

*Centre for Research in Applied Economics
(CRAE)*

Working Paper Series
200711
November

“Conveyor Belt or Competitive Market: What is a railway?”

By Nick Wills-Johnson

Centre for Research in Applied Economics,
School of Economics and Finance
Curtin Business School
Curtin University of Technology
GPO Box U1987, Perth WA 6845 AUSTRALIA
Email: michelle.twigger@cbs.curtin.edu.au
Web: <http://www.cbs.curtin.edu.au/crae>

ISSN 1834-9536

Conveyor Belt or Competitive Market: What is a railway?

Nick Wills-Johnson¹
Centre for Research into Applied Economics
Curtin University
GPO Box U1987
Perth WA 6845
Tel: +618 92663759
Fax: +618 92663290
email: n.wills-johnson@curtin.edu.au

Abstract

The notion that allowing third party access to the natural monopoly, below-rail track and signalling infrastructure might induce competitive entry in above-rail train operations has been a part of European and Australian rail policy since the early 1990s. However, competition has been slow to emerge and it is useful to ask why. This paper examines railways from a number of different perspectives in an attempt to understand the limits of what policymakers might expect from a rail access regime.

¹ n.wills-johnson@curtin.edu.au View my research on my SSRN Author page:
<http://ssrn.com/author=106139>

Introduction

Third party access to railway infrastructure was first introduced more than a decade ago in Australia and Europe. Contrary to the expectations of many policymakers, there has been relatively little entry into the market for above-rail train operations. This paper asks why, and endeavours to answer the question by considering railways from a number of different perspectives. The resulting analysis, it is hoped, will be useful for policymakers seeking to chart the sustainable future of Australia's railways.

Section Two of this paper presents the two extreme arguments; that railway track is a marketplace and that it is a conveyor belt, integral to above-rail operations. Section Three examines the historical record of the provision of access. Section Four examines railways as economic entities from a number of different perspectives, endeavouring to ascertain the extent to which we might expect access and structural reform to be successful. Section Five provides some policy conclusions.

The Perspectives

The arguments surrounding the nature of the above-rail sector in respect to access seem to have divided into two opposing camps; that railway track can be made into a marketplace and that a railway track is integrally tied to above-rail operations. This is seen most clearly in the recent National Competition Council (NCC, 2005) deliberations in regards to the iron ore railways in the Pilbara. As this paper will endeavour to show, whilst both arguments might apply to some railways, neither has general application in the industry. In this section, I summarise the arguments.

Above-Rail Operations are a Marketplace

The notion that railways are a marketplace stems from the notion that the below-rail infrastructure is a natural monopoly; that its sunk costs mean there is room for only one provider. If this is so, competition might best be introduced to the industry through the above-rail sector.² In turn, this requires the railway track to become a marketplace. A marketplace has two fundamental characteristics:

- There is something to sell, and there are multiple sellers and buyers of the service.
- Rules can be devised to effect sale which are acceptable to all parties and match the nature of the good being sold.

Railways sell transport services and require train paths in order to do so. An access regime is the means by which above-rail operators obtain train paths from below rail operators. These train paths are the 'stalls' in which the railways sell their services. In order for there to be a market, different railways need to own (or lease) different 'stalls'; otherwise one has a shop, not a market.

In a general sense, the rules by which a market operates must reflect the underlying characteristics of the good or service being traded. For example, an electricity market which ignored Kirchoff's Law would be useless. In a railway, the underlying 'laws' are the train management protocols. Unlike Kirchoff's Law, these might vary from railway to railway. This adds to flexibility, but also means that they are partially subjective, potentially making trust difficult to engender.

² This is not the only way in which competition might be introduced. Biggar (2004) suggests a number of different options for introducing competition.

Train management protocols mean that a railway operator must surrender control of its trains to the train manager as soon as they enter the network. The train manager is not influenced by economic factors such as price, but rather operates according to practices developed which ensure safe and efficient movement across the network. These rules need to incorporate unforeseen events, such as accidents, or trains moving too slow or too fast. They also need to ensure that delays are not spread through the network, and must hence be rather authoritarian. They are more like traffic signals and signs in road networks than a Walrasian auctioneer in the standard economic model. In principle, it is possible to design penalty and charging regimes to ensure that market incentives are aligned with the underlying rules of the train management regime, and that the system is not ‘gamed’. However, in practice, this is difficult. In the UK, the system of apportioning penalty payments according to an assessment of whether the relevant fault was above or below the rail interface, resulted in a total penalty payment of between £150 and £200 million in the three years to 2002/03 during which it operated. Some 300 people were employed by the rail companies to work on apportioning blame. A recent UK government White Paper (UKDFT, 2004) suggested that, whilst the franchising had improved understanding and transparency of rail costs, these costs had increased due to “complex commercial and bureaucratic relationships, the lack of clarity for responsibilities and the misaligned incentives between each part of the industry” (Ibid, p21).

Clearly there are difficulties associated with forming an effective marketplace on a railway track. This does not mean that creating a new market is impossible. However, where the network is complex (or congested), or where the train paths themselves are more complicated (for example, cycles, rather than set scheduled services), forming a market may be more difficult. Thus, rather than presuming that a market will be able to form, regardless of the particulars of a given railway, policymakers should pay particular attention to how such a market might form.

Above-Rail Operations as a Conveyor Belt

The opposing argument holds that above and below-rail operations are tightly integrated, and place a barrier between them (by either vertical separation or third party access) will lead to marked reductions in efficiency. An extreme form of this argument was used by Hamersley Iron when Robe River Associates sought access to its track in the Pilbara in September 1998. Hamersley Iron argued that their railway track formed an integral part of their iron ore logistics chain, from mine to port, and hence that access should not be granted on the basis that the railway was part of its production process. This gave rise to the ‘conveyor belt’ description of a railway used in the title of this paper. In June 1999, the Federal Court handed down its final decision, accepting this production process argument.³ In a different context, Ivaldi & McCullough (2006) have suggested that vertical separation in US railways would lead to efficiency losses of between 20 and 40 percent.

The argument for railways as a conveyor belt pre-empts the discussion of transactions cost economic below, and suggests that it is more efficient to provide rail track services in-house than via a third-party track owner. It is not too difficult to understand the underlying reason for this suggestion. The critical interface in a

³ More recently, in the case of BHP, this finding has not been upheld.

railway is between the wheel of a train and the rail track. Optimising this interface is the main goal of railway engineers. If the interface is managed by contract, it seems likely that this will cause more problems than if it is managed within a single company simply because writing complete contracts in complex situations is difficult. In addition, separating a railway at the point of intersection between wheel and rail also gives rise to potentially poor incentives; fixing a poorly ground wheel might bring few benefits for a railway operator without track and with a small freight task, but not fixing it could have major impacts on all other users of the track. Designing systems which overcome these incentive mismatches may prove difficult.

However, the mere fact that railways might be able to better manage the interface between wheel and rail in-house does not necessarily mean that a given railway will do so. In an examination of Australian public railways (Wills-Johnson, 2007a) found that vertical separation in the mid 1990s was likely to have caused few efficiency losses, due in part to the fact that the vertically integrated railways had not been particularly adept at managing the wheel-rail interface in-house. Indeed, some industry stakeholders have suggested that putting the interface into contracts threw many of the problems associated with its management into sharp relief, forcing the above and below rail parties to deal with them in a transparent manner. In some instances, therefore, it may be simpler for policymakers to require open access or to vertically separate a railway than to attempt reform from inside the railway.

The key phrase above is ‘in some instances’. Just as it is not possible to generalise and suggest all railways will make good marketplaces, it is also not possible to generalise and say that all railways are suited or unsuited for vertical separation; there are many paths to cost minimisation. The focus for policymakers should be on how a given railway has integrated its above and below-rail operations, and the impacts either third party access or separation might have on the railway in question. In some instances, the railway will indeed be a ‘conveyor belt’, whilst in others it will not.

The Emergence of Above-Rail Competition

Australia and Europe have now more than a decade of experience with third party access regimes. The historical record thus far, however, is not particularly bright. In Australia, immediately following the introduction of open access in the mid Nineties, SCT, Toll and Patrick Rail entered the above rail industry, with Toll and SCT taking up to a quarter of the market on the East West freight rail link. Toll and Patrick Rail subsequently formed Pacific National, and SCT now has a market share on the East West link of less than five percent. Other new entrants include:

- South Spur Rail, in WA, which has a small fleet of locomotives and undertakes hook and pull services for other rail companies. In 2006, it merged with Silverton Tramways to form Southern-Silverton. In 2007, the merged group became part of Coote Industrial Rail.
- CRT, in Victoria and NSW which owned wagons, some terminals and brought Sprinter trains into Australia. CRT has subsequently been taken over by QR
- Lachlan Valley, which owns wagons and moves container freight in NSW.
- Chicago Freight Car Leasing, which leases wagons and locomotives in Australia, filling a key role for new market entrants.

The market share of these new entrants is negligible. Most of the competition in Australia has come from the rail companies formed during the reform process or

given concessions as part of it. These companies are beginning to compete in each other's markets. For example:

- Pacific National (PN) has secured freight haulage contracts in north Queensland.
- QR has secured coal haulage contracts in NSW and has recently purchased CRT in Victoria (with its associated terminal) and the above-rail interests of the Australian Railroad Group (ARG) in WA. It also plans to turn its Acacia Ridge terminal into an open access terminal.
- Freightlink, the operator of the Tarcoola-Darwin Railway has begun offering services between Adelaide and Melbourne.
- Genessee & Wyoming Australia, once part-owner of ARG and now the owner and operator of the intrastate network in SA has begun offering contract services, locomotives, wagons and crew to freight forwarders on the interstate network.

There is also evidence of industry consolidation:

- QR has taken over CRT and has purchased the above-rail operations of ARG in WA in a joint venture with Babcock and Brown Infrastructure, who now own the lease on the below-rail assets.⁴
- PN has taken over the freight concessions of Freight Australia in Victoria and ATN in Tasmania (with the State Governments taking over the track infrastructure). Subsequently, one of the owners of PN (Toll) has taken over the other owner (Patrick) and the rail business PN has been combined with Patrick's port operations and vested in a new company, Asciano Limited.

Since the consolidated railways are still smaller than their US Class One counterparts, the consolidation seen to date may not be the end of the process, absent of ACCC intervention in the merger process.

Whilst consolidation may mean greater power for railways in the short-term, contract renegotiation provides at least larger customers with countervailing power. Major freight customers, place their haulage contracts out to open tender and, even when incumbents win, the pressure of competitive bidding can force down prices. This, however, may be a short-term phenomenon, as firms fight for market share, rather than a characteristic of long-term market equilibrium.

In Europe, the history is slightly longer; Sweden first introduced rail access in 1988, and EC Directive 91/440 required both accounting separation of above and below rail entities and the provision of access for international, inter-modal railway operators, as part of the European Union's advocacy of cross-border trade integration from 1991. This has been extended in the First and Second Railway Packages (2001 and 2002 respectively) to address the many inter-operability issues amongst European railways that had made cross-border traffic difficult, and to extend the right of access to domestic as well as international freight operators. Europe also has a larger freight task than Australia, although many country markets are smaller, and routes are generally shorter. However, in Europe too, however, progress has been disappointing, apart from incumbents in each country obtaining access to neighbouring markets on a reciprocal basis. Table One summarises new market entry in Europe.

⁴ This is a rare example of the market choosing vertical separation, rather than it being imposed by policymakers.

Table 1 New Entrants in European Rail Markets (2004)

Country	Number of New Entrants	Share of market
Austria	10	negligible
Belgium	4 (only one operating on Belgian network)	Not provided, but market regarded as effectively closed.
Czech Republic	7 (two of which are the transport arm of coal mines)	Two percent of freight market in tkm.
Denmark	6 (plus small network concessions for regional passenger networks)	Less than five percent, for both freight and passenger transport.
Estonia	4 (two passenger and two freight)	n/a
Finland	None (state railway has legal monopoly)	zero
France	None	Zero
Germany	160	Approximately 10 percent in freight and passenger.
Great Britain	28 passenger (25 from concessions, 3 new) and four freight	100 percent (incumbent dissolved in rail reforms)
Greece	None (two small operators scheduled to start in 2004 for local services)	Zero
Hungary	None (two incumbents share a duopoly)	Zero
Ireland	None	Zero
Italy	33 (12 active on incumbent's network, remainder active before reform on regional networks)	Two percent in freight and less than one percent in passenger markets
Latvia	Two new entrants in freight, none in passenger rail	2-3 percent of freight market.
Lithuania	Four entrants hold licences but none are active	Zero
Luxembourg	none	Zero
Netherlands	15 (six in freight)	n/a
Norway	None	Zero
Poland	21 in freight, zero in passenger	Three percent in freight.
Portugal	None	Zero
Slovakia	18 (only three active)	n/a
Slovenia	None (but 90 percent of the passenger and freight market is international thru-traffic)	Zero
Spain	Two state owned companies share the market as a duopoly.	Zero
Sweden	16 (ten active in freight, seven in passenger rail)	Almost half of the freight market and a third of the passenger market (including regional franchises) in 2002.
Switzerland	10, but only one (BLS Cargo) is a result of liberalisation.	BLS Cargo has a 12 percent share of the freight market. The passenger market is still closed.

Source: IBM Consulting Services, 2004. Note that figures for new entrants do not include reciprocal cabotage rights between incumbents in different countries, but rather to the number of new entrants which are domiciled in each country as a rail transport provider. These may have as their parent companies, incumbent operators from other countries.

In part, this failure reflects institutional inertia. Many domestic railway companies have been hostile to third party access and structural reform, and this has led to less than fully-fledged enthusiasm on the part of governments driving the reform process. In some cases, this has meant delayed introduction, whilst in others, it has meant structures which reflect the letter, rather than the spirit of the EC directives. De Rus (2006) suggests that unbundling in France and Spain created nominally independent infrastructure companies which are dependent upon the incumbent, publicly-owned railway company, a situation unlikely to be conducive to new entry. In other cases, the structure of the reformed industry was poorly thought out, as Nash (2006) suggests was the case in the UK, or did not have much political support (Glaister, 2006, also in reference to the UK). However, poor implementation seems to be only part of the story. The other part would appear to be lack of opportunities in the respective above-rail markets. This is more troubling, for it means that solutions are unlikely to be found simply by improving the access system.

North America

Before examining the different perspectives of railways as economic entities in order to seek reasons why the historical records of Australia and Europe have been so poor in promoting above-rail competition, it is worthwhile examining briefly the experience of North America. There is relatively little mandatory third party access in North America. In Mexico, the privatised railway concessions were devised to

promote origin-destination competition (by ensuring different companies connected major ports and cities), and mandatory access is required only over some assets in Mexico City and a few other centres, which several of the concessionaires share. In Canada, inter-switching rights, first devised in the 1900s to prevent duplication of infrastructure in urban areas, are used by shippers with access to only one railway at their origin or destination to achieve some competitive pressure. Shippers also have access to mandated running rights and (since 1987) competitive line rates. Neither of these are used with any degree of frequency; the Canadian Transportation Act Review Panel (2001) reports fewer than a dozen cases of both. The same review also argued against the extension of extant rights to a general access regime similar to Australia, due to concerns about the impacts this might have on the capital sustainability of the industry (ibid). This recommendation was taken on board.

Prior to 1980, the US had almost no requirement for mandatory access, because rates were set by the Interstate Commerce Commission (ICC). Since that time, the ability of the ICC and its successor (the Surface Transportation Board - STB) to set rates has been sharply curtailed. However, the STB maintains the power to set conditions associated with rail mergers. As successive merger waves amongst US railways after deregulation in 1980 has reduced the number of competing railways, the STB has included access provisions in some later merger approvals to ensure shippers do not become 'captive' to a single rail provider. These access conditions are targeted to the needs of particular shippers (or locations), rather than being blanket requirements covering a whole network, as is the case in Australia and Europe.

Additionally, US railways have long provided each other with trackage rights; the right (usually mutual) to traverse each other's track, though not usually the right to stop and pick up or unload freight or passengers. These trackage rights extend also into Canada and Mexico, as Class One railways operate in all three countries. The Association of American Railroads (2006) estimates that roughly 20 percent of route miles was subject to voluntary or mandatory track access across the whole of North America (US, Canada and Mexico) in both 2005 and 2006. Although this does not appear to be a large share, it is worth noting that this performance is better than any European country outside Sweden and the UK, and considerably better than Australia. A question of some importance, which is a subject of ongoing research, is whether this larger share is due to the fact that most of the access provided is voluntary. That is, whether it is the fact that access is regulated in Australia and Europe that is of issue. The discussion below on economic regulation as a form of social choice, and of railways as a form of quasi-commons, suggests there might be some merit in this view. However, equally, the much larger rail market in North America may provide more opportunities for railway operators, and the long history of cross-continental operations may have resulted in a marketplace less averse to sharing infrastructure than the historically closed operations of railways in Australia and Europe.

Different Perspectives on Railways and the Limits of what Access Can Achieve

The preceding discussion argues that neither of the two end-points are correct, a railway is neither (necessarily) wholly a marketplace or wholly a conveyor-belt. In fact, it is not possible to address the issue from a principled perspective, but it is rather advisable to approach it from the characteristics of each railway concerned. The historical record, which shows relatively limited success in introducing competition

above rail amongst those jurisdictions which have introduced mandated third-party access, suggests that the application of access as a principle was inappropriate, and that there are limits to what one might expect an access regime to achieve. The question is how one might perceive these limits. This section explores the issue by examining railways from a number of different perspectives.

Subadditivity

In order for third party access to have any hope of success, there must be potential for sustainable above-rail competition. If this potential does not exist, and the railway is not vertically separated, there will be no net change in the railway as a whole when third party access is applied, except perhaps some inefficiencies associated with requirements to ring fence operations. This is because, even with perfect regulation of the below-rail component, the unregulated above rail component can simply capture the same rents as existed prior to reform and regulation. If the railway is vertically separated into its above and below rail components, the pre-reform monopoly profits are in fact the best outcome one can expect. If the regulator is unable to hold prices for below rail services down to competitive levels, the inability of the above-rail sector to support competition will result in double-marginalisation; higher prices and lower output than under vertically integrated monopoly.

The potential for the above rail sector to support competition can be examined via subadditivity analysis; examining whether it is more or less costly for one firm or multiple firms to undertake the above rail task. Costliness, in this context, is a function of the fixed costs of above-rail operation, such as locomotives. A number of papers have examined subadditivity in the context of US railways (Bitzhan, 2000, 2003 and Ivaldi & McCullough, 2002, 2006) and one has examined it in the context of Australian railways (Wills-Johnson, 2007a). All of the papers find that the above-rail task is indeed subadditive, in both the US and Australia, suggesting that attempts to introduce competition may be short-lived. From this perspective, third-party access endeavours to perform an impossible task.

However, two important caveats exist in relation to these findings. Firstly, by necessity, each of the above papers takes the above-rail task of the incumbent monopolists and splits it into a two-firm task (usually in several thousand different combinations). Thus, the underlying cost structure is that of the incumbent. A new entrant might have a cost structure sufficiently different from the incumbent that it could survive, particularly as part of a competitive fringe. Secondly, although there may be room for only one above-rail player, that player need not be the incumbent, and indeed competition for the market (particularly as large minerals haulage contracts are renewed) may be a suitable proxy for competition in the market, in terms of its ability to promote efficiency in the industry.

Whilst the studies mentioned above cover only Australia and the US, and focussed on whole systems, rather than individual routes where high traffic might support competition which a network would not, it seems that above rail competition as a presumption underlying reform is inappropriate. Instead, policymakers should rather focus, as the Productivity Commission (2007) suggested recently, on individual, highly trafficked routes, which might support competition in point-to-point services.

The Effects of Oligopoly Above Rail

The discussion above focuses on whether competition might emerge above-rail. This section examines whether the mere presence of competitors is likely to result in prices and outputs which are close to the levels one would expect under perfect competition. Since regulation controls below-rail prices and outputs, the focus is on the above-rail sector. Since the empirical evidence on the emergence of competition thus far suggests that the number of competitors which arise will be small, it suggests one should focus on competition amongst members of small groups. This suggests the framework of oligopoly analysis may be more fruitful than perfect competition.

Oligopoly is a vast body of literature, impossible to effectively summarise here.⁵ Moreover, there is considerable conflict in the literature; it does not represent the same cohesive body of theory as perfect competition and perfect monopoly. However, to give some flavour of the effects of considering the above-rail sector in an oligopolistic sense, consider Cournot, or quantity-based competition, which is commonly used to model oligopolistic competition.

If the above-rail firms engage in Cournot competition with the same cost functions and the below-rail firm is regulated effectively to produce competitive output and price, then the formula describing the pricing of the above-rail forms is as follows:

$$\frac{p - c}{p} = \frac{1}{n\varepsilon}$$

where p refers to price, c to marginal cost, n to the number of firms and ε to the elasticity of demand for rail freight. The above formula essentially shows the mark-up over marginal cost for each firm one might expect in such a situation. As n increases, this approaches marginal cost pricing.⁶ A key element is the elasticity of demand for rail services. Meyrick and Associates (2006) in a recent paper for the Victorian Essential Services Commission, survey the Australian literature and suggest a 'consensus range' of own-price elasticity for rail of between 0.4 and 0.9.⁷ For a given track at the bottom of this range, in order to achieve mark-ups of 50 percent above competitive levels, one would require five above rail firms, and if one was to achieve mark-ups for rail freight services that are within ten percent of competitive levels, one would need 25 competitors. At the upper end of this range, the figures are 2.2 and 11.1 respectively. By comparison, the best Australia has produced so far is six above-rail freight operators competing on the East-West link,⁸ which is likely to have elasticity of demand towards the lower end of the above range, because its long distances mean rail is more competitive against road. Thus it is far from clear whether the amount of competitors which, realistically, are likely to arise will generate competition of a sufficient amount and type to move prices and outputs a significant distance towards competitive levels on most Australian railways.

⁵ Schmalensee & Willig (1989) provide a comprehensive overview of the literature, in two volumes.

⁶ This is not quite correct, and depends upon all firms having non-negative output. See Novshek (1980) for details.

⁷ Rail-road cross elasticity figures are higher, with a one percent decrease in road freight price resulting in a 2.2 percent decrease in rail freight. This reflects the fact that, amongst the items which are also carried by road over distances less than 1500km, rail is very sensitive to price.

⁸ According to ARTC's website (www.artc.com.au), a total of nine railways utilise its network. Seven of these operate on the East-West link and six of these carry freight.

The above analysis is, of course, very crude. In the first instance, it is not clear whether above-rail firms engage in Cournot competition at all, and a different conjectural variations framework may give different results (notably Bertrand competition, which Whinston, 2006, suggests drives long-term rail haulage contracts in the US). Secondly, the assumption that all above-rail firms have the same costs is also unlikely to be true. However, this makes the situation worse than outlined above, because then the result turns on market share, and the market share of newcomers is often very small. Further work in this respect is clearly needed, most particularly in understanding the way in which above-rail firms might strategically interact. At present, all that can be said is that, even where above rail competition emerges, the effect might not necessarily be to replicate or even approach the outcomes of perfect competition. Actual gains may be more modest, and this should be reflected in an assessment of the appropriateness of a given access regime.

Transactions Cost Economics

The previous two viewpoints focussed on the likelihood of above-rail competition and the impact smaller numbers of competitors might have on the level of prices and output. This section focuses on the interaction between above and below rail, and on the degree to which a railway is a 'conveyor-belt'. It does so by considering railways from the perspective of transactions cost economics.

Coase (1937) suggested that markets were not the only place in which transactions were made and resource allocations decided, pointing out that many economic transactions occur inside firms. For example, firms will often make, rather than buy, intermediate components and train, rather than hire, their employees. Each transaction, he suggested was accompanied by a cost were it to occur in a market setting, and a different cost if it were to occur in a managerial setting within a firm. Managers of firms, he suggested, would internalise those transactions which were less expensive when handled through a managerial structure and go to the market when it provided lower transactions costs. For example, a standard widget with an easily assessed level of quality might be cheaper to purchase in a marketplace, particularly if only small amounts of it were needed and its manufacture incurred high costs. By contrast, a talented, responsible manager whose loyalty and performance could make or break a company might better be trained up from entry-level within the firm, so that the firm's owners could be confident she would not betray their interests. The literature seeking to determine whether transactions are more likely to occur in the market or within a firm is known as Transactions Cost Economics (TCE).

The very brief description above suggests that, whilst in principle it might be simple to imagine the borders of a firm as being that point where the market cost of a transaction equals the cost of the same transaction inside the firm, in practice, there might be a great deal of heterogeneity.⁹ Indeed, the large differences between firms, even in a single industry suggests this is the case empirically. This can frustrate analysis. However, Williamson (1979) has provided some more detail within which to frame a TCE assessment. He suggests three key dimensions of a transaction:

⁹ Indeed, the presence of joint ventures and other similar arrangements suggest that the line between firm and market is quite blurred.

- **Uncertainty:** transactions whereby the buyer finds it very difficult to assess quality ex-ante might be more likely to occur within a firm.
- **Frequency:** transactions which occur frequently might motivate the firm to incur the fixed costs required to produce the good or service internally.
- **Asset Specificity:** transactions for goods or services which have little value outside the firm might be less expensive if sourced internally.

In railways, there are two key transactions, from the perspective of third party access. The first of these is the longer term transaction whereby above rail firms contract with those below-rail in order to obtain access and train paths. The second is the shorter term transaction which occurs on the day, whereby the above-rail firm transacts with a train manager for the actual movement of the train itself. The two are separate transactions because, even within the constraints of a given train path, there is a requirement to manage the movement of a train on the day it runs, due to the complex nature of a rail network and the over-riding need to ensure trains do not collide.

The main focus here is on the longer-term transaction, whereby a train operator purchases (or otherwise obtains) access and a train path from the below-rail operator. Is this transaction likely to be less expensive to conduct in-house or in the market? On the basis of Williamson's (1979) three criteria above, the judgement is difficult to make on a principled basis. On the one hand, engineering reports and other documents make it relatively simple to judge the quality of the track to which access is being bought, but on the other hand, the transactions are frequent; a railway operator might sign a contract involving several train paths a week over many years. Asset specificity is something of a product of the access regime itself; there is only one purpose to which a railway track can be put, running trains, but if there is more than one access seeker and a secondary market exists, it is likely to be relatively simple to on-sell unused capacity.¹⁰ If there is no secondary market, or the market is thin, on-selling capacity may prove very difficult.

Australian policy towards third party access in railways reflects this mixed assessment. The decision to mandate third party access with no vertical separation is, from the perspective of (TCE), a declaration that the access transaction can be as effectively governed by the market as by mechanisms internal to the firm. The decision to vertically separate a railway into its above and below-rail components is a declaration that the market is a more efficient way of organising this transaction than the managerial mechanisms internal to a firm. In Australia, the fact that third party access with and without vertical separation is being trialled in different states with similar freight tasks is difficult to reconcile from a TCE perspective, but suggests perhaps that the natural extent of a railway might not be a finely defined line, but rather, a band. The experience of Europe, where some countries have vertically separated but some have not, suggests that policymakers share the same view.

The issue should be capable of resolution in an empirical examination. Since all railways which are now vertically separated were once vertically integrated, if the transaction is less costly in the marketplace than internal to the firm, one should

¹⁰ Although not instantaneously; if a train at Cooke on The East-West link breaks down and can go no further, there is unlikely to be anyone to whom the train operator can sell the now unnecessary remainder of that train path.

expect to see a decrease in cost or an increase in efficiency with separation. If costs and efficiency do not change, then the transaction is equally efficient in the firm and in the market, which suggests, absent of other costs, that it does not matter whether third party access is accompanied by vertical separation or not. If costs increase and efficiency decreases, then the transaction is better handled within the firm, and thus that both vertical separation and third party access are unwise policies.

However, the evidence is mixed. Wills-Johnson (2007a) finds little evidence that vertical separation in Australia should have caused efficiency losses and reports the results of a survey of industry participants which suggests few major impacts on investment due to separation in Australia. Ivaldi & McCullough (2006) examining US data, suggest that vertical separation could cause efficiency losses of between 20 and 40 percent. Preston (1996), examining European railways, suggests that optimal economies of scale occur for mid-sized European railways, and hence that larger railways might be broken-up without efficiency losses, although he does not specifically examine vertical separation. Cantos, Pastor & Serrano (1999), examining European rail productivity, suggest that most of the productivity gains in recent times occurred between 1985 and 1995, before separation and access became prevalent. Moreover, the authors suggest that productivity gains were caused by technological change. Freibell, Ivaldi & Vibes (2003), examining separation, independent regulation and the introduction of competition, find that sequencing of these reforms produces efficiency gains, but that introducing the reforms as a package does not. This suggests the capacity of the industry to absorb reform might be limited. Finally, Cantos (2001) examines interactions between infrastructure costs and freight and passenger transport output. For freight output, he finds increasing infrastructure costs decreases marginal costs, suggesting perhaps efficiency losses from separation.

Clearly, more work is required before one can make a definitive statement concerning the efficiency effects of vertical separation. At present, it would seem most wise to conclude that the mix of findings suggests that each railway is different, and that some are well and others ill-suited (from a TCE perspective) to the introduction of third party access or to vertical separation. Policymakers should thus proceed along the same lines; railway by railway rather than according to some general principle.

Regulation as a Form of Social Choice – Arrow’s Impossibility Theorem

Third party access is presented as a decision-making process based in economics. However, economic decisions do not exist in isolation; arguably, the process of economic regulation is merely one type of social choice mechanism. That is, it is merely one way to go from the preferences of each party in the process (the regulated utility, its customers and the regulator) to a form of ‘social preference’ which represents the regulatory outcome of a price or revenue cap. This is especially the case because economic regulation requires the use of models and forecasts. A regulator commonly develops a model of a ‘best practice’ version of the railway being regulated, and then forecasts cost and demand conditions over the regulatory horizon in order to arrive at the appropriate price or revenue cap. Each forecast is based upon a set of assumptions, and each set of assumptions is based (explicitly or implicitly) on the preferences of those making the assumptions. The assumptions are often different amongst the different parties in the regulatory process, due to their different preferences, and this gives rise to different forecasts.

Examining economic regulation from the perspective that it is a form of social choice allows some rather useful insights into the process itself, by considering some general results associated with social choice mechanisms. Arguably, the most important result in the social choice literature is Arrow's (1950) Impossibility Theorem. The argument is developed more fully in a companion paper (Wills-Johnson, 2007b) and sketched below. Firstly, consider an assumption underlying a forecast to consist of two types of information:

- Objective information: which can be objectively assessed by, quantified by and compared between all players in the regulatory game.
- Subjective information: which is either private to a player or, if public, cannot be meaningfully compared between players or objectively assessed by them.

Profit streams are an example of the former, whilst the differing views between the NCC and BHP (see NCC, 2005) concerning the impacts of third parties on BHP's existing operations in the Pilbara are an example of the latter.

Secondly, note that each player has a preference schedule, comprised of numerous outcomes. For example, a railway owner might prefer forecasts based on his own assumptions over those of the regulator, and those of the regulator's assumptions over those in submissions by its customers. There may also be many more outcomes, based on sensitivity analysis of certain assumptions or some other mechanism. The important point is that each outcome is discreet, and that each party is capable of ordering the outcomes into a preference schedule. The means by which they do so is not relevant. It is also useful to assume, as Arrow does, universality and monotonicity of preference ordering and that irrelevant alternatives are independent of the choice process in respect to preference formation (see Arrow, 1963).

Finally, note that, in forming an ordering of outcomes, each player makes use of both subjective and objective information. It is proposed (see Wills-Johnson, 2007b) that, if only objective information determines the ordering, then it is possible to map from the set of individual preference schedules to a social preference, but that if a piece of subjective information is decisive (that is, it determines an ordering), Arrow's Impossibility Theorem holds.¹¹ This means that a regulatory outcome is either:

- a social preference which is unrelated to any individual preference schedule, or any combination of them; or
- a social preference which reflects the individual preferences of only one player; the Arrowian dictator.

Both of these outcomes have unpalatable consequences for economic regulation. If the social preference (ie – the outcome of the regulatory process) is unrelated to individual preferences, this means that the requirement that the regulator consider the legitimate business interests of the infrastructure owners is a logical impossibility; the infrastructure is inevitably socialised, regardless of who owns it. It also means that the process of consultation is largely a waste of time for stakeholders; although it might glean some information, the final outcome can never reflect any of the desires of stakeholders, nor any combination of those desires.

¹¹ Proof of this proposition is a work in progress.

If the social preference always reflects the preferences of a single individual, and all parties are equally balanced, then perhaps one might have an outcome which favours one party at one stage and another at a different stage. However, all parties are not equally balanced; the regulator has the unique power of being able to enforce an outcome. It thus seems likely that the regulator will, over time, make more and more of the decisions of the industry, becoming an Arrowian 'dictator'. Indeed, the history of long-lived regulatory bodies, such as the Interstate Commerce Commission (ICC) in the US (see Hoogenbaum & Hoogenbaum, 1976) and the 19th Century Railway Commissioners Court in the UK (McWilliams, 1923) show precisely this increasing role in the decision-making process. It seems, therefore, that the notion of light-handed regulation is something of a myth.

Regardless of which outcome (above) a given regulatory system obtains, it is unsurprising that owners of railways and other stakeholders in them (see, for example, the discussion of union opposition to access regimes in France in Quinet, 2006) have resisted access; the change in governance effectively removes their ability to control the asset. It may also explain why so few have been willing to play the access game as above-rail entrants; why partake of a game which one seems destined to lose?

Considering economic regulation from the perspective of social choice theory thus provides a useful means of questioning the fundamental basis of regulation itself. For example, economic regulation of corporatised or privatised entities is often held up as a means of improving resource allocation and efficiency in industries which were formerly managed as public-sector organisations. However, if the industry concerned is characterised by a great deal of subjective information, it is difficult to see how economic regulation is any different or more effective than any other social choice mechanism. It also allows one to isolate cases where economic regulation might be a more effective process, namely those industries where preference is characterised by objective information. Finally, as the companion paper (Wills-Johnson, 2007b) argues, this perspective of economic regulation allows one to develop predictive models of regulatory evolution.

The Tragedy of the Commons

Third party access changes the economic characteristics of a railway in two important ways. Firstly, it dilutes the property rights of the track-owner, transferring some of these rights to access seekers, who commonly sign relatively long-term contracts with infrastructure owners. These contracts give them some rights of input into decisions pertaining to the operation, maintenance and investment profiles of the railway which exceed those enjoyed by customers of a firm. Secondly, access potentially provides a misalignment between the private benefits and social costs of a decision made by above or below-rail firms. For example, wheel grinding might cost an above-rail firm \$2 million per annum, but bring only \$1 million per annum in cost savings to it. There is thus no incentive to grind wheels. However, unground wheels on trains operated by this firm might cause \$10 million in damages to the railway track. Glaister (2006) provides an example of precisely this scenario in the UK. One has, in essence, an example of Hardin's (1968) "tragedy of the commons"; a common (or quasi-common, as a railway track has owners) resource is overused because the benefits from over-use are privatised whilst the costs are socialised.

In theory, at least, charging and penalty regimes within an access arrangement should be able to align public and private incentives again. However, as discussed previously in the context of UK penalty regimes, these schemes can be difficult to put into practice. It is therefore useful to step outside the framework of neoclassical economics, and into the field of co-operative game theory, where a substantial literature examines potential solutions to tragedy of the commons type situations. Ostrom (1990) and Bromley (1992) provide comprehensive accounts of mechanisms used to govern commons resources, whilst Friedman (1977) and Myerson (1991) provide textbook introductions to the study of co-operative games. To give a flavour of these models, consider the approach of Sethi & Somanathan (1996).

In this model, there are three classes of player producing using a common resource; defectors who overuse the resource, enforcers who punish defectors using punishments which are costly to themselves and co-operators who do not impose sanctions. Through the use of an evolutionary game,¹² they show two classes of stable equilibria are possible. The first of these occurs where all players are defectors, an outcome which is locally stable for all parameter values. This results in unsustainable use of the commons resource; Hardin's (1968) tragedy of the commons. The second is a series of less stable and rarer local equilibria consisting just of enforcers and co-operators. Each is based around social norms associated with a punishment function. Sustainability thus turns on developing the right social norms.

The development of suitable social norms is an issue in itself, and requires a quite different paradigm from that which pervades economic regulation. Moreover, the organic growth of such norms and their potential diversity may be troublesome to policymakers more accustomed to a more deterministic, centrally-planned approach. There may also be issues in ensuring that social norms do not simply split economic rents, although presumably this can be addressed by policymakers becoming part of the process of developing them. The fact that a process is unfamiliar, difficult and uncertain in its outcomes does not, however, mean it should be dismissed out of hand. In its favour, the development of social norms is demonstrably better at sustaining a common resource than economic regulation. The longest-lived regulator of a utility is the ICC in the US, which managed less than 100 years of governance of that nation's railways. By the 1970s, the model had become so uncondusive to the long-term survival of US railways that it was largely abandoned. By contrast, even pre-literate societies have been able to develop sets of social norms governing the use of commons resources which sustain the resource for centuries. There would thus seem to be at least some lessons policymakers could draw from the approach.

It would seem, moreover, that the lessons are being learned in the Australian railway sector. The Hunter Valley Coal Chain Logistics Team is an example of an attempt to establish a set of 'social norms' to cover the use of a logistics chain in Australia.¹³ However, it exists only through an exemption to the *Trade Practices Act* which is renewed following assessment by the ACCC on a regular basis. This caution is understandable, as a set of 'social norms' which result only in a way of sharing monopoly rents is not particularly helpful. However, the perspective of railways as a

¹² A static model always predicts over-exploitation

¹³ Shires, Preston, Nash & Wardman (1994) suggest that Amtrack and US freight railways similarly went through a process first of endeavouring to tie each other down via contracts over access and later to working cooperatively on investment and operational expenditure.

quasi-commons resource does suggest approaches designed around social norms might be able to bring sustainability to the industry in the 21st Century which economic regulation could not in the 19th and 20th Centuries.

Can We Improve Rail Policy? Lessons from the Different Perspectives

The preceding discussion suggests a number of useful lessons for policymakers. Examining the issue of railway access from the perspective of subadditivity suggests that one should expect, at best, rather limited scope for competition to emerge above-rail. Examining it from the perspective of oligopoly theory suggests that such competition as does emerge above rail, need not necessarily reduce prices and increase output to competitive levels. The extent to which it does so depends very much on the nature of interaction between above-rail firms. The perspective of TCE highlights the need to consider each railway in turn, and not simply to try and apply broad principles from elsewhere. This is because the degree and type of integration between various elements of a railway and the nature of cost-minimisation is not necessarily homogenous. The practical upshot of these lessons for policymakers is that they should not consider third party access in rail as a blanket solution to be applied across the industry, but rather as a targeted solution, tailored to certain situations. In previous work (Wills-Johnson 2007a), the author has suggested that the East-West mainline is perhaps the only place in Australia that third-party access is likely to really have the effects which policymakers hope for. The Productivity Commission (2007) has advocated a similar targeted approach, though without the same sectoral specificity.

Examining the issue of access from the perspective of economic regulation as a special case of social choice theory allows one to consider the very fundamentals of how economic regulation operates when it relies upon subjective information to form forecasts. The implications of the analysis are troubling, and perhaps it is unsurprising that few have entered an industry where regulation implies that their preferences will seldom, if ever, be met.

Examining the issue from the perspective of a railway track as a quasi-commons allows policymakers to consider the merits of alternate governance mechanisms. These might not have the appearance of clarity and simplicity that current methods possess, but the beauty of current regulatory methods may only be skin-deep, particularly if one considers the sustainability of the infrastructure being regulated. Whilst economic regulation has succeeded in sustaining industries for at best a few dozen years before systems have become unworkable, social norms developed by even the most primitive of societies, have managed to sustain common resources for centuries. As the managers of the Hunter Valley Coal Chain Logistics Team appear to be discovering, they may assist the sustainability of rail infrastructure as well.

Bibliography

- Arrow, KJ (1963) *Social Choice and Individual Values*, John Wiley & Sons; New York.
- Arrow, KJ (1950), "A Difficulty in the Concept of Social Welfare" *Journal of Political Economy* **58** 328-46.
- Association of American Railroads (2006) *North American Freight Railroad Statistics*
<http://www.aar.org/PubCommon/Documents/AboutTheIndustry/Statistics.pdf>
- Biggar, D (2004) *Structural Reform in the Rail Industry: Should rail operations be separate from the provision of the track infrastructure?* Paper presented at the ACCC Regulatory Conference, Gold Coast, Australia July 2005.
- Bitzan, J.D. (2000), *Railroad Cost Conditions: Implications for Policy*, Paper prepared for the Federal Railroad Administration, US Dept of Transportation, mimeo.
- Bitzan, J.D. (2003), 'Railroad Costs and Competition: The Implications of Introducing Competition to Railroad Networks', *Journal of Transport Economics & Policy*, **37** 201-25.
- Bromley, DW (ed) (1992) *Making the Commons Work*, ICS Press; San Francisco
- Canadian Transport Act Review Panel (CTARP) (2001) *Vision and Balance: Report of the Canadian Transport Act Review Panel* Canada, Ministry of Government Services & Public Works,
- Cantos, P (2001) "Vertical Relationships for the European Railway Industry", *Transport Policy*, **8**(2) 77-83.
- Cantos, P Pastor, J & Serrano, L (1999) "Productivity, Efficiency and Technical Change In The European Railways: A Non-parametric Approach", *Transportation*, **26**, 337-357.
- Coase, RH (1937) "The Nature of the Firm", *Economica*, **4** 386-405
- De Rus, G (2006) "The Prospects for Competition" in Gomez-Ibanez, JA and G De Rus (eds) *Competition in the Railway Industry: An international comparative analysis*, Edward Elgar; Cheltenham UK 177-92
- Friebel G, M Ivaldi & C Vibes (2003) *Railway (de) regulation: A European efficiency comparison*, IDEI report no 3 on passenger rail transport, University of Toulouse.
- Friedman, JW (1977) *Oligopoly and the Theory of Games*, North Holland: Amsterdam
- Glaister, S (2006) "Britain: Competition undermined by politics" in Gomez-Ibanez, JA and G De Rus (eds) *Competition in the Railway Industry: An international comparative analysis*, Edward Elgar; Cheltenham UK 49-80
- Hardin, G (1968) "The Tragedy of the Commons", *Science*, **162** (3859) 1243-8
- Hoogenboom, A & Hoogenboom, O (1976) *A History of the ICC: From Panacea to Palliative*, WW Norton & Co, New York.
- IBM Consulting Services (2004) *Rail Liberalisation Index 2004: Comparison of the market opening in the rail markets of the Member States of the European Union, Switzerland and Norway*
www.bahn.de/presse.
- Ivaldi, M & McCullough, GJ (2001), 'Density and Integration Effects on Class 1 US Freight Railroads', *Journal of Regulatory Economics*, v19 pp161-82.
- Ivaldi, M & McCullough, GJ (2006), 'Subadditivity Tests for Network Separation with an Application to US Railroads', *SSRN Working Paper 528542* <http://ssrn.com/abstract=528542>
- McWilliams, RF (1923), "The Future of Railway Control", *Quarterly Journal of Economics*, **38**(1) 31-53.
- Meyrick and Associates (2006) *Rail Freight Price Elasticities*, Report prepared for the Victorian Essential Services Commission, January 2006
- Myerson, RB (1991) *Game Theory: Analysis of conflict*, Harvard Uni Press: Cambridge Mass.
- Nash, C (2006) "Europe: Alternative models for restructuring" in Gomez-Ibanez, JA and G De Rus (eds) *Competition in the Railway Industry: An international comparative analysis*, Edward Elgar; Cheltenham UK 25-48
- National Competition Council (NCC) (2005) *Application by Fortescue Metals Group Limited for Declaration of a Service Provided by the Mount Newman Railway Line: Draft Recommendation* November 2005 Canberra NCC
- Novshek, W (1980) "Cournot Entry with Free Entry", *Review of Economic Studies*, **47** 473-86
- Ostrom, E (1990) *Governing the Commons: The evolution of institutions for collective action*, Cambridge Uni Press; Cambridge UK
- Preston J (1996) "The Economics of British Rail Privatisation: an assessment" *Transport Reviews*, **16**(1) 1-21.
- Productivity Commission (PC) (2007), *Road and Rail Freight Infrastructure Pricing: Inquiry Report*, AGPS, Canberra

- Quinet, E (2006) "France: Avoiding competition" in Gomez-Ibanez, JA and G De Rus (eds) *Competition in the Railway Industry: An international comparative analysis*, Edward Elgar; Cheltenham UK 81-110
- Schmalensee, R & Willig, R (1989) *Handbook of Industrial Organization: Vols 1 & 2*, North Holland; Amsterdam
- Sethi, R and Somanathan, E (1996) "The Evolution of Social Norms in Common Property Resource Use", *American Economic Review*, **86** (4) 766-88
- Shires, JD, Preston, JM, Nash, CA & Wardman, M, 1994, *Rail Privatisation: The practice – An analysis of seven case studies*, ITS Working Paper 420, University of Leeds.
- UK Department of Transport (UKDFT) (2004) *The Future of Rail: White paper CM 6233* available from www.dft.gov.uk/stellent/groups/dft_railways/documents/divisionhomepage/031104.hcsp
- Whinston, C (2006) "The United States: Private and deregulated" in Gomez-Ibanez, JA and G De Rus (eds) *Competition in the Railway Industry: An international comparative analysis*, Edward Elgar; Cheltenham UK 135-52
- Williamson, OE (1979), 'Transactions Cost Economics: The governance of contractual relations', *Journal of Law and Economics*, **22** 233-61.
- Wills-Johnson, N (2007a) *Separability and Subadditivity in Australian Railways*, PATREC WP 11, Available from www.patrec.org
- Wills-Johnson, N (2007b) *Is Economic Regulation Possible?* Paper presented at the 2007 PATREC Research Forum *forthcoming*