach, rather than contesting for each other's business.

Regulation is predicated on a belief that rent extraction in the industry concerned, absent of regulation, would have a negative effect on allocative efficiency in the economy. However, research undertaken during the project indicates that opportunities for rent extraction in railways are limited. Where rents do exist, they are generally not rents enabled by market power, but 'resource rents'. Since firms earning resource rents behave in the same way as competitive firms, the scope for regulation is limited. Resource rents dominate because the majority of the rail freight haulage task is export minerals and grains, sold into competitive world markets where the Australian logistics chains serving such markets are not monopolies.

In summary, economic regulation and mandated third party access do not appear to have had major impacts on investment in the industry, at least not yet. In essence, the industry has had to contend with bigger causes of insufficient investment than regulation. The Productivity Commission (1999) mentions aspects of the taxation system which did not then favour investment as one example, and notes that government shareholders often have very different investment priorities compared to the private sector. HRSCCTMER (1998) suggests the historically poor returns from rail and lack of co-ordinated commitment to investment on the part of government may have influenced investment decisions in rail. Regulation has relatively small effects compared to these issues. However, experience with regulation is short and aspects of the regulatory process, notably the asset valuation process, are in principle inimical to the promotion of investment. Thus, in future, investment may well be constrained for reasons other than vertical separation. By contrast, as indicated above, it seems likely that vertical separation has lead to more investment, albeit from a very low base. Much of the investment has come from the public sector rather than from a corporate sector searching for financial returns and it is not clear how the industry will fare if public policy investment priorities change before the historical backlog investment is cleared. From the broader perspective in which the goals of third party access have been promotion of competition, the findings indicate there is in fact limited scope for sustainable competition, and that the application of access regulation has sought to capture too many rail lines.

Detailed Summary of Project Findings

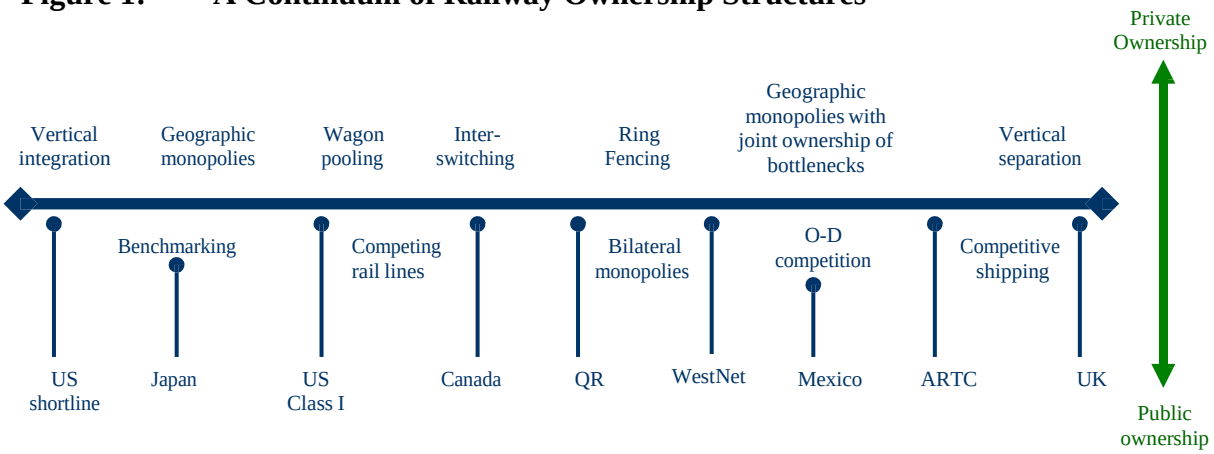
The following headings provide further details on the findings from the various publications flowing from the project[5]. A consolidated set of publications completed to date is provided as a separate document.

5 The headings under which of findings from research conducted by the author are reported here do not necessarily match the content of any single publications or working papers.

International Best Practice in Railway Reform

Railway reform involves two separate aspects: structure and governance or regulation. In neither case does there appear to be an evolving best practice model which might easily be adopted, for all that there is considerable and growing consistency among regulators in their approaches. The appropriate structure for a railway industry is very much a function of the type of competition in the market concerned. As shown in Figure One, structure can be viewed as a continuum.

Figure 1: A Continuum of Railway Ownership Structures



At the extreme left sit the US shortline railways, which are vertically integrated and often feed into Class One railways. There are few benefits from economic regulation of these railways which could not be obtained from the working of standard competition or antitrust laws, as their small haulage means they are unlikely to support above-rail competition and their customers often have substantial countervailing market power, preventing rent extraction. Japanese passenger railways are vertically integrated and profitable. Each focuses on a different geographic market based on the different nodes of economic activity in Japan. It is likely that splitting the passenger task in each market would render each railway unprofitable and thus, to prevent abuses of market power, Japanese regulators benchmark the passenger railways against each other

Where competition occurs in the market, as in North America, the market itself can create workable access regimes; US and Canadian railways have had reciprocal running rights for more than a century to allow railways to extend their reach beyond the track which they own. Pooling of freight cars (wagons) is even older, originating in Great Britain in the 1850s. Even in competitive markets, however, not all routes will be competitive, and thus North American railway regulators apply regulation selectively, where particular assets are under monopoly ownership. As these monopolies expand to cover more of the system, the rationale for vertical separation becomes stronger (where above rail competition is feasible). In markets where there is a small number of large customers (such as mineral haulage in Queensland and WA), there is limited scope for competition *in* the market, but more scope for competition *for* the market as haulage contracts are periodically put to tender. In this situation, full vertical separation seems likely to be overly costly, but a right of third-party access coupled with ring-fenced above and below-rail operations within the incumbent railway might be a useful trade-off. Again, this is consequent upon the above-rail market being able to support sustainable competition.

If the number of customers is large and each customer is small but there are many origin and destination choices, then policymakers can allow regional (vertically integrated) monopolies with origin-destination competition. Mexico is a case in point; much of the freight is for export, and there are several ports on each seaboard. Even if one railway monopolises the route to each port, if it endeavours to raise prices shippers will choose another port. Vertical separation is thus unnecessary, and origin-destination competition can provide competitive forces with limited regulatory involvement. The notion of competing logistics chains is a key theme in understanding railway competition, and is taken up further below.

Finally, where origin-destination competition is not feasible and customers are small, vertical separation coupled with regulation may be both useful and necessary to promote competition in the industry. A necessary caveat, of course is that the above-rail market has sufficient size for competition to emerge.

Public ownership is also helpful, as it means separation can be applied without expensive violation of property rights. Where, as in Australia, the presence of political boundaries between areas traversed by single railways has caused inefficient *horizontal* separation below-rail, *vertical* separation may also promote horizontal aggregation below-rail, with its resultant economies of scope. There are relatively few cases where all of these stars align; the Australian Rail track Corporation Ltd (ARTC) and UK passenger railways are two cases where it has been attempted, but only the former has been successful.

There are, in general, three alternative governance regimes which might be applied to a railway for the purpose of its economic regulation:

- **Judicial**: in which a tribunal or court operating in accordance with statutory rules and precedents determines whether economic decisions, such as rates, made by railway operators are 'reasonable'; this was typically applied in nineteenth century Great Britain.
- **Administrative**: in which appropriate rates and other economic decisions are made by a public sector manager of the railway mandated by Parliament; this was typically applied through public ownership..
- **Technocratic**: in which decisions are made by a corporate entity and overseen by a statutory regulator preserving the public interest through the use of objective models; this is the model applied by Australia's current rail access laws and codes.

'Judicial governance' would work best either where there are few cases of abuse, or where the situation is changing rapidly. If abuse of market power is a relatively rare event and/or the negative consequences are not large, the expense of permanent regulation can outweigh its benefits. In such a situation, judicial governance can be a more economical approach. The *Trade Practices Act* is an example of this approach. Judicial governance can also be useful where the situation is changing rapidly.

To operate effectively, a 'technocratic governance' model would need to operate with good information on probable demand, and a public service 'administrative model' with a clear vision of what objectives are being sought. When neither of these requirements are met, the incremental approach of the 'judicial model' in which tribunals relying upon case-law can be very useful. Indeed, when the vexed question of how much a railway should charge for its services first became an issue in nineteenth century Great Britain, the solution was to establish the Railway Commissioners Court in 1873, to work out on a case-by-case basis answers to this question. Whilst ultimately unsuccessful (it was too slow), the court formed

an important stepping-stone for policymakers to begin to understand questions related to how railways should price their services.

Administrative governance by a public service works most appropriately where there is a mismatch between social objectives and economic reality. This might be because the country is new and its economy small compared to what it might be if expensive railway investment is undertaken, as in nineteenth century Australia. Alternatively, it might be because the economic returns to the railway are far inferior to the desire of the community to have it, as is the case with most passenger railways. In such cases, there are likely to be few complaints which a judiciary could test, and fewer economic rents which a technocratic regulator could objectively assess. Since there would also be few (net) private benefits from providing the service, the only way in which a community's desire for service can be expressed is through public sector ownership and management.

It is not the case that public sector governance is diametrically opposed to private ownership. Rather, full public sector ownership and management and full private sector management and ownership lie at two ends of a spectrum defined by risk. Where the risks are high (and not compensated by expected returns), the public sector is best placed to provide the service. With slightly lower (or at least apportionable) risks, aspects of the business, such as maintenance, can be contracted out. As the risk-return balance improves further, the private sector can share more risk via a PPP (public private partnership)-type approach. Where the risk-return balance improves still further, there is scope for greater private ownership. However, with railway infrastructure, due to the sunk costs associated with its investment, there will always be some form of government involvement. Even the first British railways required assistance from Parliament to obtain the land they needed. It is not a question of whether one has public sector involvement in railways, but how much and in what form.

Finally, 'technocratic governance' involves the use of an independent economic regulator, whose task is to develop a model of the best practice railway, and then ensure that the prices charged by the actual railway reflect the costs of this best-practice model. This approach works well where railways are corporate entities seeking profit, where there are economic rents being earned and where the regulator can in fact develop a useful model of the railway. Economic regulation of railways via a technocracy began in the USA in the early twentieth century when the Supreme Court determined that railways were entitled to a reasonable rate of return under the US Constitution's 'fair taking' provisions. It was a essentially an attempt to give a scientific definition to the requirement that rates be 'reasonable', and the regulators of the day turned to the only part of the railways they could objectively and independently determine: its ideal cost structure.

Despite methodological advances such as Myerson's (1979) 'Incentive Compatible Regulation' and Beesley & Littlechild's (1983) 'CPI-X' regulation,[6] regulators still operate in much the same way as their US forebears a century ago. Incentive Compatible Regulation can be difficult to implement, and requires that some portion of the monopoly rent be given to the regulated firm to provide it with an incentive to reveal its true costs. This is often anathema to regulators, to say nothing of their political masters. In contrast, CPI-X simply takes time to correct its mistakes, and hence it has thus far only been used to alter prices between regular asset revaluations by regulators, who seem reluctant to give up their power to correct for past errors or changes in the state of play.

6 Further refined by Bernstein & Sappington (1999), with an operational example by Bloch, Kenyon and Wills-Johnson (2005).

Although it seems unlikely that regulatory policy will change substantially in the near future, it is worth understanding where its problems lie. Most particularly, this is useful for understanding the limitations of regulation, and why it might not achieve desired results. The first problem of economic regulation is a methodological flaw which cuts to the heart of the regulatory question. Lancaster & Lipsey (1956) show that if there are several sectors of the economy which price above marginal cost and in which governments control the prices of one of them, then allocative efficiency is not achieved by setting government-controlled prices at marginal cost (as regulators attempt to do). In fact, setting prices at marginal cost may move the economy further from allocative efficiency, not closer to it. Correct price-setting requires that prices be set above or below marginal cost, depending upon the degree to which the other oligopolistic goods and services are substitutes for the good or service whose price is controlled by government. This is difficult to achieve in practice, and no regulator has attempted it. However, it points to significant limits to what one might reasonably expect regulation to achieve, even if it works as intended.

Beyond this methodological flaw, there are several other issues associated with the implementation of economic regulation in Australia. These include:

- **Information asymmetry:** It is not possible for a regulator to know the marginal costs of the regulated firm as it cannot observe its inner workings. Worse, the regulated firm has no incentive to reveal the truth about its marginal costs (see Laffont & Tirole, 1993) under existing regimes. The best a regulator can hope for is to get close to marginal cost. To this end, the false precision of regulatory determinations in Australia is unhelpful.
- **Arbitrariness:** Fixed costs are allocated across users in regulatory models in ways which have no real economic meaning and hence are always inefficient. Breautigam (1980) provides a summary of the inefficiencies resulting from such cost allocation mechanisms. The use of revenue, rather than price caps in rail means efficient price discrimination is more feasible, but it is still restrained by this arbitrariness.
- **Regulatory risk:** Regulation usually occurs ex-post, when both the agency and regulated firms know if a speculative investment has proven successful. However, the investment must occur ex-ante and hence involves risk. Gans & King (2003) outline the results in detail. In short, regulation will cut off the peaks of any returns from speculative investment which turns out to have underestimated demand, but will still force firms which overestimate it to carry losses from over-investment. This is known in the literature as regulatory risk, and the only means of countering it thus far proposed by regulatory agencies is to provide a 'regulatory (or access) holiday' for greenfield investment. To be a credible commitment, this would need to be inflexible in its duration (at least across investments in a similar class) which would potentially cause problems of its own, in the same way that patents can. Moreover, 'access holidays' beg the obvious question whether regulation is actually useful for any assets.
- **Pricing atrophy:** Australian access regulation currently mandates revenue ceilings and floors, not actual prices. However, the access arrangements applying to ARTC and QR have reference tariffs, and recent changes to Victorian regulation now requires them of access providers in that State. Reference tariffs can be of value for transparency, but they can also prevent useful price discrimination. Unlike electricity and gas, rail has enormous heterogeneity in its freight task and needs to be able to apply 'Ramsey pricing'[7] to efficiently support such diversity and recover its significant fixed costs. If it cannot, some

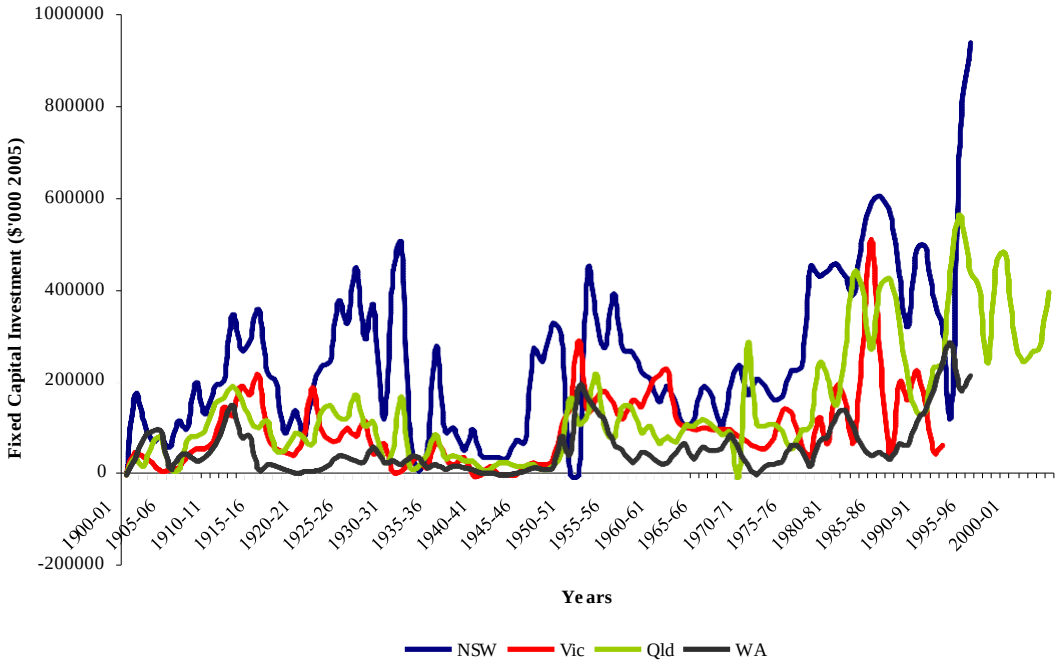
7 That is, price discrimination based on differing demand elasticities.

services cannot be viably provided. Moreover, railways need to be able to change their relative pricing structure in the event that a transport task is lost in order to re-optimise their recovery of fixed costs. If reference tariffs prevent this from happening, it is likely a large of a railway's operations will become unsustainable. In 1893, the British parliament passed legislation setting in place a number of price caps which allowed price levels to increase but allowed few changes in relative prices. By 1921, this ossified price system had led British railways close to collapse, as the demand situation had completely changed, and complete legislative overhaul was required (McWilliams, 1923).

Providing Investment Incentives

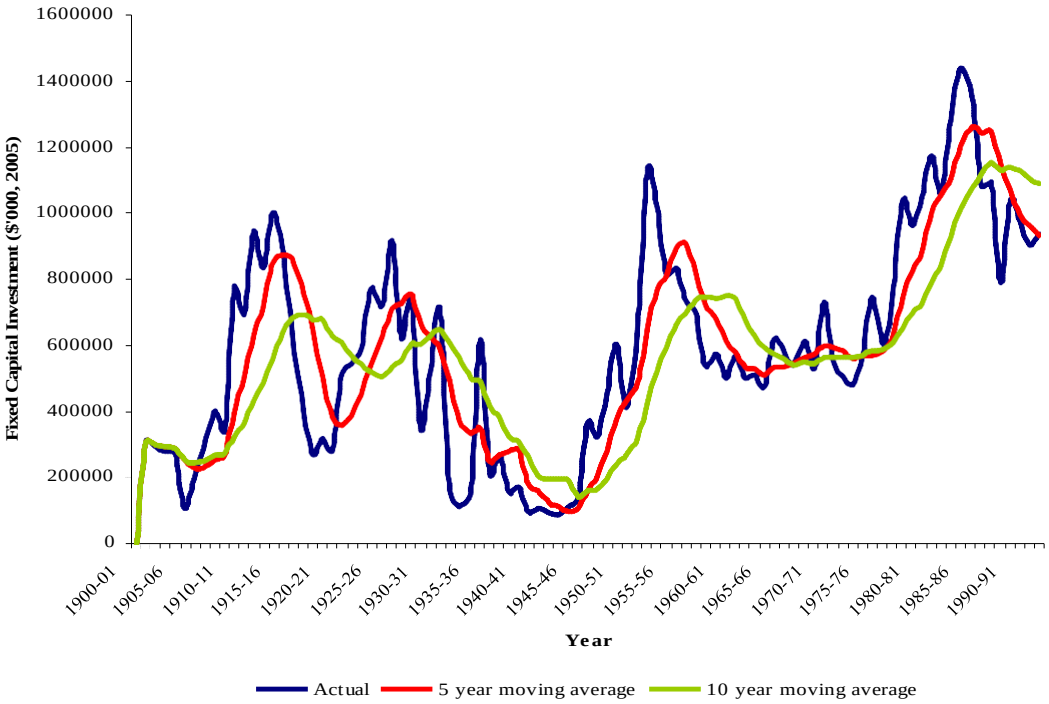
A key issue relating to railway reform is how it affects investment. Figures 2 through 5 show investment in Australian railways over the past century. Such a long record is useful because railway assets typically have very long lives; the rights of way designed in the nineteenth century are still in use today, as are bridges of the nineteenth and early twentieth centuries, track and culverts laid during World War Two, diesel locomotive acquired in the 1950s and 1960s and the wagons bought before reform in the 1980s. With such a long period of analysis, comparability becomes an issue. In particular, whilst consistent data exist in ABS publications from 1900 to around 1985, key aspects of railway costs, including the accounting treatment of assets and their values, are defined fundamentally differently today. Moreover, as railways have become more commercial, the amount of useful economic data they publish has decreased. For these reasons, the comparisons in Figures 2 and 3 are fairly rudimentary. Figure 2 shows the amount of new fixed capital investment in the four railways for which the longest time series are available. Figure 3 compares fixed capital investment per annum with its five and ten year moving averages. This is because investment in below rail infrastructure takes many years, and thus annual figures can distract from a realistic understanding of long-term trends.

Figure 2: Annual Fixed Capital Investment (NSW, Vic, Qld & WA)



Source: ABS Yearbook Australia (various)

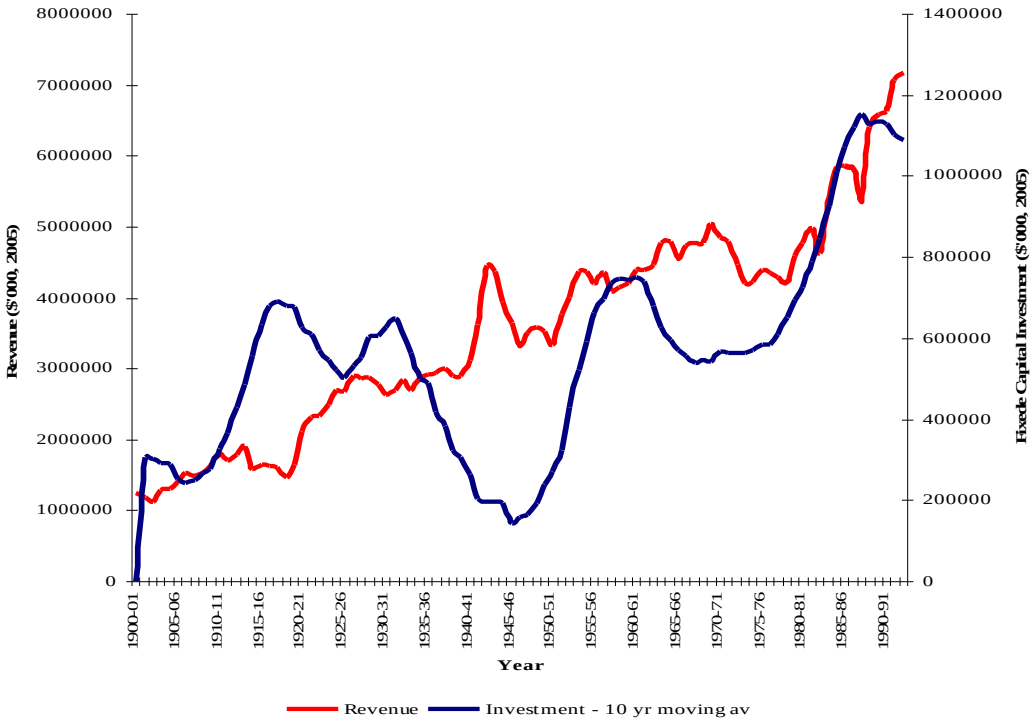
Figure 3: Annual and Average Fixed Capital Investment (Australia)



Source: ABS Yearbook Australia (various)

From Figure 3, it is clear that a cycle of roughly 30 years duration operates in regards to fixed capital investment. Up until the early 1920s, the railways were still in a building phase. With the Depression, investment slumped, and continued to slump through the war years. Investment the picked up in the early 1950s, before falling gain, only to rise in the 1980s as reforms started to make railway investment more viable.

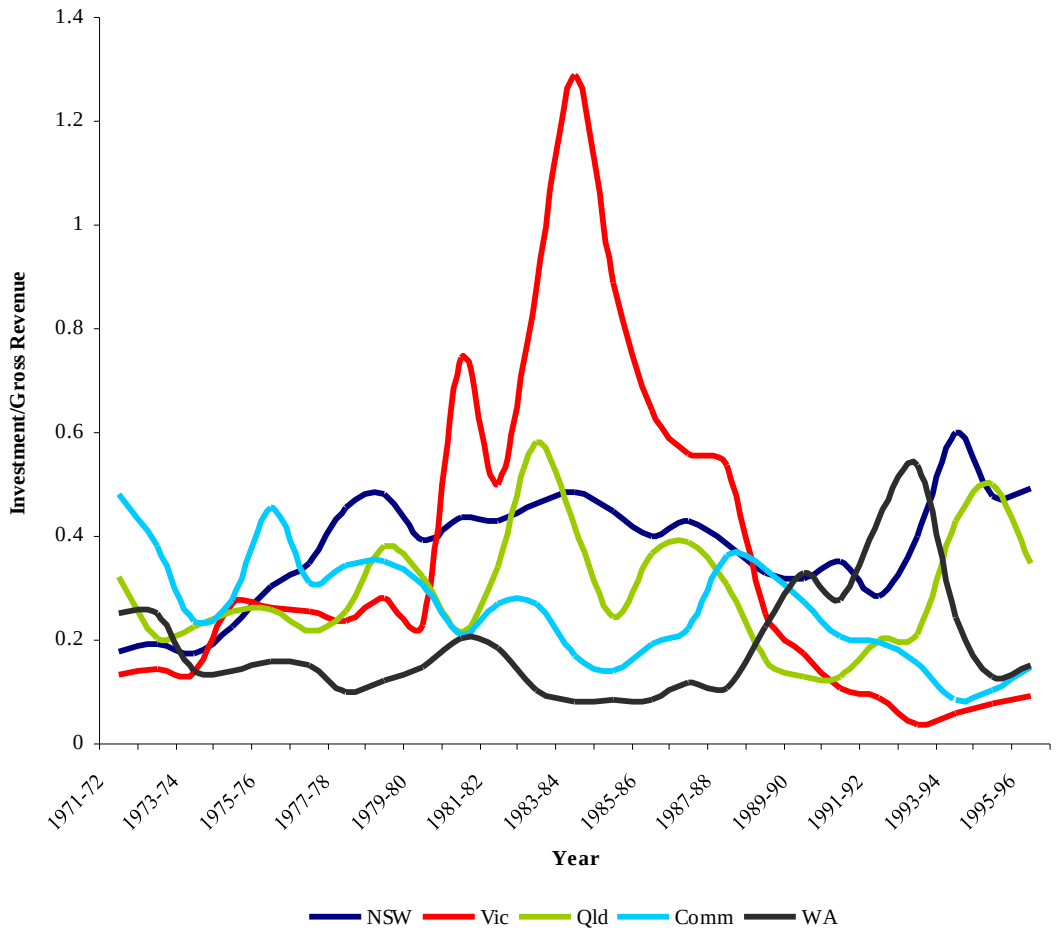
Figure 4: Investment and Revenues



It is also useful to look at fixed capital investment compared with revenues. This is shown in Figure 4. As can be seen, investment moved ahead of revenues until the 1920s, and then fell behind revenues right through until the 1980s, with a very brief period of catch-up in the early 1950s. By the 1990s it appears fixed capital investment was roughly on-track with revenue growth, though not making up for any lost ground. Over the century, annual new fixed capital investment averaged 18.43 percent of annual gross revenues.

Figures 2 through 4 are based on ABS data (augmented with other data in later years), which record only below-rail investment in the series covering fixed capital. This is because traditionally, many railways built, rather than bought their rolling-stock, meaning it was not always reliably recorded as 'capital'; ABS figures include rolling-stock construction and maintenance together. Reconciling the data back to 1900 to include above-rail investment and make meaningful comparisons with the present day is a work in progress. However, it is possible to examine investment ratios for above and below-rail investment back to 1971. This is shown in Figure 5, which covers 1971/72 to 1995/96.

Figure 5: Investment as a Proportion of Revenue



Source: ABS Yearbook Australia (various)

On average, over the period shown, the railways invested between 20 percent (WA) and 40 percent (NSW) of their gross revenues in above and below rail capital. In Australia as a whole, the average over the period was 30 percent. Despite the large peak in investment in Victoria in the 1980s, the median was roughly the same. A key issue is how this compares with the current period. Investment figures for Australian railways from 1995 to today are

shown in Table 1. Note that some data are missing for Pacific National and FreightCorp. Note also that the figures for ARG/ASR and Freight Australia are annual, not financial years, due to the reporting periods used by their American parent companies.

Table 1: Investment and Revenues 1996/97-2005/06 (%)

	ARTC	QR	ARG/ ASR	Freight Australia	RIC	Railcorp	NSW SRA	Freight corp	NR	PN
1996-97		29.71	0.18				14.13	5.88	60.54	
1997-98		29.25	5.70				15.08	7.62	12.89	
1998-99	6.14	37.51	15.08	18.24			13.49	7.13	8.82	
1999-00	48.42	38.70	16.71	17.95			18.74		14.50	
2000-01	29.48	26.52	29.91	19.93	4.75		10.64		2.61	
2001-02	18.57	19.59	13.47	18.01	12.83		9.54			
2002-03	11.61	20.09	14.33	15.59	39.03		22.89			9.59
2003-04	12.76	20.69	20.84	13.04	20.63	17.13	12.73			24.15
2004-05	10.45	27.44	23.23		5.05	22.27	0.19			16.30
2005-06	37.70	28.68				22.22	0.67			
Average	21.89	27.82	15.49	17.13	16.46	20.54	11.81	6.88	19.87	16.68

Source: Railway Annual Reports

On average, investment levels are now closer to the lower end of the range between 1971/72 and 1995/96. Overall, Australia is investing around two-thirds what it did from 1971 to 1996. This is due in part to NSW and Victoria, two of the least efficient railways, moving downwards considerably in response to privatisation of substantial parts of their rail systems. The other railways have not moved substantially downwards. Thus, the reduced average seems more likely to be a combination more efficient investment (coupled with higher revenues) than under-investment today.[8] Importantly, the combined Australian Railroad Group/Australia Southern Railroad entity (ARG/ASR) is tracking at roughly the same rate as previously recorded by government-owned Westrail; this is of particular note given the first two years in which the ASR component of ARG was operational in South Australia, which dragged the averages down. This indicates that there was not a significant change in investment profiles post-privatisation in WA. ARTC, which invests only in below-rail infrastructure, averages almost four percent more investment (as a proportion of gross revenues) than was achieved by the railways of the twentieth century in their fixed capital investment. However, since it has no above-rail operations, ARTC's revenues are likely to be lower than those of a vertically-integrated railway. Much of this investment has come from government grants: $250 million for route improvements in 1998, $450 million in 2003/04 and $100 million in 2004/05. Additionally, the ARTC received a major increase in equity when it took over the responsibility for managing the NSW network in September 2004.

For this research, the key issue in this history is what economic regulation may have done to influence the results. With such a short time since reform occurred, it is difficult to be confident about conclusions. However, a number of effects from regulation seem possible. Examining vertical separation, it could have reduced investment by changing the incentives for above and below-rail players from co-operation within a firm to rivalry in a marketplace, or it could have rendered co-ordination difficult due to differences in commercial objectives.

[8] This may not be the case in Victoria, where investment halved under privatisation. Also, the Australian average is likely to increase substantially over the coming decade as increased public investment, such as Auslink, comes on-stream. The past decade contained considerable industry turbulence, caused by the progress of reforms, and it is thus unsurprising that investment was affected.

Either or both are possible. There is some anecdotal evidence from industry consultation of difficulties in co-ordinating investment plans and of game playing by various parties. However, few stakeholders suggest this has prevented investment, merely delayed it.

Separation may also have increased investment by improving incentives for government to invest. As noted previously, governments may prefer (all else being equal) to invest below rail where the costs are sunk and the value of assets created cannot be destroyed through inefficiency or extracted through profits. By vesting track in an entity with no above-rail operations, vertical separation can facilitate this form of asset 'value' protection; there is some evidence from industry consultation and the rise of spending programmes such as Auslink that it has done so.

The presence of an economic regulator may assist in overcoming some of the incentive issues outlined above, because it can make enforceable decisions. However, a judicial process can do the same, and in any case, enforceable adjudication to moderate incentives is not the primary role of economic regulation. Its primary role is to ensure that prices reflect marginal costs, and the key question is how this role can affect investment. Regulators commonly aim for prices which reflect long-run marginal costs which, if they estimate such costs correctly, should lead to neither too little nor too much investment. Whilst higher returns are not a sufficient condition for more investment (firms could simply pay higher dividends to shareholders), they are necessary condition.

However, regulators cannot use price or revenue capping to *improve* investment, since capping can only curtail returns, not improve them. Even perfect economic regulation using price and revenue caps cannot increase investment, but its imperfections can result in too little investment in a number of ways. Firstly, a regulator may simply make poor decisions, overestimating demand or underestimating costs in the benchmark model. Because this reduces returns for the railway, investment may suffer. Whilst some isolated cases of this have occurred, industry consultation suggests that, on the whole, regulators estimate costs reasonably well. However, the length of time taken for regulatory decisions to be made can be an issue adversely affecting investment decisions. Although not entirely in the hands of regulators, the longer it takes for a regulatory decision to be made, the greater the uncertainty for the industry and the higher probability that investment may suffer. Morana & Sawkins (2000) provide an indication on how share price volatility in UK water utilities is affected by the timing of regulatory decisions, and in Australia, the recent delays to decisions affecting the Dalrymple Bay coal terminal is often highlighted as a case study in the effects of delayed regulatory decisions (see for example, Prime Minister's Taskforce, 2005). Finally, the previously mentioned issues of risk asymmetry and the poor investment incentives of a DORC approach to asset valuation can also affect the scope and timing of investment, biasing investment towards assets that are less risky or less affected by technological change.

If, at best, economic regulation is neutral in respect to investment, it is useful to examine some means of improving investment incentives:

- **Rate of return regulation:** this has fallen from favour amongst investors because of the Averch-Johnson (1962) effect, whereby regulated firms have an incentive to 'gold-plate' assets. On the other hand, if the asset base is degraded, the approach may act to improve returns, to the extent that it can guarantee a revenue stream. Pittman (2005) is one who has advocated rate of return regulation for this reason.

- **Intermodal competitive neutrality:** Policymakers can price and fund road and rail to include social costs and benefits and (theoretically) render the two modes competitively neutral. This is very difficult to achieve in practice, and has in effect been rejected by the Productivity Commission in its recent examination of road and rail infrastructure pricing in Australia. However, it is attempted in Sweden.
- **Targeted government subsidies:** Provided in cases where rail is the socially efficient choice but is not chosen because the private benefits of rail do not match its private costs (the rationale for payments to railways to compensate for 'community service obligations'). Targeted capital cost subsidies are being used increasingly to fund rail infrastructure projects in Australia. Government investment in rail links to support woodchip haulage in the South West of WA is a relatively small example of the approach, and Auslink is a much larger example.
- **Additional revenue streams:** Provided to railway owners to give an incentive for more rail to be built by providing revenue streams additional to that from rail haulage. Historically, land-grant railways fell into this category, but only one railway in Australia has been successful as a land-grant railway (the former Midland Railway from Midland to Geraldton in WA).
- **Alternative equity streams:** Where some benefits from a railway are captured by the railway's neighbours, rather than the railway owner, these stakeholders can be induced to provide equity or other funds to support the building of the railway. Many of the early British railways were built in this manner, and local branch-lines in Queensland, under Part XV of the *Local Authorities Act 1902*, could be constructed with funds borrowed from the government and repaid by local governments using levies if one-third of ratepayers in the region agreed to the proposal. The Industry Commission (1991) also advocates such a process of 'value capture', noting its use elsewhere in the world and the difficulties associated with it.

If government provides investment incentives, it begs the question whether assets thus created should be subject to regulation. It could be argued that if demand is larger than expected , regulation should be imposed to prevent excessive economic rents from occurring. However, if this policy were pursued, the same issue as raised by Gans & King (2003) would arise: the investor, aware that high returns could be truncated by regulation, might require more incentives ex-ante in order to overcome this risk. Because such extra incentives could exceed the competition and efficiency benefits of regulation, in such instances, regulation would be ill-advised.

Australian Railways and Economic Rents

Economic regulation exists to prevent railways with market power from extracting rents and hence causing inefficient allocation of resources in the economy. However, not all rents are created equal, nor do they have the same effect on efficiency. There are three types of rents:

- **Market-power rents** occur where a firm serves the demand of the whole market and hence produces a level of output at which marginal revenue equals marginal cost and takes its price from the market demand curve. This results not only in higher prices but also less output than the competitive case.
- **Schumpeterian rents** occur where a firm gains a temporary degree of market power (or cost reduction) through innovation. These rents are competed away through imitation,

and are the static efficiency price an economy pays to compensate firms for the fixed costs of research and development which underpin dynamic efficiency.

- **Resource rents** occur where a firm cannot serve the whole of the market and hence a higher cost firm sets the market price, giving the lower-cost firm rents. Importantly, since the lower cost firm does not set the price, it has no incentive to reduce output (as it would if it had market power). In fact, it has the same incentive to maximise output as a competitive firm.

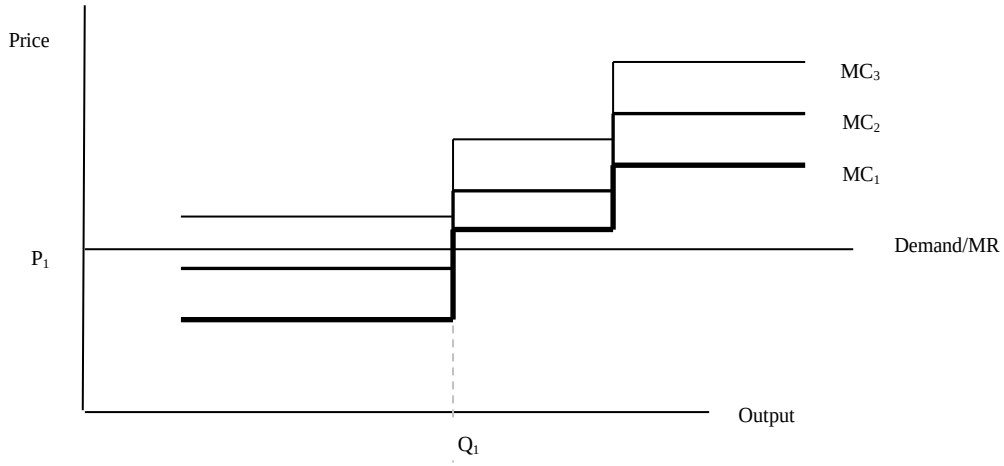
'Market-power rents' are the only rents which result in sustained, anti-competitive change in behaviour by firms and hence these are the appropriate focus of economic regulation. In considering the nature of rents, the definition of the relevant 'market' is important. Where a transport service forms a link in a logistics chain leading to a single final consumption market, regardless of whether surrounding links are controlled by the same firm, there is arguably a single market. This is because the rents exist only in the final consumption market; none of the links in the chain face some final demand, but only the derived demand expressed by the link immediately downstream from it. Friedman (1976) makes an analogous case concerning the demand for blades and handles versus the demand for knives. If the final consumption market served by the logistics chain is competitive, and there are multiple chains serving that market, then the market power of one link compared with another in the chain is irrelevant, as such market power cannot be used to collect rents which do not exist for these contending links. In this situation, economic regulation provides no value.

The requirement for a competitive final market and multiple logistics chains serving it is critically important. In some instances, the end-market may appear competitive, but be capable of monopolisation. For example, an end-market in a town might be served by numerous, competing retailers. However, if all of these retailers rely on the same railway for supply, the logistics chain is a monopoly, and the railway owner can act as a cartel manager. This occurs regardless of whether there is one vertically integrated railway, or one track owner and numerous train operators. The only difference is that the vertically integrated railway may use haulage charges to extract rents from the cartel, whilst the below-rail entity may use access charges.[9] In this situation, economic regulation is highly desirable. It ceases to be desirable if a competing logistics chain begins to service the same town, removing the monopoly of the incumbent.

In some cases, however, even where the railway in question feeds into a competitive global marketplace served by many logistics chains, there may still be scope for regulation to be useful if resource rents are available. However, the rationale is not to prevent market-power abuses. Consider a producer with high fixed costs and low marginal costs which uses a railway to transport its produce into a competitive global market – say a mine. Since the global market is competitive, the demand curve the mine faces is flat. As the mine has high fixed costs which rise sharply as capacity constraints are reached and low marginal costs when it they are not, its cost curve is stepped. The situation of such a mine is illustrated in Figure 6.

9 Note: in practice, the vertically integrated railway may be more successful, as it is closer to the final market and thus more able to observe information from it, in particular its sensitivity to prices.

Figure 6: A Railway Price Increase with Resource Rents



Consider the case where the mine is operating with a cost curve represented by MC_1. It earns resource rents, as its cost of production is below the price the global market is willing to pay (P_1). A railway serving this mine might attempt to capture some of these rents, by increasing haulage (or access) charges such that the mine's total costs of production rise to MC_2. Note that output does not change, nor does price. The only difference is in the distribution of rents. Now consider the railway increasing haulage (or access) charges to MC_3. The mine is now priced out of the global marketplace and the railway loses not just the revenue on the marginal units hauled, but all revenue from this mine. There is thus no incentive to increase charges to MC_3. Since there is no incentive for the railway to increase charges in such a way that output is reduced or prices in the final market increased, there is no role for regulation.

Very few logistics chains consist of one mine and one railway. Most have many mines, with heterogenous cost structures. Ideally, a railway would price discriminate to ensure it maximised the resource rents it could extract from each mine. However, in practice this might be very difficult to achieve. The railway faces the same information asymmetry as that faced by a regulator (see Laffont & Tirole, 1993) and the mines face the same incentives to overstate costs as are faced by a regulated firm. Thus, price discrimination may be difficult and the railway may instead decide to impose a single haulage (or access) charge; political influences might also affect this decision. This charge would extract sufficient rents from lower-cost mines to compensate for the loss of revenue from higher-cost mines which are priced out of the market by a single charge. The railway would optimise its returns over the entire range of mine output instead of over the output of each mine in turn. Here a regulator can assist. An unregulated railway will extract its sunk costs plus some resource rents. A regulator can force it to extract only its sunk costs, with the potential outcome that more small mines are made viable and output expands. In effect, regulation allows the industry to achieve a better second-best outcome. Importantly however, this is not as good as achieving the first-best outcome of efficient price discrimination. Indeed, most Australian access regulation regimes cannot assist in this regard, as they mandate like charges for like services.

A key issue for Australian railways is the type of rents available in the logistics chains of which they are part. If these are not market-power rents, then the rationale for regulation is weakened, covering only the 'many mines' case above.

The major haulage tasks of Australian railways are iron ore, coal, alumina, steel, grain and intermodal freight. Iron ore railways are currently not subject to access regulation and are

integrated into the production processes of their mining company owners.[10] However, access is being sought. As the NCC (2005) notes, global iron ore markets are competitive, so the degree to which access is an appropriate option turns on the degree to which the railway owners might be able to engage in *efficient* price discrimination. Since the incumbent railway owners are also mine owners, it is very likely they possess sufficient information to price discriminate. In fact, they could avail themselves of the resource rents associated with the ore production of third parties with relative ease through providing access. Therefore, if access imposed no risk of cost externalities on their logistics chains, there would clearly be an incentive for mining companies to provide it. The fact they do not suggests these externalities are perceived (or calculated) to exceed the resource rents which might be earned from third parties. In other words, the logistics chain may become more costly and deliver less product with an access regime than without it. Moreover, the externalities cannot be eliminated by mandated access with regulated pricing, as regulators consider only the marginal costs of access provision, not externalities. This suggests that the push for access by the NCC is misplaced.

Coal is also sold into internationally competitive markets, but the coal railways have never had operations upstream in coal mines, and thus are in an inferior position to collect the information necessary to price discriminate. Moreover, there is a multitude of mines with highly heterogeneous cost structures. As such, regulation may provide for a better 'second-best' outcome than the railways could achieve alone and thus, in the absence of mechanisms to achieve first-best solutions, may be useful. A similar argument applies for alumina, except that three of the four refineries which use rail are owned by one company, allowing it to cross-subsidise its refineries. In a static sense, this may mean access and regulation are unnecessary, but in a dynamic sense, if any refinery is viable only if cross subsidised, the mining company may decide to close it.

Grain is also sold into competitive international markets, but its production is not subject to the stepped cost curves typically experienced by mines. There are also many more producers. Therefore, a railway extracting resource rents from the larger producers seems more likely to render smaller, higher cost producers unviable, giving rise to a rationale for regulated access. However, three caveats apply. Firstly, although grain may be produced in almost perfectly competitive conditions, it is marketed through a small number of agencies, which therefore negotiate from a position of strength with the railways on behalf of growers. There is little scope for regulation to be effective in such cases of bilateral monopoly. Secondly, rail faces substantial competition from trucking, reducing the potential rents which a railway might otherwise earn. Third and finally, and perhaps most compellingly, few grain lines cover even their operating costs, and the notion that unrestrained railways might extract monopoly rents from grain haulage seems somewhat ridiculous. However, there might be some routes with relatively heavy traffic and little competition from trucking which might support two train operators. Where these exist, a case might be made for access. Elsewhere, a more appropriate focus for industry and policymakers would be the viability of the lines.

In Australia, intermodal and steel freight do not generally sell into international, competitive markets, but into domestic, oligopolistic ones, providing scope for market power rents to be earned by the logistics chain and hence extracted by the monopoly links within it. In the case of steel, however, the small number of steel suppliers provides a degree of countervailing market power and the degree to which regulation can provide improvements to the logistics

10 Some ore is hauled on the interconnected 'public railway' system, but most of Australia's iron ore is mined in the Pilbara, and is transported by private railways owned by the ore mining companies.

chain (as opposed to giving advantage to one link in it relative to another) is limited. For intermodal freight this is less the case (although many shippers, such as Toll, have substantial countervailing power). But intermodal freight is similar to grain in that it faces competition from trucks and many intermodal services and corridors do not recover their cost of capital. There is therefore only a limited rationale for access, specifically on longer lines with heavier traffic and higher potential rents. East-West corridors would appear to be among these, but there are currently few others.

Access regimes at present cover the entire integrated rail system, and this level of coverage would seem to be overdone. It is difficult to separate rail lines by commodity in order to make judgements on which lines should be open to access and which should not. However, it may be appropriate to examine each major route, the mix of freight upon it and the costs of providing and not providing access in each case, rather than simply assuming it will always be beneficial. The Productivity Commission (2006) has drawn broadly similar conclusions.

Australian Railways and Vertical Integration

From the mid 1990s, some of Australia's railways were vertically separated into above and below-rail companies (ARTC, NSW rail infrastructure, National Rail, Great Southern Railway passenger services, and NSW Freight Rail). Other railways had their respective above and below-rail operations ring-fenced (QR, ARG in Western Australia and recently Pacific National in Victoria). The basis for this vertical separation was the notion that by isolating the natural monopoly below-rail component, competition might emerge above-rail and thus lead to efficiency gains for the system as a whole. Many commentators (see, for example, Biggar, 2004) have criticised the approach citing inefficiencies which result when above and below rail operations are managed in isolation from each other, and their interactions managed via contracts. Potentially, there are two issues of principle associated with managing the interaction via contract:

- Some aspects of the interaction are difficult to write into contracts. For example, discussion with industry stakeholders suggests that early access contracts did not treat allocation of damage costs well, relying upon concepts of negligence, rather than forensic cause.
- There may be externalities associated with the interaction which can be captured or avoided if both parties are part of the same company but which cannot be effectively managed if they are separate. For example, investment in rail grinding delivers benefits train operators, but these may be difficult for the rail owner to capture if the two are not part of the same company.

The potential scope of these inefficiencies was not quantified prior to reform taking place in Australia in the mid-1990s. Some work examining the potential effects in US railways (Bitzan, 2000,2003 and Ivaldi & McCullough, 2001, 2006) has been undertaken, but the current PATREC research project has been the first time such inefficiencies have been estimated using Australian data.

This aspect of the research involved examination of the coefficients of the terms in a railway cost function dealing with the interaction between above and below rail inputs. Work done on US railways showed these were negative and statistically significant, implying that separation would raise costs. However, for Australia, the model suggests that the relevant interaction terms are not statistically significant and nor are their signs consistently negative. This makes

it difficult to conclude that there would be any substantial efficiency losses associated with vertical separation in Australia. The short time series available made it necessary to undertake the analysis using a panel data set, and it was not possible to obtain robust results for individual railways. However, testing of the characteristics of the data for each railway suggests that the cost functions of each are roughly the same, and hence that the conclusions for the industry as a whole probably apply to each of the firms in it.

Data issues aside, the author's interpretation of the outcomes from this analysis is that, whilst a perfectly operating vertically integrated railway might be more efficient than a perfectly operating contract between two vertically separated above and below firms, Australian railways in the 25 years to 1996 were a long distance from this 'efficiency frontier'. Anecdotal evidence from industry consultation also suggests that many Australian railways had less than fully effective internal co-ordination of their above and below rail activities, with the relevant professionals responsible for each task divided into disparate 'silos'. If the integrated Australian railways were not particularly efficient at the point of their vertical separation, there should be little surprise that vertical separation would lead to few efficiency losses. Some industry sources have even suggested that vertical separation assisted the industry to become more efficient by highlighting areas which needed improvement when above and below-rail entities were required to deal with each other through the transparency of contracts.

However, it does not follow from the econometric results reported above that the remaining vertically integrated railways should thus be separated, as they are different entities than they were in 1995, and certainly far different from what they were 25 years earlier. Rather, the mere fact that there are both vertically integrated and vertically separated railways in Australia provides for the possibility of a unique natural experiment in relative efficiency.

Australian Railways and Above-Rail Competition

In 1995, one of the main policy drivers for vertical separation was a belief that it would enhance the potential for competition in the above-rail task, and that this competition would produce efficiency gains for the rail industry as a whole. However, the potential for competition was assumed, not tested. Although above-rail tasks have few sunk costs, their fixed costs are high; around 20 percent of above-rail costs for Australian railways. This and the relatively lumpy investment required for entry into the market (even at a small scale) are significant barriers to entry and may mean that above-rail competition is not sustainable on many routes where haulage tasks are small. The consequences of a mistaken assumption of the viability of competition could be very important. If one vertically integrated monopoly is replaced by two vertically separated ones, then 'double-marginalisation' occurs, producing higher costs and lower output than a single monopoly.

The standard approach used in testing the sustainability of competition is to examine the 'subadditivity' of the particular task. That is, to examine whether industry output can be produced at lower cost by one firm than by two. If it can, then it is likely that one firm will come to dominate the industry and competition will be unsustainable. The test involves taking the cost function and applying it to a range of different output divisions (some 25,000 in the case of Australian railways) to ascertain if different market shares by two operators result in lower costs than a single operator. In the case of the Australian above-rail industry, there is very little evidence to suggest subadditivity, with no model specification providing more than a quarter of cases where two firms are less expensive than one. There is some variation between transport tasks, with intermodal freight being slightly more supportive of

competition than grain or minerals freight, but on the whole, policymakers should not have expected much competition to emerge, nor for any that did emerge to be sustainable.

There are, however, a few caveats. Firstly, the investigation of subadditivity' was undertaken using a cost function based on the large, formerly state-owned railways. A smaller new entrant might utilise fixed and variable costs in its above-rail operations in a different way, and hence survive as a competitor. Unfortunately, data do not exist which could confirm this. Secondly, although competition *in* the market might be difficult to sustain, it may well be possible to support competition *for* the markets of each of the major freight tasks carried by rail. Minerals haulage contracts are commonly renegotiated periodically, and the fact that access is possible allows the mines to play above-rail operators off against each other in negotiations. Anecdotal evidence from industry suggests such competition for the market is occurring already, and driving down prices. The key issue is whether competition from the fringe is sufficient in size and whether competition for the market is sufficiently long-lived (that is, the potential competitors do not adopt a 'live-and-let-live' approach to each other's market shares after an initial bout of competition *for* the market) to deliver the competitive efficiency forces desired by policymakers. In the relatively short time since reform has occurred, this is difficult to assess.

Railways and Fairness in Pricing

The economic regulation of Australia's railways is based on the neoclassical economics paradigm and the notion of economic efficiency. Although differences exist between each of the regulators in application, all operate under this fundamental paradigm, as do regulators world-wide. In Australia, there is a movement towards conformity, rather than diversity of approaches. Regulators of all kinds meet regularly to discuss best practice, and the Council of Australian Governments (CoAG) recently agreed to move towards more uniform safety regulation of rail (CoAG, 2006). Moreover, economic regulation seems to be expanding its scope of interest. In recent merger cases, the ACCC has considered the potential for market power in freight terminals, which in earlier declaration decisions had been found by the NCC not to be assets of national significance, and the NCC itself is endeavouring to extend mandated access to private minerals railways, a world first policy experiment.

Such regulatory expansionism, or mission-creep, is a common phenomenon, as Hoogenboom & Hoogenboom (1976) relate in their history of the US Interstate Commerce Commission. However, various commentators, including the Productivity Commission (2006) have advocated winding back regulation rather than expanding it. Others have suggested 'access holidays' for new investment, Gans & King (2003), and the ACCC (2002) suggests a lighter hand be applied to greenfields investment to provide better incentives for new investment than might be available in various regulatory codes. Such lighter hand regulation was in fact applied to the Tarcoola-Alice Springs-Darwin railway corridor in the 1990s, to facilitate private investment in the new line.

Could the goals of economic regulation be better achieved in a different way? Concerns associated with the nature of economic regulation based on the economic efficiency paradigm may call for examination not just of improvements to regulatory technique or rolling back of coverage, but of wholesale change to regulatory practices. One potential avenue to explore is the notion of 'efficiency' itself, and whether there might be other paradigms upon which regulation could usefully be based.

The notion that prices should be 'efficient' is a relatively new one, scarcely 100 years old. The alternative notion that they should be 'fair' is much older, dating back at least to the ancient Persians 1500 years before the birth of Christ. Decreeing that a price should be fair is relatively simple and uncontroversial, but determining what is a fair price is much more difficult. The first to seriously attempt this were the Scholastics, religious scholars in Medieval Europe. Their best answer was that a market price (produced free of coercion and with full knowledge by both parties about the good being sold) was the best standard to use in judging the fairness of a price. This suggested a link between competition and fairness. The link was made mathematically precise by game theorists in the 20th Century. Aumann (1964) showed how the game-theory notion of a 'core' produced precisely the same resource allocation as one would obtain in a model of a perfectly competitive economy. Others later extended this proof to other game theory solution concepts, including those based on fairness.

From the perspective of economic regulation and the owners of regulated assets, the most useful game theory solution concept is the Shapley Value, which is based on a notion of fair allocation. Aumann & Shapley (1974) show how this solution concept corresponds with the perfectly competitive resource allocation for a game of continuous players and Hart (1977) shows how it approaches the perfectly competitive equilibrium when players are discreet.

The Shapley Value is a widely used solution concept in the game theory literature, and Roth (1988) highlights the contributions it has made in a wide variety of fields, from voting power through to benefit and cost allocation. The latter is perhaps of greatest interest here. A famous example of cost allocation via the Shapley Value is that of runway pricing (Littlechild & Owen, 1973). A given runway might need to service a large variety of aeroplanes, each of which require a different length of runway. The question is how to charge each for the fixed costs of building the runway such that the resultant charges are fair. The answer is that the cost of the minimum runway length should be divided amongst all of the aeroplanes equally, the runway length required by the group of planes requiring a slightly longer runway should be divided evenly amongst all those planes except those which need only the shortest runway and so on. A broadly similar approach to cost allocation is used for road user charges in the price determinations of the National Transport Commission. This approach is potentially useful to railway owners not only because the same approach could be applied to railway access charges (see Fragnelli et al, 1999) but also because it can be shown that a Shapley Value provides the same resource allocation in an economy as does the assumption of perfect competition in the neoclassical economics framework. Thus it is a different way in which to achieve the same outcome desired by regulators.

The key issue in relation to notions of fairness being used in regulation is not whether they obtain a better result, as theory shows they provide exactly the same result. The question is whether this result is more easily obtained in practice. There are a number of reasons to suggest this might be the case. Firstly, a fair allocation of costs requires information only about total costs, not marginal costs, and this is easier to obtain. Thus, it might be less expensive to base regulation on fairness than efficiency.

Secondly, notions of fairness are better understood by the courts than notions of efficiency, as they are far closer to the framework with which judges and lawyers are familiar. Moreover, it is possible to make the notion of fairness more mathematically precise than it is the notion of economic efficiency, and hence it is easier to show that a party is being 'unfair' than it is to show that the party is being 'inefficient'. This would assist in formalising contracts.

A final point is worthy of note. Notions of fairness need not be restricted only to determining access prices. Other aspects of the regulatory framework might also benefit. For example, the access arrangements associated with railway infrastructure in WA contain a complex schedule of over and under-payment rules. Notions of fairness could clarify far more precisely how these might operate, greatly simplifying this part of an access contract. A similar approach might be used in relation not only to the funding of construction of new infrastructure for use by an access seeker, but also to the manner in which the access seeker and the asset owner might share any additional revenue flowing from future users of that infrastructure.

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