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Open access for railways and transaction cost economics – Management perspectives of Australia's rail companies

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TITLE: **Open access for railways and transaction cost economics – Management perspectives of Australia's rail companies**

ABSTRACT: With the aim to improve efficiency and value for money, in addition to tendered services the European Commission approach to rail organisation allows substantial open access rail services in both passenger and freight operations. This paper investigates, from a transaction cost perspective, whether the European approach is applicable to the Australian context, and more generally to all regions and types of operation. A key focus of this paper is on vertically integrated railways owned by mining companies who are increasingly encouraged to provide open access to their competitors. In addition to the policy perspective, our discussion also includes the views of senior rail managers.

KEY WORDS: ***Railways, Open access, Competition, Train operation / rail infrastructure interface, Supply chain integration***

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1. Introduction

Getting value for money in the provision of rail services is increasingly not only of vital importance to public transport authorities but also to various players in the freight transport chain. One way of achieving this is to ensure that there is sufficient competition in the rail market. The degree of vertical integration at the train operation / track infrastructure interface is central to the discussion for introducing competition, and hence providing adequate incentives to produce efficiently (high quality and quantity at low cost). Once one allows for competition, it becomes then a question of whether competition *on the tracks* (open access) is desirable for the entire network or whether perhaps part of the network and certain services (i.e., scheduled passenger rail services) should be procured through tendering; that is, competition *for the tracks* (franchise contracts). Such 3rd party access is usually opposed and lobbied against by the incumbent operator, regardless of whether that operator is a vertically integrated train operating company or a franchised passenger train operator (at least in situations where the new operator would compete directly for traffic) that is separated from the infrastructure manager on whose tracks it runs train services on an exclusive basis (for a certain period of time). In both cases we have monopolistic structures, and open access is usually seen as a way of introducing innovation and incentives into the relevant market. While the entrant will bring in new product/services ideas, the incumbent will now be disciplined to operate more efficiently and to price according to market mechanisms rather than purely focussed on its internal cost/profit structure. While this may result in welfare improvements, it is sometimes argued that vertical separation, and in particular open access, will increase costs and may have detrimental side effects such as a lack of coordination, a loss of scale/scope economies, inferior long term planning/investment and particularly for freight, undesired knock-on effects on other elements of the supply chain.

The European Commission approach to rail organisation (best implemented in the UK), which is often referred to as a model that has resulted in substantial improvements in rail performance, but also to cost increases in some countries (e.g. McNulty, 2011), allows besides tendered services, for (regulated) open access rail services in both passenger (fully liberalised by 2019) and freight operations. Despite its federal and decentralised rail system, in Australia there is a trend to harmonise rail regulation, with safety regulation being governed by a new National Rail Safety Regulator (NRSR) from January 2013. In terms of economic regulation, the Australian Competition and Consumer Commission (ACCC) regulates most but not all economic and track access issues at the federal level, and there are voices that advocate that the open access approach should not only (as currently) be applied and enforced for large rail networks but also for privately run integrated freight railways, with a particular focus on those connecting iron ore mines with deep sea ports in the Pilbara (Western Australia).

The aim of this paper is to establish whether open access is, in the view of rail managers, appropriate for all train operations in Australia in terms of transaction cost economics. For that we undertook a survey of senior Australian rail managers in rail companies asking them for their views and experiences with the transactions that they have with infrastructure managers, regulators and other train operating companies. The paper is organised as follows. Sections 2 and 3 provide an introduction to the theoretical context of open access and an overview of the Australian rail market respectively. The methodology and sample are presented in section 4, followed by a discussion of the main results in section 5. Section 6 summarises our findings and offers some policy recommendations.

2. Theoretical background and setting the scene

The European approach to improving cost efficiency and to reduce the need for subsidies for railways is to introduce effective competition. The current European legislation (consolidated in its core in Directive 2012/34/EU), which will be strengthened by the fourth railway package in

2014 (it has not taken any effect yet, the legislative process is advanced but not finished), requires that all railways (except for local or regional stand-alone networks) have to be vertically separated, at least to the extent of having separate accounts and divisions for infrastructure, passenger and freight operations (but can be part of the same holding company). According to European law (EC COM(2010) 475) member states may exclude certain undertakings from the application of most of its rules related to infrastructure access, which includes, most relevantly to this paper, "undertakings which only operate freight services on privately owned railway infrastructure that exists solely for use by the infrastructure owner for its own freight operations".

In cases where the management of the infrastructure is not independent of train operators, the directives require that key decisions on the allocation of capacity, and the setting of track access charges, must be taken by a third party. In principle there are a number of mechanisms available to facilitate competition in rail markets. One is to split the rail network horizontally and let a number of vertically integrated rail companies (i.e., train operation and infrastructure management under one roof) compete with one another. The second option is to separate infrastructure management from the train operations so that multiple train operators compete for track access capacity on a level playing field. The third option is to allow vertical integration, but to mandate that the vertically integrated rail company allows third parties (other train operators) to use its tracks (with that access being governed by track access agreements and slot contracts). This is usually referred to as open access, at least in the rail freight business. On the passenger side, open access also refers to circumstances where there is competition *in the* market (between different train operators sharing the same track infrastructure) as opposed to the franchise model where train operators compete *for the* market (through tendering). Open access is practiced in all freight rail markets in Europe (which is legally opened up for freight and for international passenger trains). To some extent it is also permitted in passenger rail markets, with the pioneers being Sweden, Germany and the UK, but recently also starting in other parts of Europe (such as high speed train operator NTV competing with Trenitalia in Italy or open access competition in the Czech Republic). In practice open access in the European passenger rail market can be classified into two approaches. The German and Swedish approach is that any operator can apply for infrastructure access and a neutral institution coordinates these applications and resolves conflicting applications based on objective criteria (full open access used as the precondition for free competition in the market). In contrast, in the UK open access in the passenger context is used for free competition for the capacities which remain after the franchising of passenger rail services (second-tier open access to spare capacities). In practice this means that if a potential operator identifies a new market for train services not currently served by a franchise, they can apply to Network Rail (the UK rail infrastructure manager) for open access rights to run those trains.

While it is widely acknowledged that complete separation of infrastructure and operations has the benefit of removing a prime motive for discrimination by the infrastructure manager, there is concern that it may raise costs. Econometric evidence from studies of the European experience (e.g., Friebel et al., 2010; Growitsch and Wetzel, 2009; Cantos et al., 2010) does not yield consistent results. Hence, the most efficient degree of vertical separation of European rail systems is subject of an ongoing debate (e.g. Bougna and Crozet, 2013). Interestingly, for purposes of this paper, Mizutani and Uranishi (2013) found that cost savings of a vertically integrated organisation depends on train density, with lower train density tending to reduce and higher train density to increase cost, which led van de Velde et al. (2012) to conclude that EU-wide imposition of vertical separation in rail would increase costs. This may be similar in the Australian context, and we conjecture whether mandatory open access, which essentially is a degree of vertical separation, is indeed cost efficient for all types of train operation and on all parts of the network.

Further to the cost discussion, there is the concern that contractual relationships between separated train operations and infrastructure management would result in higher transaction

costs than in an integrated or a holding model (Preston, 2002; Pittman, 2005; Growitsch and Wetzel, 2009. Merkert's (2012) empirical results suggest that vertical separation indeed increases transaction costs[1], but in a later study Merkert et al. (2012) reveal that even in the most extreme case of full vertical separation and open access, transaction costs at the train operation / infrastructure interface only account for three per cent of total operating cost. However, what they have also shown is that the transaction cost difference between more integrated and separated railways is largest for open access passenger operators followed by open access freight train operators (those not operating on their own tracks). This indicates that open access is a transaction cost critical issue, also confirmed by Merkert and Nash's (2013) qualitative findings that suggest that open access passenger train operators in Germany (who operate non-franchised passenger operations on track infrastructure that is to some extent integrated with the incumbent train operator Deutsche Bahn through a holding company model) perceive their environment much more uncertain and complex than their Swedish and UK counterparts (who run non-franchised passenger trains on the vertically separated national track network). This is also a result of weak regulation of the conditions of track access. Access rights are awarded only 9 months before the start of the operations, which makes it despite the fact that full open access is granted almost impossible to take the risk of investment into new rolling stock (at least at a larger scale).

In terms of the theoretical justification for open access, it is usually argued that according to the theory of contestable markets (Baumol et al., 1982), not only market entry as such but also the threat of entry alone, would be sufficient to incentivise the market players to produce efficiently and to offer their product/services at market/cost prices, rather than enjoying monopolistic producer rents. This view, however, is rather limiting in that its interpretation focuses on costs and assumes a steady state without innovation and dynamics within the relevant market (Carlton, 2004).

For the European passenger rail markets, it has been found that open access competition (in the sense of offering passenger services not subject to franchising, such as First Hull Trains running services on the East coast mainline in the UK) has been limited (although now starting in a number of European countries) and that there is evidence that undesirable cream skimming can be problematic in terms of achieving the aim of increased welfare (Nash, 2010). For passenger operations, Allen and Lu (2010) point out further that in order to make open access work, it should be consolidated and governed region wide by some public transport authority in order to increase the purchasing power for train paths and to achieve a productive relationship with the infrastructure manager. In terms of freight, Zunder et al. (2013) established that open access enabled significant growth of cross border pan European rail freight operations despite the fact that those open access operators faced very challenging barriers from various players including incumbents, infrastructure managers, terminal operators and even rail regulators (e.g., with regards to non-transparent energy supply; monopolistic shunting services; safety certification; terminal access restricting trade; weak regulatory authorities or the access to non-path infrastructure and services). This is expected to be similar in the Australian interstate market. Further difficulties in the EU cross-border market are related to different safety rules, a lack of clarity in the state's track infrastructure managers (or incumbents) track access conditions as well as differences in signalling systems, voltage and gauge (which often requires multiple changes of locomotives along the journey; (see e.g., The Economist, 2013), which again is also likely to be an issue in interstate (and even intrastate) rail transport in Australia. While Drew (2009) shows that, for the European case, freight customers would benefit more from vertical separation than just open access, it is very unlikely that vertical separation (and possibly also open access) will be the optimal option for all rail operations in Australia. To investigate the applicability of the various European views in the Australian context, in this paper we will to

[1] In line with Coase (1960), we define transaction costs in this paper as all costs resulting from preparing, negotiating, enforcing and monitoring contracts and rights.

compare the different types of train operations in Australia through the lens of transaction cost economics.

According to Williamson's (1998, 2005) theoretical transaction cost framework, a rail company would in terms of its choice of governance structure primarily aim to minimise its transaction cost. The level of transaction cost is driven by (at least for transactions associated with problems of small-number exchange relationships) a lack of partnerships, asset specificity, complexity of environments, frequency of exchange, and perceived uncertainty of the firms in question. Highly specific assets, such as railways (see e.g., Yvrande-Billon and Ménard, 2005 or Preston, 2002), can result in investment hold-up (i.e., if the contract is due for renewal, the stronger partner may try to dispossess the quasi rent of the weaker partner) or lock-in issues where the partner who did not make the investment in the specific asset may extract the resulting potential quasi-rent (Klein et al., 1978). For that reason, some firms tend to internalise stages of the production process, depending primarily on Williamson's key transaction attributes: asset specificity, frequency and uncertainty. Asset specificity in particular is seen as problematic in the traditional transaction cost economics literature, and applies to both the question of the optimal degree of vertical integration and open access in railways. The latter can be seen as a degree of vertical separation (i.e., in the freight market), where an integrated rail company gives third parties access to its infrastructure and hence employs contracts (between the 3rd party and the infrastructure arm of the integrated firm) rather than internal hierarchies (train operating arm and infrastructure arm of the same integrated firm) for parts of its train path portfolio. In the rail context, competition and hence open access is further seen as increasing transaction costs as a result of an increased need for train service co-ordination (Starkie, 1993). From a transaction cost perspective a la Williamson, large or highly specialised railways with only one operator and one infrastructure manager with specific technical characteristics (e.g., signalling and electricity systems) would have therefore strong incentives to vertically integrate with no option for open access (as their transactions are specific, frequent and often uncertain). As shown in Merkert and Nash (2013), this theoretical case is not applicable to most European train operators, and it is questionable whether all train operations in Australia are associated with the same transaction attributes and readiness for open access.

3. The railway market in Australia

Railways play a vital role for both passenger and freight operations in most parts of Australia. As shown in Figure 1, there are substantive passenger operations in five of Australia's seven states (but not in the Northern Territory and Tasmania), and freight rail haulage is significant in all states, most notably in Western Australia (iron ore), Queensland (coal, sugar, grain) and New South Wales (coal). According to the Australasian Railway Association (ARA, see Nye, 2013), 770m passenger journeys were made and 951m tonnes of freight carried in 2012 by rail, with both passenger and freight networks at or exceeding their capacity. There are over 1,800 locomotives and 32,000 wagons and carriages in the system, and in 2012 alone the industry saw $36bn of investment commitments in rolling stock and track. The Australian rail industry employs 44,210 people directly (+70,000 working in industries supporting rail).

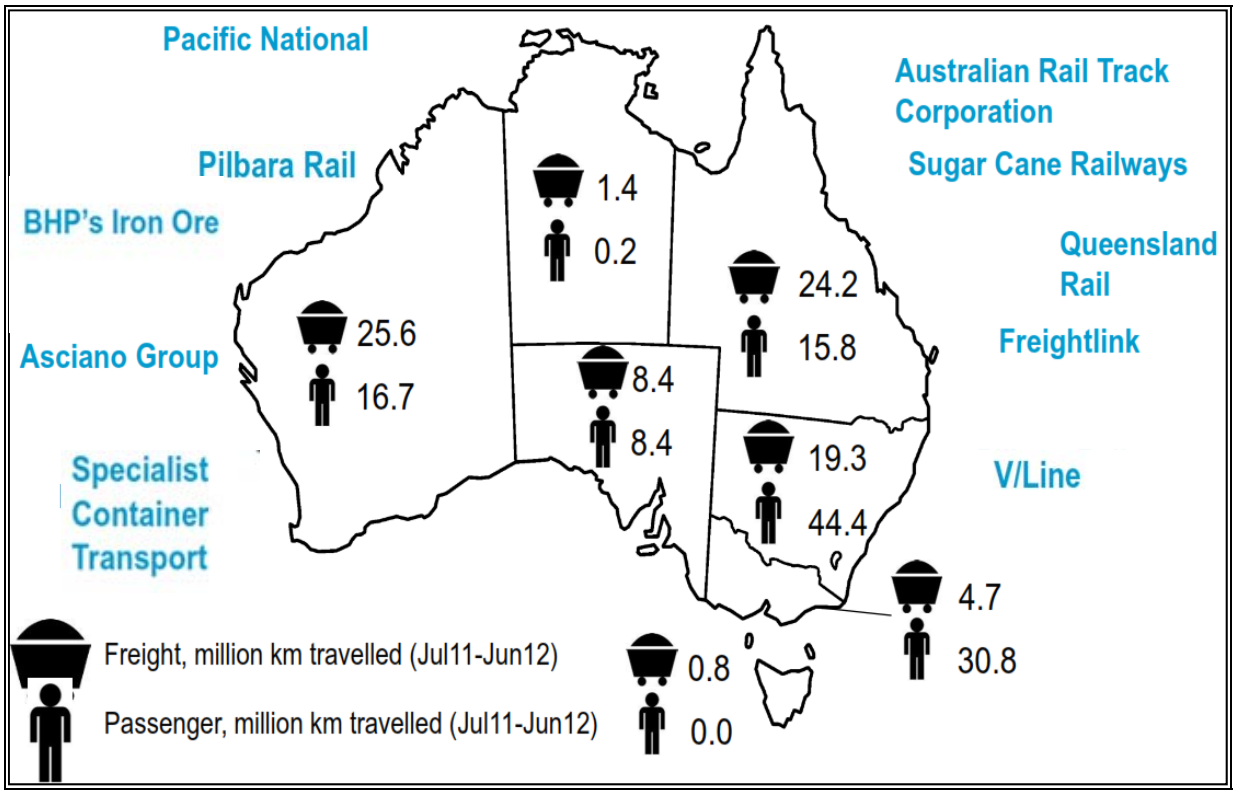

Fig. 1. The Australian railway market in a nutshell
Source: Gavan (2013) based on: Australian Transport Safety Bureau: Australian Rail Safety Occurrence Data.

Passenger rail operations are primarily an intra-state business with very limited inter-state operations (mainly for tourism purposes). Contrary, rail freight also affects inter-state operations but the trip length depends on the commodity that is carried. It is noteworthy that in contrast to Europe, a major focus in Australia is on transporting mining products. In 2012, around 931m tonnes of bulk commodities (coal, ore, sugar, bauxite, grain etc.) and 13.99m tonnes of non-bulk commodities were moved by rail freight. In 2012, 818m tonnes of that were dedicated to coal and iron ore transport. The Royal Bank of Scotland Transport Equities' (2012; Nye, 2013) estimates suggest that by 2020 this will be some 1530m tonnes, which, at current levels of investments in rail infrastructure, clearly shows a key capacity challenge but also the opportunity for rail freight in Australia (note that "only" 43.5m tonnes of goods are moved by rail to and from the UK's ports). However, this will only affect parts of the network which currently has a total length of 44,262 km of track.

While, as illustrated in Figure 2, there is a long distance interstate standard gauge network, considerable gauge differences still exist across the country, which indicates increased asset specificity. The majority of the interstate network is managed by the Australian Rail Track Corporation (ARTC; federal government owned corporation established in 1998 and vertically separated from any train operation). According to ARTC, the consistency of regulatory and commercial arrangements across Australia has increased in the last decade as a result of allowing larger parts of the interstate network to be managed by a single infrastructure manager (ARTC) through leasing parts of the interstate network in Victoria (1998), NSW (2004) and Queensland (2011). This has increased the number of cooperative arrangements between jurisdictions at an operational level (ARTC, 2013).

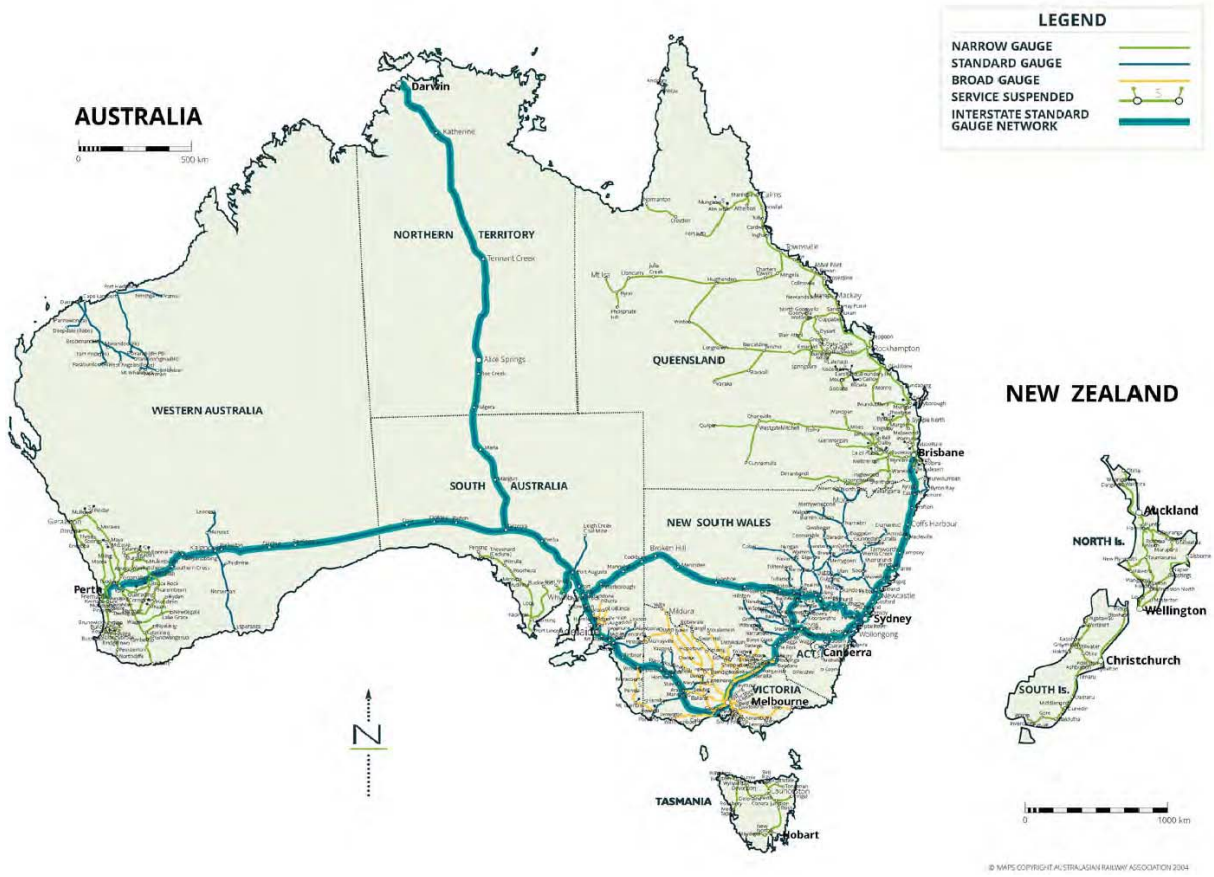

Fig. 2. The Australian rail network
Source: Australasian Railway Association.

Most rail track infrastructure managers in Australia (regardless of whether they are separated from train operations of vertically integrated train operators) are, as a result of being seen as natural monopolies with potential for abuse of market power, regulated at the federal level by the ACCC. In the light of additional jurisdiction/state specific rail legislation, in 2006 all state governments agreed through the Competition and Infrastructure Reform Agreement (CIRA) to provide for less complex and more consistent economic regulation of significant infrastructure, including railways. Through that process a proposal for a track access code was developed which would have governed coverage and intensity of regulation applicable to all rail networks (including a consistent set of principles for track access). This proposal was considered by all governments, but according to ARTC (2013) the relevant governments decided to proceed differently by seeking certification of existing state based regimes in order to satisfy CIRA requirements.

Table 1. Below-rail (track) service providers in Australia (outside metropolitan areas)

Infrastructure manager	Integrated or separated	Location	Primary usage
Interstate			
ARTC	separated	Brisbane–Kalgoorlie, via Melbourne and Broken Hill [excluding track around Sydney–Newcastle]	intermodal, grain, ores, steel
Brookfield Rail	separated	Kalgoorlie–Perth	intermodal, grain
Genesee & Wyoming Austr.	integrated	Tarcoola–Darwin	intermodal, ores
Intrastate			
Aurizon (QR National)	integrated	Goonyella, Newlands, Moura, Blackwater coal lines	coal
Queensland Rail	integrated (mostly)	Non-coal lines in Queensland (but including West Moreton coal)	passenger, grain, coal, cattle, ores, intermodal
John Holland	separated	NSW grain lines and Cobar line (Country Regional Network)	grain, ores, cotton
RailCorp (NSW Trains)	int.. (pax); sep. (freight)	Sydney, Newcastle, Wollongong	metropolitan areas passenger
ARTC	separated	Hunter Valley, Parkes–Dubbo, Boggabilla, Yarrawonga–Oaklands	coal, grain, cotton
V/Line	int. (pax); sep. (freight)	Portland, Benalla–Yarrawonga Intrastate Victoria	grain, mineral sands passenger, grains, mineral sands, intermodal
TasRail	integrated	Tasmania	intermodal, coal, ores
Asciano (for Alinta Energy)	integrated	Stirling North – Leigh Creek	coal
Brookfield Rail	separated	Intrastate tracks in south-west WA	grain, ores
BHP Billiton	integrated	Pilbara (to Port Hedland)	iron ore
Rio Tinto	integrated	Pilbara (to Dampier, Cape Lambert)	iron ore
Fortescue Metals Group	integrated	Pilbara (to Port Hedland)	iron ore
Aurizon in talks (2015?)	integrated but applying for open access	Pilbara (to Port Hedland)	iron ore

Note: In addition to these key players, there are a number of smaller infrastructure managers, which we don't cover in this paper (some 578 route-km in total). Source: BITRE and ARA (2012).

Although interstate rail access is in most cases not an issue (because of ARTC and Brookfield Rail being vertically separated and Genesee & Wyoming Australia regulated), at the intrastate level it is still an aspect that introduces a degree of uncertainty for all parties involved. It creates uncertainty among potential new entrants (and their investors) as well as vertically integrated rail operators who currently do not have open access operators running services on their tracks but are concerned about voices demanding open access for all types of train operation in Australia. As shown in Table 1, at the intrastate level there are a variety of infrastructure managers, some being vertically separated while others are integrated.

While open access is mandatory on interstate routes, at the intrastate level there are minor but important differences. Access to intrastate integrated rail infrastructure is generally mandatory in Queensland (QR), Tasmania (TasRail), Victoria (to a small extend Pacific National (otherwise separated train operator) and V/Line) and South Australia (Genesee & Wyoming Australia) under National Competition Policy principles agreed by the Federal, State and Territory governments in these states. While the train operators in those states act as incumbents on their own track infrastructure, they all (with the exception of TasRail) also operate trains in

other jurisdictions and are hence affected by open access both ways. The most interesting railways are the iron ore railways of the Pilbara and the sugar cain railways in Queensland, who are vertically integrated at the train operation / track infrastructure interface and are also backwards integrated into their respective (upstream) supply chains (e.g., iron ore mines). With that regard, Will-Johnsson (2007) found that any policy recommendation on open access (mandatory third party access to rail infrastructure) and economic regulation should depend not only on the specifics of the rail freight tasks under consideration but also on the characteristics of the related logistics chains, as summarised in Table 2.

Table 2. Recommendation for regulation of different rail freight markets in Australia

Commodity/ market	Recommendation for regulation/open access	Main justification
Iron ore	No open access	Potential reduction in efficiency of supply chain as rail infrastructure manager is also backwards integrated into mining operations, and 3rd party access would reduce flexibility in optimisation of train ops and mining shifts
Coal	Open access	No backward integration into mines
Bauxite and alumina	Open access but not in all cases	Three out of four refineries owned by same firm and hence cross-subsidisation if rail operator supporting industry gets too powerful
Grain	Open access in principle but not mandatory	Competition from road freight industry who offer rates that ensure that rail can hardly recover costs
Steel	Best case for open access	Only one railway company running trains for the three steel producers in Australia (in three states); monopoly rents; open access would result in welfare improvement and benefit the steel industry
Intermodal freight	Open access only on East-west links	Everywhere else trucking is likely to offer rates that ensure that rail can hardly recover costs

Source: based on Wills-Johnson (2007).

Will-Johnsson (2007) undertook a desk top analysis only; our paper however seeks to discuss the perspectives of the involved rail managers. We also provide an update to the open access situation. While open access in freight train operation has been an issue for some time (for example, in 2005 Linfox and Queensland Rail challenged Pacific National over access), and although most freight tasks are to some extent still affected by uncertainty over open access, in recent years it was particularly the non-regulated Pilbara iron ore railways who have caught the attention of the media, investors and the mining business at large. Initially it was Fortescue Metals Group who was the underdog fighting to get access to BHP Billiton's and Rio Tinto's infrastructure, but since 2013 the roles have changed as Fortescue denies rail access to Brockman Mining. While backward integration is also discussed in the coal business (see for example the proposed alliance between GVK and QCoal on a rail/port link from coal mines in the Bowen Basin to Abbot Point in Queensland) it has so far only happened in the Pilbara, where the three big iron ore players - BHP Billiton, Rio Tinto and Fortescue Metals Group - run integrated train operations exclusively for their iron ore arms. Will-Johnson (2007) argues that these railways are very efficient as a result of the same company owning the mines, as well as controlling all other parts of the integrated logistics components, namely the railway (train operation and track infrastructure), the port and the product. The single decision maker has full knowledge of the system, and it is argued that open access to the rail track infrastructure for 3rd parties would create inefficiencies, complexities and delays in addressing operational and investment issues. These are all aspects that are commonly discussed in the transaction cost context too.

The situation became even more interesting in April 2013 when junior miners Atlas Iron and Brockman Mining, as well as Aurizon Operations Ltd. (Australia's largest freight train operator), published the first phase of their independent Pilbara rail study which aimed at evaluating the scope for a new, multi-party, open access railway (in the sense of Aurizon running the trains for any interested mining company, rather than a single/dedicated miner) connecting iron ore mines the East Pilbara to Port Hedland. It is worth noting that their study was based on the economics of this new independent rail solution from the mining companies' point of view in the sense of that alternative to the status quo aggregating rail freight throughput from a number of operating and prospective minors. This model of open access would be a mini step towards the European model in the sense that one vertically separated train operator would most likely become a monopoly player on the relevant rail lines. Although, since then, Aurizon indicated that it would not be rushed into such a project (reportedly the cost for the rail network would be some $10bn), the project idea still shows that open access is high on the agenda in Australian railways. In May 2013, the situation intensified when junior miner Brockman Mining considered submitting an open access proposal to a Pilbara rail system (which would then become much more similar to the European model) and by doing so to test for the first time the Western Australia access code. In this case Brockman was seeking access rights for 20 years to Fortescue Metal track infrastructure that would allow it to use another party (Aurizon) to haul 20m tonnes of iron ore from its Marillana project to Port Hedland. In August 2013, Western Australia's Economic Regulation Authority (ERA) approved the start of negotiations between TPI, Fortescue Metal Group's infrastructure subsidiary, and Brockman over the requested access to its Pilbara railway tracks. However, in October 2013 Fortescue challenged ERA's cost determination and decision to support negotiations between it and Brockman Mining, for rail access in the WA Supreme Court. While third party access is now certainly on the nationwide agenda in Australia, the debate on open access does seem to be limited to freight (contrary to Europe), with two different forms of open access. One where miners and train operators try to get access to an existing vertically integrated iron ore line of one miner (the European open access debate) and one where a group of miners and a train operator want to work together to ensure that all minor get access to rail infrastructure (open access for a preferred train operator who is not owned by a mining company). While the earlier could potentially be linked to intended competition effects at the train operating level, the latter would rather allow to make accessible and exploit different mining areas more efficiently (and hence have competition effects at the mining company level).

4. Methodology

The aim of this paper is to establish whether open access is, in the view of rail managers, appropriate for all train operations in Australia. In addition to desk top analysis, we have undertaken a survey of senior rail managers in passenger and freight train operating companies as well as key infrastructure managers in Australia. We asked them for their views and experiences with the transactions that they have with infrastructure managers, regulators and other train operating companies. By doing so we focused on vertical integration and open access in the context of the three key transaction attributes of Williamson's framework, namely asset specificity (How easy (time and cost) would it be for your company to move its a) rolling stock, b) human assets such as train drivers, c) brand and d) all other assets to other parts of the network), frequency (How many trains does your company run and how often do you/your company interact with the infrastructure manager per week?) and uncertainty. Regarding the latter, we differentiated uncertainty into trust between the infrastructure manager and the train operating companies (How much do you trust your infrastructure manager? How certain are you that he does not act against your companies interest?), and the exogenous environment which includes uncertainty over future regulation (How uncertain are you regarding future regulatory changes, level of subsidies or other exogenous factors that might affect your business?). We further explored open access issues potentially related to disputes, behavioural aspects or

regulatory actions, with a specific focus on the role of various institutions, contracts, trust and regulation. For the sake of simplicity, we focused on open access as being mandatory third party access to otherwise vertically integrated infrastructure, and have omitted the further potential differentiation in the passenger train operation context of non-franchised versus franchised passenger train operations.

With regard to the sample, we approached all train operating companies and the larger track infrastructure managers in Australia (as well as two train operators in New Zealand). While we were in contact with more than 80 managers, a total of 45 senior rail managers participated but not all completed all questions of the survey. This is a result of us asking some background questions (e.g. their position within the firm) and hence ensuring that all respondents were working in a position that qualified them to provide robust/well informed answers. As shown in Table 3, we obtained a full/valid response from 15 rail companies, including four passenger train operators (TOCs; please note that this includes KiwiRail who are based in New Zealand and who also run some freight operations), nine freight train operators, and two separated infrastructure managers (SIM). Seven of the 13 train operating companies are vertically integrated on either their entire network or on parts of their network and hence also manage below rail infrastructure. The nine freight train operators can be further classified into six general freight train operators (FOCs) and three iron ore freight train operators (IronFOCs), the latter being vertically integrated (also with the mines) and with no connection to any other network.

Table 3. Sample of analysed rail companies

	Primary business	Governance at train/track interface
Queensland Rail (pax arm of old QR)	TOC	Integrated
V/Line	TOC	Integrated (some separated freight)
Great Southern Rail	TOC	separated with long term contract
KiwiRail	TOC/FOC (NZ)	Integrated
Aurizon	FOC	separated with long term contract
Pacific National Rail	FOC	separated with long term contract
Qube Logistics (South Spur Rail S.)	FOC	separated with long term contract
Manildra Group	FOC	separated with long term contract
Watco Companies Western Australia	FOC	separated with long term contract
Genesee & Wyoming Australia	FOC	Integrated
BHP Rail	IronFOC	Integrated
Rio Tinto Iron Ore Rail	IronFOC	Integrated
Fortescue Metals Group	IronFOC	Integrated
Brookfield Rail	SIM	separated with long term contract
ARTC	SIM	separated with long term contract

While initially we feared that the IronFOCs would not cooperate, all of them eventually did. In terms of the management level of the respondents, our data shows that all of them are in senior management with a number of them being at the CEO/MD level. It is worth noting that metropolitan train operators did not provide us with useful responses. While some of them never replied, others stated that is not in their board's interest to contribute to our study, which we find an interesting and unexpected result in itself. As all of these metropolitan train operators are vertically integrated with no option of open access (and apart from Melbourne in public ownership and hence with no internationally experienced parent group supporting them), we decided to discuss them separately in the results section.

While we acknowledge that the sample consists of very different types of train operations, we see this as a positive in that if a trend can be established across all types or within a certain type of rail business, then that will inform policy makers about the specifics of either all or parts of Australia's diversified rail system. Although the sample is representative (geographically, type of operation, seniority of management) we did not envisage testing our findings for statistical significance, but rather we use mean and standard deviation values to show any potentially existing trends in the collected data.

5. Results

The survey results show that there are systematic differences in perceived transaction attributes across the different types of train operations in Australia. In terms of similarities, as with Merkert and Nash (2013), we argue that temporal asset specificity is by definition relatively high in any type of railway operation. The findings suggest that in contrast to the European case, the frequency of interactions between Australian train operators and track infrastructure managers across the different types of train operations is relatively low, which would favour vertical separation and open access. In terms of differences, it becomes apparent that perceived asset specificity, uncertainty and trust levels differ noticeably across the different types of train operation as shown in Table 4.

Table 4. Perceived transaction and relationship attributes by type of operation

	TOCs*		FOCs		IronFOCs		SIM		Total
	mean	SD	mean	SD	mean	SD	mean	SD	mean
Rolling stock asset specificity**	**1.0**	0	2.0	1.1	3.7	1.5	**1.0**	0	1.7
Human capital asset specificity**	**1.2**	0.5	2.0	0.9	2.0	0	1.5	0.7	1.7
Brand asset specificity**	**1.7**	0.9	1.8	0.8	3.3	1.5	2.0	1.4	1.9
Other asset specificity**	**2.0**	0.8	3.7	0.5	3.0	1	3.5	2.1	3.1
Trust between train operator and IM (1-10)	7.3	1.9	5.3	2.7	**10**	0	9.0	1.4	7.3
Exogenous uncertainty (1-10)	**7.0**	2.2	6.2	1.2	3.7	3.8	**7.0**	2.8	6.0
Level of disputes between train operators and IM (1-10)	**6.0**	2.7	4.7	3.4	1.7	1.2	2.0	0	4.1
Most important in relationship to IM***	2.8	0.5	2.7	0.5	3.0	0	2.5	0.7	2.7

*Note: * TOCs= passenger train operating companies; FOCs= freight train operating companies; IronFOCs= Iron ore freight train operating companies; SIM= separate infrastructure managers*

*** the values for asset specificity were: 4= impossible; 3= Matter of 1-2 years; 2=Matter of a few months; 1=Matter of a few days (very low asset specificity)*

**** the values for Most important in relationship to IM were: 1=tough/independent/transparent regulation; 2=good contracts; 3=trust and good relationships*

What is apparent in the results presented in Table 4 is that the perceived transaction attributes of all of the IronFOCs are almost identical and very much in line with the textbook small relationship transaction cost economics case. Their asset specificity (regardless of which type) is highest in relation to all other types of rail operation, their trust towards the infrastructure manager is extremely high (with no variation across the three IronFOCs), which is underpinned with very low level of disputes and the high importance they place on trust and good relationship to the infrastructure manager (again with zero variation). From a cost benefit

perspective, the competition effects of potential open access (as a degree of vertical separation) to existing rail infrastructure (in the sense of both other train operators getting onto the IronFOCs' vertically integrated rail infrastructure and other miners getting access to the vertically integrated rail solution of the relevant IronFOC; this is however unrelated to the earlier discussion on building a new line with open access for miner and one train operator having monopoly access rights) in such a setting would have to be significant in order to over compensate the expected increase in transaction costs.

As expected, the TOCs perceive their transactions with the infrastructure manager differently, and the FOCs (who are associated with some variation across them as a result of some of them being vertically integrated while others are not) are approximately in the middle between the TOCs and IronFOCs. That said, both FOCs and SIM place slightly more importance on good contracts than trust, which indicates past bad experiences with the other side. In terms of asset specificity, it is noteworthy that is not so much the rolling stock or the human capital but rather other assets (such as depots and terminals) that are, across all types of rail operation, perceived to be associated with relatively high levels of asset specificity. We also note that the freight share on Australian rail lines is in many cases either much higher or much lower compared to most of Europe, suggesting a mix of operations and hence increased complexity in Europe.

Turning our focus again to the metropolitan rail operations, Nye (2013) stresses the importance of the intra-region market by highlighting the 770m passenger journeys p.a. (2012) in those areas and the 5 % annual growth of this market segment, which translates into 60,000 new passenger journeys every week and 300 new passenger cars every year. It is hence valuable to discuss the characteristics of metropolitan passenger train operations, despite their management refusal to contribute to our study. Table 5 shows that the metropolitan railways in Australia are similar in the sense of their governance (vertical integrated monopoly with no open access) and ownership structure (apart from Melbourne all in public ownership). However, the differences are also quite apparent, most notably in the different network sizes/mixes, gauges and electrical systems.

Table 5. Key network characteristics of urban railways in Australia

	Sydney	**Melbourne**	**Brisbane**	**Perth**	**Adelaide**
Integrated/separated	integrated	integrated	integrated	Integrated	integrated
Primary usage	Pax	Pax	Pax	Pax	pax
Ownership	Public	private	Public	Public	public
Route lengths					
Dedicated metropolitan pax. route length (km)	181	234	86	168	88
Dedicated metropolitan cargo route length (km)	33	66	81	121	62
Shared metropolitan passenger/freight route length (km)	156	196	134	1	30
Non-metropolitan passenger route length (km)	714	0	172	0	0
Electrical system (overhead, for passenger trains)	1 500 kV DC	1 500 kV DC	25 kV 50 Hz	25 kV 50 Hz	Not electrified
Gauges					
Urban passenger lines (mm)	1435	1600	1067	1067	1600
Interstate** freight lines (mm)	1435	1435	1435	1435	1435
Intrastate freight lines (mm)	1435	1600	1067	1067	1600
Operators (pax)	Sydney Trains / NSW trains	Metro Trains***	Queensland Rail	Transperth	Adelaide Metro
Number of vehicles	1 618	987	627	234	100

*Note: * government franchise; ** Some intrastate freight operate on interstate tracks in Sydney, Melbourne, Perth and Adelaide; *** Some metropolitan services are provided by V/Line, the State government country service operator. Source: based on BITRE (2012); BITRE and ARE (2012).*

Given that each system has its very own specific characteristics, it is possible (even without receiving the responses of the relevant managers) to conclude that the transactions associated with train operation and infrastructure management are aligned with very high asset specificity, high frequency and possibly (based on the European experience of similar operators as detailed in Merkert and Nash, 2013) high uncertainty. This suggests that vertical integration or competition for the train operating market (franchising with long term contracts) would be appropriate governance structures for this type of operation, although it is less clear why open access (in the sense of competition in the market) should not be feasible in this context. If an open access (rather than franchising the entire metropolitan network) policy would be pursued, the key issue would be to assure that all passenger open access operations in the relevant metropolitan area would be consolidated and governed region wide by some public transport authority.

In terms of the results of our survey, we received answers on three further sets of questions.

Table 6 shows the managers' reply on the following question: "*Thinking about the degree of vertical integration and open access, how important are the following issues for your choice of organisational structure?*"

Table 6. Importance of issues for your choice of organisational structure

	TOCs		FOCs		IronFOCs		SIM		Total
	mean	SD	mean	SD	mean	SD	mean	SD	mean
Protection of your train operating company's investment	9.75	0.50	9.33	1.21	**10.00**	0.00	9.00	1.41	9.5
Speed and quality of decision making processes	7.75	1.71	8.50	1.05	**9.33**	1.15	8.50	0.71	8.5
Duplication of processes and staff cost at both sides of the interface	5.75	2.36	6.67	2.07	**8.67**	1.15	3.50	0.71	6.4
Certainty of your company about the current and future situation	7.25	1.71	8.67	0.82	**9.00**	1.00	8.50	0.71	8.3
Control of your company over access & management track network	7.00	1.63	8.33	1.86	**10.00**	0.00	8.50	0.71	8.3
Leverage of risks across different stages of the value chain	7.50	1.73	8.33	1.03	**8.67**	2.31	7.50	0.71	8.1
Cost and ease of coordination	7.50	1.29	**8.67**	1.03	8.00	2.00	**9.50**	0.71	8.3
Level of competition between train operators	5.50	2.38	6.50	1.76	**6.67**	3.06	4.00	0.00	5.9
Incentives to efficient production at both train operation and infrastructure level	**9.00**	0.00	8.00	1.10	8.33	2.08	7.00	1.41	8.2
Independent and efficient regulation of the rail infrastructure manager	7.25	1.71	**8.83**	1.33	6.67	3.06	6.50	0.71	7.7

Note: A value of 10 stands for very high importance.

Our results suggest that IronFOCs place relatively high importance on all issues except regulation. Only SIM place less importance on regulation of the rail infrastructure manager which is hardly a surprise as any firm would not perceive its own regulation as important. With regard to the most important issue for railway choice of organisational structure (mean of all firms), protection of the rail firms' investment scores highest, followed by speed/quality and cost of decision and coordination processes. IronFOCs place the highest possible value (without any variation across the three IronFOCs) on the protection of investment and control of access and management of track networks, underlining the point that open access would most likely not be their choice of organisational structure.

This is further manifested by the results on the next set of questions (which is related to the previous set), as summarised in Table 7. The question we asked the rail managers was:
"*Thinking about the degree of vertical integration and open access, how has your experience with this issue been to date?*"

Table 7. Experience with issues for your choice of organisational structure

	TOCs		FOCs		IronFOCs		SIM		mean
	mean	SD	mean	SD	mean	SD	mean	SD	
Protection of your train operating company's investment	6.3	1.7	6.8	3.2	**9.7**	0.6	7.5	0.7	7.3
Speed and quality of decision making processes	4.5	1.3	6.2	3.4	**9.0**	1.7	7.5	2.1	6.5
Duplication of processes and staff cost at both sides of the interface	5.5	1.0	6.0	2.1	**9.0**	1.7	7.5	2.1	6.7
Certainty of your company about the current and future situation	4.3	1.7	7.3	3.3	**9.0**	1.7	6.0	0	6.7
Control of your company over access & management track network	4.3	1.9	6.5	3.1	**9.7**	0.6	7.5	2.1	6.7
Leverage of risks across different stages of the value chain	5.8	1.5	6.7	1.9	**9.0**	1.7	7.0	1.4	6.9
Cost and ease of coordination	4.8	2.2	5.7	3.1	**9.0**	1.7	7.5	0.7	6.3
Level of competition between train operators	5.0	2.2	5.8	2.5	**9.3**	1.2	7.0	1.4	6.5
Incentives to efficient production at both train operation and infra. Level	3.5	0.6	5.0	3.5	**9.7**	0.6	7.0	1.4	5.8
Independent and efficient regulation of the rail infrastructure manager	4.0	2.7	6.2	2.6	**7.3**	3.8	6.0	0	5.8

Note: A value of 10 represents very satisfied and 1 stands for very dissatisfied with the relevant issue.

The results in Table 7 suggest that IronFOCs are most satisfied with their current operating environment (and all the issues that are usually associated with vertical integration), as they score on average highest (by quite a margin) in all of the prompted areas. In addition to transaction cost arguments, this can also be related to economies of scale and the simplicity/homogeneity of their commodity. What they run and try to protect from any disturbance (which would in their view be a result of third party access to their track infrastructure) is a fully optimised and standardised integrated supply chain, which takes their case beyond the usual train operation/track infrastructure interface discussion (for the latter see e.g., Merkert and Nash, 2013). TOCs on the other hand tend to be most dissatisfied regardless of the organisation issue in question, with least satisfaction about incentives to efficient production at both train operation and infrastructure level, presumably targeting the latter participant.

Finally we asked our respondents the following question:

"*How important are the following institutions to the relationship between train operation, infrastructure management and open access?*"

Table 8. Importance of institutions to the relationship between train operation, infrastructure management and open access

	TOCs		FOCs		IronFOCs		SIM		mean
	mean	SD	mean	SD	mean	SD	mean	SD	
Regulator	7.0	3.5	**9.2**	1.0	6.7	3.1	8.0	0.0	7.9
Public Transport Authorities (or Ministries of Transport)	6.8	2.4	**8.0**	1.9	3.7	1.2	2.5	0.7	6.1
Your company's end customers	8.3	2.4	**9.3**	0.8	**9.3**	1.2	9.0	1.4	**9.0**
Your parent company	7.0	1.4	**9.3**	0.8	9.0	1.7	5.5	6.4	8.1
External consultants	3.3	2.1	**5.7**	1.2	3.0	2.0	2.5	0.7	4.1
Competitors of your company	5.8	2.9	**8.3**	1.4	2.3	1.2	6.0	2.8	6.1

Note: A value of 10 stands for very high importance.

The results presented in Table 8 suggest that the rail firm's end customers are most important to the relationship between train operation, infrastructure management and open access. Reviewing Tables 5 to 7, this was expected for the IronFOCs (as their customers are their backward integrated mines) but not for the FOCs who place the same level of importance on end customers. Interestingly FOCs see, apart from external consultants, all of the listed institutions as very important for vertical rail organisation and open access. In addition to their parent company (noting that it is likely that FOCs are the type of rail operation that is most likely to have a parent company),they place very much importance on the regulator but also on public transport authorities and ministries. What we find most noteworthy is that FOCs are similarly concerned about and focused on supply chain efficiency and their end customers than backward integrated IronFOCs. SIM and surprisingly also IronFOCs place very little importance on their competitors when it comes to the relationship in question. This confirms that for IronFOCs, the competition does not happen at the train operating level but between integrated mine supply chains. In those well optimized supply chains any open access is perceived as a significant disturbance. That said, we note that Newcastle is a useful example for cooperative competition in access to the port, with of course the key difference being that it is not associated with backward integrated iron ore mines.

6. Conclusions

The organisation of railways, and particularly the aspect of mandated open access to vertically integrated rail infrastructure, is currently a heated topic in Australia. This paper sets out to analyse for the Australian context rail managers' perception of transaction attributes (asset specificity, frequency, uncertainty, the latter further distinguished into trust and exogenous uncertainty) and organisation issues with regards to the relationship between train operators, infrastructure managers and open access. While we have established some similarities with respect to the relatively low frequency of transactions required in Australian railways (compared to the European case), our results suggest some significant differences across the different types of train operation in Australia.

Interestingly, while in Europe the open access debate is focused on open access passenger operators trying to get access to routes of either vertically integrated or separated franchised (incumbent) passenger train operators, in Australia the recent debate has been centred around end costumers (i.e., miners) and 3rd party freight train operators trying to get access to vertically integrated freight track infrastructure. Our results suggest that perceived asset specificity is an issue particularly for the vertically, privately owned IronFOCs who are essentially an integrated business along the entire supply chain from the mine to the deep sea ports. Our survey has

further shown that according to the managers' perceived transaction attributes and organisation issues at the train operation / track infrastructure interface, IronFOCs are least suitable for open access from a transaction cost perspective. While this confirms Will-Johnson's (2007) theoretical considerations, we do not say that open access (particularly second-tier open access to spare capacities) cannot be implemented for this type of train operation (and the Pilbara more generally). Rather, we conclude that all other types of train operation (including the metropolitan passenger railways) in Australia are, from a transaction cost perspective, on average much more suitable as candidates for open access. Hence the European example of excluding privately owned and vertically integrated freight train operators from the relevant directives may be worth considering in the Australian policy making context of mandatory third party access to existing privately owned rail infrastructure. If the intended competition effects are to be initiated at the mining company rather than train operating level (in a sense of allowing access to bottleneck infrastructure to explore or exploit mining areas more efficiently), then the policy question (and with it potential conclusion on open access) becomes different to the European case of trying to improve the efficiency of its railways and in general a policy question that goes beyond the organisation of railway firms. What our research has also established is the importance of ensuring a clear definition and terminology when using the term open (third party) access. As discussed, full open access, second-tier open access to spare capacities or an essential facilities approach providing access under specific conditions have not only different intentions but also substantially different effects.

The survey has also revealed that trust between the infrastructure manager and the train operating companies, in contrast to good contracts or independent regulation, is what makes the railways work. This confirms and strengthens Merkert and Hensher's (2013) findings on the importance of trust in the organisation of transportation, insofar as trust and good working relationships can reduce transaction costs regardless of the degree of vertical separation. What is interesting in the Australian rail context is that the level of trust between train operation and infrastructure management appears to be higher in vertically integrated iron ore rail companies (IronFOCs), which suggest that those systems benefit from more stable operation and lower transaction costs. Further research should investigate the potential benefits of full and second-tier open access to IronFOCs infrastructure, and evaluate whether they outweigh the increase in transaction costs.

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