Rail Infrastructure Pricing:

PRINCIPLES and PRACTICE

REPORT 109

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Rail Infrastructure Pricing:

Principles and Practice

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FOREWORD

As a significant break from past practice, Australia's trains may now operate over tracks owned and managed by other entities. This access may lead to competition between train operators, stimulating operator efficiency. Track owners then need to establish fair prices for train operators' use of their tracks. This development has been echoed in overseas countries, where debate and experience with rail infrastructure charges lends perspective and insight to emerging issues in Australia. Explicitly identifying track charges can also provide insight into rail infrastructure costs, thereby facilitating fair and equitable charges for, and investment in, road and rail infrastructure.

This Bureau of Transport and Regional Economics (BTRE) report considers the principles of rail infrastructure charging and reviews the policy objectives, practical applications and experiences of rail infrastructure charging, in Australia and overseas.

The authors are grateful to those who have assisted in the development of the report. In particular, Professor Derek Scrafton provided constructive comments and insight, in his role as an independent reviewer of the draft report. The vital industry perspective and feedback provided by various rail infrastructure managers and train operators is acknowledged. The authors also recognise the contribution of their colleagues, particularly Lyn Martin, in preparing the review of charging principles.

The study was undertaken by Peter Kain, initially under the guidance of Dr Mark Harvey and, latterly, Phil Potterton.

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July 2003

AT A GLANCE

- On-track competition, commercial viability and seamless operation across rail networks are the main objectives of access pricing policies in Australia and overseas. Access and access pricing arrangements vary across countries, in part due to differences in the relative emphasis placed on these objectives.

- However, there is a tension between these objectives. In particular, in encouraging fair and equitable track access, infrastructure cost recovery can be compromised. For North American privately-owned railways, train operator competition is a secondary issue to cost recovery and differential freight tariffs greatly facilitates railway viability. However, because the Australian policy of mandated access emphasises train competition, this militates against applying differential charges. Such charges might hinder competition objectives by favouring one operator over another.

- Train operators benefit from prices that are predictable and transparent, as is widely adopted in Europe. Australian pricing regimes are generally set by negotiation within a wide floor-ceiling band. However, the provision of 'reference' tariffs (such as undertaken by Australian Rail Track Corporation) can reduce uncertainty and negotiating costs.

- Ideally, access charging structures would encourage efficient infrastructure use and investment and be consistent with efficient train operations. Poorly-structured charges in Britain, under the Railtrack regime, led to under-investment in infrastructure and over-use of track.

- Development of access charges that can allocate capacity effectively amongst competing train operators, is still in its infancy internationally. In principle, it might be possible to use auctions to allocate track capacity among rival operators, but no rail system has yet identified a practical way of doing this.

- Despite the now-common separation of train operations from track management, there has been little development of risk-sharing strategies and performance incentives. However, a performance incentive scheme in the British rail network, which (in contrast to Australia) is complex and has numerous train operators, has proved costly and ineffective.

CONTENTS

TABLES

FIGURES

SUMMARY

Since the early 1990s, railway operations in Australia and in many overseas countries have been radically reformed. One reform has been widespread outsourcing of railway activities such as infrastructure maintenance, to encourage efficient provision through competitive tendering for services. In some cases, entire rail operations have been contracted out or privatised. The major reform, however, has been to introduce regulations to require access to rail infrastructure by outside ("third-party") train operators. This mandated access also supports rail interoperability objectives—facilitating train service coordination by streamlining the logistics chain across infrastructure networks.

Prior to these regulations, there were no access charges because the track use was an internal transaction within the railway company—the company maintaining the infrastructure had exclusive use of the tracks for its own trains. In essence, the railway's revenue was generated only from tariffs for transporting goods and passengers. However, with mandatory access, rail infrastructure owners offer an additional service—non-track owners' access to the infrastructure.

What are fair, equitable and efficient charges for that access? We know that the level and structure of these charges matter, for they account for, perhaps, one-third of the train operator's total operating costs. This report focuses on the rail infrastructure pricing structures that have developed with mandated access around the world, and the lessons that can be drawn from the subsequent experiences.

Our analysis involves consideration of the benefits and costs of mandatory access; the principles of efficient access charges; Australia's systems of access and pricing; international pricing and access systems and the lessons from the experiences with them. While principles of access charges apply equally to freight and passenger trains, mandated access is generally directed only at freight operations. For that reason, in this report we consider only freight operations.

POLICY OBJECTIVES

Rationale

In recent years, rail policy has sought to improve rail's efficiency through a range of approaches:

- corporatisation of railway departments;

- contracting out; and
- privatisation.

In most railway systems across the world, such approaches have been implemented on the presumption that the systems would improve cost recovery, even if most systems remained unprofitable.

More recently, policy makers have mandated third-party access to rail infrastructure. This access is intended to provide train customers with alternative (competing) providers; this can reduce rail operator margins, encourage operators to seek further efficiencies and be more responsive to customers' service quality requirements.

The service competition can occur in two forms:

- through establishing the potential for competing above-rail services; or
- through inviting competing bids *for* a contract to run above rail services.

Thus, opening access can assist competition and contestability in train service operation and contracting.

In addition, mandated access enables train operators to extend beyond their traditional rail network. Consequently, it facilitates inter-network service coordination. In this way, service logistics can be streamlined to match the flow of the goods rather than the pattern of the incumbent railway company's network.

Policy implementation

There are three distinct forms of regulation that underpin access reform policy:

- those that mandate access;
- those that regulate the industry structure; and
- those that regulate and arbitrate access charges.

Regulation of industry structure is used to underpin mandated access. Its objective is to improve transparency in transactions between the infrastructure provider and the access seeker, providing fair and equitable access. The industry is then restructured by separating 'above-rail' and 'below-rail' activities and accounting *either* within the firm or into a managerially and commercially independent business.

Access regulation and arbitration are intended to ensure that charges are non-monopolistic, are fair and equitable (and subject to arbitration if they are not) and be set in a way that encourages efficient infrastructure provision.

Benefits and costs of mandatory access

Access reform is intended to benefit train services. Better services may arise (through improved service coordination across individual rail networks). On-track competition and contestability may bring about more efficient service provision, improving cost recovery and/or lowering tariffs. To the extent that rail's improved efficiency generates additional rail traffic, the infrastructure captures economies of density in infrastructure provision. (These economies arise because, until the railway approaches capacity, additional trains can be handled at relatively little additional cost.) Finally, the explicit calculation of access charges facilitates the development of policies aimed at competitive neutrality across modes.

Mandating access also bring costs. Notable amongst these is the increase in coordination and transaction costs. Coordination of activities such as signalling, timetabling, train operations, maintenance and investment within an integrated railway are considerable; the complexity of these tasks rise as additional players are introduced to the industry and as those players bring objectives that can differ fundamentally from other players. Coordination costs rise disproportionately as each additional player may require liaison with all existing players. Similarly, as infrastructure approaches capacity, the costs can rise rapidly as reconciliation of the conflicting demands on capacity requires disproportionately more effort. In addition, transaction costs increase as non-priced trading within the integrated firm is replaced with more formal purchasing processes.

Other reform costs can include the potential loss of economies of density in train operation that would arise if on-track competition led to reduced train lengths. Crucially, the aim of fair and equitable competition restricts the types of access charges (such as Ramsey and two-part pricing) that can be applied within an efficient and high cost recovery framework. Infrastructure capacity may also be less efficiently used, to the extent that trains are of shorter lengths or have conflicting speed characteristics. Investment risks can also rise to the extent that the infrastructure manager no longer has control of the train operations; this reduces investment incentives. Vertical separation of infrastructure management and train control also adversely affects incentives for maintaining and optimising track and rolling stock and for controlling the impact of rolling stock on infrastructure. Finally, the shift from entirely integrated operations increases the resource costs required to maintain safety standards.

The net benefits of mandated access therefore arise from the difference between the additional benefits and the offsetting costs. Positive net benefits are less likely when the freight market is small and where transaction and coordination costs are likely to be substantial.

PRINCIPLES OF EFFICIENT RAIL INFRASTRUCTURE PRICING

We consider the principles of efficient pricing to the provision of access to rail infrastructure. There are a number of factors influencing the price-setting:

- the freight market—market size and the degree of competition from other modes;
- policy objectives of efficient infrastructure provision and use and efficient train operation;
- pricing structures and their impact on infrastructure provider and train operator;
- relating infrastructure use to infrastructure cost causation; and
- the institutional and regulatory setting.

This price-setting environment should be seen against the perspective of the historical (closed access) setting, where the single, integrated railway operator balanced infrastructure parameters and the prevailing freight market in setting that rate. Depending on the railway operator, freight rates *may* have borne some relationship to the cost of the separate activities of operating trains *and* providing infrastructure.

Freight market

One characteristic of rail infrastructure that plays an essential role in the economics of infrastructure provision is the link between the freight market size and the minimum track capacity. Generally, there is lumpiness in track capacity provision. Capacity supplied is often large relative to the demand for conveyance. As track utilisation increases, large overhead capital costs can be spread across traffic. Consequently, average unit costs decline over a wide output range with the result that unit costs of a single infrastructure provider are typically lower than with two or more providers. Thus, most rail provision is perceived to be 'natural monopolies'. Nevertheless, even with just one provider, the minimum capacity that can be supplied may be very large relative to the demand for freight. However, demand is often relatively price-elastic, because for many freight commodities and journey lengths, road (in particular) is a close substitute. Typically, then, charges cannot be raised to a level that can recover all costs.

Since the construction of common-carrier railways (mostly before the Depression), road freight competitiveness has improved dramatically; this has altered the economics of rail freight competitiveness. Indeed, due to the superior quality of road-based conveyance, rail often follows rather than sets freight tariffs. The train operator's tariffs are thus constrained by prevailing road freight tariffs—by implication, the rail tariffs are price-elastic. For this reason, an infrastructure manager is similarly constrained in raising access charges: higher charges would lead to higher rail freight tariffs, that would

accelerate the shift of traffic to road and so reduce infrastructure cost recovery and train operator viability.

Thus, the overall level of commercially-set access charges may be constrained by the level of competition in the above-rail freight market. In this way, an infrastructure manager may then apply "market-based" access charges (that reflect price elasticities) rather than "cost-based" charges. A consequence is that optimal (commercial) charges may not recover long-run infrastructure costs.

Economic efficiency

It is assumed that the underlying objective of rail access charges is to set prices that bring about 'economic efficiency'. For an economy to be described as economically efficient, there must be allocative and productive efficiency. Previous rail policy was focused on allocative efficiency; current reforms centre on productive efficiency.

Allocative efficiency

Rail access charges that are allocatively-efficient are unlikely to recover capital and operating costs, requiring government to contribute to infrastructure costs. Allocative efficiency requires the allocation of resources to the production of the goods and services most valued by society. To be allocatively-efficient and recover costs requires:

- that economies of density do not exist in long-run infrastructure provision and operating costs;
- that investment is optimal, so that at the prevailing demand, the efficient charge equals the long-run and short-run marginal costs; and
- that there are no significant external costs and benefits of production.

However, rail infrastructure provision *does* have each of these characteristics and, as such, access charges that are allocatively-efficient means the charges are unlikely to recover costs.

Productive efficiency

There are also concerns with setting access charges to be productively-efficient. Access charges need to reflect and balance three primary efficiency objectives:

- efficient *use* of railway infrastructure;
- efficient *provision* of railway infrastructure; and
- efficient train operation.

In the single-user, integrated railway, these balances between infrastructure use and provision and train operation are an internal trade-off. However, the

access reforms separate these activities. Thus, the access charging process leads, at the least, to vertical separation of the trade-off processes. Implicitly, the "right" access charging level and structure (which need to balance these three considerations) is the access charge that would have prevailed in the single-user, integrated railway.

The efficient level and structure of access charges should send the right signals for the use of the railway infrastructure; it should also encourage the appropriate level of *timely* investment in infrastructure. The structure of access charges can also strongly influence the form of the train operations; this form can complement or *work against* economics of train operation. For instance, the train operator can capture economies of density in running long trains. These economies can vary across train types. For instance, block trains (shuttle trains that involve minimal terminal shunting) will have different economies from general goods trains (which can involve considerable, and therefore costly, shunting). A consequence is that 'efficient' access charging structures will vary across train types.

Thus, charges must be structured in a way that optimises productive efficiency in infrastructure use and provision and in train operation. Of course, to be structured to encourage those efficiencies, the signals that the pricing system sends to providers and users must have certain characteristics. Specifically, those prices must be

- comprehensible;
- transparent; and
- stable.

Rail access charges necessarily involve trading off between higher levels of cost recovery and allocative efficiency; this is now considered.

Establishing efficient access charges

Pricing at marginal cost

Pricing track access at marginal cost is allocatively efficient. The marginal costs of supply are the costs arising from supplying an additional unit of service. Train operators willing to pay their extra (marginal) costs for using infrastructure should be permitted to use it: prices should be set to equal the marginal costs.

The costs of service provision can be divided into distinct time periods, notably, in the 'short-run' and 'long-run' marginal costs. In the context of railway infrastructure, the short-run is a period where level of track capacity cannot be varied. In the long-run, capacity can be varied.

Short-run marginal costs

Typically, the prevailing demand for track infrastructure use is well below capacity. At these demand levels, average costs are usually still declining and consequently short-run marginal costs are less than average costs. Thus, if access charges are set at the level of (allocatively-efficient) short-run marginal costs, financial losses will result.

To ensure that changes in track capacity are efficient, access charges should send appropriate investment signals. In particular, there are rising costs of congestion and opportunity costs of unfulfilled capacity demands as track reaches capacity. Given the lengthy process required to expand capacity, short-run marginal cost provides *poor* signals for timely investment.

Long-run marginal costs

An alternative approach is to set prices based on long-run marginal costs though, when facilities are below their optimal capacity, long-run costs are above the allocatively-efficient short-run marginal costs. Thus there is a trade-off between ensuring allocative efficiency and the long-run dynamics of ensuring adequate (timely) investment.

Consequences of setting access charges based on marginal costs

The allocative efficiency benefits of setting charges at marginal cost would almost inevitably lead to the infrastructure operation sustaining substantial losses. Public funding—notably, through direct government payment for infrastructure—can be used to offset these losses. However, dependence on public funds has detrimental effects. It leaves the railway operation as being particularly prone to the uncertainty in the ongoing political balancing of public funding needs. Also, the more the operation is publicly funded, the less incentive management faces for cost minimisation and for efficiency gains. Thus, we may deduce that pricing above marginal costs should be adopted.

Pricing above marginal cost

There are two primary forms of setting higher charges: either market-based pricing or cost-based pricing. Market-based pricing reflects what the train operator customers can sustain; this pricing can involve varying degrees of price discrimination. One major limit on the pricing-up is competition from other transport modes, notably road. The rail product has had to rely increasingly on low prices (tariff or access charge) relative to road freight in order to offset the widening gap in quality between rail and road. That is, rail traffic is assumed to be price-elastic: this is particularly the case with non-bulk freight movements, where road is very competitive.

Cost-based pricing is the other primary form of setting higher charges. The approach can be based on allocating marginal costs and at least some of the unattributable fixed and common costs.

Charging level using Ramsey pricing

One *approach* to improving cost recovery, while minimising allocative efficiency losses from doing that, is to adopt discriminatory pricing. "Ramsey" pricing sets prices that discriminate across operations. There is a range of forms of discrimination. One form would be to set access charges according to how dependent the train operator's customers are to the rail service. Another form would be to set low charges for smaller or new train operations, to facilitate their development. Thus, charges for financially-marginal users may be set at marginal cost while higher charges are set for train operations that are less price-responsive (less price-elastic). Ramsey pricing can be used with different pricing structures.

Pricing structure using two-part pricing

One pricing *structure* that can be used to improve cost recovery is two-part pricing. The structure consists of a fixed (or 'entry') fee and a variable fee. The fixed fee can achieve high levels of cost recovery. The variable component can be based on the marginal cost of use, thereby generating the appropriate signals for marginal use. Nonetheless, to the extent that the fixed component becomes a barrier to entry (dampening competition), the pricing structure is allocatively inefficient. However, by also using Ramsey discrimination with two-part charging, this efficiency loss can be minimised, e.g., by setting low fixed fees for marginal users.

Pricing structure using full-distributed cost pricing

An alternative pricing *structure* involves distributing costs across users in relation to each operator's physical usage or revenue. For instance, 'fully-distributed cost' charges might set access charges across operators in proportion to each operator's gross-tonne kilometres or train kilometres run. In essence, unattributable costs are recovered by setting the level of access charges as an uplift of observable costs (or revenue); the uplift is used as a proxy of the underlying costs incurred as a result of each operator's infrastructure use. There are two concerns. First, whichever proxy is used, the level of charge is somewhat arbitrary. Secondly, the charge is not set relative to marginal usage and so is highly allocatively inefficient.

Capacity charging

Rail infrastructure is inevitably limited in capacity so an efficiency issue is how or whether the charges provide a mechanism to ration that capacity amongst

conflicting demands, to those users who most value the capacity. In principle, train path auctioning could be one such mechanism although, *in practice,* it could stifle the development of new/small operators and, thus, undermine policy makers' on-track competition objectives.

Cost estimation

Central to cost-based access charging is cost estimation. However, it should be noted that, despite rail industry participants sharing terminology for infrastructure costs—such as common costs and operator-specific variable, incremental and marginal costs—there is no industry consensus in defining each of these railway cost components.

We have identified the need for access charges to be set to provide the right incentives in infrastructure use and provision and in train operations. Nonetheless, in devising those access charges, the charges must be predictable, comprehensible and transparent. Central to this strategy, however, is the need to understand what 'drives' the costs that underpin the infrastructure provision. If access charges reflect resource costs (in full, or in part) then central to this price-setting is an understanding of how marginal and variable costs are driven by usage.

There are a number of problems in estimation of both physical and temporal costs. One key point is that there is not a precise 'science' of estimating the link between track usage and infrastructure costs. It may be that the link is more of an 'art' than a 'science'. In any case, the usage–cost link is not two-dimensional; it is multi-dimensional. That is, there can be a broad range of costs associated with a single type of usage. The variance arises from factors such as the underlying infrastructure standard and the maintenance regime. Thus, for instance, different maintenance levels are associated with differing levels of investment in infrastructure and differing standards of train performance. For instance, a low-quality track might support relatively high axle loads so long as the maintenance regime is relatively high; conversely, higher investment can mean higher axle loads and relatively low maintenance. *There is no single maintenance cost–usage relationship.*

There is also no consensus in the industry on how costs should be estimated. For instance, there are various ways of estimating the value of infrastructure assets, the rate of return on the assets (and the related risk premium) and the appropriate asset depreciation profile.

Given the difficulties in the usage–cost link, and the divergence in cost estimation and definition, it is inevitable that different administrations will report markedly different rail infrastructure costs. Thus, the European Commission has noted that, across the European Union, marginal cost figures vary by a factor of 1 to 20 (which is well beyond the variance that would be expected due to different prevailing unit costs in each State).

It is therefore not possible for administrators to specify a generic marginal cost rate. Consequently, a range of access pricing can result even where different rail jurisdictions adopt the same pricing principles and efficiency objectives. More generally, we conclude that even with agreement on charging principles, it is unlikely that a jurisdiction will converge to a single 'optimal' access charge.

The price-setting process

The determination of access charges may evolve from one of a few processes:

- prices may be posted (published and set) in advance;
- prices may be negotiated and, perhaps, based around reference ('standard' train) prices; or
- prices may emerge from a bidding or auctioning process.

Prices are more likely to be posted when they are cost-based and so are strongly based on usage–cost estimation. Having estimated charges on the basis of cost drivers, such charges will be more transparently set than negotiated prices, which will be assessed from an infrastructure manager's market-based perceptions. As we have noted, however, access charges need to be set or agreed between infrastructure manager and access seeker in a setting where there is considerable ground for diversity in establishing charges, especially given there is no consensus on cost estimation.

The primary charge is a charge for a train path—an agreement on track availability over a given geographical range and a given time band. (Other charges may be levied for station and terminal access.) Given this apparent diversity in path quality, posted pricing may need to be quite comprehensive to accommodate the various parameters that influence capacity and usage costs.

One area where a range of (negotiated and posted) access charges may be required arises from train type diversity. As noted earlier, charges need to be consistent with efficiency in train operation. Thus, charges may need to be modulated to reflect differences in the type of freight movements (especially non-bulk versus bulk goods) and how these differences impact on the physical and capacity utilisation characteristics of the infrastructure (e.g., lengths of passing loop).

It may be argued that policy-makers should seek consistency in price-setting across regimes. Divergent interpretations of charges leads to higher transaction costs in setting charges, send conflicting signals for infrastructure use and provision and increases uncertainty in the outcome of access negotiating processes. Nonetheless, there is a need for diversity of charges to reflect the divergences in the standard and capacity of inherited infrastructure, and in train types.

AUSTRALIAN EXPERIENCES WITH RAIL ACCESS PRICING

Policy environment

Until the middle of the twentieth century, rail was a dominant freight mode in Australia. However, road freight has captured most of the rapid growth in the freight task since the Second World War. Rail still dominates bulk goods movements.

As rail lost relevance in this evolving industry, there was a need for reforms to reflect its current role and, more generally, to take on the opportunities for greater efficiencies. A major obstacle to the competitiveness of interstate rail services was the State-based operating jurisdictions, with inconsistent regulations and with crew and locomotive changes on State borders. Following a Commonwealth and State governments agreement to develop seamless inter-capital train services, National Rail Corporation (NRC) was formed as an above-rail operation in 1993. Its assets included rail cars, locomotives and city freight terminals. It did not own track—it payed for access to integrated train operators' tracks—though it was originally intended that the NRC would subsequently gain control over that track. The advent of the National Competition Policy changed these plans.

Competition environment

The 1993 Hilmer Report, and the 1995 Competition Principles Agreement between the Commonwealth, State and Territory governments, laid the basis for the introduction of competition in network industries. To assist in developing that competition, third-party access (or open access) is permitted to certain facilities.

The third-party access terms are set out in Part IIIA of the Trade Practices Act. The provisions do not distinguish between private and public ownership of infrastructure. Terms of access to rail infrastructure can be formalised by way of a voluntary 'undertaking' to the ACCC; by way of 'declaration' of the services through the NCC; and by 'certification' of the access regime as being 'effective', by application to the relevant State or Territory authority.

Industry structure

Each government responded in different ways to the access reform policy. Commonwealth (interstate) and NSW 'below-rail' infrastructure was separated from train operation (forming what are now Australian Rail Track Corporation [ARTC] and Rail Infrastructure Corporation [RIC], respectively). Victoria leased its interstate infrastructure to ARTC but kept other infrastructure integrated; the freight business was sold and infrastructure was long-leased (to Freight Australia). WA and SA freight businesses were sold and their intrastate track long-leased (to, what is now, Australian Railroad Group). Similarly, the freight business in Tasmania

was sold/long-leased (to Australian Transport Network). Each State (apart from Tasmania) set up a rail access regime.

Ancillary issues

Although access regimes can be established, it does not necessarily follow that competition or contestability will come about. The absence of a common gauge has hampered rail movements, from the early days of inter-connections between State rail systems. Thus, quite apart from whether the access charges are acceptable to would-be train operators, there can be other practical and market factors that inhibit the development of on-track competition.

Terminal access

While competition policy has generally led to mandated access to rail infrastructure, there are limits to the access that may be available to a third-party operator. There are three essential issues of access: rights of access, terminal ownership and capacity. First, generally the access regimes exclude terminals from the terms of the access regimes. Secondly, in terms of ownership, we note that although RIC and ARTC own the track, the city terminals are owned by existing freight operators. Thus, unless a new entrant buys or builds a terminal, third-party access will be required. This can impact, in particular, on the contestability of the market as it may be costly as well as difficult to find suitable, long strips of land adjacent to rail lines but still close to cities or ports. Finally, the competition policy is intended to apply to spare capacity. There may be very little 'spare' terminal capacity if 'spare' is defined by third-party access that does not impinge on the incumbent's service reliability and general efficiency.

Ancillary markets

Other facilities are important to the development of on-track competition and contestability. For instance, the ability of a bulk goods shipper to switch train operators may be restricted where the incumbent owns the rolling stock. Differences in rolling stock and gauges can impede competition.

Service coordination

Important changes in the structure of national transport have improved rail's ability to provide a coordinated service. In particular, the formation of National Rail and ARTC provided for national freight services and coordinated infrastructure management. ARTC is intended to supply seamless inter-capital infrastructure access.

Despite separate access regimes in each State, there are areas of broad consistency. Access charges for the seven jurisdictions *generally* include the following features:

- a floor-ceiling revenue band;
- market-based negotiations;
- a two-part tariff; and
- variable charges based on a rate per net or gross tonne kilometre.

There is, however, considerable variation of the detail. A consequence is that the number of access regimes and the diversity of the interpretations of access pricing parameters can be important influences on service coordination.

The number of access regimes

At present there are seven jurisdictions for rail access: the Commonwealth (ARTC), NSW (RIC), Victoria (intrastate), Western Australia (intrastate), South Australia (intrastate), AustralAsia (Tarcoola–Darwin) and Queensland. In two of the jurisdictions (ARTC and RIC) the infrastructure has been vertically separated from train operations. To facilitate its 'one-stop-shop' for access, ARTC acts as a wholesaler on the WA interstate track, leases the Victorian interstate track and is seeking to lease the NSW interstate track.

However, multiple regimes may require the access seekers to deal with a number of regimes and regulators. This also means there are ultimately higher transaction costs and greater uncertainty and can hinder on-track contestability.

Pricing diversity

Although access regimes follow common pricing principles, there are varying approaches to asset valuation, depreciation and risk *as well as* differing views on the linkage between infrastructure usage and cost causation.

Market-based negotiated charges prevail on the network, with charges being set at a level below the (regulated) ceiling limit. Given this, price diversity across jurisdictions is less the issue than the fact that the access seeker will need to undertake separate negotiations and appreciate the different pricing signals of each regime.

Pricing diversity generates different incentives for train operators and infrastructure managers to use and maintain the infrastructure. Thus, even when a one-stop-shop is established, the different prices on different line segments can send conflicting messages for train service patterns. The diversity also increases transaction costs and causes delays in quoting for freight movements.

The price-setting process

Negotiated price-setting

Much of Australian access is based on the negotiate–arbitrate model. That is, the access seeker and provider negotiate access but, if negotiation fails, the regulator will set an arbitrated charge that will fall within the floor–ceiling price band. There is objection to the model, however, as it can involve protracted negotiations. Further, the price band is very broad and so provides a poor signal of the likely charge.

One solution to these concerns is the use of indicative (or reference) charges, which are set between the floor and ceiling limits. ARTC publishes such charges; they are market-based rather than cost-based. In providing an indication of the likely charge, they produce a starting-point for negotiations and therefore reduce transaction costs. Nonetheless, there are objections to such charges as they bear no relationship to cost, although they are set below full economic costs. The issue then is one of negotiated prices versus prescribed prices. We note, however, that the negotiated prices approach can form an important part of the process of price discrimination, which can be used to increase cost recovery.

Capacity management

Access charges are not generally used in Australia to allocate, or assist allocation, of track capacity. Almost invariably, passenger trains receive priority in path allocation although they may incur higher charges for relatively high capacity usage (e.g., the ARTC "super premium" charge is applied to the XPT passenger train). Of the remaining capacity, incumbent freight operators have *de facto* "grandfather rights" to the train paths they have traditionally used. This may inhibit on-track competition as the most lucrative paths are likely to have been secured by the incumbent operators. Thus, the absence of price-based allocation processes may inhibit on-track competition.

Path allocation rights for integrated operators has additional complications: the national access regime applies only to genuinely *spare* capacity. That is, the national access policy framework protects the property rights (and, thus, incentives to invest) of the incumbent integrated operators. That operator has first choice of train paths—even if this means that this gives the incumbent a competitive advantage.

The primacy of the incumbent's right to paths can create a further conflict with above-rail competition objectives. A firm may seek tenders from train operators to haul its goods (e.g., coal or wheat). To the extent that it perceives a risk that the third-party operator will not secure the paths hitherto used by the incumbent, it is likely to favour the incumbent operator. That is, non-incumbents lack certainty of capacity allocation when they bid for a haulage

contract. Thus, in securing the rights of the asset owner, the process introduces uncertainty in contract bidding, which can undermine competition objectives.

Regulation

Access charges are regulated through pricing limits in the negotiate–arbitrate model. In addition, the charges may be regulated to encourage efficiency: the so-called "performance-based" regulation. This has traditionally been applied to vertically-separated network providers; in the absence of competition for network provision, the regulation seeks to alter the firm's incentives to encourage it to strive towards greater productive efficiency. Access charges may consequently be regulated to an annual change in charges that lie somewhat below the inflation rate, that is, a reduction in the real charge. The extent of this reduction would be a function of the regulator's assessment of the efficiency gains that the firm could make. (This is "CPI-x" revenue regulation, where "x" is the perceived efficiency gains that could be made.) While ARTC is not regulated in this way, in its Access Undertaking to the ACCC it has committed to annual adjustments in its reference prices using this approach.

The intention is that performance-based regulation will also be applied to vertically-integrated firms; it has yet to be clearly developed. Regulators in Queensland, Victoria and WA intend that the integrated operators' access charges will, as for vertically-separated systems, be based on efficient costs rather than actual costs. In practice, this can mean that a third-party operator may face lower "efficient" access charges than the "actual cost" access charges faced by the incumbent train operator. Consequently, the incumbent operator's freight tariffs may then be higher than the third-party operator's tariffs. That is, the incumbent's train operation may lose custom even if it is more efficient than the third-party operator. The counter argument to this is that the infrastructure manager will cross-subsidise its own train operation by levying efficient access charges; in the long-term the infrastructure manager will have the incentive to improve its efficiency, thereby removing the need to cross-subsidise.

Real-time pathing and cost of path usage

Australian access price systems do not include "real-time" pricing mechanisms that either penalise train operators for train delays they generate or penalise infrastructure managers for delays they cause by infrastructure faults. Similarly, Australian systems generally lack "real-time" costs of track usage, such as where vehicles with wheel defects are used on the track, inflicting far more track damage than the assumed wear-and-tear level. ARTC has, however, introduced on-track monitoring devices to detect such defects.

Cost recovery

Historically, Australia's government-built (common-carrier) railways have generally not earned sufficient revenue to earn a return on assets or even to make an operating profit. Queensland Rail apart, the integrated operators and the above-rail operators have been privatised in recent years. The privatised entities are recording profits but there is no long-term track record to establish whether assets are being run down, that is, whether the profits are consistent with long-term viability.

Access charges form a major part of train operating costs—in Australia, this is likely to be upwards of one-third of the costs. The charges are essentially market-based rather than cost-based—in effect, the infrastructure managers recover what costs they consider they can, though for most lines this is short of full cost recovery. We have noted that discriminatory, Ramsey and two-part, pricing can be used to improve cost recovery. One concern with two-part pricing on its own is that a high fixed component can provide a barrier to entry. Thus, for instance, the ACCC has suggested that ARTC could adopt Ramsey-type pricing to the fixed (flagfall) component of its access charge, to encourage specific low-volume operations.

While Ramsey pricing is desirable for vertically-separated operations, there are difficulties in applying it to integrated operations. In particular, the integrated manager might be expected to issue favourable prices to its own train operations. This can be constrained by limiting the discrimination to freight commodity-based discrimination (rather than operator-based discrimination). This is the basis for discrimination, for instance, in the WA access regime. Nonetheless, there is still the potential for the integrated operator to set higher mark-ups on commodities where its own train operation has a relatively low presence.

What has been achieved?

There has been some third-party access and competition on Australia's railways since the mid-1990s. It is perhaps still too soon to conclude whether the reforms will attract new operators or what the impact of regulated charges on incumbents will be. However, importantly for freight customers, there are some examples where competition has translated into significant reductions in freight tariffs. Nonetheless, to the extent there is a question over the long-term viability of much of the rail network, the need to raise returns on infrastructure investment may mean that such tariff reductions cannot be sustained.

We note that in recent years control of much of the loss-making public rail infrastructure has been transferred to the private sector. Thus, given the financial history of these lines, what is pertinent to policy is that the long-term viability of these operations remains unclear—irrespective of whether fair access charges for third-party operators can be established.

There are limits on the likely extent of on-track competition. This is due to the small size of the underlying freight market and the small size of the market for which rail can offer a competitive service. There can be strong economies of density in train operation and some terminal, rail gauge and rolling stock barriers to entry. Consequently, there are likely to be, *at most,* only a few train service providers.

As yet, there has been little third-party or open access. Significant access use has essentially been limited to existing freight customers (such as SCT, Toll and Patrick) or existing (privatised) State freight operators (that is, Freight Australia and Australian Railroad Group), for whom barriers to entry (freight revenue risk, know-how, rolling stock, licensing, insurance and crewing) are relatively low. The presence of operators is therefore critical to any competitive or contestable market.

Due to the number of bulk grain terminal origins and destinations, it can be efficient for grain to be shipped by multiple operators. However, for other bulk goods movements, it is often more appropriate (for superior operational and logistical efficiency reasons) that such movements be provided by a *single* operator, such as between a given coal mine and the export port. With such traffic, therefore, it may be more appropriate to facilitate competition *for* haulage contracts rather than to stimulate competition *between* freight services.

Despite the Commonwealth's objective of service coordination, the development of different access regimes can impede interoperability and competition/-contestability. Inevitably, the regimes have brought a diversity of views on infrastructure usage cost drivers and different measures and interpretations of asset valuation and risk. The resulting differing price levels and structures then give conflicting signals for operator incentives. In dealing with multiple regimes, it also increases risks and transaction costs.

The negotiated price-setting environment has yet to be extensively tested in Australia. One benefit of negotiated charging is that it can facilitate price discrimination and, thus, improve cost recovery. Such discrimination can, however, work against competition objectives. None of the regimes has yet adopted Ramsey price discrimination.

While some current charges are varied to reflect the speed or capacity usage of the train, they are not varied to reflect the value of a given path (for instance, its departure–arrival times). Further, the charges are not varied to reflect deficiencies in the quality of paths delivered.

INTERNATIONAL RAIL ACCESS PRICING SYSTEMS

There are important similarities and differences in pricing policies adopted in other countries. Like Australia, much of the European continent has embraced access reform. By contrast with Australia, however, for many of its railway systems the cost recovery objective is centred on marginal or incremental

costs rather than full cost recovery. The North American continent has not adopted mandated access policies and is focused, instead, on full cost recovery. Indeed, it has also sought the benefits from coordination ahead of those from competition. North American regimes do, nonetheless, have a degree of voluntary third-party access, from which we can obtain insight.

Policy environment

In the last decade, world-wide railway policy has centred on four primary approaches to railway efficiency.

- *Competitive neutrality.* Scandinavian countries have adopted rail access pricing and road access pricing based on marginal social costs, to facilitate cross-modal competitive neutrality.
- *Privatisation.* Some loss-making railways have been privatised as integrated operations, such as in New Zealand and Argentina.
- *Mandated access.* This approach has been adopted widely in the Europe. The policy is aimed at improving productive efficiency through on-track competition and through improving inter-network interoperability.
- *Revenue adequacy.* Canadian and USA policy has been to maintain status quo: a conscious decision to facilitate revenue adequacy to safeguard provision, with a presumption against third-party rights of access.

Multiple policy objectives

Some jurisdictions set more than one policy objective. The Canada and USA policies favour efficiency in infrastructure provision above optimal competition. EC policy seeks both competition *and* coordination objectives. However, this can lead to conflict between objectives: coordination encourages large operating blocs, which can reduce the scope the competition.

Access charging levels and structures can lie at the heart of these policy conflicts. For instance, Germany seeks to facilitate efficient use of infrastructure, high cost recovery and on-track competition. The high cost recovery sought led to adoption of alternative pricing systems: the operator could choose between a full-variable pricing system and a two-part pricing system. The fully-variable (alternative) charge was designed to remove the barrier of a high fixed charge in the two-part tariff. Inevitably, however, the average (per unit) charge faced by the small, new entrant, was greater than that of the large incumbent. The German Cartel Office ruled, therefore, that both systems discriminated in favour of the incumbent integrated operation. Third-party operators have, nonetheless, criticised the replacement single, fully-variable pricing structure, arguing that this structure reduces competition because the incumbent integrated operator captures efficiencies of *integrated* operation that cannot be

captured by third-party operators. Inevitably, therefore, there are trade-offs in efficiency objectives.

Iterative policy development

As there has not been previous applications of mandated access, policy instruments have had to evolve with experiences. As deficiencies of European policy instruments have been increasingly clear, policy principles and instruments have been revised and strengthened. In introducing its two "railway packages" of directives (legislation) in 2001–02, the European Commission has acknowledged that its earlier mandated access efforts had failed, observing that there was still little competition in national and international freight markets. Thus, while the EU's iterative process of adapting and strengthening policy instruments has facilitated political consensus, it has inevitably postponed the achievements.

The EC's policy instruments extend well beyond setting access charging principles (which, in themselves, are moving towards greater prescription). The latest access regulations require that fair and equitable third-party access be facilitated by instituting independent management for setting charges, capacity allocation and timetabling and operator licensing. The licences are to be mutually recognised by each infrastructure manager. Further, each European Member State must now appoint a regulator to oversee capacity allocation and to oversee incentives to reduce costs.

Competition environment

Access terms

Mandated access rights have been adopted in a number of countries. We contrast these rights with Australia. European rail infrastructure is almost entirely publicly-owned and operated. To the extent that these firms are funded or underwritten by taxpayers, the consequences of misaligned or poorly structured access charges bear less threat to the firm's survival than if the firm was privately-owned. We note, therefore, that by contrast with Australia, the environment for mandated access is almost invariably applied to government-owned operations. Britain's government quango infrastructure manager, Network Rail (successor to publicly-listed Railtrack), is no exception to the European model, with revenue being sourced from, and loans guaranteed by, government.

Railways in North American countries are almost entirely privately owned and funded and third-party access is essentially voluntary. Third-party access accounts for around 14 per cent of the route miles. Charges for access in these countries are typically settled by mutual agreement. Where the access rights differ from mandated access elsewhere is that access is negotiated and the terms for that access are limited. In particular, the access seeker is often

limited to running *over* the provider's track but not soliciting for traffic *along* that track. By limiting the direct rivalry for traffic, this limits the detrimental impact of that access on the incumbent's revenue.

Mandated access is still subject to considerable restrictions. In Europe, generally, there are restrictions on passenger train operations and on some freight operations. In Britain, freight operations are unrestricted (though the extremely marginal nature of the rail freight market presents its own restrictions). Competition in passenger operations is "moderated"—open access is largely prevented. This restriction is designed to curtail the effect of on-rail competition on the Exchequer's contribution to the publicly-subsidised passenger services; and to retain some spare track capacity to limit congestion problems.

Uptake of access rights

Despite Europe's decade of access reforms, there has been little uptake of access rights. Uptake has tended to be by existing, small integrated operators (such as the German branch line operators), freight forwarders and major customers (such as BASF–rail4chem and IKEA), rather than entirely new operators.

There are a number of reasons for the poor response to access reform, of which the access charges is just one. There has been explicit obstruction by incumbents (in defiance of EU regulations); an absence of spare train paths; and the absence of coherent pan-European mutual recognition in safety systems, licenses and insurance, made worse by an absence of interoperable locomotives and wagons.

page xxx

There is also a general issue of an absence of ancillary facilities and markets—third-party operators may not be given access to freight terminals and rolling stock maintenance facilities. In Denmark and Germany, for instance, it is the national train operator rather than the infrastructure manager that controls the public terminals. By contrast, however, in Mexico three privatised separated integrated operators co-own (with the government) the Mexico City freight terminal.

Service coordination

The number of regimes

Interoperability is a primary concern and policy focus in European countries. Because of technical and operational barriers at jurisdiction interfaces, national-based freight operations tend to be more competitive than longer, cross-jurisdictional freight movements.

One-stop-shops have been established in Europe to market origin–destination train pathing, to offset jurisdictional borders. However, after five years, uptake remains low; the opening of unrestricted freight access to defined international routes in March 2003 should stimulate access take-up. One reason given for

the low take-up to date has been that major differences remain between national regulations on train operation. Further, the quality of the service offered to customers has been impeded as the absence of cross-border freight-tracking systems (such as GPS and Galileo). In 2002, the EC responded by announcing the establishment of a European Railway Agency; one of its tasks will be to identify processes to expedite freight movements across jurisdictions.

Pricing diversity

We did not find consensus in access charging levels or structures or even in marginal cost pricing systems. That diversity reflects the balancing of differing objectives; it also reflects the differing interpretations of the infrastructure usage–cost linkage. As noted earlier, the level of marginal cost charges varies across the EU by a factor of 1 to 20. Inevitably, the effects of the differing pricing structures on operators and infrastructure managers can be instructive. We also note the effect that pricing diversity has on incentives for cross-jurisdictional interoperability. These experiences are evident in the European federation, in particular.

The access charging on the international one-stop-shop freight corridors reflects the diversity of cost recovery through pricing. On German "Freight Freeways", for instance, the main line access rate is €3.80 per train kilometre whereas it is €1.17 on the Danish main lines. Similarly, there is a diversity of primary pricing parameters used, such as train kilometres and gross tonne kilometres; and varying usage–cost ("modulating") parameters such as average train speed, axle load and relative speed.

The European Council of Ministers of Transport (ECMT) reports that the wide range of prices creates difficulties in negotiating prices for cross-jurisdictional freight movements. Transaction costs are therefore raised, delays occur in making transactions and train operators lack responsiveness to shipper queries. Further, the differing pricing structures also creates conflicting incentives for train speeds, lengths, axle loads and frequencies.

Despite the EC's recognition that these varying cost recovery levels and varying pricing structures send confusing signals, the EC's subsequent (2001) directive leaves jurisdictions with considerable latitude in setting access charge levels and structures.

The price-setting process

Negotiated price-setting

The majority of access charges are cost-based rather than market-based. There is therefore relatively little negotiation in prices. A consequence is that most of the access charges are posted. Negotiation would then be limited to the allocation of specific paths.

Great Britain is the only European country that has extensively used negotiations for setting charges. Its experiences illustrate the problems with negotiated pricing, particularly where there is high track utilisation. One problem arose because of Railtrack's extensive use of fixed tariffs for congestion charges: despite negotiation, there was little scope for movement in access charges. Thus, negotiation often failed to clear excess demand for paths and transaction costs rose significantly, without satisfactory outcomes. In reviewing these problems, the Rail Regulator also noted that train operators generally preferred transparent and predictable charges to negotiated charges. A new process was introduced in 2001; operators' capacity charges are essentially predetermined.

The current German access charging system maximises transparency in setting charges, by publishing the base rates and the cost-based modulations used. The need for negotiations is minimised and the charges are transparent. The system has, nonetheless, faced opposition from train operators *because* it does not differentiate charges by the type of freight being carried—a modulation that might be possible if there was negotiation.

In Canada, charges are negotiated. Because the access is generally voluntary rather than mandated, the very initiation of a negotiating process implies that third-party access will bring mutual benefit. Consequently, convergence on acceptable charges is arguably less onerous. There are limited situations where access is mandated; in that situation, and in freight rate negotiations, the incentive to reach agreement is that an arbitrator will set binding charges. Negotiations do fail, however; the 'final-offer arbitration' process has been found costly and time consuming; a streamlined process has been introduced for smaller disputes to reduce those time and financial costs.

The experiences are, therefore, that the negotiated charges generate transaction costs, cause delays in establishing access, blur the pricing signals and lack transparency and certainty. Conversely, if used, they would facilitate price discrimination.

Capacity management

Setting capacity levels

Our country review has identified a general absence of price-based capacity management. In many cases, the rail routes where there is sufficient freight traffic to sustain competition are also those that have limited spare capacity. Usually, the first claim for train paths is made by government passenger services (although such services do not pay more for taking the most valuable paths). The next claim on capacity is thus-far allocated to "grandfather" users.

There are some plans to alter the allocation processes. First, European infrastructure managers will be required to prepare a "network statement" that sets out capacity charges, capacity allocation and coordination principles.

Secondly, a body that is independent of train operation will allocate capacity—though the allocation process will remain essentially non-price-based. For instance, in Denmark, government fiat requires that train paths for new operations be extracted from existing path usage. However, the EC has concluded that governments' claims on capacity (for passenger services) will not be removed; it concludes that the solution is to build *additional* capacity through a network of dedicated freight lines.

Allocating capacity

There are a few price- or revenue-based systems proposed or adopted to allocate capacity though we did not find any path auctioning systems. One alternative bidding approach (franchising) has been applied in Great Britain where paths have been allocated through a system of competitive bidding for the sole access rights to the paths. In Germany, conflicting demands for paths are settled by allocating the paths to the operator that maximises the infrastructure manager's revenue. Germany, France and Britain have variants of an approach to resolving competing demands for paths with discounts for allowing "flexing" of the actual train path allocated away from the desired train path; in effect, the operator pays a premium for specifying a given path.

Managing congestion

The British system (1994–2001) adopted congestion charges to try to manage capacity. In essence, however, the charges did not relate directly to capacity utilisation. As such, the charges were viewed as fixed charges and did not motivate operators to vary their demands. The consequence was that coordination costs were considerable. In the current charging regime, the Strategic Rail Authority has made two major changes. First, it has sought to offset this by modifying the congestion charging principles by structuring the charges essentially as posted, variable charges; an incentive payment was introduced for Network Rail to accept additional traffic, by increasing the future regulated asset base by growth in operators' traffic and revenue. Secondly, the Authority intends to reduce the number of train operators sharing given infrastructure. The consequence of this will be to reduce the coordination costs (as a single operator will resolve its own pathing conflicts rather than have to negotiate with other operators). However, because train operators will be merged, this reduction in coordination costs will come at the cost of lower actual or potential on-track competition.

The other principal capacity management tool is to modulate access charges by the nature of the rail line used (main line or branch) and by the time of day (peak and off-peak). Such charges may discourage or shift usage though they do not necessarily clear excess demand. This has been adopted in France and Germany and, latterly, in Great Britain.

Regulation

Regulation of access charges can take one of three main forms: capped charges to stimulate productive efficiency, arbitrated charges and regulation of charging structures.

While there is extensive experience with revenue capping and rate-of-return regulation in network industries, there is very limited price- or revenue-capping regulation of below-rail provision. This regulation is aimed at generating incentives for the infrastructure manager to pursue productive efficiency. The principal model is the regulation of Railtrack (now Network Rail) in Britain. The company was revenue-capped through a CPI-x process, subject to a floor income that ensured that it had sufficient income for to sustain and improve the network. In practice, no matter how poorly the company performed, the Regulator was required to *guarantee* that access charge levels would be sufficient for Railtrack's viability and on-going investment needs. Arguably, however, the model was flawed by this overriding public interest because it dampened the Regulator's ability to generate the necessary incentive framework.

There is little experience with arbitrated access regulation. Canadian experience with 'final offer arbitration' points to the financial and time cost of reaching an arbitrated settlement; these costs led shippers to withdraw their dispute before reaching arbitration.

There is limited experience with regulators requiring the restructuring of access charges. One notable case is where the German competition regulator required the infrastructure manager to withdraw its two-part pricing. The regulator deemed that the two-part structure had the effect of discriminating between train operations of different scales of track usage, favouring the large incumbent over third-party operators.

Real-time pathing and cost of path use

Traditionally, the impact of poor infrastructure and poor rolling stock quality would have impacted directly on its own profitability. Under mandated access, however, infrastructure manager and train operator objectives can be somewhat at variance. Does the new industry structure contain incentives to ensure that infrastructure and rolling stock standards are maintained? For instance, access charges can be varied to reflect changes in infrastructure standards—for instance, when the track speed is reduced.

Performance regimes were adopted in Great Britain in 1994 in order to re-introduce the infrastructure–operator incentives lost when the railways were separated. There is a "performance" regime for maintaining scheduled train services and a "possessions" regime for infrastructure maintenance. Payments would flow from an infrastructure manager or train operator for delays caused. In effect, the regimes provided a real-time variation of the access charge.

A number of flaws were identified with the system. Key issues included setting the appropriate initial benchmark level (from which there would be no net flow of funds between parties); setting the appropriate monetary levels of penalty and reward; and the high running costs associated with fault attribution. The British system, in particular, has faced high running costs; this is due to the high level of interaction resulting from the large number of industry players and the large number of train services run. Despite these significant problems, the European Commission recently (2001) issued a directive, requiring each State to introduce a performance scheme.

There are, therefore, some experiences and lessons arising from infrastructure-based performance monitoring. However, we found no evidence of the development of an incentive system for train operators presenting their vehicles in a condition that minimises undue infrastructure costs.

Cost recovery

Levels of cost recovery

Essential efficiency attributes of access charges are that they should send the right signals in infrastructure usage and provision and in train operations. Self-financing (that is, genuinely profitable operation) is key to infrastructure provision. Establishing whether a rail firm is achieving full economic cost recovery is somewhat subjective. In rail infrastructure, in particular, some maintenance and renewal expenditures can be deferred for extended periods. It is possible, therefore, for a firm to report profits while slowly running down its asset base.

Before Network Rail took over the rail network in Great Britain, the network was privately owned, by Railtrack. Until 2001, Railtrack had consistently reported profits, but a serious accident in 2000 exposed a strategy of systematic under-maintenance, suggesting that the profits arose by running down the assets. It should be noted that Railtrack was the only (arguably) profitable, separated, infrastructure manager outside Australia.

Elsewhere in Europe, access charges are not set charges that ensure full cost recovery; new infrastructure projects are an exception. Projects such as the Channel Tunnel, the Øresund [Denmark–Sweden fixed link] and the Storebælt [Zealand–mainland Denmark] involve unique access charging structures aimed at reducing investment risks and securing high degrees of cost recovery. Further, the charges are based on restricting third-party access rights.

Canadian and USA railways are essentially closed to prescribed third-party access; most of them report profits though their low returns indicate that many are unlikely to be achieving full economic cost recovery. Ramsey pricing underpins their cost recovery strategies—in shipper tariffs, though, and not in access charges. Where rail operators voluntarily agree terms of access, the

charges normally involve the marginal cost, a contribution to overhead and unattributable costs. In addition, where an access seeker solicits for traffic over the host railway's tracks, the charge can also incorporate a contribution for the profit opportunity cost of that access.

Pricing restrictions

There is no evidence of Ramsey pricing being permitted where access reform has been introduced. We note, for instance, that the European Commission requires equitable pricing *within* freight commodity markets. This is one area where focus on fostering competition—by guaranteeing fair and equitable access charges—impacts on the type of pricing that can be adopted and, therefore, the cost recovery that can be achieved.

Similarly, pricing structures that might be desirable for achieving high cost recovery have been restricted because of how they impact on on-track competition. In several European countries, in particular, there has been a shift from two-part pricing because of the effect of the charges on on-track competition and on train operators' incentives. The effect of the two-part charges has been particularly marked where high cost recovery levels are sought—that is, where the fixed component is large. The high fixed component affects operator and infrastructure manager incentives:

- the fixed component impedes market entry;
- once in the market a fixed component encourages maximum use of infrastructure;
- in maximising infrastructure use—either by maximising the number of trains run or maximising the train length—it gives a competitive advantage to larger operators; and
- the infrastructure manager's revenue is relatively inelastic to increases in usage. This reduces the manager's incentive to invest in additional capacity.

A consequence of the distortionary effect of the charges on incentives has led to a move from, or a lessening in, fixed charges in access charges. For instance, German and Austrian pricing structures are now fully variable while the fixed component has been reduced in Great Britain and France.

We note that the basis of Railtrack's fixed–variable access charge split (92 per cent/8 per cent) was underpinned by research that suggested that around 90 per cent of infrastructure costs are invariant with traffic. If the findings of that research are robust, it means that even where such charging structure can be based on allocative efficiency *and* achieve high cost recovery, the high fixed cost charge can deter new operators and therefore impede the objective of promoting above-rail competition.

The high fixed component gives distinct outcomes for infrastructure managers. On one hand, it discourages managers' investment in additional capacity when

traffic is rising. On the other hand, however, it does (as the architects of the British Rail privatisation intended) provide a high degree of certainty in access revenue should capacity usage decline. This revenue certainty was an important objective as it was thought that passenger patronage would remain static or decline. Given this perspective and that Railtrack was in the process of being privatised, the objective of reliable access revenue was important.

The high fixed component proved a liability to the British Government, however, when, instead, the patronage grew strongly but there was little incentive for Railtrack investment in additional capacity. The patronage growth increased demand for paths, not fewer paths and this demand was reinforced by the low charge for additional paths. A lesson arising from this experience is that infrastructure managers need charging structures that can withstand demand outcomes that are very different from the projections.

In conclusion, it is clear that there is a financial trade-off when multiple policy objectives are pursued. One manifestation of this trade-off can be seen in the form of pricing regime that is adopted. It can also be concluded that governments' contributions to supporting rail infrastructure will depend, in part, on the pricing regime that is adopted.

INTRODUCTION

Since the early 1990s, railway operations in Australia and many overseas countries have been radically reformed. One major reform has been privatisation of railways. Where railways remain state-owned, they have often moved to contracting or franchising of railway activities such as track maintenance and renewals or to train service provision.

Another major reform has been the adoption of the policy to mandate access to the track. This application of competition policy entails governments legislating to require track managers to provide capacity to outside ('third-party') train operators to use the rail infrastructure. A third, related, reform has been the restructuring of railway companies, notably by separating the control of infrastructure (the 'below rail' activities) from the provision of train services (the 'above rail' activities).

Mandated access has, however, meant that pricing systems have had to be established for activities that hitherto have been unpriced internal trades between the infrastructure and train operating divisions of an integrated railway company. The focus of this report is on that access reform process, the complementary industry restructuring, the resultant pricing structures and the consequent experiences with these reforms.

Our analysis involves five primary subject areas. First, we consider the main impetus behind the access reforms. That impetus is the development of private sector businesses interested only in above-rail activities. Without these new operators, there would be no need to establish mandatory rail access regimes. Indeed, most international railway operations have happily operated without such prices for almost two centuries precisely because there were no new operators. We note that at present the main area of this access reform policy lies in Europe, which is where the focus of our analysis lies. Nonetheless, we do consider other rail systems (especially those in North America), which can provide contrasting policy objectives, concerns and pricing systems. Having considered the motives behind adopting (or

rejecting) the access reform process, we then consider the benefits and costs of the policy. Finally in this subject area, we seek and look for parameters that would assist in understanding the net benefits that could arise from the policy.

The second primary subject area is the review of the principles of efficient access prices. This review differs from railway economics analysis that is traditionally undertaken. It differs in that it centres on the characteristics of the supply and demand for railway infrastructure—characteristics that cause difficulties in setting access charges. We consider the extent that pricing principles can be drawn from other network industries (such as electricity and telecommunications). We also review the interrelationship between the way that the access charges affect the economics of infrastructure provision with those of train operation. These issues have hitherto been hidden within the vertically-integrated railway.

In our third primary subject area, we review the process, application and experiences of rail access reform in Australia. We set the scene with the underlying policy environment. Access charging is a complex issue so we have structured the discussion of Australia's charges in terms of their effectiveness in contributing towards the three main policy objectives. One objective is to infuse competitive forces into the supply of train services, improving productive efficiency and leading to cost minimisation to consumers and reduction of public subsidies. The second objective is to use access reform in coordinating the hitherto disparate (State-based) rail networks so that the links in the freight logistics chain follow the changes of mode and not the changes of rail jurisdictions. Thirdly, the access charges are considered in terms of how they fulfil objectives of the track manager's cost recovery—*and* incentives to invest. We also consider the price-setting framework: the ways in which the access charges are agreed upon (or dictated by) the infrastructure manager. This also includes consideration of just what aspects of infrastructure use are priced, such as wear-and-tear, capacity and quality variance.

The fourth primary subject area considers various international pricing systems, and adopts the same basic review structure as adopted for Australian access pricing.

In the last subject area we compare and contrast the Australian and international access pricing systems and lessons. We seek to identify which are lessons that are relevant for Australia and to draw conclusions from them.

The focus of the report is thus on practices in setting access charges. We should note at the outset, however, that much of the overseas experiences with access charges have been on rail infrastructure that is dominated by passenger train operations; this is particularly the case with the rail network

in Great Britain, from where many lessons can be drawn. However, outside Australia's major capital cities, the primary rail task lies in freight movements. The performance of the *freight* task is this country's dominant railway concern. Consequently, we generally focus on the consequences of access charges for the freight market. We argue, however, that these divergent uses of railways in different countries do not change the essential common economic principles of access charges, which are blind to what the trains are shifting. That said, we seek to identify where particular issues concerning passenger train operations may have less relevance for freight operations.

chapter 1

POLICY OBJECTIVES

In this chapter, we review the rationale for rail access reform. We consider the objectives of the reform and the underlying benefits, costs and risks.

RATIONALE

In recent years policy makers across the globe have sought to improve the rail industry's competitiveness and efficiency through a range of approaches:

- corporatisation of the (typically) government-owned firm;
- privatisation of the firm; or
- franchising of operations.

The other principal approach has been to mandate access to the network. This approach follows that adopted for other utility network industries (such as telecoms, water, gas and electricity). The strategy is based on the recognition that the natural monopoly characteristics arise from the infrastructure provision rather than from the 'above-rail' (train) services that are provided. Thus, the principle is that rail's train services can be provided competitively amongst train operators, given sufficient demand for freight or passenger movements or given sufficiently low barriers to entry to make the train service market at least contestable[1]. This separation (or 'unbundling') of network activities is identified in other networks (such as in communications, water and electricity) where the generation and distribution activities can be split into natural monopoly and competitive sectors. Access reform policy for

1 Contestability refers to the ease with which a firm can enter or leave an industry. Like perfect competition, a 'perfectly contestable' market has no barriers to entry. The difference between perfect competition and perfect contestability, however, is that perfect contestability does not imply anything about how many firms exist in the industry. In fact, there may be only one firm in the market. However, due to perfect contestability, that firm has the incentive to not price excessively and to be productively efficient. This is because the real threat of competition (due to the ease of market entry) creates an incentive for the firm not to exploit its position by making excessive profits and not striving for productive efficiency.

network industries has developed from this, where policy makers regulate to enable access to the competitive segment of the industry and regulate the natural monopoly segment.

Competition for services is normally assumed to result in lower prices and/or higher quality product or service than when there is only a single producer. Historically, rail transport has been typified by a single producer because it was considered to have 'natural monopoly' characteristics, where one producer can meet demand cheaper than multiple producers can. In the absence of competition, the single rail company may therefore be able to earn monopoly profits and to pass on the burden of production inefficiencies to customers. In Australia, intramodal rail competition is relatively low (compared with, for instance, Canada and USA). Where competition exists, it is mainly concerned with grain movements to competing ports.

Competition from road transport, which could moderate prices and encourage rail efficiency, is often not strong in bulk goods movements. Rail often has a comparative advantage in bulk haulage for a number of reasons, including the ability to provide a single-mode source-to-destination service (e.g., mine-to-port) and lower terminal handling and shunting costs. Government ownership of the infrastructure has been used in the past to avoid the undesirable features of a commercial monopoly. This, then, is the area where access reform may introduce competitive pressure. By contrast, competition (from road freight) is generally already very strong in non-bulk freight movements, particularly over shorter distances. That is, the benefits from access reform would be expected to flow principally from bulk freight movements.

There are other limitations to the potential gains. The potential for competition to lower rates is partly a function of the extent to which the costs of the 'competitive segment' figure in the freight tariff. Gómez-Ibáñez estimates that, on average, the above-rail activities represent around 50 to 60 per cent of total railway costs. This, he points out, is significantly less than for other unbundled network industries, such as gas and electricity, where the competitive segment makes up around 75 to 80 per cent of the total utility costs (Gómez-Ibáñez 1999a, p. 80). Thus, the potential competition gains from rail access reform are arguably modest compared to other networks.

The application of the network unbundling strategy to rail also differs from other network utilities in its complexity. Indeed, we note the view of the Canada Transportation Act Review Panel (CTARP) that rail should not be regarded as an analogous situation to other network industries:

> From a technical and operational perspective, railways are considerably more complicated than other network industries in terms of physical planning, co-ordination, safety, switching and administration. In many significant ways, railways are not industrial analogues of gas, electric or telecommunications utilities and cannot be treated as such. (CTARP 2001b, p. 58)

Queensland Competition Authority's view is consistent with this, noting that gas and electricity convey a homogenous product but rail differs 'because an operator's consumption of capacity is highly dependent upon the interaction between that user and others on the network' (QCA 2001b, Appendix One, p. 2).

Mandated access can bring competition into *rail* freight markets in two ways.

- **Bulk freight.** There are markets dominated by single shippers, notably in bulk freight haulage: competition may be introduced by enabling competitive tendering for long-term haulage contracts between a dominant shipper and a single train operator. The consequence is that the goods over a route continue to be hauled by a single train operator but productive efficiency is encouraged through the competition *for* the haulage contract. This also applies to contracts for moving the goods of freight forwarders (such as Specialized Container Transport, SCT, in Australia) as well as large-volume non-bulk shippers (such as IKEA Rail in Europe).
- **Non-bulk freight.** The impact of access reform is different in the multiple-shipper and non-bulk freight market. Where non-bulk goods are being moved, rail freight faces greater competition from road vehicles—rail has less inherent market power. Even within this non-bulk market, however, the rail services can be widely differentiated and, therefore, services may not be in direct competition with each other. For instance, some services are terminal-to-terminal whereas others (notably, logistics companies) offer comprehensive door-to-door services. *When* there is sufficient freight traffic, the train operator may deal with multiple shippers. Each shipper may operate in different goods markets or goods with different wagon requirements. Each train operator therefore consolidates the wagons of different shippers. Train operators take on the revenue risk and attract business from other train and road operators through competitive shipper tariffs. This area of the industry would then be characterised by multiple train operators (with some differentiation of products) serving multiple shippers over the same routes.

POLICY IMPLEMENTATION

Three distinct forms of regulation underpin access reform policy:

1. regulation of conduct—mandated access;
2. regulation of industry structure or form; and
3. regulation of prices.

Regulation of conduct is the primary instrument used to implement access reform policy. This regulation requires the infrastructure manager to provide access to the infrastructure. In addition to oversight of access charges, the regulation requires the monitoring of a range of other factors. These factors

can include capacity allocation processes (including access to terminals and stations) and processes in essential ancillary markets (such as locomotive and rolling stock availability).

Mandating access may, however, lead the incumbent train operator to use access charges and these ancillary tasks and assets to frustrate competitiveness or contestability in the freight market. For this reason, regulation of industry structure or form is also used to *underpin* mandated access. The general objective of the regulation of the industry structure is to ensure transparency in transactions, thereby facilitating fair and equitable treatment of the access provider and the access seeker alike. Transparency in transactions is seen as evidence (though not necessarily a guarantee) that transactions between train operators and infrastructure managers are conducted fairly and equitably. The regulation generally follows one of two courses:

- separation of activities and accounting of the integrated operator into train operating and infrastructure management tasks—the firm's train and infrastructure activities remains vertically integrated; or
- separation of the train operation and infrastructure management operations into managerially and commercially independent businesses—the firm's train and infrastructure activities are vertically separated.

Note that when a train operator gains access through an integrated operation, this is defined as 'third-party' access provision. When the operator gains access through a vertically-separated infrastructure manager (who does not run revenue-earning trains for traffic), this is defined as 'open' access.

There are merits and costs in each structure. Vertical integration does not incur the restructuring costs of vertical separation or lose any synergies of integrated operation. However, the degree of transparency in transactions is less than when the transactions are externally traded (as under vertical separation). Further, under integration, there remain the incentives that encourage the frustration of third-party access. There are three important reasons why an integrated operator may seek to frustrate third-party access:

- **impact on traffic and rates.** The access seeker is likely to be competing with the incumbent for freight traffic—to solicit for the same downstream traffic, depressing the incumbent's traffic and putting downward pressure on freight rates;
- **impact on capacity.** The access seeker may also seek the same track (and terminal) capacity. This can be relevant when there is scarce capacity in general, or at certain times of day; if the capacity becomes unavailable, the operator may be limited to offering freight services at less commercially-attractive times for shippers; and
- **impact on incumbent efficiency.** The third-party traffic may affect the efficiency of the incumbent's rail business or other activities. For instance, sharing terminal space may reduce the efficiency of the

incumbent's shunting and marshalling activities. Further, in vying for capacity, capacity can become scarce and train scheduling can become less flexible. This may have the effect of reducing the operational efficiency of other areas of the incumbent's business. In practice, a railway may effectively form an integral part of the production process. An example would be where a railway serves both a mine and a smelter or power station acting like a conveyor belt, integrated within the production process of power generation or processing of metallic ores.

Thus, the third-party can therefore be perceived as a commercial threat to traffic, rates or, indeed, a production process. It may be that no matter what arrangements are put in place to facilitate neutrality of treatment of incumbent and third-party operators, the integrated operator still has an incentive to favour its own train operations.

Vertical separation removes that incentive. The access provider does not compete for traffic or track capacity; the infrastructure manager has little incentive to obstruct access. In principle, the access revenue is its only source of revenue so it is *generally* in the interests of the infrastructure manager to encourage use of its infrastructure.

A vertically-separated structure is likely, however, to be more costly to establish than an internal separation of activities. Separation removes the benefits attributed to a vertically-integrated structure—see, for example Koutsoyiannis (pp. 278–309) for a discussion of these factors. Thus, in particular, while separation may improve the ability to coordinate activities *along* the rails (that is, between railway networks), coordination *between rail and train* becomes more difficult. Separation brings with it greater ongoing transaction and coordination costs than under integration. Policymakers need to consider these additional set-up and ongoing costs when deciding between integration and separation[2]. Thus, if the likely on-track competition will be modest (due to small freight movements), the relatively low resulting benefits may not warrant the costs of vertical separation. For this reason, the Productivity Commission has concluded that where competition is not possible (for instance, because of low traffic density) then vertical integration is *preferred* over separation. (See, for instance, Owen, p. 19; Productivity Commission 2000, pp. 295–96.)

The third major form of regulation that underpins access reform is regulatory oversight of prices. There are concerns that access charges be:

- non-monopolistic;
- be fair and equitable (and be subject to arbitration if they are perceived not to be so); and

2 Sandberg (2002) considers these separation costs in the context of another network utility, telecommunications.

- be set in a way that encourages efficient infrastructure provision.

Factors that may affect the degree of oversight are, first, the degree of competitiveness in the freight market and, secondly, the industry structure chosen. The competition–market power matrix is illustrated in Table 1. Thus, moving down the figure, the third-party regime requires the additional regulatory oversight of fair and equitable charges across incumbent and third-party operators. In addition, moving across Table 1, the perceived need for regulation rises as rail's market power increases. In principle, less regulation is required where rail freight market power is relatively weak, primarily in non-bulk freight movements—the shipper price elasticity will be high. Thus, if the infrastructure manager abused its monopoly position by setting high access charges, this would lead to considerable loss of shipper traffic. This would affect both the infrastructure manager and train operator. Where rail freight market power is weak, therefore, there is less need for regulatory oversight for abuse of power. As noted by the ACCC, however, separated infrastructure managers nonetheless have commercial leverage over non-bulk train operators to the extent that the operators have significant 'sunk' ancillary rail investments (such as dedicated terminals) (ACCC 2001b, p. iii). For this reason, it may be argued that a degree of oversight of access charges is still required where rail's market power is weak; this oversight would provide incentives for productive efficiency and to prevent monopoly pricing abuse.

TABLE 1 DIFFERENTIATION OF ACCESS REGIMES AND DEGREE OF REGULATION

	Rail freight market power	
Industry structure	None →	Significant
(On-rail competition)	*Non-bulk goods*	*Bulk goods*
Vertical separation *(Infrastructure manager does not solicit for traffic)*	**Open access regime** Regulatory oversight of: * productively-efficient charges	**Open access regime** Regulatory oversight of: * productively-efficient charges * monopoly pricing abuse
Vertical integration *(Infrastructure manager solicits for traffic)*	**Third-party access regime** Highly prescriptive oversight: * fair and equitable charges * anti-competitive behaviour (such as path allocation)	**Third-party access regime** Highly prescriptive oversight: * fair and equitable charges * anti-competitive behaviour (such as path allocation) * monopoly pricing abuse

Source: Derived from figure 1, ARTC 2001a, p.5.

Where train operators' downstream market power is relatively strong—such as when bulk freight is moved over longer distances, for which rail has a comparative advantage compared to road—the infrastructure manager has a greater capability of abusing the position as monopoly infrastructure provider. The firm's charges may therefore be constrained by regulation, below a maximum (ceiling) price. This ceiling represents the price level where excess profits are not generated. The manager is also relatively sheltered from competitive pressures that would otherwise lead it to dynamic efficiency. For these reasons, regulation of a vertically-separated manager is likely to include oversight for pricing abuse and revenue regulation. CPI-x single-till regulation of monopolies is widely adopted across network industries as a process for encouraging productive efficiency. The annual increase in the firm's revenue is normally capped by the rate of inflation *minus* 'x' percentage points, where 'x' reflects the regulator's perception of the manager's achievable efficiency gains.

Implementing price regulation can, however, bring about costs. These include:

- **Level playing field.** Under third-party access, revenue regulation will not necessarily improve productive efficiency. If the integrated operator's access charges were constrained by CPI-x regulation to lie below the operator's infrastructure costs, the third-party access seeker would, by implication, face lower access charges than those faced by the incumbent operator. This could mean, therefore, that the potential exists for a less-efficient train operator to capture a larger share of the rail market.
- **Regulatory failure.** Economic regulatory decisions are informed by the regulator's understanding of the cost and revenue structures of an industry. To the extent that the regulator does not have direct access to all this information, the consequent asymmetry of information relative to industry players may lead to the wrong decisions, bringing lost efficiency.

BENEFITS AND COSTS OF MANDATORY ACCESS

The introduction of mandated access represents a radical change in the way that networks, including railways, have traditionally operated. The changes provide the potential for benefits arising from competition and coordination, though mandated access also brings costs. These benefits and costs are now considered.

Benefits of mandatory access

Access reform policy seeks to promote efficiency in train service provision, through competition or through the development of a contestable market. The primary benefits are considered here.

Competition

The National Competition Council (NCC) refers to 'bottleneck' infrastructure facilities that enables the infrastructure owner to exercise market power in the infrastructure service market and in ancillary markets (such as in the provision of train services on railway infrastructure) (NCC 2002a, p. 4). The NCC argues that, 'when applied appropriately, access encourages new firms to compete in upstream and downstream markets, encouraging efficient investment in those markets and better outcomes for consumers' (NCC 2002a, p. 6).

Thus, it should be stressed that competition is *not* an end in itself, rather than a means to an end. Competition can:

- stimulate production efficiency;
- spur quality improvements; and
- lower freight tariffs.

Thus, an 'access regime is one means of restraining prices and maintaining efficient levels of output' (NCC 20021, p. 4). As the European Council of Ministers of Transport (ECMT) has noted, in most markets rail already faces intense competition from road; the intended impact of the competition is thus not on freight tariffs but, rather, on rail efficiency/operating costs and service quality (ECMT 2000, p. 10). In Europe, then, one desired outcome would be relatively lower government subsidies to rail through improved efficiency.

Thus, mandating access to rail infrastructure can use on-track competition to encourage on-rail technical and dynamic (or production) efficiency. Access reform introduces a way for train operators to compete with each other for shippers' freight movements. It may draw in new train operators—including shippers operating their own trains. This infusion of competition and new operators fosters innovation. Lower train operating costs then enable operators to offer lower freight rates and more freight customer-responsive services. This also acts to improve train service competitiveness relative to road services.

Coordination

Since the development of railways, freight trains have tended not to extend beyond the track owner's network. Consequently, as freight flows have lengthened, train coordination problems have increased as freight flows extend beyond those networks. The pattern of service has thus become increasingly inconsistent with flows of goods. Separation of control of trains from track enables separate development of (seamless) train operations across infrastructure networks and increases rail's geographic market reach (where rail is relatively more competitive). These improvements would therefore enhance rail's competitiveness.

Economies of density of infrastructure

Increased train operation can spread the significant fixed infrastructure charges across a larger number of train operations—so long as that capacity can be utilised without significant congestion occurring. This is the basis of economies of density of infrastructure[3]. The increased utilisation therefore improves cost recovery in infrastructure provision and enables the infrastructure manager to offer lower rail access charges or lower freight rates.

Policy enhancements

Mandated access can facilitate governments' policies. For instance, the explicit calculation of infrastructure costs facilitates policies designed to bring about fair and equitable treatment of competing transport modes. In addition, there can be greater flexibility in policy options such as in privatising the train operation component while leaving infrastructure publicly-owned. (Such a policy may, of course, be regarded as essential to train competition by ensuring that train operators are given an equal financial footing.)

Costs of mandatory access

For many countries, rail is a significant transport mode so improved rail competitiveness can be a major benefit to the country. There are costs, however, that arise with mandating access. We have noted that the policy requires regulations to bring about and facilitate access. We note thus that:

> Legislated enhancements of rail access can be expected to increase regulatory oversight and costs to government. Additionally, compliance and dispute resolution will raise costs to industry. (CTARP 2001a, p. 46)

We now consider other potential costs.

3 The crux of capturing the infrastructure economies of density is to increase traffic. Incremental costs are assumed to decline as traffic volume increases. Thus, QCA (2000, p. 5) reports the costs for maintaining a line for 2 million gross tonnes per annum and the costs for a line carrying 20 million gross tonnes. The low volume track has poor track formation, timber sleepers and jointed rail; the high-volume line is set on good formation, concrete sleepers and welded rail. QCA indicates that 'The higher-volume line costs more per kilometre, but only by about 15%, and its cost per gross tonne-km is thus only about 11% of that of the secondary line' and that only part of the cost savings of the high volume line are attributable to the higher standard of provision (QCA, p. 5). Pittman (2002, p. 10) gives a range of economies of density, for integrated railways, of 1.31 to 1.92, e.g., meaning that increasing output will increase costs by 31 per cent.

There is considerable research from the USA suggesting that railways have strong economies of density but little or no economies of scale. That is, as the decline in average costs due to increased traffic volume is much greater than a decline in average costs arising from expanding the network size. See, for instance, Fischer, et al., for a literature review of this issue; the authors themselves found economies of scale with increased network size if the average length of haul rises. (That is, it is scale economies in above-rail operation.)

Economies of density of operation

Train operations can exhibit economies of density: as the density of traffic rises over a given rail network, the train-related staff levels rise—but these costs do not rise as much as the per-unit costs of overhead costs fall. Thus, to the extent that competition reduces an operator's traffic density, economies of density will be lost. Tranz Rail commented to the Neville Committee that

> The problem…with an orientation that would perhaps result in an artificial stimulus of competition on the rails is that it flies in the face of railway economics and economies of scale, which is very important in our industry. The operator that will have a low unit cost is a large scale operator. You can Balkanise the freight operation and have a number of small operators, all of whom would be competitive between themselves but would be relatively high cost units because none of them would be achieving the volumes that result in low unit costs. So they would have difficulty competing with the highway. (House of Representatives Select Committee on Communications, Transport and Microeconomic Reform [HRSCCTMR] 1998, p. 62)

The ECMT has similarly noted that 'Evidence of economies of scale, scope and density suggest that fragmenting rail freight businesses can make them uneconomic' (ECMT 2001, p. 12); the Canadian Government has expressed similar concerns[4].

Transaction and coordination costs

Mandated access leads to increased transaction and coordination costs between infrastructure provision and train operation; these costs are one aspect of economies of scope that are lost when the two functions are separated. In the absence of regulation of structure, transaction cost theory postulates that the industry will be structured in a way that minimises transaction costs. The theory points to integration as the preferred industry structure when 'there is a high risk of self-interest, conflicts of interest, substantial uncertainty, and recurrent, complex transactions' (Bale and Dale, p. 119)[5]. With railways, it is worth stressing that the uncertainty and complexity is more likely to occur with large numbers of train operators and where infrastructure reaches capacity. Thus, as the number of operators and capacity utilisation rise on given infrastructure, therefore, transaction costs are likely to rise *disproportionately:*

4 See, also, Starrs 1999, p. 67, for similar discussion in the Australian context. Similarly Transport Canada argues that 'expanded running rights could result in inefficiencies being introduced in the system by fragmenting traffic among two or more operators or reducing the economies of scale and density that are essential to efficient railway operations' (Transport Canada 2003, pp. 31–32).

5 These costs are more generally incorporated in 'economies of vertical integration', based on five productivity areas: technologically-complementary stages of production; lower coordination costs; lower inventories; better utilisation of management and research and development; and supplier discounts for large-scale purchasing. See, for instance, Koutsoyiannis, pp. 280–81.

the number of interfaces is multiplied rather than added as each new player enters the industry[6].

When the railway is integrated, internal liaison between the infrastructure and train service areas is used to resolve conflicting objectives. (The liaison on access terms may be between the infrastructure manager and the train service provider or the end-user[7].) With internal transactions, the firm's broad objectives are more likely to be shared by the constituent train service and infrastructure departments. When access is mandated, a greater degree of liaison is required and objectives are more likely to differ *and* conflict. Open access, in particular, requires additional liaison. For instance, capacity (train path[8]) allocation requires additional dialogue to resolve conflicting requirements. Such transactions must also be formalised (with associated legal costs) and risk margins need to be built in.

As the number of external firms rise, the contractual arrangements and the number of interfaces are *multiplied*. These multiple interfaces duplicate the tasks originally coordinated internally between a single group of managers. The complexity of interaction between the infrastructure manager and the train operators increases disproportionately because, as arrangements become more intricate, disproportionately more resources are required to coordinate and resolve conflicts between the extra train path market players. The potential exists, therefore, that where routes or networks are *approaching* capacity, the level of transaction and coordination costs may exceed the benefits flowing from the access reform.

Infrastructure capacity usage

The mandated access can reduce the effectiveness of infrastructure capacity utilisation. There are four aspects to this:

- *track* capacity usage;
- *terminal* capacity usage;
- integrated production efficiency; and
- less efficient administrative capacity allocation.

New train operations can bring different train types—trains with different speeds, lengths and axle loads. Having different operators with differing train types may

6 In a Working Paper written prior to Great Britain's rail restructuring, Preston identified the likelihood of a very substantial increase in transaction costs in Great Britain resulting from open access (Preston 1992, p. 8).

7 For instance, Queensland Rail's Network Access infrastructure provider may agree access terms and conditions with end-users (such as coal mines). The end-user can then directly contract with a train operator to haul the goods.

8 A train path can be defined as a 'defined entry, exit and transit time for a train consist on a particular network or corridor' (QCA 2000, p. iii).

result in a disproportionate increase in track capacity utilisation[9]. For instance, high capacity utilisation can be achieved where trains follow other trains at similar speeds. If a new train operator introduced a train with different speed characteristics[10], however, that train uses up a disproportionate amount of the spare track capacity. (A line used by a series of slow trains would, for instance, have a lot of its spare capacity used by introduction of a single fast train, which would need to delay the slow trains enroute to be able to overtake them.)

This cost is realised *only* when the line approaches capacity as it may:

- increase congestion (and thus delay freight movements);
- impede additional train operators from entering the market;
- increase the cost of track maintenance and renewal (by reducing the time windows available for such activities); and
- lead to the need to undertake additional investment to increase line capacity.

Thus, access reform can bring additional rail traffic but efficiency in line capacity use may fall. That is, the opportunity costs of capacity use can rise. (Preston (1992) illustrates this with desk-based simulations of capacity usage.)

Efficiency in terminal capacity usage can be affected. Shunting and marshalling activities are most efficiently undertaken when there is no interaction between different trains—whether it involves marshalling two trains for a single train operator or two trains for two operators. Thus, to the extent that access to terminals is mandated, and terminals are congested, there is a greater likelihood of intermingling of (different operators') trains, which will reduce terminal efficiency.

When rail transport is a critical element of the production process, the production efficiency may be adversely affected by mandated access. For example, if a power station operates its own coal mine and train line, then mandated access may attract third-party train operations that affect the efficiency of that 'conveyor belt'-like production process.

In principle, when capacity is allocated within the single, integrated railway (without third-party access), there may be path allocation tensions between operating divisions (e.g., freight and passenger; urban and country services). Nonetheless, in aggregate, the railway operator is more likely to compromise in a way that maximises the good for the firm. This is by contrast with the

9 The Strategic Rail Authority in Britain is proposing to restructure its passenger franchises into London termini; it believes that having a single operator using a station 'would facilitate optimum capacity both in the station and on the approaches to the station' (SRA 2002).

10 For instance, faster or slower trains or different stopping patterns or acceleration/deceleration rates.

situation where operators compete for access; in the absence of path-auctioning (or other price-based) processes, an administrative allocation process is likely to bring about even less desirable outcomes.

Cost recovery

Mandated access can shift the primary revenue source for infrastructure from the shipper tariff to the access charge. Striving for on-track competition in this way may, however, reduce railways' ability to achieve high cost recovery because it can restrict pricing options. Ramsey price discrimination of shipper tariffs is a critical technique for achieving high cost recovery in railways. In principle, *integrated* operators can use Ramsey-type price discrimination across freight *commodities* but it would be difficult to justify such discrimination across *operators*. (There would be a strong incentive for an integrated operator to give favourable access charges to its own train operator.)

Ramsey pricing is more difficult under vertical separation. An OECD Round Table Review of separation issues concluded that the 'separation of track from services will make the application of the Ramsey efficient pricing very difficult, if not actually impossible' (OECD 1999, p. 176). This is because the infrastructure manager negotiates with the train operator, not with the train operator's customer. As a consequence, the manager has a much-diminished ability to perceive the shipper's price sensitivity.

Reduced investment incentives

Mandated access has the potential of reducing the viability, or increasing the risk, arising from ownership of rail infrastructure. The impact on investment may not be immediate; as the CTARP noted, 'Railways could be subject to years or even decades of under-investment before obvious system failure' (CTARP 2001b, pp. 46–47).

There are, in any case, a number of ways in which investment decisions may be affected. First, the impact of imposed access terms attenuates, or reduces, the private property rights. The Canada Transportation Agency argues that it is 'expropriative in nature' (Canada Transportation Agency 2002) while the NCC notes that the 'costs of access regulation stem from its intrusions on property rights, especially in relation to privately owned infrastructure' (NCC 2002a, p. 5). In doing so, this increases investment risk. Secondly, we should note that the 'wrong' access charge may affect the return on investment and therefore the incentive to invest. As the 1998 Australian review of access systems (the 'Neville Committee') noted, the '… manner in which access prices are set has a crucial bearing on the level of rail utilisation and investment' (HRSCCTMR, pp. 79–80). To the extent that infrastructure is not upgraded (or modernised), this affects

rail productivity and, thus, rail tariffs; this, in turn, affects the competitiveness of the goods being conveyed[11].

In addition to access charge levels and structures, mandated access requires additional effort to coordinate investment needs, priorities and risk allocation:

> It may be difficult for any operator (or retailer) to co-ordinate, as necessary, with the infrastructure monopoly (or wholesaler) entity, especially if their incentives with respect to investment behaviour are not in harmony. (Kessides and Willig 1998)

Bruzelius argues that there is greater risk that the investment occurs in the wrong areas—this is more likely to be the case with vertically-separated operations:

> a number of investments will be made that should never have seen the light of the day whereas other investments of great importance to the railway's future competitive situation run the risk of not being implemented (Bruzelius, et al., p. 460).

The risks of these wrong or inadequate investments are a valid concern. For instance, train operators benefit from infrastructure that supports greater wagon weights, train speeds and train lengths[12]. It is inevitable that operators' improved competitiveness from such improvements would filter through to the infrastructure manager (through higher access revenue). However, such benefits are not necessarily obvious and, indeed, to the extent the primary investment risk lies with the access provider, the infrastructure manager may identify lower incentives to invest in such a project that where only a single-operator, integrated operation is involved.

Thus, the infrastructure investment and the associated risk are borne in the first instance, by the manager; the access charge needs to reflect that. Similarly, it is probably more practical for the infrastructure manager (rather than the different operators) to undertake investment in track-side monitoring devices; such devices can reduce the risk of operators damaging infrastructure through

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11 The Canada Transportation Act Review Panel (CTARP) concluded that a crucial capital expenditure for Canadian branch (or 'short') lines was to upgrade track structures in order to take mainline freight wagons (CTA 2001b, p. 50). More generally, commissioned research undertaken for the CTARP by the Research and Traffic Group (2001, p. 1) expressed doubt that long-term capital sustainability can be achieved. Freight Australia voiced a similar point about wagon weights, arguing that branch line upgrades are essential for taking larger, faster mineral sands wagons and arguing that the resulting cost savings will assist in the viability of mineral sands mining.

12 We should note that some operators will have greater productivity gains than other operators with infrastructure enhancements. For instance, raising axle loads will often have little bearing on passenger train operations; canted track will have no practical benefit for freight operations. Canted track will, however, increase the incremental maintenance costs of that track resulting from freight train usage. What is the appropriate change in access charge where such investments are undertaken?

derailments. The direct beneficiary is the operator but the benefit of a more viable train operation also accrues to the manager. It is then a relatively greater challenge under access reform to establish incentives (primarily through access charges) that translate obvious integrated railway optimisation strategies into suitable incentives when there is a wheel-rail operator interface[13].

Asymmetrical incentives for the wheel–rail interface

The mandating of access to the track changes the fundamental structure of incentives within the industry[14]. There can be asymmetrical (and distorted) incentives to use, and provide, the infrastructure though the activities are actually highly interdependent. There can be impacts on optimal investment strategies, on costs of operation and provision and on viability of train services. The access reform policy is occurring at a time when technological developments are increasingly focused on the wheel–rail interface for productivity gains:

> The modern railway environment of increasing axle loads, faster and longer trains, higher-adhesion locomotives, and greater cant deficiencies are all increasing the demands on the wheel/rail interface. (Magel, et. al., 2002)

In essence, the risk arises that the industry loses the dynamic trade-offs that can be made in wheel and rail decision-making. This change in incentives can impose efficiency costs.

The infrastructure provider may have less incentive to maintain a given infrastructure standard if its access charge is not reduced when the standard is not achieved. Track speed and wear on the rolling stock can be affected. (For instance, it has been estimated that between 40 per cent and 50 per cent of wagon maintenance costs and 25 per cent of locomotive maintenance costs are related to wheel maintenance (Railway Gazette International 2003, p. 427). To some extent, incentives may be built in through responsive access charges: one British report has noted that the access charge should reflect track quality as rough track accelerates wear on rolling stock (ORR 1999, para. 186).

13 Indeed, Affleck (2002, p. 11) has suggested that where there is vertical separation in Australia, there is a need for 'building bridges' that link above rail entities to below-rail entities. This recommendation complements European developments in the technical bridge-building, with the development of Wheel–Rail Interface System Authorities (see footnote 14).

14 Note the establishment of 'System Authorities' in Britain from 2001 (and developing elsewhere in Europe). These authorities seek to generate greater co-operation and consistency between train and rail infrastructure management—aspects lost or weakened by vertical separation. For instance, in May 2001 a quasi-government organisation, the Wheel Rail Interface System Authority (WRISA), was set up as a Company Limited by [government] Guarantee (CLG). WRISA was established to manage and optimise the interface. Similar Systems Authorities have been established in signalling and communications.

Mandated access can also alter the train operator's incentives: the train operator may have less incentive than an integrated operator does to introduce or maintain rolling stock that minimises wear and damage to the track. If the benefits accrue primarily to the infrastructure, then unless the access charge has clear differentials for optimising wheel sets, there may be little incentive for the operator to invest to optimise the wheel–rail interface. Further, the train operator may have standards in wheel condition (and, possibly, in overloading wagons) that differs from the (otherwise–integrated operator's) optimal wheel condition. To the extent that such an incentive arises, however, it can be offset by the risk that wagon defects lead to accidents, destroying both operator capital and shipped goods and the infrastructure manager's track. To the extent responsibility for such accidents can be attributed, it provides a powerful incentive for both operators and infrastructure providers.

More generally, to the extent that the wheel–rail interface emerges with separate train and track operations (p 19), incentives need to be set to optimise operator use or infrastructure provision. Damage to infrastructure can be considerable—especially where wheel defects lead to a derailment[15]. Preventative maintenance and monitoring of wheel sets at terminals can minimise but not eliminate such events—failures will occur even when operators have not been negligent with vehicle maintenance. This event risk means that train operators must be backed by a significant insurance indemnity[16]. There is, in any case, the potential for infrastructure failure (avoidable and otherwise) to bring about derailments.

Separation, therefore, can lead to a loss of dynamic trade-offs between actions that optimise provision and use of the infrastructure. The consequence may then be that there is greater insurance indemnity relative to prevention and monitoring; under the integrated operation, the outcome is optimised by preventative *wagon and infrastructure* actions (in addition to some, lower, level of insurance). For instance, a single operator, integrated operation might choose greater use of track-side monitoring devices than under mandated access, where disproportionately more is spent on insurance than incident avoidance and detection.

Thus, a risk with the mandated access process is that a charging structure will be insufficient to replicate the incentives and the dynamics in fully integrated operations.

15 For instance, the Chief Executive of Britain's Network Rail apportions blame for the British network's endemic 'gauge corner cracking' problem (which led to the Hatfield railway accident in October 2000) to the stiffer suspension of new rolling stock. The suspension, he argues, increases dynamic forces. (See Railway Gazette International, 2002)

16 The level of public liability insurance required to run over rail lines in Victoria is reported to have led Great Northern Rail to cease operations in November 2002. (*The Australian*, 18 November 2002, p. 29.)

Safety costs

Access reform brings with it additional players in the market; greater costs are incurred in ensuring that safety standards are maintained. Professor Evans, of the European Transport Safety Council, has indicated that:

> The separation of infrastructure management from rail operation, and the entry of newcomers to the railway scene potentially increase railway risks. Railway fragmentation requires more formal safety processes than in the past. (European Transport Safety Council 1999)

Assessing the net benefits

Mandating access to the railway network is intended to bring net efficiency benefits. However, history has shown that there can be no presumption that such benefits will be forthcoming. We can identify features of a rail industry that point to the net benefits that might accrue and how the industry might best be structured and regulated. As a general point, the benefits from 'unbundling' are likely to be less than for other network industries, mainly because (as we noted on p. 6) rail's competitive segment generally represents a lower proportion of total costs than in other network industries.

Further, the level of benefits of access reform will be a function, in part, of the freight market size. More *specifically*, the level of benefits will be a function of *where* competition can be introduced into rail freight markets where it has not previously existed. Thus, we note that the part of the freight market where rail does not face strong competition (from road or sea)—is largely, in *bulk* freight movements from the hinterland to the port. (We should note, however, that some bulk grain movements—with multiple terminal origins and destinations—often face considerable intermodal competition *and* can be subject to *intramodal* competition.) Non-bulk rail freight, where it still survives, generally faces very strong competition from road. Consequently, the benefits of the reform (competing away market power and increasing incentives for productivity gains) are likely to be considerably less.

In terms of the coordination objective of the reforms, the level of benefits arises from:

- the extent of the actual or contestable rail freight market;
- the size of the rail networks; and
- the number of infrastructure managers.

In terms of assessing the costs, we note that there is considerable economic literature on the operational benefits of a vertically-*integrated* operation. These benefits are sacrificed (become costs) when we separate the integrated activities for the sake of competition and coordination. Thus, set against these benefits are costs arising from the loss of scope of activity and adverse incentives on provision and use of infrastructure. Further, the separation has the potential to lower cost recovery and, thus, create disincentives for

investment and, thus, undermine long-term sustainability. Therefore, there can be no a priori assumption that net benefits will result from access reform. The decision to regulate for mandated access to the network based on net benefits therefore relies on a perception of the likely importance of such issues.

We should, finally, note just whether we can observe those 'net benefits'. For instance, can we conclude the success of the reform from the observed level of competition and movements in rail freight tariffs? We have a concern about the cost recovery and sustainability of the railways. The detrimental impact of mandated access may only become apparent in the longer term, due to the ability of railways to run down their assets over extended periods without materially affecting the train operations.

Unfortunately, there is no simple, unambiguous measure of the success of on-track competition—certainly not the number of 'competing' train operators. In this context, we should note the strong degree of economies of density in *non*-bulk freight train traffic. A consequence is that the reform is highly unlikely to result (in the absence of regulation) in more than a few train operators providing competing services, though we might seek 'contestability' in the market. There is a proviso here, however: the depth of the industry structure can play an important part in the number of players. Thus[17], the number of branch line and regional industry players provides an essential pool of train operators seeking to provide competing services or, at the least, seeking access to the main line to provide a seamless service.

In bulk freight, also, the success of access reform cannot be measured by the number of operators: the economics of bulk freight (and non-bulk movements undertaken for one large company, such as a freight forwarder) are that a given volume of freight is more efficiently operated with only one train[18]. The benefits of the reform here lies in establishing an uninhibited contract market for exclusive operation of the trains. The benefits, then, are seen in whether tenders for (bulk *and* non-bulk) haulage contracts can be made competitive and then result observed in lower freight rates.

We conclude, then, that the net benefits of access reform need to be determined on a case-by-case basis and that the benefits do not necessarily flow to the same extent as might occur in other network industries. More generally, the economics of the rail industry define the way that access charges are levied. Benefits flowing from increased on-track competition may compromise achieving other objectives—notably, cost recovery and, thus possibly, not just sustained lower freight tariffs but also re-investment and long-term infrastructure provision. These issues are considered in the next chapter.

17 as we note, below, in the case of Germany and Canada, p118.

18 Because grain movements often have multiple loading origins (silos) and port destinations, it may be possible for a geographic area to be served efficiently by multiple train services.

chapter 2

PRINCIPLES OF EFFICIENT RAIL INFRASTRUCTURE PRICING

In this chapter we consider the principles of efficient pricing of goods and services in the context of the market for transport (essentially, freight) services. First, we consider the freight transport market. In this context, we then apply the principles of efficient pricing to the provision of access to rail infrastructure. We then examine characteristics of rail transport that may require other than simple free-market price setting. Finally, we consider cost estimation issues.

FREIGHT MARKETS AND COST RECOVERY

An important characteristic of rail infrastructure is that there is lumpiness in capacity provision. Specifically, to provide the infrastructure needed, given minimum expenditure and capacity is required. In practice, this means that the supply of capacity may be large relative to the demand for conveyance—particularly, in Australia's case, the conveyance of freight. This can influence the access pricing principles adopted.

Market size

The minimum rail infrastructure capacity that can be supplied is typically large relative to the prevailing freight market. This is a primary reason why competing (duplicated) railway infrastructure generally does not occur. (The high level of freight moved in Canada and the USA provide important exceptions to this generalisation.) Given the minimum capacity that has to be built and the limited freight market, it is usually efficient for only one firm to provide infrastructure in a given geographic corridor. This aspect of the railway industry is shared with other network industries: there can be a number of electricity generating companies but it would be prohibitively costly to duplicate the power lines so as to foster some competition in electricity transmission. The rail infrastructure network is similarly characterised by considerable capital costs and short-term fixed overheads. As utilisation of track capacity increases, these overhead costs are spread across traffic and average unit costs decline over a wide output range. This

is the basis for the 'economies of density' that are found in rail infrastructure provision[19]. In a sense, there is too much capacity supplied for the demand that prevails[20]; the lumpiness of much rail capacity, however, is such that there are limited reductions in infrastructure supply that can be made. In this context, interstate rail traffic in Australia uses less than half of the available capacity. The demand is at a level where average cost is falling with marginal cost being less than average cost—in fact, marginal costs are estimated to be around one-third to one-half of the average operating costs (Freebairn 1998).

To the extent that a single firm captures a large output share (as is likely in Australia) its unit costs will be lower than other capacity providers and would lead in the long term to this firm undercutting other firms and becoming the sole capacity provider. For this reason, most railway operations are considered to be 'natural monopolies'. Specifically, within the range of output normally demanded at the prevailing tariff, the unit costs with a single rail infrastructure provider are lower than with two or more infrastructure providers. Thus, the most effective way to provide infrastructure is through a single provider. Even so, the amount of capacity that has to be provided may still be excessive and affect the viability of the railway.

Cross-modal competitiveness

At the time that many of the railways were constructed, road freight movements were often relatively unproductive: slow and relatively unreliable. However, improvements in road freight productivity have been generated in both heavy vehicles and road infrastructure. At the same time, there has been relatively less growth in railway (train and track) productivity. This is particularly the case with non-bulk freight movements over short distances. A consequence has been that rail transport (non-bulk freight, in particular) is no longer the monopoly or dominant provider. Rail often follows rather than sets freight tariffs.

In the short-run (which can still be a long time, when considering railway infrastructure), rail service should be sustained as long as the lowest short-

19 Gómez-Ibáñez and Meyer (amongst others) draw out the distinction between 'economies of density' and the more commonly used term, 'economies of scale'): 'Traffic density is the volume of traffic on a given route or network of constant length. Increases in scale can include expansions of the length of the route or network as well as increases in traffic density. The distinction between density and scale is rarely used or relevant in nontransportation industries.' (p. 257).

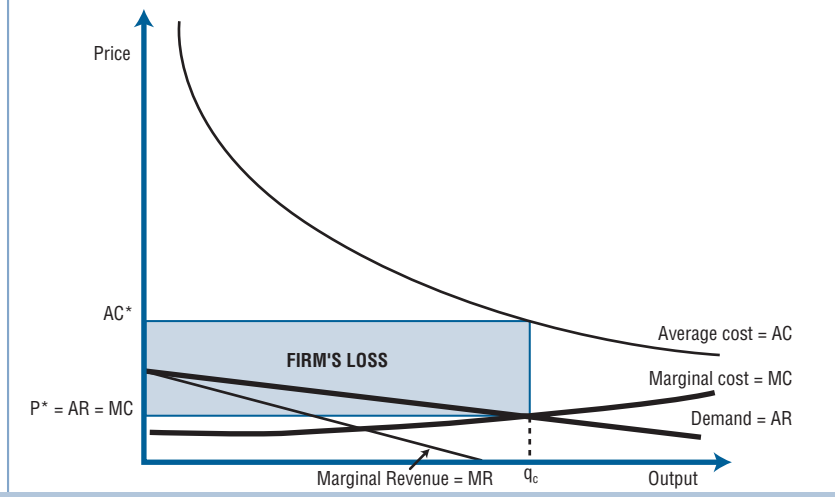
20 There is too much capacity relative to the prevailing demand *in aggregate.* Nonetheless, it should be noted that there can still be *temporal* capacity constraints and physical 'pinch-points'. For instance, in some parts of the network, demand is very seasonal, notably, in grain haulage, and infrastructure may be fully utilised at these times. Similarly, export coal movements are strongly peaked to the period that a ship is in port; and capacity can be fully utilised by interstate trains aiming for specific arrival times in city terminals.

run supply price at least matches the average variable costs[21]. In the long-run[22], the firm should cover its total average costs. Given the large economies of density that are available in rail infrastructure provision, ongoing traffic losses impact on the unit freight rates that can viably be offered. This can be illustrated in the following figures.

Figure 1 illustrates the parameters often faced by railways with non-bulk freight movement, namely:

- economies of density with insufficient freight traffic to fully-utilise the infrastructure capacity;
- consequent financial losses when the firm produces at the allocatively-efficient output, where price is set to marginal cost (which is below the average cost); and
- relatively elastic demand for freight.

FIGURE 1 ILLUSTRATION OF PRICING AND DEMAND ELASTICITIES WITH NON-BULK FREIGHT



Rail services in non-bulk freight face relatively elastic demand because road freight is a close substitute for non-bulk rail freight. Rail faces relatively high terminal and shunting costs. However, these costs can be 'spread' as distance increases, enabling rail to reduce unit costs. Thus, for longer distances, rail becomes more competitive. However, some competitive disadvantages remain.

21 In the short-run, the capital costs are fixed, by definition. Thus, note that fixed costs are not part of the short-run marginal costs (that is, the marginal fixed costs are zero) and so the marginal costs are marginal *variable* costs.

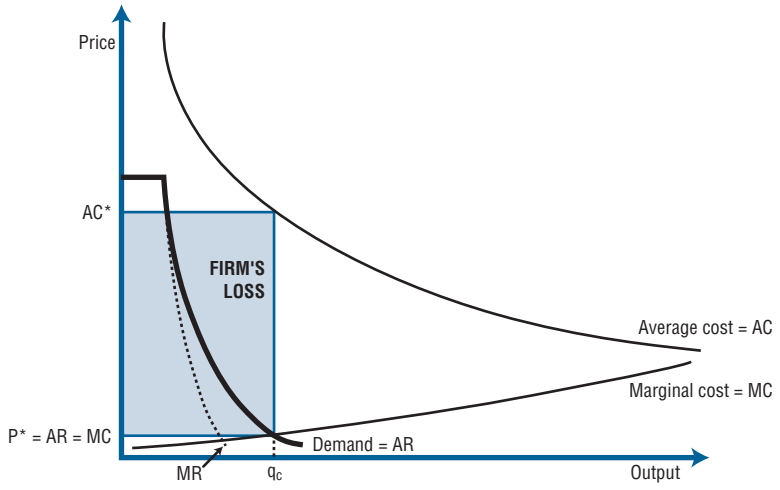
22 Long-run is defined as the period of time when a firm can vary its capacity; the long-run costs therefore include short-run costs and the (capital) costs of changing capacity.

In particular, the non-bulk rail terminal-to-terminal price needs to be sufficiently competitive with road freight's door-to-door tariff to accommodate the costs of road-based goods transfers between origin/destination and rail terminals. Similarly, rail transit times are often longer compared to road, especially to the extent that rail's service is not door-to-door. In these circumstances, the rail tariff may be set lower than the road tariff to provide shippers with an incentive to opt for the lower quality.

Because non-bulk freight is generally considered to be price-elastic, however, in principle rail traffic can be captured from road by lowering freight tariffs. This additional traffic, in turn, would enable freight tariffs to be kept low.

Figure 2 illustrates pricing and demand conditions that can prevail with bulk freight movements. In this example, the routine movements in bulk freight by rail over medium or long hauls can be undertaken more efficiently and practicably than by road[23]. Nonetheless, like the conditions in Figure 1, the firm faces losses: although the price elasticity for the bulk freight movement is relatively inelastic, there is insufficient freight. Given its losses and the lack of competition from road, the firm may opt for higher prices. Beyond a given price level, however, the high freight tariffs feed into higher costs for the goods being moved; the production of the goods themselves then becomes

FIGURE 2 ILLUSTRATION OF PRICING AND DEMAND ELASTICITIES WITH BULK FREIGHT

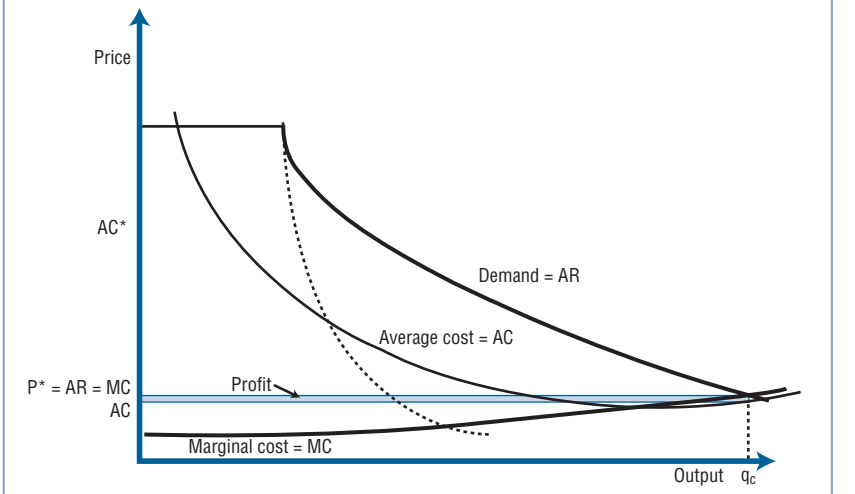


23 Road, or other technology, may be competitive on short-haulages; even pipelines may be competitive over longer distances. However, even where road may be competitive with rail, local authorities may require that the bulk goods be transported by rail, as in some NSW coal traffic and with Queensland sugar traffic (over the sugar 'tramways').

uncompetitive in the export (or import-substitution) market and the rail freight movements cease.

In Figure 3, we again present a bulk freight market. As before, demand is price-insensitive. In this case, however, the level of demand relative to capacity is considerably greater. Economies of density are then realised and sufficient revenue is generated to over costs at the efficient price level. The firm then records a profit. In principle, this situation can also apply to non-bulk freight movements (which can also attract relatively higher tariffs than bulk freight movements), though the freight market itself needs to be even larger as the freight task is more evenly shared between road and rail.

FIGURE 3 ILLUSTRATION OF PRICING AND DEMAND ELASTICITIES WITH BULK FREIGHT AND HIGH DEMAND



Market-based pricing

In the foregoing discussion, we presented the consequences of the high costs of railway infrastructure provision, its lumpiness in provision (leading to economies of density as capacity utilisation rises) and rail's competitiveness in certain (long-distance and bulk freight) movements. Critically, rail might have a low operating cost base but, if there is insufficient freight movements on offer, the firm would still record losses.

It is in that typical industry environment, therefore, that rail access prices have been developed and applied. In this context, 'market-based' access charges may be applied. These charges are set at levels that reflect the prevailing demand levels and price elasticities; the charges may aim (in the long run) to achieve full cost recovery even if current rail throughput is insufficient to generate the revenue needed to cover costs. In this context, the access charge may be set at a level that recognises how the charge affects the ability of the train operator to offer a

competitive tariff. The infrastructure manager therefore perceives that if it sets cost-based access charges, the resulting train operator tariff will be uncompetitive.

The other important aspect of market-based pricing is that the access charges will be set with reference to the capacity utilisation. That is, the level of rail freight traffic on a given corridor will be a primary determinant of the access charge that is set. This is a consequence of the economies of density: increasing the freight moved would reduce the unit costs of infrastructure usage. A somewhat circular argument then follows: the ability to offer competitive access charges is directly correlated to the ability to attract freight traffic (which is highly dependent on the level of access charges).

We note, therefore, the importance of the freight market size and rail's competitiveness in setting market-based access charges.

ECONOMIC EFFICIENCY

It is assumed that the underlying objective of rail access charges is to set prices that bring about 'economic efficiency'[24]. That efficiency is normally considered as:

- allocative efficiency (where resources are directed to production of goods and services that the economy values most.); and
- productive (or technical) efficiency (where output is produced at the lowest cost).

Allocative efficiency

Before the 1990s, the emphasis in publicly-owned railway systems across the world was on allocative efficiency: public ownership of monopoly railway operations enabled allocatively-efficient tariffs to be set through public underwriting of losses; often, this was facilitated by various forms of regulation of road freight. Since the Second World War, in particular, railways have had relatively low productivity growth (with low take-up of technical and dynamic innovation) and static or declining traffic. This contrasted with growth in road traffic, facilitated by improvements in freight vehicle sizes and other efficiencies, improvements in road infrastructure and significant deregulation of road freight[25]. This forced governments to provide increasing levels of subsidy to rail.

24 The ECMT sees competition and consolidation of international rail operations will lead to lower costs and better quality output (ECMT 2001, p. 10).

25 Until the 1960s–1980s, Australian intrastate road transport in Australia was regulated to prevent it competing directly with rail services. (Interstate regulation ended in 1954, following the Privy Council's ruling in the Hughes and Vale case that 'revenues from licensing long distance transport across State boundaries were inconsistent with s.92 of the Constitution' (Productivity Commission 2000, pC4).) One objective of this policy was to ensure that rail capacity was utilised—and thus that demand for rail traffic was closer to the efficient and financially self-sustaining level.

For these reasons, public policy on utilities, including railways, has shifted to an emphasis on productive efficiency.

Productive efficiency

A range of policy options has been applied to improve productive efficiency. These options include corporatisation, privatisation and franchising. A central tenet of this policy direction is that productive efficiency is stimulated through introducing competitive forces.

Railway production can be considered as being comprised of two core parts, train services and infrastructure provision. Given sufficient passenger or freight traffic, it may be possible for competition (or contestable forces) to occur in train service provision. Once we decide that competition in train services is feasible, we need to isolate the services and infrastructure provision into two markets, one competitively driven and the other provided by the monopoly infrastructure provider. We should recognise, however, that despite any separation of activities, the intimate relationship between services and provision means that it is inevitable that policies focused on services will also impact (favourably or unfavourably) on infrastructure provision.

In the past, railway service production has involved essentially one price—the passenger or freight ('shipper') tariff. That tariff should have had some relationship to the sum of the cost of operating trains *and* the cost of providing infrastructure[26]. Competition in above-rail service provision means, however, that we need to establish a separate charge for use of infrastructure by third-party train operators *and* the infrastructure owner's train operator. If we seek production efficiency then, for similar track usage, each train operator's access charge must be fair and equitable. The access charge should therefore not be affected by whether a train is operated by the infrastructure manager's company or by a third-party company.

One basis for the charges, therefore, is that they be fair and equitable. Train operators will be sold access to 'infrastructure'; this infrastructure *will* include railway track and *may* include ancillary facilities such as stations, marshalling yards, terminals and sidings. (The access seeker may be expected to provide its own ancillary facilities.) The infrastructure manager sells track capacity—train paths[27]. What is sold is an agreement on track availability over a given geographical range and a given time band. Thus, we define a 'train path' to

26 Note, however, that there is evidence that, for some railways at least, there was never any relationship between railway costs and the derivation of freight tariffs. See, for example, the thesis by Fitch, 2002.

27 In practice, a train operator may actually purchase an 'access right'; this may mean that the operator gets to use the track within a given time window and at an average train speed that may vary in response to preceding trains.

mean the infrastructure capacity needed to run a train between two places over a given time-period (European Parliament 2000a, p. 15). The paths are generally bundles of 'slots' of different line or line segment capacity. These slots are assembled into a contiguous geographic *and* time 'path' to enable a train to move between origin and destination.

In setting the level and structure of the access charges for these paths, there are three primary efficiency objectives:

- efficiency in *use* of railway infrastructure;
- efficiency in *provision* of railway infrastructure[28]; and
- efficiency in train operation.

The balance between these objectives was previously considered *within* the integrated railway operation. That integrated operation also balanced its own capacity allocation between different train services whereas with a third-party, the access charge should ideally be providing the necessary signals to allocate the capacity efficiently. It is important to note that, in meeting the efficiency objectives, the access charges should also be comprehensible, transparent and stable. In the absence of such characteristics, the inherent efficiencies would not be realised.

ESTABLISHING EFFICIENT ACCESS CHARGES

In this section, we consider the factors that influence the level and structure of the access charges. At the outset, however, we need to reiterate point that access charges will be set to recover infrastructure cost *and* to facilitate on-track competition.

In these conditions, there are three primary conditions, which must be met where the infrastructure provider can use allocatively-efficient charges to recover its investment and operating costs. These are:

- that there are not economies of density (or scale) in the long-run costs of construction and operation of the facility;
- that investment must be optimal so that at the prevailing demand, the efficient charge equals the long-run marginal cost as well as the short-run marginal cost; and

28 Ferreira and Martin (p. 218) consider the provision efficiency in the short-term and long-term: 'it is important to ensure that the owner has sufficient incentive to move towards the most productive maintenance methods, as well as the most effective long-term track standards'.

- that there are no significant external costs or benefits (such as infrastructure pollution or where use of the rail infrastructure relieves road congestion)[29].

However, these conditions feature prominently in the characteristics of rail infrastructure provision. A fundamental feature of rail access pricing that then follows is that, at the prevailing demand and rail service competitiveness, allocatively-efficient rail access charges are unlikely to achieve full cost recovery. In the following discussion we therefore consider further the characteristics of rail that lead to this conclusion; and we consider the consequences of various alternative pricing approaches.

Pricing at marginal cost

The natural monopoly characteristic of rail infrastructure provision can generate problems for setting efficient rail access charges. Economic theory postulates that, across all firms, production of a good or service should occur up to the level where the cost of the last unit of good produced equals the price obtained for that unit.

For natural monopolies, however, average costs may still be declining *throughout the relevant range of the prevailing demand*. Even with just one *rail* firm supplying capacity, the lumpiness of capacity supplied means that there is excess capacity; extra services can then use the facility with only relatively small wear-and-tear costs. This is the basis for the economies of density of infrastructure provision. These economies may not prevail for two primary reasons:

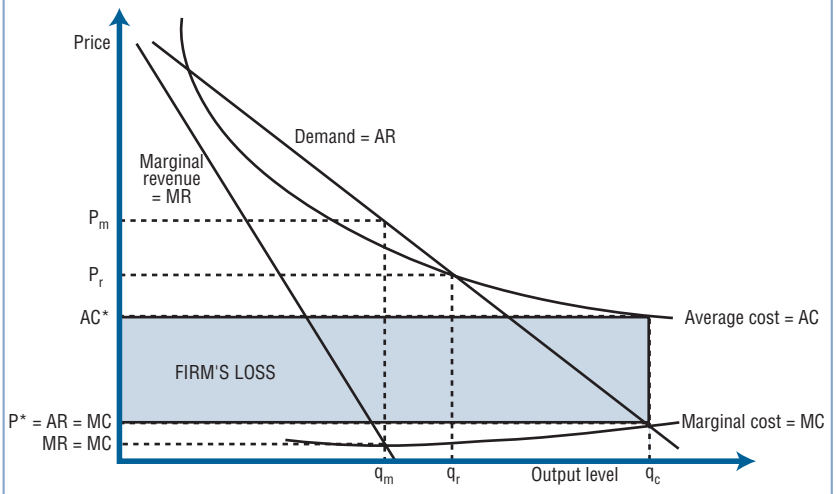
- there is limited potential freight traffic on a given freight corridor; and
- over time, rail has lost competitiveness relative to road freight (where quality has risen and tariffs have fallen).

Thus, when utilisation occurs where average costs are still declining, short-run marginal costs are less than average costs. In this case, therefore, setting price equal to the short-run marginal cost will mean that the price per unit is less than the average cost. The infrastructure manager would therefore operate at a loss.

This is illustrated in Figure 4: at the efficient (first-best) output level, q_c, the price is P^* but the average costs are AC^*. The government may own or subsidise the firm to produce at the efficient output level, q_c, but it will need to raise revenue (such as through borrowing and taxation). Each form of government revenue raising has its own distortionary effects and there can be negative

29 See, for instance Gómez-Ibáñez and Meyer, pp. 256–57.

FIGURE 4 FIRM LOSSES ARISING FROM DECREASING AVERAGE COSTS AND INSUFFICIENT DEMAND



effects on management of the railway[30]. One consequence of this detrimental impact of the taxes on economic efficiency is that the access price should be set above the marginal cost. Freebairn notes that this price margin *above* marginal cost should increase with price inelasticity for rail infrastructure and with the economic inefficiency cost of the tax (Freebairn, p. 290).

At the allocatively efficient output level, the rail infrastructure losses may be considerable. As the short-run marginal cost in rail infrastructure is considerably less than the average cost, the firm's loss will be large relative to the revenue generated through access charges. *At the prevailing demand* in the rail industry, therefore, short-run marginal cost-based pricing can often make it impossible to provide financially free-standing rail infrastructure.

As an alternative to producing at q_c, the government may regulate to require the operator to produce at output q_r and where price p_r equals the average costs. (If unregulated, the firm would choose to produce at q_m.) At this point, output is sub-optimal but at least the firm breaks even. We should note that one implication of such pricing, however, is that if the price is based on the average cost, a regulated firm will have less incentive to initiate technological or organisational changes than an unregulated firm.

Efficient prices need to encompass the price paid by society in general for that production rather than the price paid by the producer. Specifically, efficient

30 Goergen argues that public funding will 'greatly favor inefficiency of management and will provide no stimulus to minimisation of costs. It will also render very difficult any realization of the rational investment policy' (p. 35).

rail access prices should recognise externalities of infrastructure usage, both positive and negative. While there is a general issue of the ability to measure those externalities, nonetheless there is a case for incorporating these costs (charging at the marginal *social* cost) which will comprise:

- the user's wear-and-tear costs;
- congestion and scarcity costs[31]; and
- environmental and (external) accident costs.

One external benefit of rail is argued to be its *relative* environmental advantage over road transport; this advantage is often used to justify rail subsidies. The absence of marginal pricing of road use, which therefore does not vary with congestion; and the unpriced environmental costs of road traffic (such as noise and air pollution) can lead, other things being equal, to over-expansion of road usage. Subsidising rail transport (setting access charges below cost-recovery levels) is put forward by its advocates as a means (in the absence of road pricing) of shifting traffic from an over-used road system onto rail. (The subsidy can also be argued to redress the competitive advantage between the modes, to the extent that rail does pay for the economic costs of the resources it uses.)

Subsidising rail may seem straightforward. However, unless rail transport can be readily substituted for road transport, subsidies will not generate the required mode shift. This absence of mode shift means that there will be minimal impact on road externalities. Depending on the circumstance, therefore, subsidising rail may not be an effective way for correcting problems in pricing road usage. We should also note that deficit-funding does not give strong incentives to rail firms to be efficient. A better approach is to remove the distortions in pricing externalities.

One externality of rail infrastructure usage is the incremental effect of additional trains: as the line approaches full capacity utilisation, it is inevitable that delays to existing services will increase. In the same way as lumpiness (indivisibility) of assets leads to a mis-match of capacity and usage (typically, under-utilisation) it also means that as capacity approaches full utilisation, congestion occurs with little ability for remedial incremental capacity expansion. We should also note the opportunity costs of traffic that has to be turned away when the line reaches capacity and the consequent need for the pricing mechanism to allocate capacity to the highest-value users (i.e., those who accrue the highest benefit from access). Thus, as track utilisation approaches capacity, congestion and opportunity costs rise substantially[32].

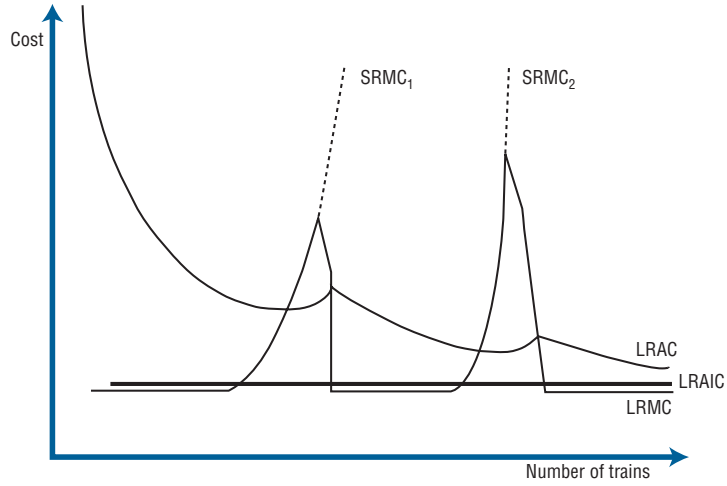
31 The congestion costs relate to the additional delays to other services that may result from running an extra train while scarcity costs relate to the cost of not being able to run a train or run a train at a preferred time.

32 Note that if there is only one train operator on the line, the congestion and opportunity costs are internal to that firm and thus are a cost already borne by that firm rather than an externality: the access charge would not incorporate a congestion or opportunity component as the firm already bears those costs in its train operations.

Short-run marginal costs (SRMC) incorporate these congestion and opportunity costs. At this level of capacity utilisation, therefore, access charge set at SRMC will therefore increase to a level that can exceed average costs. The access charge can be used to recover the extra costs. The charge is also a capacity management tool, providing price incentives for operators to shift their traffic movements to times when spare paths are available. The track may be congested only infrequently during a given time period: this may not justify incremental investment even in the long-run. To the extent that access charges reflect temporal variations in demand, this can reduce pressure on capacity and delay or, indeed, eliminate the need for investing in capacity expansion.

It is only when utilisation approaches capacity, however, that the charges begin to signal that new investment may be required. We should note that investment often requires long lead times to facilitate the planning and financing tasks. Thus, when infrastructure is approaching capacity utilisation, short-run marginal cost-based prices can provide poor signals for *timely* investment. As capacity constraints are relieved by expanded infrastructure investment, the congestion and opportunity costs largely disappear. A consequence of this pattern, however, is that the short-run marginal cost profile on a line will follow a series of asymptotic profiles as illustrated in Figure 5—short-run marginal costs escalate as capacity utilisation leads to rising congestion and opportunity costs at given levels of infrastructure. This implies that the access charges should be adjusted to reflect those increased costs; price negotiation between train operators and the infrastructure manager may ensure that the scarce capacity is allocated to the operator valuing the path most highly and prepared to pay for it thus.

FIGURE 5 SHORT-RUN AND LONG-RUN COSTS



In the long-run, infrastructure capacity can be expanded though this expansion leads to some spiking in long-run marginal costs (LRMC) as additional capacity is introduced to cater for that demand. Following the incremental investment, however, capacity constraints would be relieved. Prices based on SRMC would decline significantly; this would reduce incentives for the infrastructure manager to undertake additional investment until short-run costs had again escalated. Further, SRMC-based charges in these situations also lose the desirable attribute of price stability.

One alternative approach is to set LRMC-based prices. Long-run marginal costs incorporate production costs where inputs can be varied; they allow for optimal plant capacity. Thus, the long-run costs would be below the short-run costs whenever the facilities are above their optimal capacity. Conversely, the long-run costs would be above the short-run costs whenever the facilities are below their optimal capacity. Gómez-Ibáñez argues for prices based on long-run costs, though he accepts that this will result in some loss in allocative efficiency. That is, Gómez-Ibáñez recognises the trade-off between ensuring (allocatively) efficient utilisation of existing facilities and the long-run dynamic considerations of ensuring adequate investment (Gómez-Ibáñez 1999, p. 122)[33]. Indeed, Gómez-Ibáñez, et al., argue that 'allocative efficiency implies rules for both pricing and investment in new capacity (Gómez-Ibáñez and Meyer, p. 255). In their report to the European Commission, NERA similarly noted that 'where capacity constraints are widespread, however, and particularly where demand is growing, ensuring that the right amount of capacity is provided may be more important than ensuring that existing capacity is used efficiently' (NERA 1998, p. 6). That is, ensuring timely investment may be more appropriate than short-term allocative efficiency. Thus, NERA suggests a pricing system based on the LRMC profile. This charging is an estimation of the long-run average incremental cost (LRAIC); it takes out the spikes arising from lumpy investments (on the presumption that incremental investment can be undertaken in small chunks). Such charging does, however, require considerable foresight and information in profiling the future investment needs.

Establishing access charges that allow for congestion are, therefore, not straightforward. The auctioning of train paths can allow for congestion but it, also, is not straightforward. Gómez-Ibáñez notes that 'The difficulties of calculating congestion prices on railroads have encouraged some economists to propose auctioning track and station capacity as an alternative' (Gómez-Ibáñez 1999a, p. 78)[34]. There are a number of benefits of the auctioning process.

33 Gómez-Ibáñez notes a further benefit of charges based on long-run marginal costs is that they can be more stable; this presents rail operators and customers with the correct long-run signals for making their own investments (Gómez-Ibáñez 1999, p. 122).

34 We should also note that a market in train path capacity—intended, principally for bulk freight—has also been advocated. The proponents suggest that such a market could be facilitated by a hedge market in capacity, to insure against the risk that there is insufficient track capacity to shift goods when required. See Law, MacKay and Nolan 2001.

In particular, it can resolve both the timetable formulation *and* generate a set of congestion charges. Through such charging, capacity would then be allocated to the highest-value users, that is, to users who accrue the greatest benefit from that access. Further, auctioning would generate market-clearing prices for the periods where there would otherwise be excess demand; this can maximise the infrastructure manager's revenue. Finally, auctioning allocates a train path to train operators who most value the path.

There are major deficiencies with auctioning, however. The prices may not be stable. Further, there are practical and other concerns with auctioning:

- there is considerable complexity in the task of assembling groups of slots into train paths that are perceived to be demanded and to arrange an auctioning process around it;
- there are the risks imposed on the value of operators' rolling stock investment if the paths are subsequently lost...[35]; and
- the quality of the overall rail service relative to road can be undermined: the shipper can face increased risk in using rail due to the threat to continuity of supply of given services.

Even for simple rail networks with minimal interfaces at rail junctions and terminals, train operators' differing priorities can lead to an almost impossible process of allocating individual train paths through auctioning. Each conflicting demand can also have implications for the maximum line capacity: if trains of complementary speed patterns cannot be timetable-grouped or 'flighted', disproportionate amounts of capacity can be used up. Given the number of permutations of time, location and variants in occupation of capacity (i.e., the speed and stopping patterns of trains), the auctioning of individual paths would be an almost impossible task for all but the most basic and low-usage network. The auctioning process can be made more feasible by grouping of train 'slots' into origin–destination 'paths' and then, further, into full timetables. Nonetheless, this has led Dodgson to conclude that even a very simplified auctioning process, with bids placed on alternative pre-packaged sets of timetables, would be 'extremely difficult' (Dodgson 1998, pp. 119–122). Thus, while slot auctions offer the greatest benefit where it is difficult to use conventional pricing to resolve competing claims, nonetheless, at high levels of capacity utilisation, the path coordination challenges of an auction system itself make auction pricing of bundles of paths most difficult to implement. We should also note that, in the absence of price controls, the infrastructure manager may gain supernormal profits which, Dwyer and Lim note (p. 33), 'may act as a perverse incentive for infrastructure owners *not* to invest in additional capacity'.

35 ...though Nilsson suggests that this risk can be tempered by establishing a futures market for paths: operators could then hedge against adverse future allocation outcomes. (Nilsson, p. 23)

Pricing above marginal cost

When we move beyond marginal cost-based pricing, we achieve a greater degree of infrastructure cost recovery. Irrespective of the pricing structure chosen, however, as this cost recovery rises, the access charge becomes an increasingly important component of the train operator's costs. (In some cases, the charge may represent as much as half of the total train operating costs.) Thus, access charges become an increasingly important variable affecting if, and how, the train services are provided.

We have identified that at the prevailing demand for rail transport, the marginal cost can often be less than average cost of infrastructure provision. Thus, the provider would incur financial losses if access charges were set using marginal costs. In recent years, despite the upward trend in traffic movements, improvements in road freight productivity and quality have diverted traffic that might otherwise have gone by rail. At the same time, relatively low productivity gains have meant that input (principally labour) costs have exceeded those gains and average costs have thus tended to rise. These different trends, experienced in rail operations across the world, have therefore tended to exacerbate the gap between the actual traffic demand and the break-even demand.

The rail product has had to rely increasingly on low prices (tariff or access charge) relative to road freight in order to offset the widening gap in quality between rail and road. That is, rail traffic is assumed to be price-elastic: this is particularly the case with non-bulk freight movements, where road is very competitive. This strategy of setting low prices can be underpinned by public funds as long as most rail operations around the world remain publicly-owned. Infrastructure managers usually seek, nonetheless, to recover at least some costs above marginal cost. Any pricing above marginal cost deviates from allocative efficiency, while noting that the consequent allocative efficiency losses should be balanced against the efficiency losses arising from funding continued rail losses (through tax distortions on firm and labour incentives). The balance should also address the consequences of low access charges on incentives for investment to renew or expand infrastructure[36]. Gómez-Ibáñez comments that, as the World Bank has discovered with roads:

> short-run marginal cost pricing may conflict with the efficient allocation of resources in the long-run if it generates too little revenue for maintenance and investment and if governments are simply unable or unwilling to supplement the road budget out of general tax receipts. (Gómez-Ibáñez 1999, p. 133)

Two principal approaches to pricing above marginal cost can be adopted, with varying impacts on allocative efficiency:

- market-based; and
- cost-based.

36 See, also, Rothengatter (2003) on this issue.

While these approaches seek to recover costs above marginal infrastructure usage, the resulting prices may nonetheless not achieve full cost recovery.

Market-based pricing essentially use Ramsey and two-part charges. There is some form of price discrimination. The three categories of discrimination are:

- first-degree price discrimination: charging what the market will bear;
- second-degree price discrimination: setting volume discounts or, for instance, bundling different types of services; and
- third-degree price discrimination: setting different prices for different markets (e.g., freight commodities moved or geographical localities of business) and customer groups.

It should be noted that two-part pricing *may* fall within the definition of second-degree discrimination. It is not discriminatory *if* the per-unit charge falls with increasing use of the facility to reflect the cost of provision. For instance, the costs of printing a brochure can involve large (fixed) set-up costs but low variable costs. The customer is likely to be charged a relatively high price for a small print run but relatively little extra for a large print run: the average costs decline. However, if a volume (two-part) discount is applied that is unrelated to costs, this would be second-degree discrimination.

Cost-based pricing is based on allocating some or all of the unattributable fixed and common costs across train operators. Note that while we review these pricing systems separately, choosing one pricing system does not preclude the use of elements of other systems, such as using Ramsey price discrimination within two-part pricing. Each pricing system has differing impacts on allocative efficiency. We now consider each pricing system and then consider, as a related issue for regulation and cost-based pricing, the process for establishing infrastructure costs.

Ramsey-based pricing

The principle of Ramsey pricing[37] is that if users' valuations of the product vary, then different prices could be charged to recover the unattributable costs or at least achieve relatively high cost recovery. Access charges would be set in relation to the users' responsiveness to prices. Charges would be set higher above marginal cost for those users who are least responsive to the price changes—in this case, train operators who have shippers with a low price elasticity of demand. Conversely, access charges would be lower for train

37 As originally conceived by Frank Ramsey, the pricing principle was applied to minimising the distortionary effects of taxation: if we tax certain goods, the tax should be highest on goods with relatively inelastic demand and lowest on goods where demand is elastic. The principle has since been extended, in a similar way, to minimising welfare losses where it is necessary to price above marginal cost. The generic term for the principle is the 'inverse elasticity rule'.

operators who have shippers that are highly responsive to prices (freight rates). The unallocated costs are thus recovered disproportionately from captive traffic. In this way, allocative efficiency losses would be minimised, as output would be relatively close to the efficient level.

Ramsey pricing thus has particular merit from an allocative efficiency position, although there are significant deficiencies such as:

- The application of the pricing means that the train operator's potential customers (shippers) where there is no practical alternative transport competition will have the most inelastic demand. A good that can be transported by road, but which faces inelastic demand, may therefore incur a lower access charge mark-up than a good which has no feasible alternative transport mode and for which goods demand is relatively price elastic. For allocative efficiency, it is the effect of the price in the *final* market that matters—not the effect in the intermediate (transport) market[38].
- Setting price levels by discriminating between track users may also have legal implications. In some countries, this form of discrimination may breach anti-trust laws. In Australia, until 1995, the Trade Practices Act (section 49) prohibited discriminatory pricing such as Ramsey pricing.
- To set the prices correctly, a large amount of demand and cost data is needed. This is a large enough task when an integrated operator sets shipper rates by identifying its customers' elasticities. Thus, it is *even more* demanding when setting access charges, which requires the infrastructure manager identifying the price sensitivity of the manager's customers' (train operators') customers (shippers) [39].

One consequence of using price discrimination could be that, for two operators in the same freight market, a productively inefficient train operator can receive preferential charges, giving the operator a competitive advantage relative to an efficient operator. That is, the price discrimination can distort on-track competition.

It has been suggested that, in any case, the pricing approach rarely works in practice because 'they arouse consumers' suspicions of unfair treatment and undue discrimination' (Campos and Cantos, p. 45).

Note that Ramsey prices are discriminatory but are set only to cover unattributable and common costs. Rates set *above* that level are monopolistic prices, which is not an aspect of Ramsey pricing. That said, in the absence of

38 See, for instance, Nash, et al., 1999, Section 2.3

39 In practice, the task may be considerably more complex, to the extent that the train operators' customers' elasticities are dynamic, due to the changes in the traded commodity market. For instance, the price sensitivity of these customers can be strongly influenced by the prevailing world price for the commodity (e.g., the iron ore, coal or grain price).

regulatory scrutiny, the price-setter may still exploit captive users by setting prices that exceed production costs.

Since the passage of The Staggers Act in USA in 1980, railways there have been permitted to undertake Ramsey pricing of shipper tariffs[40]. This mechanism has been seen as an essential way of achieving long-term commercial viability of the industry in that country. The Surface Transportation Board (STB) has concluded that:

> the industry's ability to earn revenue sufficient to maintain the **existing** extent of rail service does appear to depend to some degree on the use of differential pricing (STB 1998a).

As has been noted, 'The Staggers Act requires revenue adequacy of the railways to be of paramount importance for regulatory decisions' (The Conference Board of Canada, p. 41). Thus, Beshers comments in his report to the Federal Railroad Administration that 'The regulatory regime set in place by the Staggers Act recognizes that differential pricing is a necessary aspect of a private-sector railway industry.' (Beshers 2000, p. 5)

Two-part pricing

The two-part tariff consists of two components pricing components, one variable and one fixed. The fixed charge is effectively an 'entry fee' to operate. The principal advantages of two-part pricing are, first, that if the fixed charge is sufficiently large, a given cost recovery target can be achieved. Secondly, the variable charge *can* be based on short-run marginal costs, which preserves efficient consumption decisions at the margin. As Freebairn notes (Freebairn 1998, p. 292), so long as the fixed charge is less than the train operator's consumer surplus (net benefit), there would be no adverse efficiency effects: the train operators' extra payments are simply a transfer to infrastructure managers.

Despite its effectiveness in achieving relatively high cost recovery, however, there are some concerns regarding the impact of the two-part structure on

- allocative efficiency;
- competition between operators; and
- train operator service incentives.

First, the tariff would be allocatively inefficient if an operator, who could pay the marginal cost, was deterred from operating, in order to avoid the large fixed charge. However, we should note that the impact of the fixed charge will vary with the nature of the fixed charge: for instance, a flat fixed charge per operator might be expected to impact relatively more on a small operator than a fixed

40 Strictly speaking, they follow 'Constrained Market Pricing', which uses the observed market demand as the basis for pricing, rather than pricing based on precise demand elasticities for each movement. See, for instance, Flicker p. 23.

charge per route kilometre of network traversed[41]. Further, in general, it may be possible to set each train operator's fixed charge in relation to their ability to pay. Thus, a train operator facing inelastic shipper demand with respect to its own tariffs would face a two-part tariff with a relatively large fixed charge; conversely, if the shipper's demand for the train operator's service was highly sensitive to price, the optimal fixed charge would be relatively low.

There are related concerns about the impact of two-part tariffs on competition between operators. Two-part charges can impede on-track competition because small operators face higher average charges than large operators. As Nash notes,

> two-part tariffs are a barrier to entry, since the new entrant almost inevitably ends up either paying a higher marginal charge per train kilometre, or a fixed charge that is much higher relative to the level of business (Nash 2001).

One way to retain efficient use of the facility with two-part pricing is to discriminate across users, such as by varying the fixed charge in favour of new or marginal operators. Thus, we note the views of the ACCC that 'In its Access Undertakings Guide, the Commission has previously encouraged the use of two-part tariffs in undertakings'(ACCC 2001b, p. 108). The ACCC expressed reservations, however, that adopting a two-part tariff, 'particularly in conjunction with a commitment to provide like services at the same price, may act as a barrier to entry for some smaller train operators' (ACCC 2001b, p. 110).

Freebairn argues that 'with freedom of entry and exit of firms in the train operator sector the entry fee becomes a variable cost rather than a lump-sum charge' (Freebairn 1998, p. 293). This does not, however, preclude the operator in responding to the charge structure by varying train length and frequency accordingly. For regular, long-term customers, the fixed charge may have advantages and becomes a variable cost as Freebairn argues. More generally, however, the benefits depend on the type of fee used. If the fixed charge is a flagfall then entry is less problematic than an annual charge. The decision on the type of fixed charge or whether to adopt a two-part charge at all has implications for train operator entry barriers as it may have for infrastructure cost recovery. Given this, Clough and Gale argue that if suppliers do not know enough about their customers to establish the appropriate fee structure, then a two-part charge should be made optional. That is, users should be permitted to choose between two-part and an average-charging system (Clough and Gale, p. 35). Thus, small operators may choose a fully-variable charge while large operators may choose the two-part charge. Giving alternative pricing structures may therefore minimise allocative inefficiency by enabling operators to choose the structure that suits them. More generally, Aberle proposes that train operators be given a range of fixed and variable costs:

- a purely variable cost with a high variable rate;
- a structure with a moderate fixed charge and a lower variable charge; and
- a structure with a high fixed charge and a low variable charge (Aberle 1998).

41 See Hylén (Section 3.2) for a further discussion of fixed charging options.

A variant of Aberle's explanatory diagram is reproduced as Figure 6. It can be seen that when usage is below x_0, then the user will use variable charge option p_{dk}; when it is between x_0 and x_1 then the user will choose fixed charge E_1 and variable charge p_1. With usage above x_1 the user will choose the tariff with E_2 fixed charge and p_2 variable charge.

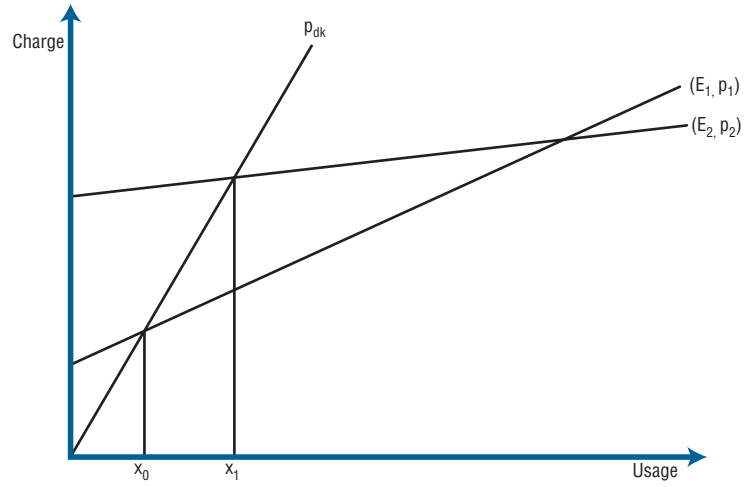
NERA notes, however, that while this self-selecting option avoids a high fixed charge that would otherwise have applied, the impact on *competition* may nonetheless be compounded

> … as small operators will face higher variable charges than large operators, as well as higher average charges. These high variable charges will also affect small operators' decisions on service expansions (or reductions). (NERA 1998, p. 101)

The critical issue here is the fully-variable rate (the slope in Figure 6); the more shallow (lower) the variable rate, the lower the small operator's average charge—which, we should note, is at the expense of a lower cost-recovery for the infrastructure manager. How access charges are structured therefore affects relative train operator competitiveness as well as in attracting new operators. Thus while a two-part tariff can be an effective means of achieving the infrastructure manager's cost recovery, it may have perverse effects on train operator competition.

Apart from these allocative efficiency and competition issues, the two-part pricing structure can also alter the incentive structure as to *how* train operators provide their train services. Thus, even if the train operator decided to run trains, the size or specification of the fixed charge could strongly influence the operating strategy of the train operating company; this might cause dynamic responses leading to operational losses or to situations influencing the nature of long-run investment. Two illustrative cases are presented:

FIGURE 6 DIFFERENTIATED SYSTEM CHARGES WITH THE POSSIBILITIES OF CHOICE



- A large fixed charge *per train* would lead train operators to run fewer, but longer trains. This impacts on the type of infrastructure demanded—for instance, long passing loops will be demanded. Similarly, the train operator market will be influenced: operators capable of developing high-volume movements will be favoured over smaller operations. This has implications for competition in the train operator market and may result in fewer, larger operators than may be socially optimal (ACCC 2001b, p. 109).
- A high fixed charge, which is not-train number-related, and a low marginal price would provide incentives for operators to run additional trains. The marginal cost to the operator would be low relative to the train service revenue that may be recovered from shippers.

It is clear from these two cases that the nature of the fixed charge (or 'entry fee') can play an important role in determining train operator incentives and viability and, thus, in determining how the infrastructure is used. The cases illustrate how the degree to which the entry fee is 'fixed' affects incentives on train operation and consequently affects infrastructure demands and above-rail competition (through influencing the optimal train/business size). Examples of different 'fixed' charge might be the taxi flagfall charge compared with a vehicle registration charge. The taxi flagfall is incurred only when a taxi journey is made whereas a vehicle registration charge is (typically) an annual charge that is incurred for running a motor vehicle, irrespective of vehicle use.

The two-part tariff therefore provides an effective structure to achieving high cost recovery but exactly how the tariff is applied may well have crucial implications for allocative efficiency, on-track competition and the provision of train services.

Fully-distributed (average) cost pricing

Ramsey and two-part pricing can focus on train operator market conditions that set access charges that claw back infrastructure costs while seeking to minimise traffic (and therefore allocative efficiency) loss resulting from pricing above marginal cost. A third pricing system is fully-distributed (or average) cost pricing. This sets access charges essentially based on perceived cost causation or infrastructure usage. The relationship of the mark-up above marginal costs is not market-related and so bears no specific relationship to the train operator's price sensitivity. As with other pricing systems, pricing above short-run marginal cost leads to allocative inefficiency. In this case, the somewhat arbitrary allocation of fixed and common costs is likely to lead to somewhat greater efficiency losses.

The cost-recovery prices disperse the common costs based on a range of distributional rules. First, the pricing typically involves setting a charge based on the marginal cost of an operation. In addition, the operator is levied a pro-rata share of the fixed and common costs. This is based on an infrastructure cost or output measure or on a train operator revenue measure. Quite apart from the pricing being more allocatively inefficient than Ramsey pricing, it also generates the wrong operator incentives. This is because there is a somewhat

arbitrary relationship between the access charges and the economic resources used. For instance, a tonne-kilometre-based charge would treat carrying a tonne of a commodity 100 kilometres the same as carrying 100 tonnes a distance of 1 kilometre[42].

In excluding marginal users, the charges may even jeopardise cost recovery. If would-be operators had contributed to common costs, this would have lowered the costs distributed amongst *all* train operators. The Industry Commission noted thus (paraphrasing Baumol and Willig), in relation to such mark-ups on shipper tariffs:

> If unattributable costs are substantial and if the value of rail services vary substantially, users shipping below average value goods may find it cheaper to avoid the arbitrary mark-up and turn to other modes of transport. Ironically, pricing to recover costs in this way can preclude enterprises from earning enough to maintain financial viability. (Industry Commission 1991, p. 70)

Fully-distributed cost pricing is usually based on one of four yardsticks for distributing costs:

- **Relative output.** Common costs are distributed amongst train operators according to each operator's share of the total output of the infrastructure owner. Rail output may be measured in terms of gross or net tonne kilometres[43]. Under this allocation process, for instance, costs will be relatively higher for heavy goods trains than for other users.
- **Gross revenue.** Common costs are distributed amongst the train operators according to each operator's gross revenue.
- **Attributable cost.** Common costs are allocated across operators in proportion to each operator's identified, *attributable*, (short-run marginal, variable or incremental) costs.
- **Technical cost.** With a 'prime user' concept on a given rail line, the operator with the highest demands (e.g., speed or rail weight) that impact on technical standards, is the 'prime user'; they bear all line costs except for other operators' incremental costs. With the 'sole user concept', the operator with the highest demands pays only the incremental costs of the line standard plus the direct user-independent costs (fixed costs and overheads) that it actually needs for its use.

Common costs might be identified at a network level and distributed across all train operators. Some common costs may, however, be identified with given regions or different lines. Where costs can be identified in this way, such costs may be levied across operators in those regions or on those lines. Irrespective of the way that costs are geographically assigned, however, the infrastructure manager has to establish projections of line usage. If the level of traffic proves

42 In this way, the allocation ignores the economies of hauling (longer trains lead to lower unit costs) and of stage length (high fixed terminal costs mean that the per-kilometre unit cost declines with increasing distance between the origin and destination terminals). See OECD 2000, p. 23.

43 This is the product of the number of net or gross tonnes carried by the number of kilometres that the goods are carried.

to be less than assumed, then the distribution of costs will be inadequate to ensure profitable operation.

The ACCC has noted on these distribution systems that while they 'are likely to be poor substitutes for efficient pricing principles' they 'may also lead to opportunities for excessive charging for access by infrastructure owners' (HRSCCTMR, p. 80).

COST ESTIMATION

It is crucial that the infrastructure manager understands how the use of infrastructure generates costs—the 'cost drivers'. This understanding is vital in framing charges that provide incentives for the efficient use of the infrastructure. Other reasons why an appreciation of the link is important include:

- access charges for integrated operations are essentially cost-based so as to preserve competitive neutrality across (integrated and third-party) train operators;
- 'constrained market pricing' regulation relies on setting access charges within floor[44] and ceiling cost bands, with the floor based on marginal or incremental costs and the ceiling based on either 'stand-alone' costs[45] or opportunity costs[46];

44 Strictly speaking, this is the 'combinational' floor price—and also 'combinational' ceiling price: the floor is the combination of all the operators' marginal/incremental costs and the ceiling is the combination (summation) of all the operators' revenues. That is, the ceiling revenue must be no more than the line's economic costs.

45 The stand-alone cost is the cost if the infrastructure provided only the service that is sought by the train operator. If there is more than one operator, the stand-alone cost would be shared amongst the operators. In USA, for shipper tariffs, 'A rate's reasonableness is determined by the 'stand-alone cost test' (SAC). Costs are developed on the basis of a hypothetical model of an 'efficient railway' carrying the shipper's traffic, along with the other existing traffic that contributes to fixed costs. The process is complex and time-consuming, but is intended to simulate what would be expected if competition did exist and a new railway was allowed to enter the market. Recognizing that the expense of mounting a rate reasonableness complaint using such procedures puts it beyond the financial reach of small shippers, the STB in 1996 set out a simplified methodology for use in complaints from these shippers.' (CTARP 2001a, p. 26). Note, also, that the stand-alone costs are net of revenue earned from other operators.

46 The 'Efficient Component Pricing Rule' (ECPR) is used to estimate an opportunity cost of third-party access. In essence, ECPR compensates for the income loss arising from third-party access. The ECPR price consists of, first, the contribution to joint fixed costs that the incumbent now earns on the traffic in question; and secondly, the incumbent's incremental costs arising from the third-party operator's use of the infrastructure. The crux of the system is that the access charge would provide the infrastructure manager with the same financial return whether it provides the above-rail service itself or allows the third-party rail operator to provide it (Beshers 2000).

- railway costs need to be understood in justifying and regulating an infrastructure manager's commercial revenue; and
- access charges or price band limits may be based on an assessment of the infrastructure manager's least-cost inputs—productively efficient costs (as used in 'CPI-x' revenue-capping regulation of the infrastructure provider).

We should also note that even two-part tariffs and negotiated Ramsey-price access charges will be based on some estimation of the marginal and common costs, even if detail and rigour is not required.

In this section, we consider cost causation of rail infrastructure and how each element is estimated.

Cost terminology

Understanding the costs of infrastructure provision and usage is key to setting efficient access charges. There is a range of such costs, which we will refer to in this report. It is important to note that these cost terms often overlap each other—the costs are non-inclusive. For instance, access charges may be based on 'incremental' costs; these costs are a *portion* of the infrastructure manager's sunk, fixed and operating costs.

In general, the physical cost terms can be presented as in Table 2 and Figure 7.

In essence, railway cost terminology seeks to answer two questions:

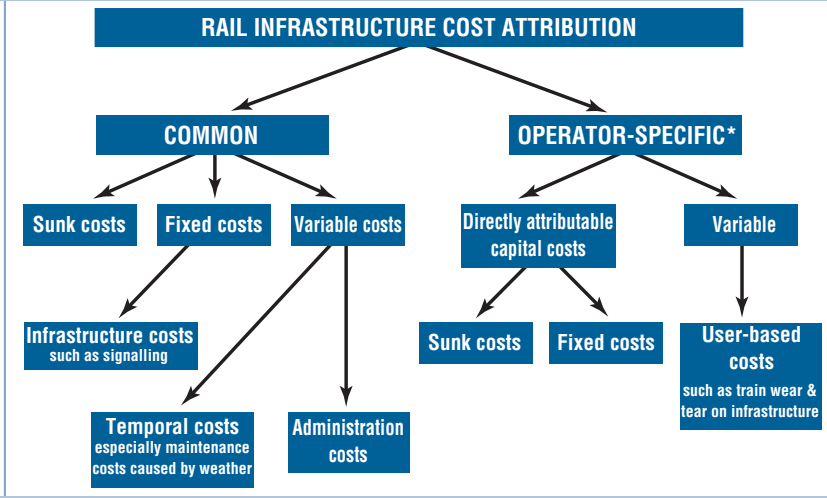
- can the costs be attributed to a given operator?; and
- how avoidable are the costs?

There is a degree of consensus over cost attribution terminology of operator-specific costs: these can include short-run marginal costs, variable costs and incremental costs (which include the capital costs that can be directly attributed to a given operator). There is less agreement over common and joint costs. We note, however, that common and joint costs are related in the degree of cost attribution: common costs involve some (but not total) attribution (such as

TABLE 2 RELATIONSHIP BETWEEN RAILWAY COST DEFINITIONS

Cost attribution	*Cost category/avoidability*	*Description*
Common/joint	Sunk	e.g., tunnels
	Fixed	e.g., buildings
	Operating—non-traffic sensitive	e.g., H.Q. administration
Operator-specific—variable	Operating—traffic sensitive	e.g., wear and tear on rails
Operator-specific—incremental	Sunk or fixed	e.g., track upgraded for operator-specific traffic

FIGURE 7 RAIL INFRASTRUCTURE COST ATTRIBUTION



when only two operators use a rail line) whereas joint costs have unclear attribution (such as the costs of running administration headquarters). Thus, the distinction between common and joint costs is a matter of degree. More to the point, even with common costs, the subsequent allocation of costs between operators can be somewhat arbitrary, depending on how the infrastructure usage by each operator is measured. Consequently, our subsequent discussion refers to the more generic term of common costs, to the extent it includes joint costs. In Appendix A, we set out and define the principal cost terms.

Physical and temporal cost causation

An important consideration of access charge setting is the link between track usage and the resulting physical costs—principally, wear-and-tear. We should stress, however, that where access charges are cost-based, they often consist of *two* cost elements, namely:

- **physical** costs; and
- **capacity** costs.

The capacity costs relate to the duration of track use and reflect the opportunity and congestion costs of using the infrastructure. The cost estimation can be ambiguous. As noted above (page 16), the estimation of capacity used by the incremental train is determined, in part, by the extent to which that train's speed, acceleration and stopping pattern complements patterns of existing trains. That is, the capacity cost of the train is set in *reference* to the other trains, no matter how efficiently (or otherwise) these trains use the track capacity.

In principle, when considering the marginal costs of a train service, capacity costs should include internal costs such as a component for on-track congestion: as the traffic increases, the congestion leads to increasing disruption costs and, ultimately, to foregone revenue (opportunity costs) as potential traffic is turned away. The marginal cost of a train operation should, however, exclude disruption costs insofar as they relate to delays to the operator's own services. The marginal costs of the train operation should also incorporate costs that are external to the industry—social costs such as air and noise pollution.

The infrastructure manager's physical operating costs consist of two primary areas:

- *traffic-sensitive costs*—these are incurred when the train operator runs trains. These costs will include costs such as traffic-sensitive maintenance (wear and tear) costs; and
- *non-traffic-sensitive costs*—these are operating costs that are incurred irrespective of train operation. The costs include head office and signalling labour provision and non-traffic-sensitive maintenance costs. Such costs are operating costs to the extent that if the train did not run, the relevant track was closed down and the costs saved.

Traffic-sensitive costs could be defined in terms of a measure of usage, such as the gross tonne kilometres hauled. In addition, for any given level of usage, these traffic-sensitive costs also vary with track and train characteristics. In the USA, there has been a long-term development of principles relating cost variability with track usage: this has been formalised in the Uniform Railroad Costing System[47]. A recent study for the Rail Regulator in Great Britain on 'asset degradation' has identified the following infrastructure items as being influenced by track usage: track geometry, rail, sleepers, ballast, switches and crossings and maintenance levels. Expenditure on track consists of three main areas of maintenance:

- a component largely invariant with *traffic*, that is associated with environment and safety, such as drainage, vegetation control and line patrols;
- a component that varies in part with *traffic* and in part with elapsed time, such as tamping, ballast and sleeper renewal; and
- a component that is largely directly variable with *tonnage*, of which rail renewal[48] is the most important element (ORR 1999, para. 18)[49].

47 See, also, the Weighted System Average Cost Model—now known as 'TrackShare'—which allocates maintenance and renewal costs between traffic of varying speeds and axle loads. The Model has been, or is, used by all six major North American railways. See Zeta-Tech (2000).

48 So, for instance, the 'rail' asset is estimated to be 95 per cent variable whereas sleepers are estimated to be 25 per cent variable.

49 Zeta-Tech (2000) have demonstrated that, in North America, when traffic volume exceeds 25 million gross tons the track maintenance costs increase linearly with increases in traffic, reflecting the dominance of the variable maintenance component in total maintenance costs at this traffic level.

The consequence of this structure is that fixed (environment, safety) costs of provision dominate at low levels of track usage. Variable costs dominate at high levels of usage. Perhaps, for this reason, cost variation with gross tonne miles is not consistent across rail systems. For instance, variable costs on Canada's rail infrastructure (which, in aggregate, is relatively highly used[50]) in Canada is estimated at 55 per cent. By contrast, variable costs on Australia's track (which, in aggregate, is relatively lightly-used) has been estimated to be 30–40 per cent (ORR 1999, paras. 20, 37). QCA has identified a range of cost variability by tonnage, as illustrated in Table 3. It is likely that tonnage on many lines is very light so cost variability on Australian lines is generally likely to be well below 30 per cent[51].

The *magnitude* of maintenance costs is a function of the infrastructure manager's track standard *and* the train operator's vehicle standard and train speed. Other things being equal, higher standard track requires higher levels of maintenance, for instance, in maintaining the standard of the track formation. Vehicle characteristics (such as number of axles, axle load, the unsprung wagon mass and the form of suspension) also affect the extent to which a train wears the infrastructure and, thus, it impact on the magnitude of the infrastructure manager's operating costs (ORR 1999, para. 161)[52]. The Office for Research and Experiments (ORE) of the Union International des Chemins de Fer (UIC) has

TABLE 3 COST VARIABILITY, BY TONNAGE (PER CENT)

	Sleeper type	
Tonnage (million gross tonnes)	*Concrete*	*Timber*
1	5	10
5	15	30
10	30	40
20	45	55
30	60	70
50	80	80

Source: Excerpt from table in QCA 2000, p. 22

50 For instance, Cairns (2001, Exhibit 1, p. 1) shows that Canadian Pacific Railway's weight of million gross tonnage per route-mile is around 20 718; Canadian National's is 18 009. By contrast, Cairns quotes the equivalent measure for Australia as 6 584 (ARTC), 4 792 (RIC) and 7 634 (QR).

51 Conversely, the reporting of the variable cost proportion may appear relatively high, because if maintenance work is deferred, then 'simply relating annual expenditure to the traffic volume in that year thus over-emphasises the purely physical impact of traffic volume on track maintenance' (QCA 2002, p. 9).

52 See ORR 2002b for an illustration of variation in access charge per kilogram tonne-mile by wagon and locomotive type. Thomas (2002, p. 6) notes that 'initial research' suggests that some track 'friendly' suspensions lead to 'significantly' less damage to infrastructure.

noted that maintenance costs vary directly (around 60–65 per cent) with the rate of change in both train speed and wagon axle load. The research also found that the increase in these costs (with increased speed or axle load) was greater when the quality of the track was lower (ORR 1999, para. 29)[53].

One measure of rail usage that is a commonly used output measure for deriving marginal costs is 'gross tonne kilometres'. However, Munduch et al. (2002) note the implication of the gross tonne kilometre cost function (which is usually applied in a linear way) is 'not only that gross tons *ton* and track length *km* have the same cost effect but that the isolated effects interact multiplicatively' (Munduch, et al., p. 5)[54]. Their econometric analysis then confirms this: the distance and weight components do *not* exert equal effects. Thus, they conclude that 'gross tonne kilometres' is an inappropriate output measure for the calculation of marginal costs (p. 18)[55].

Apart from the rail track itself, there are other infrastructure components such as structures (bridges, tunnels, etc.), signals and electrification. These items tend to be driven by elapsed time (environmental degradation and technical obsolescence) although traffic over bridges (affecting bearings) and electrical contacts are related more directly to traffic levels.

It is asserted that the private North American railways misunderstand their infrastructure costs, which has led them to adopt wrong strategies (Resor and Thompson 1999, p. 15). UK Rail Regulator consultation with industry bodies concluded that:

> we recognise that there is a general lack of knowledge and research into the incidence and causation of usage-related costs. This is an issue which has been brought into sharper focus by the separation of infrastructure from train operations in Europe and is now beginning to receive greater attention worldwide (ORR 2000, para. 5.17).

Noting this lack of understanding about cost causation, the UK Rail Regulator indicated that access charges would need to be reviewed, as information became available:

> ...future research into cost causation, such as developments in the understanding of the wheel/rail interface, may make future changes to the structure of charges desirable (ORR 2002a, p. 39)

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53 See also the EC work on causation, as reported by the [Finnish] Ministry of Transport and Communications (Table 4.7, p. 27).

54 In effect, moving 100 gross tonnes a distance of one kilometre will have a different marginal effect than moving 1 gross tonne a distance of 100 kilometre, even though both tasks amount to 100 gross tonne kilometres. As in road freight (with its 'fourth power rule' on road damage), the rail wagon axle load affects the marginal cost.

55 This should not infer, however, that access charges priced in this way necessarily ignore the maximum vehicle mass. For instance, the ARTC reference charges are classed according to track capacity used, *subject to* maximum axle loads. Thus, for instance, a 'Premium' train is classified as a train with a maximum train speed of 115kph and a maximum axle loading of 20 tonnes. In this way, the gross tonnage is controlled for.

Scherp reports that the rail regulatory Committee, reporting to the EC, found that each EU Member State arrives at different figures for marginal cost. This, the Committee concludes, is a function of differences in scope, definitions, unit costs, what is included in those costs and unit cost differences across States[56]. Marginal cost figures diverge by a factor of 1 to 20. The Committee concludes, nonetheless, that it is possible to calculate marginal cost by harmonising methodology (Scherp, pp. 4–5). We argue, however, that it is unlikely that this can be achieved: there is a trade-off between the level of investment in infrastructure/standard of infrastructure, the level of performance permitted (e.g., axle loads and train speeds) and the level of maintenance that is then required.

Despite the absence of a precise relationship between infrastructure usage and cost, there is, nonetheless, a broad understanding of the factors that influence the generation of resource costs. This point is raised at this stage in the report in order to alert the reader to both the diverse *and* rudimentary pricing structures used by infrastructure managers across the world. Because the *strength* of the link between usage and resource cost is unknown, it is unusual for prices to be stratified ('modulated') by observed physical parameters. We need to ensure that access charge incentives do not exceed wear-and-tear savings[57]; a conservatively priced incentive would, however, seem more appropriate than to ignore that any relationship exists. For instance, we note the general absence of price variation for differential axle weights—something that is central to the concept of marginal costs in road usage and has been shown to be important in rail usage[58]. Access charges can be structured in various ways to reflect the physical characteristics of a train; this can encourage optimal wagon weight and suspension and train length and speed.

56 Thomas, for instance, notes (p. 5) that in EU countries, a category of maintenance cost in one country can be classed as a renewal cost; and that this problem includes definitions of renewals and infrastructure enhancements. One definition may relate to marginal costs of 'infrastructure' use; another relates only to 'track' use (Op. Cit., p. 11).

57 For instance, the Rail Regulator in Britain proposed to incorporate vehicle suspension discounts in Railtrack's access charging structure. However, the principal freight operator, EWS, responded that 'it has not been demonstrated that lower track force bogies necessarily caused less damage to track in practice, and that it would be premature to include suspension characteristics in the model until such time as more reliable information is available on track degradation and wheel maintenance regimes' (ORR 2001e, p. 50).

58 There are notable exceptions. For instance, Railtrack's access charges are modulated by vehicle type. The range of QR Network Access coal train reference tariffs are varied to reflect variance in axle weights. ARTC's flagfall charges are also very broadly differentiated by axle load and train speed, though the differentiation ('super premium', 'premium', 'high', 'standard' and 'low') is primarily intended as a capacity charge. 'A fixed component, known as the flagfall, is in effect a charge for occupying capacity on the network, regardless of the size of the train.' (ARTC web site).

The link between track standards and cost causation can, however, lead to tensions in access charge pricing. There are two key forms of tension:

- across operators with differing infrastructure needs; and
- between operators and the infrastructure manager (the wheel–rail interface).

In the former case, it is possible that a track upgraded for one user will result in higher access charges for other users. An example of this is where a track is canted (banked) to enable higher passenger train speeds: while canting requires additional maintenance (which would be paid by the passenger operator), a freight operator's heavy trains would bring about higher wear-and-tear costs than on non-canted track. Should the freight operator now pay access charges set with the higher marginal costs?

In the latter case, there can be benefits from differing infrastructure provision and maintenance processes. For instance, in the USA, Burns reports that a 10 per cent increase in axle load may bring about a 20 per cent increase in maintenance costs but it can lead to a reduction of 8 per cent in transport costs (Burns 2002, p. 418). Zeta-Tech report similar benefits, noting also that freight volumes could then be accommodated with fewer trains, thereby freeing up track capacity (Zeta-Tech 2000a). The overall savings suggest that higher operational savings can be achieved; if access charges are sufficiently responsive, the infrastructure manager should be prepared to accept the higher maintenance costs[59]. Nonetheless, Affleck (p. 11) reports problems with the wheel–rail ownership interface. Separated operators face 'frustrating and lengthy processes of persuasion' in changing the maintenance regime to permit higher speeds and axle loads and in investment in invaluable track-side equipment (such as for hot-box detection, weighing in-motion and automatic equipment identification) (Affleck, p. 11).

THE PRICE-SETTING PROCESS

Although economics may suggest principles for setting access charges, in practice there can be a range of ways of applying those charges. As noted above, such charges must, however, be comprehensible, transparent and stable. We have noted that there is a considerable degree of ambiguity over the cost causation, which can undermine the determination of appropriate pricing signals.

How are the charges agreed or decided between the infrastructure manager and the train operator?[60] In principle, there can be three processes for applying the charges:

- posted (set) prices;

59 Affleck notes, in the case of Australia, that a 'detailed evaluation of the economics and business case for higher axle load limits is overdue to determine whether there is an case for them' (p. 4).

60 We assume here the train operator purchases the train paths. In practice, it may be the freight customer (such as the freight forwarder, grain handler or mining company) who purchases the paths. The freight customer would then organise for a train service supplier to run the train.

- negotiated prices, perhaps based around 'reference' (illustrative) prices; or
- bidding or auctioning of train paths.

The difference between the posted and negotiated prices is essentially based around whether the charges are cost-based or market-based, respectively. Cost-based charging may simply involve the marginal costs of a train being run; or the marginal and incremental costs; market-based charging involves essentially the access charge that the train operator can bear (without using monopoly power).

Fully-distributed cost-based charging seeks to recover these directly-attributable costs as well as to apportion the common and fixed costs. Inevitably, this apportionment occurs in a somewhat arbitrary manner. A fundamental component of this charging is the fact that the level of track utilisation defines the level of the charge. If the common costs are allocated over a given line then halving the service level on that line can double the line-specific common charges. That is, depending on the apportionment of the common costs, the access charges can be very sensitive to utilisation. In this sense, there is the potential that an access charge will not be stable: access charges need to be structured to ensure that unstable charges do not increase operators' risk and reduce investment.

Market-based charges (two-part tariffs and Ramsey price discrimination) can claw back costs, based on capacity to pay rather than based on perceived cost causation. The charges are inevitably set as the result of negotiation between infrastructure manager and train operator though cost-based charges may also involve negotiation.

In addition to difficulties in estimating operating costs, we should note that there is considerable latitude in capital cost estimation. There is a range of issues here:

- asset value. There are different ways of measuring the value of existing assets[61];
- rate of return on assets. Given a value of assets, there is no consensus on the appropriate return on assets. In particular, a view must also be reached on the appropriate investment risk premium over other potential investments; and
- asset depreciation. Given a value of assets, assets are depreciated through time and usage—a resource cost.

Thus, there are a few reasons to expect railway systems to adopt different structures of access charges:

- there is a trade-off between infrastructure investment, track usage and the maintenance regime and, thus, the level and structure of charges that would be consistent with those parameters;

61. See, for instance, Davis (2002), for a discussion of replacement cost, market and accounting measures of estimating the value of an asset. Normally, the value of the asset can be estimated from the forecast future economic return; this is not possible with rail as the provision of rail infrastructure in a specific geographical location is neither competitive nor contestable.

- there is no consensus on the link between infrastructure usage and costs; and
- there are various ways of defining the operating and capital costs.

While accepting this lack of consensus, should policy makers seek consistency in pricing principles *across access regimes?* While there may not be direct impacts on the below-rail operation of different pricing structures in adjacent rail networks, there can be consequences for on-track competition:

- **Contestability and competition.** To the extent that the train operator wishes to expand activities beyond its home access regime boundary, the operator will need to understand, negotiate and charge its own customers on the basis of a different pricing structure. To the extent that this sets up barriers to entry, through raising the transaction costs, the inconsistency reduces competition and contestability in the above-rail market. As competitive pressures are otherwise lower than they should be, this therefore reduces the potential for productive efficiency.
- **Uncertainty.** Increasing the number of access pricing systems and negotiating processes will increase the level of uncertainty of outcome for the train operator. Such uncertainty can undermine the commercial attractiveness of goods movement by rail.

While it is likely that the number of *jurisdictions* of access regimes can impede on-track competition, this does not mean that there should be a single access charge structure. In particular, the optimal access charging structure may vary in relation to the physical and capacity utilisation characteristics of the infrastructure and of the type of goods moved. For instance, the pricing structure for bulk goods may need to differ from pricing structures for non-bulk goods (or for passenger operations). An access charge that encourages maximum length of a train may not be the most efficient solution on a line with given characteristics or a given type of traffic.

From an operational point of view, therefore, it can be important to set pricing structures that are in concert with the most efficient train operating characteristics. That is, what is needed are variable access charges that mimic the incremental costs of a given train or vehicle type. Access charges may therefore need to differ, in particular, across bulk and non-bulk freight, in how it influences train lengths, train mass, train speeds and train timetable priorities. Moreover, as bulk movements generally face less intermodal competition than non-bulk freight, relatively higher margins on those movements should be possible.

Thus, we can conclude that while there are general principles for access charges, there is no *single* optimal access charging structure. We note, though, that Ramsey-based price discrimination with a minimum of access jurisdictions but with flexibility in use and application can form keys to productive efficiency in train service provision and viability of infrastructure management.

chapter 3

AUSTRALIAN EXPERIENCE WITH RAIL ACCESS PRICING

In this chapter we consider Australia's rail access pricing systems. The governments in Australia have adopted what has been described as a 'rich and highly complex approach to restructuring and privatization, with examples of nearly every restructuring being used' (Thompson and Budin, p. 40). These reforms are reviewed within the context of the 1993 Hilmer Report for competition policy and the ensuing endorsement of the principles laid out in that Report.

In the subsequent sections we consider the primary issues that have arisen to date:

- factors influencing the on-track competitive environment—particularly infrastructure access rights;
- factors that influence efforts to improve coordination of railway service provision;
- the price-setting process—notably, how access charges are determined; and
- the impact of the access pricing regime on cost recovery. We consider the varying degrees of cost recovery sought. We also consider the types of pricing structures used and how those pricing structures influence operating and investment incentives. Given this, we then consider the efficacy of the access charges and the impact of the charges on sustainability of the rail network.

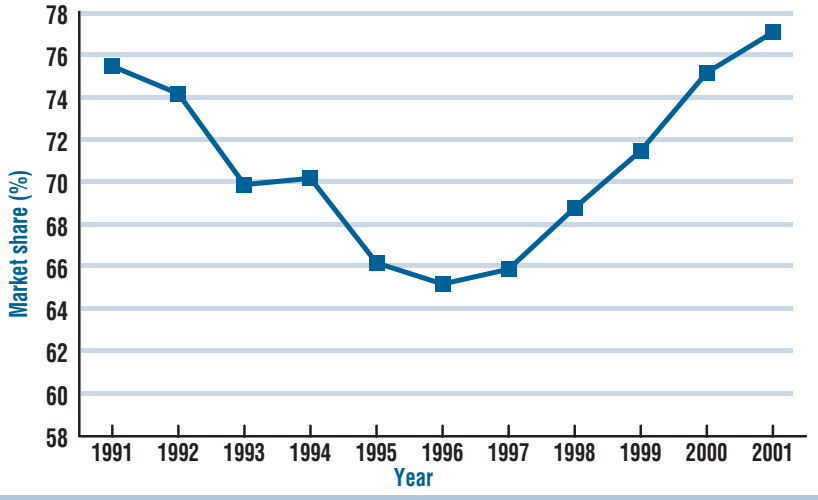
POLICY ENVIRONMENT

Until the 1960s, the construction and provision of railways was undertaken almost entirely by State and Commonwealth governments. Until the middle of the twentieth century, rail was a dominant freight mode in Australia. However, the rapid growth in the freight task since the Second World War has principally been in road movements. Trend data on freight traffic indicate that, since 1945, levels of non-bulk intrastate rail traffic have stagnated or

declined and this has been followed by withdrawal of rail services. Freight services on the government- and former-government-owned rail network have been faced with increased competition from road freight, especially in the shorter non-bulk movements.

Between 1971 and 1990, non-bulk interstate freight traffic more than doubled; this trend has continued (see Productivity Commission 2000, p. 15). However, the non-bulk interstate *rail* task in the same period has experienced little growth; that is, rail has lost market share. This loss was more marked on the east coast (north–south) freight corridor than the east–west corridor. Since the mid-1990s, market share on the east–west corridor has recovered (see Figure 8), due to above-rail investments by National Rail (such as in new locomotives) and below-rail investments (such as the standardisation of the Melbourne–Adelaide line in 1995 and new/extended passing loops). In addition, it may be argued that on-rail competitive pressures, resulting from the open access regime, have brought lower freight tariffs, improved and better tailored services.

FIGURE 8 RAIL LAND FREIGHT MARKET SHARE—NET TONNES, EASTERN STATES–WESTERN AUSTRALIA



Source: Data from ARTC 2001d.

Rail continues to dominate the task of moving bulk goods. The principal intrastate haulage task for the railways is in the movement of bulk goods such as coal, ores and grain. These bulk markets usually face low competition with road (especially as the distance of conveyance increases). In some cases, freight shippers are obliged to use rail. For instance, in NSW, approval for coal mining and development is conditional upon mining companies using rail to access sea ports (NSW Minerals Council 2000, p. 16).

Some of the bulk freight task is undertaken on railways constructed since the 1960s by the private sector. The development of iron ore mining in the Pilbara region of Western Australia has been achieved by construction of private railways that provide a viable and internationally competitive way of linking the inland mines with the export ports. In some cases, this bulk haulage may be seen as forming an indispensable link in an integrated production process of transforming ores to processed metals. By 2000, these privately-built railways performed around one-third of the total railway freight task in Australia (measured in terms of tonnes uplifted)[62].

For government-built railways, the post-war development of export markets for coal has seen the expansion of coal traffic in Queensland and New South Wales. For all Australian government-built railways, the coal and minerals traffic rose from 22 million tonnes in 1960–61 to 171 million tonnes in 1994–95 (Productivity Commission 2000, p C5). The movement of these commodities has come to dominate rail's traffic revenue in NSW and Queensland. The Productivity Commission has noted that 'In NSW, coal contributes 49 per cent of freight revenue while in Queensland it makes up 70 per cent of freight revenue' (Productivity Commission 1999, p. 177).

The growth of this bulk freight provided government operators with the means to cross-subsidise increasingly uneconomic services and outdated working practices and, thus, to postpone the reforms needed in the rail industry as the freight transport evolved. In 1991, the Industry Commission's rail industry inquiry identified a number of problems in the industry. These problems included:

> ... monopoly pricing in coal freight, inappropriate government intervention and conflicting objectives, and a lack of competitive neutrality between transport modes. (quoted in Productivity Commission 2000, p. 35)

Subsequent reforms have removed the implicit mining royalty collection from the rail freight rates. Also, government railways were corporatised.

There were other areas where rail reforms were needed. In particular, rail needed to respond to the vast improvement in the quality and price of competitors' services and in the changing patterns of flows of goods. A major obstacle to the competitiveness of interstate rail services was the State-based operating jurisdictions, resulting in crew and locomotive changes on State borders and varying regulations. The Commonwealth and State governments agreed in 1991 to develop seamless train services connecting the capital cities. The services would be run under a single ownership or would operate *as if* there was only a single owner. To facilitate this, in 1993 the National Rail Corporation (NRC) was formed from *above-rail* freight assets handed over by

62 This task figures is measured by using tonnage of BHP Billiton (Goldsworthy, Mt Newman) and Pilbara Rail (Hamersley Rail and Robe River Iron Associates), relative to the Australian total tonnage uplifted (excluding the sugar cane tramways). Source: ARA 2002, p. 11.

the Commonwealth (ex-Australian National Railways) and the States of Victoria and New South Wales; the three Governments owned the corporation. The assets included wagons, locomotives *and* city freight terminals. Train co-ordination was also transferred. When it began operations in 1993–94, the NRC was an above-rail operator, paying for track access[63] over Commonwealth (Australian National Railways), WA, Victorian, NSW and Queensland interstate tracks. It was originally intended, however, that the NRC would subsequently gain control over the track, that is, it would be a vertically-integrated operation. The advent of the National Competition Policy changed these plans.

COMPETITION ENVIRONMENT

In 1992, the Council of Australian Governments commissioned an independent inquiry into national competition policy; Professor Fred Hilmer led the review. One of the conclusions of the Hilmer Committee was that

> structural separation of vertically integrated public monopolies and the removal of legislative restrictions would promote competition and enhance the efficiency of service delivery (Productivity Commission 2001, p. 10).

Where separation was not feasible or achievable, the Committee proposed the establishment of a National Access Regime to ensure third-party access to the infrastructure of integrated entities. In 1995, the Commonwealth, State and Territory governments adopted the National Competition Policy (NCP); this included the principle of third-party access.

Inter-governmental agreements underpin the NCP. Clause 6 of the Competition Principles Agreement requires the establishment of a National Access Regime and details the principles with which a State or Territory access regime must comply. The establishment of the access regime was fulfilled through amendments to the Commonwealth's *Trade Practices Act 1974* (TPA) (Part IIIA) and the *Prices Surveillance Act 1983*. The aim of the policy is

> to promote competition in markets that use the services of such 'bottleneck'[64] or 'essential' infrastructure facilities, while preserving incentives to develop and maintain those facilities (Productivity Commission 2001, p. 36).

Inter-governmental agreements on rail reform are not part of the NCP but the general principles of NCP have been applied to the reform process. Governments have legislated access regimes, 'giving parties a legislative right to use bottleneck infrastructure facilities on reasonable terms and conditions, without compromising incentives to develop and maintain such facilities' (NCC 2002a, p. 5).

Infrastructure access

In establishing access rights to given infrastructure, therefore, there is a need to establish if specific facilities do form a 'bottleneck' and then to establish

63 The charges for third-party access were intended to be 'based on a maintenance component (tied to usage) and a capital expenditure component' (National Rail Freight Initiative Task Force 1991, p. 46).

64 See page 12 for a discussion of bottlenecks.

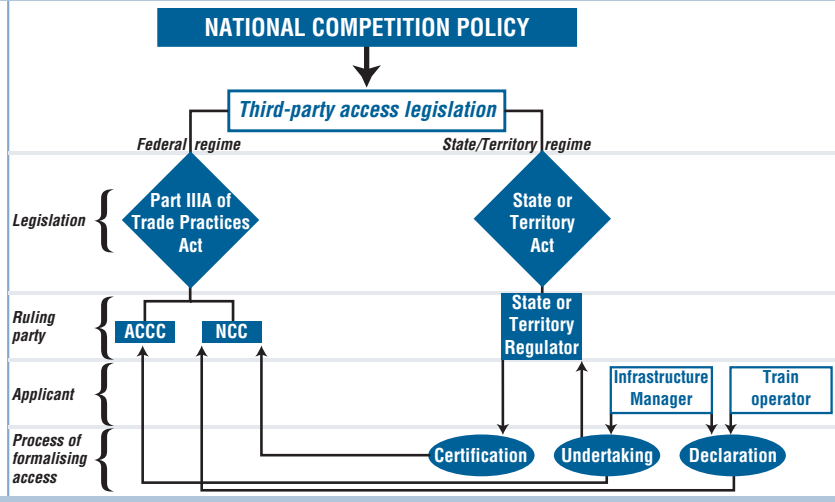
that 'access regulation is warranted if the benefits to the community as a whole outweigh the regulatory costs' (NCC 2002a, p. 5). In general, Part IIIA is therefore confined to a 'narrow range of infrastructure with natural monopoly characteristics' and that it 'ensures regulatory and arbitration processes account for the interests of infrastructure owners' (NCC 2002a, p. 6). In deciding whether to 'declare' facilities for access purposes, the NCC has established the following criteria in assessing what are 'essential' infrastructure facilities:

- access to the facility promotes competition in another market;
- it is uneconomical to duplicate the facility;
- the facility is of 'national importance' given its size, importance to trade/commerce or national economy;
- access can be provided without risk to human health or safety;
- access is not already subject to a formal access regime; and
- access or increased access would not be against the 'public interest'.

Where a railway is classed as essential, this means the railway tracks itself and *may* include railway stations, shunting yards and freight terminals.

A degree of certainty over the rights and terms of access can be introduced through legally-binding terms. These terms of access can include aspects such as access charge levels and terms for capacity allocation. The National Competition Policy provides three alternative legal processes to formalise these terms of access: 'declaration', undertaking and 'certification'. These approaches, and the parties that rule on the relevant access and pricing system, are set out in Figure 9.

FIGURE 9 LEGAL APPROACHES TO FORMALISING AN ACCESS REGIME



Note: This chart has been derived from a chart produced by Queensland Rail (QR 2001).

Figure 9 illustrates the access formalisation processes, which can be through Federal (Part IIIA) or State/Territory jurisdictions. The three routes to formalising access are as follows:

- An infrastructure manager or a access seeker can seek 'declaration' of infrastructure (under Part IIIA); the National Competition Council (NCC) rules on that process. The declaration requires negotiated access and, if that fails, legally-binding arbitration by the ACCC or a private arbitrator; or
- The infrastructure manager can provide an 'undertaking' to the ACCC (under Part IIIA) or to the relevant State/Territory regulator (under a State or Territory Act); or
- The State or Territory regulator can apply to the NCC to 'certify' its own access regime, such that the terms of access are set by that regime rather than by the National Access Regime.

We should also note that a State might legislate to *define* an access regime. However, although a State may itself proclaim a rail access regime, a State may not subsequently have the regime *formalised* through certification. (For instance, at November 2002, there were proclaimed rail access regimes in WA, SA, Victoria and NSW, though these regimes have not been formalised.) If the State adopts this approach, the regime can (for instance) be subject to declaration as the result of an application by an access user or seeker.

The consequences of the legislation passed over the last decade in Australia is, therefore, to permit third-party or open access over much of Australia's historically publicly-owned railway infrastructure. At the time of the implementation of the NCP, most of the railways were publicly owned. Undoubtedly, this greatly assisted the competition policy; subsequent privatisation of railway operations and infrastructure has therefore built-in those mandated access terms. This contrasts with circumstances in Canada, for instance, where the already predominantly private railways and their investors fear a 'change in the rules' on access that would bring increased competition *and* investment risk (Conference Board of Canada 2001, p. 46).

The issue arises as to the extent to which the national access regime should also apply to privately-built and privately-owned railways (also known as 'in-house' railways). This was tested when Robe River Iron Associates sought access to part of Hamersley Iron's 'Pilbara Rail' system. However, the Federal Court concluded (*in this case*) that the Part IIIA access regime does not apply to the railway line as it is deemed to be an integral part of the production process[65]. This report focuses on the common-carrier railways (essentially, those State-constructed railways); Rio Tinto (1998) provides an overview of much of the case against mandated access to in-house railways.

65 In a subsequent case, Hancock Prospecting sought access to BHP Billiton's rail lines, to facilitate development of ore deposits at Hope Down. In September 2002, the WA Supreme Court rejected the access seeker's case as the company could not be defined as a 'third party' because (under the State's Rail Transport Act) Hope Down was not an operating mine. (Supreme Court of Western Australia 2002).

TABLE 4 INFRASTRUCTURE MANAGEMENT[a] OF TRADITIONAL PUBLIC RAILWAYS IN AUSTRALIA[e]

Structure manager	*Organisation*	*Ownership*	*Location*	*Ring-fenced*
Vertically separated	Rail Infrastructure Corporation (RIC)[g]	Public	NSW	not applicable
	Australian Rail Track Corporation (ARTC)	Public	SA (interstate); Vic (interstate); WA (interstate, west to Parkeston); NSW (interstate, east to Broken Hill)	not applicable
Vertically integrated	Queensland Rail (QR)	Public	QLD	Network Access
	Australian Railroad Group (ARG)[b]	Private	WA SA (part)	WestNet Rail not required
	NRG	Private	SA (Leigh Creek–Stirling North)	not applicable
	Asia Pacific Transport Consortium	Private	SA (part); NT	Asia Pacific Transport[f]
	Freight Australia[c]	Private	Vic (intrastate)	required[h]
	Australian Transport Network (ATN)[d]	Private	Tasmania	not applicable

a Note that this table excludes ownership of other rail infrastructure, which can be important for the impact of mandated access—such as access to stations and freight terminals.

b 50 per cent owned by USA railway company, Genesee & Wyoming Inc. and 50 per cent owned by Wesfarmers. The operation consists of integrated railway operations in SA and WA and train operations in Northern Territory (the latter being services provided between Tarcoola and Darwin for the Asia Pacific Transport Consortium).

c Freight Australia is fully-owned by USA railway company, RailAmerica. Much of the Melbourne rail infrastructure has been franchised to passenger train operators. The 'Bayside Trains' franchise was marketed as M>Train with the National Express Group as franchisee (until December 2002, when National Express returned its franchises to the Victorian Government since when the services have been operated by government-owned Victorian Rail Services. The 'Hillside Trains' franchise is marketed as Connex, with CGEA (part of Veolia Environnement) as the franchisee. Some of the M>Train infrastructure is accessed by freight trains.

d partly owned by Tranz Rail (New Zealand).

e The major above-rail (train) freight operators include the government-owned Queensland Rail and the following privately-owned operators: Freight Australia, Australian Railroad Group, Pacific National, SCT, Silverton Rail, Interail [a standard-gauge subsidiary of Queensland Rail], Austrac Rail (ceased operations in 2002), Great Northern Rail Services (ceased operations in 2002), Lachlan Valley Rail Freight, South Spur Rail, Australian Transport Network (owner of Tasrail in Tasmania and ATN Access on the mainland). An operator may contract train service provision (such as train crewing) to another operator, e.g., Freight Australia is contracted by SCT to operate 'hook-and-pull' services (as SCT does not have its own train crews) and Pacific National is contracted to operate NRG's coal trains.

The major above-rail passenger operators include the NSW Government's State Rail Authority (trading as CityRail and CountryLink); the Victorian Government's V/Line Passenger (managed as a franchise), the Melbourne–Warrnambool service (contracted to West Coast Railway) and the Melbourne–Shepparton service (contracted to Hoys Roadlines). Great Southern Railway (owned by Serco) operates the national Indian Pacific, The Overland and The Ghan services. The Queensland Government's Queensland Rail has passenger operations trading as Traveltrain and Citytrain.

In addition, there are integrated urban operations in Melbourne, Adelaide and Perth and, from 1 January 2004, in Sydney. The privately-funded Brisbane airport rail link is owned and operated by Airtrain Citylink Limited. Melbourne passenger operations (M>Train and Connex) are managed as franchises. There are integrated government-run urban rail systems in Perth (operated for the Western Australian Government Railways Commission (WAGR) and trading as Transperth. The South Australian Government operates integrated passenger operations in Adelaide, trading as TransAdelaide. From 2004, the Sydney urban passenger operations will operate as an integrated entity: State Rail Authority will be the integrated provider of passenger services, when the Authority assumes responsibility for RIC's urban infrastructure functions[66].

f Asia Pacific Transport manages the Tarcoola–Alice Springs track (leased from ARTC) and will manage the Alice Springs–Darwin track (currently under construction). The company is 50 per cent owned by Australian Railroad Group.

g The Queanbeyan–Canberra rail tracks are owned by the ACT Government but managed by RIC.

h Following an amendment to the Rail Corporations Act in 2002, Freight Australia has been required to ring-fence its infrastructure management.

page 61

66 See Transport NSW (2003).

Industry structure

In Table 4 we present the industry structure, management and ownership of the traditional public railways in Australia. These railways originated as vertically-integrated State and Commonwealth government-owned networks. (As suggested above, we cannot classify the vertically-integrated, purpose-built lines built by the private sector since the 1960s.) It is evident from Table 4 that the current Australian rail profile incorporates a broad spectrum of structures and ownerships: vertical separation as well as vertical integration; public and private ownership.

Table 4 also shows that some integrated railway businesses have 'ring-fenced' infrastructure managers (such as WestNet Rail) while others (such as Freight Australia) do not have explicitly ring-fenced managers. The ring-fenced entities are intended to sell access to access seekers (both its own train operator and third-party operators). The separation of infrastructure activities from train operations, through ring-fencing, is intended to give an arms-length dealing between all train operators and the infrastructure manager; the objective is to facilitate fair and equitable pricing and capacity allocation and transparency in infrastructure costing[67].

One notable feature of the restructuring has been the establishment of two vertically-separated infrastructure providers, Rail Infrastructure Corporation (RIC) and Australian Rail Track Corporation (ARTC), based on the NSW and Commonwealth track infrastructure, respectively. The formation of these entities from integrated origins involved the complementary establishment of the FreightCorp and National Rail freight train operators, respectively. The separation of these train operations from the infrastructure enabled the two companies to be offered for sale as one effective entity without the need to also offer the infrastructure for sale[68]. That is, the separation enables strategic merger and alliance development that might not otherwise have been possible financially or acceptable in terms of competition law.

Melbourne provides a different approach to introducing competition in rail services. In the late 1990s, Melbourne's urban passenger rail network operations were split into two *integrated* operations, Bayside Trains and Hillside Trains. In 1999, the Victorian Government franchised these operations to two private companies, National Express Group[69] and Connex (part of the Veolia

67. ACCC defines 'ring-fencing' as being 'designed to assist the introduction of effective competition into markets traditionally supplied by natural monopolies. It involves putting structures into place to prevent flows of information and personnel, and inappropriate transferring of costs and revenues within an integrated utility and between related businesses' (ACCC web site, <http://www.accc.gov.au/gas/ring_fence/code_reqs_rf.htm>

68 The companies were bought by the Toll–Patrick consortium and the combined rail operation is known as Pacific National.

69 National Express withdrew from its franchise commitment in December 2002.

Environnement), respectively. Franchising is a different approach in using competition to achieve productive efficiency. Hitherto, we have considered the introduction of competition *in* the provision of transport services. An alternative rail competition model, used here, is to use competition *for* the provision of transport services to achieve productive efficiency rather than using competition *in* train service provision. Both operations are vertically integrated, with the companies being responsible for infrastructure and trains. (Note that competition for service contracts form a similar model.)

Table 5 (p. 66) lists the formal status of nine main railway infrastructure areas. As at 30 November 2002, only the ARTC, AustralAsia Railway and QR have approved formal access regimes.

In principle, the declaration of 'essential' facilities and (usually) their formalisation, has brought about the means for freight (and passenger) services without the need for the service provider to supply their own 'below-rail' infrastructure. In principle, this also means that on-track competition can occur *between* train operators. This competition can increase operators' incentives to keep freight tariffs competitive; in so doing, it provides greater incentives for productive efficiency (especially when the operator does not face strong competition from road or sea).

We observe, however, that in Australia, rail performs a significant bulk freight task. This task may be better performed by contract competition than through on-track competition. In particular, for superior operational and logistical efficiency reasons, it is often more appropriate that *bulk* rail freight movements be provided by a *single* operator, such as between a given coal mine and the export port, than by multiple train operators. Thus, it may be more appropriate to facilitate competition *for* haulage contracts rather than to stimulate competition *between* freight services for a given freight flow.

We should also recall the limitations for on-track competition to come about, as discussed in Chapter 1. These limits are likely to be particularly relevant to the Australian freight industry; competition can be restricted by:

- the small size of the underlying freight market; and
- the small size of the market for which rail can offer a competitive service.

There may be other factors in related aspects of rail infrastructure that may prevent the emergence of on-track competition. We now consider these issues.

Ancillary issues

Setting access charges establishes a mechanism to bring about third-party and open access to railway infrastructure, in order to bring about on-track competition. However, providing mandated track access may, in itself, not be sufficient to bring about competition in above-rail operations. Other aspects of train operation that lie outside the access charge may retard the development of new operations.

TABLE 5 RAIL ACCESS STATUS, BY INFRASTRUCTURE MANAGER[b]

Infrastructure	*Primary location*	*Rail access regime*	*Process of formalisation*	*Status[a]*	*Date*
ARTC (IM)	SA, Victoria (interstate track)	✓	Undertaking	Undertaking (to 2007) approved by ACCC	May 2002
Rail Infrastructure Corp. (IM)	NSW[c]	✓	Certification	Certified by NCC; (Nov. 1999–Dec. 2000) lapsed	-
Freight Australia (TO)	Victoria (intrastate freight track)	✓	Declaration	Submitted by to NCC; rejected	Feb. 2002
			Certification	Submitted by State Govt to NCC; withdrawn August 2002	July 2001
Australian Railroad Group (TO)	WA non-urban intrastate track	✓	Certification	Submitted by State Govt to NCC; withdrawn by State Govt.	Feb. 1999 Nov. 2000
Asia Pacific Transport Consortium—AustralAsia Railway (TO)	Tarcoola–Alice Springs (leased)–Darwin (under construction)	✓	Certification	Certified by NCC (full line length prescribed from completion date of new line, to 2030)	Feb. 2000
	Wirrida–Tarcoola		Declaration	Following application from Aulron Energy Limited, Parliamentary Sec to the Treasurer has declared this section of track for a period of five years—decision set aside[f]	Mar. 2003
Australian Railroad Group (TO)	SA (intrastate)	✓	Will not seek certification	-	-
Australian Transport Network (TO)	Tasmania	✗[e]	-	-	-
Queensland Rail (TO)	Queensland[d]		Certification	State Govt sought certification from NCC in 1998; withdrawn 1999.	
		✓	Undertaking	Approved by Queensland Competition Authority (to 30 June 2005)	Dec. 2001
Pilbara Rail (TO)	Pilbara (WA)	✗	Declaration	Access seeker (Robe River) withdrew application from NCC	June 1999

a In addition to those listed here, there have been applications made for declaration of parts of the infrastructure: by Carpentaria Transport (over QR Brisbane–Cairns); by SCT (Sydney–Broken Hill, over RIC); by SCT (5 sections of track in WA); and by NSW Minerals Council (Hunter Valley lines, over RIC).

b TO: Vertically-integrated train operator; IM: Vertically-separated infrastructure manager

c Excludes broad-gauge lines in southern NSW, which are under the Victorian access regime. From 2004, will exclude Sydney metropolitan area track, which will form part of the integrated urban State Rail system.

d Excludes the standard-gauge line from NSW border to Brisbane, which not under a formal access regime, though QR provides third-party access.

e The Productivity Commission reports that Tasmania has no formal access regime but infrastructure manager is 'required to enter into negotiations with other operators wishing to use its infrastructure through obligations contained in its contract of sale' (PC 2000, pF21) Despite the absence of this formal regime, however, ATN and 'a number of other operators' have successfully negotiated access terms (PC 2000, p. 49).

f In October 2002, Asia Pacific Transport applied to the Australian Competition Tribunal for review of the declaration; in March 2003, the Tribunal decided to set aside the Minister's declaration decision.

Inter-operability

One impediment to the establishment of effective competition and contestability (and coordination) is the absence of inter-operability across systems. At its most obvious level there is the different loading and rail track gauges, which limits both the extent to which competition and service coordination can occur. Thus, for instance, QR have expanded southwards from their narrow-gauge track, Queensland base, into NSW, through their purchase in 2002 of the small, northern NSW-based standard-gauge operator, Northern Rivers Railroad[70]. (In 2003, this subsidiary, now known as INTERAIL, won a haulage contract to transport coal from a new mine in the Hunter Valley.) There are other inter-operability issues, including differing operating standards, signalling and communications systems. These conflicts of standards can prevent or deter operators going beyond their own base[71].

Terminal access

A further impediment in Australia to the establishment of competition or contestability in train services may be in rail terminals. There are three key terminal issues:

- terminal ownership;
- rights of access; and
- capacity.

First, we note that, for the open access infrastructure managers (RIC, ARTC), it is train operators that generally own the major city terminals. Similarly, the third-party (integrated) train operators own the primary terminals. Thus, unless a new entrant buys or builds a terminal, third-party access to incumbents' facilities will be required.

In most cases, that third-party access will have to be negotiated on a voluntary basis—terminal capacity does not generally form part of an access regime. Exceptions are the Dynon and South Dynon terminals in Melbourne, which are owned by Freight Australia and Pacific National, respectively; these are included in the Victorian regime though other State rail yards are excluded. By contrast, the WA regime excludes terminal yards in that State (which are owned by Australian Railroad Group (ARG)). The SA intrastate regime also excludes terminal capacity. In NSW, Pacific National owns the major Sydney Freight Centre (Chullora) rather than RIC; the company also leases the Acacia Ridge standard gauge interstate terminal in Brisbane from QR.

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70 QR was not permitted to expand by bidding for the (standard gauge) National Rail/FreightCorp train operations—QR Press Release of 11 March 2002.

71 We should note, however, that we do not imply that all systems should be standardised. For instance, it may be more cost-effective for lightly-used railways to have a different (lower cost) signal system from that installed on highly-utilised track.

Excluding the terminals from an access regime might be an impediment to on-rail competition; where terminals are included in a regime, there is also the issue of fair access and whether ring-fencing of activities is required. Pacific National has argued that cost-benefit analysis would indicate the inappropriateness of requiring the ring-fencing of the Dynon terminals (Pacific National 2002), that is, the costs would exceed the benefits from competition.

Thus, unless new operators can negotiate fair terms and times of access to terminals, operators seeking to expand train operations to a new city may need to build new terminal capacity. *This impacts on the contestability of the rail freight market.* The potential for a competing train operator to duplicate the facilities may be limited, however, if the cost of such a task is large relative to the scale of the business or if suitable land is scarce. While there may be suitable land on the outskirts of cities, it is likely to be scarce when train operations serve a port. Thus, it may be that contestability is weakened: lack of terminal access can be a significant barrier to entry for the new train operator where access cannot be negotiated (or is impractical to have additional train operators within a facility), necessitating that it build its own facilities.

The need to build terminal facilities may therefore delay the introduction of competing services. However, Part IIIA does *not* consider such timing issues as criteria for third-party access. Thus, when, in 1997, SCT sought temporary access to Westrail's Forrestfield terminal facilities while it constructed its own facilities, the NCC ruled that the terminal facilities should not be declared as it was still economic to duplicate the facility. In any case, the NCC concluded that declaring the facilities, solely because of SCT's time constraint, 'would be likely to discourage investment and innovation by infrastructure owners and potential competitors' (NCC 1997, p. 29).

Nonetheless, there may be situations where the absence of access to terminals may impede competition. SCT has commented that:

> ... there is not enough focus on associated facilities with the interstate rail operations. For example, there is no use having the best rail, double stacking or the best loops in the world, if you haven't got a terminal. (HRSCCTA 2000, p. 36)

SCT noted that it 'has a rail terminal at Acacia Ridge and we cannot even get access to that terminal'. The company noted that it found that the economics have supported it developing its own facilities elsewhere in the rail network but given it already has a terminal at Acacia Ridge, it finds no sense in building an additional Brisbane terminal elsewhere (Ibid, p. 37). QR conceded that it was 'difficult', though 'not impossible', to get access to Acacia Ridge (Ibid., p. 37). ARTC have suggested that it is 'nearly impossible' for new entrants to get *into* terminal spaces due to the constrained space and it believes that this is 'a constraint for opening up the market'(Ibid., p. 40). ARTC has also expressed concern that ancillary facilities are excluded from the Victorian access regime; it regards such amenities as being a 'vital' part of rail operation (ARTC 2002a).

Thus, competition may not be forthcoming because of the problems with associated infrastructure supply.

A general issue about the National Access Regime, however, is that it applies to 'genuinely spare capacity'[72]. In the case of rail terminals, the *absence* of 'spare' capacity may preclude additional operations. That is, to the extent that additional operators impinge on the incumbent's service reliability and general efficiency, there may not be much 'genuinely spare' capacity. (There is a related concern about contestability with train path capacity under haulage contract bidding—see page 87.) That is, competition and contestability may be undermined by the basic fact that there is insufficient terminal capacity. Patrick and Toll have shared the Charlick (Adelaide) rail terminal. However, it has been argued that third-party access to ARG's Adelaide (Dry Creek) terminal would affect the efficiency of the company's terminal operations; access has thus been negotiated to occur when ARG are not using the terminal. Thus, it may be that even if the access regimes included access to terminals, the efficacy of that required access might be limited to the extent that there is insufficient, effective capacity for additional operators.

Rolling stock

Access to rolling stock may impede competition. The ability of a bulk goods shipper to switch train operators may be restricted where the incumbent operator owns the rolling stock; awarding a contract to a rival operator would require that either the new operator or the shipper would need to supply new stock.

Thus, despite favourable access charges, on-track competition *or* contestability may be inhibited by access to rolling stock (locomotives and wagons). It has been noted that one way in which new entrants have come into the market is through the use of second-hand stock: 'A lot of the locomotives in Australia are older generation and, in fact, the way for many new entrants to come into the market is to buy into organisations or get rolling stock that is older.' (HRSCCTA 2000, p. 62) However, locomotive and wagons are differentiated not just by power and capacity but also by loading gauge and track gauge; it can prove costly or prohibitive to switch vehicles across gauges. These physical constraints limit the market in vehicles that are 'fit-for-purpose'. The development and maturity of a rolling stock market can therefore be important for on-track competition and for contestability. We note that the sale of a number of surplus locomotives, as a requirement of the sale of National Rail and FreightCorp to Toll–Patrick, may enhance this market. However, it was inevitable that the stock that was sold (to Silverton Rail) would have less competitive attributes than those retained.

72 The Industry Commission's 1991 rail report recommended that third-party access be provided subject to 'capacity being available' (as paraphrased in Productivity Commission 2000, p. 156).

Some rolling stock leasing has developed in recent years, with operations by companies such as Chicago Freight Car Leasing Australia (CFCL), Manildra Group and Austrac.

Labour market

Another key area that can form *potential* barriers to competitive or contestable entry is the availability of train crews. We note, however, that crew suppliers have emerged in recent years, including GrainCorp (undertaking contract work on branch lines for Pacific National) and Lachlan Valley Rail Freight (supplying staff to Freight Australia in its NSW operations)[73].

Therefore, there are some areas where competition and contestability have lowered potential barriers to entry while other areas (such as terminals) may remain.

SERVICE COORDINATION

Important changes in the structure of national transport have improved rail's ability to provide a coordinated service. In particular, the formation of National Rail and ARTC provided for national freight services and coordinated infrastructure management. ARTC is set up as a corporation (under Commonwealth Corporations Law). However, its Constitution also sets a primary role for the Corporation to provide a 'one-stop-shop' to improve rail's ability to provide a coordinated service. Coordination is intended to break down the commercial, managerial and operational barriers that have led Australia's railway industry to under-perform. This section considers aspects of rail pricing and the mandated access that may impinge on that coordination objective.

The degree of access regime standardisation may be an important factor in the extent to which coordination can be achieved. A given infrastructure may be declared to be 'essential'; the infrastructure manager may then have the terms of access formalised. However, the NCP does not specify detailed pricing *principles* for rail. This contrasts with the telecom, airport and postal sectors, where pricing principles are defined. This is a deliberate omission: the NCC notes that although *certainty of outcomes* on access seeking is generally beneficial in industries, there is a need for *greater flexibility* when it comes to setting rail access charges:

> posted (or fixed) tariffs are common in the electricity industry, reflecting the premium placed by market players on certainty of outcomes. Conversely, a greater deal of flexibility in pricing occurs in rail, reflecting the fact that efficient

73 Crews traversing a given rail line must, however, have route 'knowledge' of the given line—they must have had prior, supervised, experience with the vagaries of a line's signalling and topography.

> outcomes can be achieved by recognising that capacity to pay varies widely across different categories of rail freight. (NCC 2001, p. 118)

Thus, it is this varying 'capacity to pay' that is a critical element, setting Australian rail access pricing apart from utilities. This conclusion about train operators' varying abilities to pay access charges is related to the difficulty of infrastructure managers to generate sufficient revenue from those charges to sustain the infrastructure in the long-term. The NCC's acceptance of flexibility is then, to an extent, echoed in the varying pricing levels, structures and definitions found in draft and approved access regimes that have been forwarded to the ruling parties (State/Territory regulator, ACCC or NCC). These regimes *tend* to outline broadly similar pricing features such as:

- a *combinatorial*[74] floor–ceiling pricing band, based on differing floor prices (marginal, incremental or avoidable) and a stand-alone ceiling price;
- negotiated price-setting (and arbitration, should that process fail);
- two-part tariffs pricing structure, based on a flagfall ('fixed') charge and a variable component[75]; and
- variable charges based on a rate per net or gross tonne kilometre.

Within these common features, however, there is considerable variation of the detail. A consequence is that the number of access regimes and the diversity of the interpretations of access pricing parameters can be important influences on service coordination.

The number of access regimes

A feature of the Australian reforms is the multiplicity of access regimes and a range of overlapping, regulatory bodies; each regulator inevitably oversees and interprets the access terms and conditions in their own individual way.

These regulators include:

- ACCC;
- NCC;
- Queensland Competition Authority, QCA, overseeing QR's regime;

74 The 'combinatorial' aspect of the pricing sets the floor or ceiling revenue to be the *combined* floor or ceiling revenue of *all* the operators on a given segment of line for which a specific access charge is being allocated. In practice, the combinatorial test is really a multitude of tests applicable to every combination of traffic (including total traffic) that operates on the network. One aspect of the approach is to ensure that cross-subsidisation of market segments does not occur, by having each line segment free-standing. It is used, for instance, for coal networks, to ensure that mines doe not cross-subsidise each other. See Smart (1999) for further discussion of the principles of combinatorial pricing, as applied by Rail Infrastructure Corporation.

75 Two-part tariffs are provided for in the ARTC, RIC, AustralAsia [see ESCOSA 2002, p. 53], Queensland (non-coal) and Queensland (Brisbane–NSW border) pricing.

- Independent Pricing And Regulatory Tribunal, IPART, overseeing RIC;
- Victoria's Essential Services Commission, overseeing access to Freight Australia and M>Train track and the Dynon (Freight Australia) and South Dynon (Pacific National) terminals;
- South Australia's Essential Services Commission, overseeing the AustralAsia Railway [Tarcoola–Darwin] regime;
- South Australia's Executive Director of Transport SA, who is the regulator of intrastate lines in SA. The intrastate regime excludes the ('in-house') BHP tracks on Eyre Peninsula, the Leigh Creek line (leased to NRG, the Pt Augusta power station operator), heritage lines and private sidings and freight terminals; and
- Office of the Rail Access Regulator, ORAR, overseeing the WA intrastate regime (excluding the Pilbara region's private (iron ore-carrying) lines).

The most striking contrast between the access regimes is the choice of regulated industry structure:

- the RIC and ARTC regimes are based around vertically-separated infrastructure managers; and
- the other five regimes (QR, Victorian, SA, AustralAsia and WA) are based on infrastructure management integrated (in terms of ownership) with train operations.

The different approaches may reflect different freight markets: where there is low-volume traffic, there is relatively little potential gains from competition. In this situation, the synergies of integration are more likely to outweigh the likely net competition gains that can arise from vertical separation.

To what extent does this range of jurisdictions mitigate against the objective of enhancing competition? The National Competition Policy agreements did not specify how the reforms would be applied to the rail industry (see NCC 2001, p. 131). The consequence has been the development of different, largely-State-based regimes, resulting in a regulatory fragmentation analogous to the break of railway gauge at State borders. For instance, in a recent case, GrainCorp sought rail access to its own silos. These silos are adjacent to the ARTC standard gauge track in western Victoria (and, thus, part of the ARTC Undertaking). However, the sidings are part of the Freight Australia infrastructure and, thus, are part of the Victorian rail access regime (See ESC 2002).

A consequence of the regulatory fragmentation is that transaction costs are inevitably higher than if operators and infrastructure managers deal with a single regulator. The higher the transaction costs, the more that trade across borders is inhibited. In this context, Pacific National reports that 'Interface issues have been a consistent problem given the diversity in rail access regimes' (Pacific National 2002). The inconsistencies inherent in multiple regimes also increases uncertainty for the operators. Freight Australia has noted that

'Duplication can contribute to regulatory uncertainty significantly—primarily because of the potential for inconsistent treatment of access providers and/or access seekers' (Freight Australia 2000, p. 15).

It is inevitable that having a range of access regimes adds to train operators' transaction costs and impedes competition. The development of a single access regime would improve efficiency. Such a regime could still accommodate diverse pricing frameworks, reflecting the differing train operator economics with different freight markets (bulk and non-bulk) and infrastructure managers' differing incentives under integration and vertical separation. (See above, page 54, for a discussion of the need for pricing diversity.)

The ARTC was formed to overcome the problems on the range of access regimes[76]. The Corporation has a charter to provide a 'one stop shop' for obtaining track access. ARTC owns the Kalgoorlie–Wolseley line, leases the Wolseley–Albury line (and, as at November 2002, was negotiating to do likewise on interstate track in NSW) and wholesales the sale of train paths between Kalgoorlie and Perth[77]. In this way, the Corporation acts to provide a seamless management so as to offset the pricing, jurisdictional and operational boundaries found elsewhere in the network.

Diversity of pricing

The diversity of access regimes, and the breadth of interpretation of pricing that is permitted within the regimes, leads to a range of interpretations of the appropriate access charge. Even within a given regime, however, there can be a range of possible outcomes. There are a number of consequences:

- the absence of specific pricing principles increases uncertainty for train operators;
- as noted by the train operator and stevedore, Patrick, inconsistency across access regimes 'reduces efficiency, increases duplication of effort, increases cost and reduces competitiveness' (Patrick 1998, p. 16); and
- different pricing levels and structures on a given freight route can generate inconsistent incentives to operators in how a train is operated (e.g., train length and frequency)—see, for instance, Gustaffson and Knibbe (p. 20) on this matter.

76 The Productivity Commission notes that 'Multiple sub-network managers impose costs on the interstate network. Train operators have faced significant financial and time costs in negotiating access charges and train schedules with numerous owners. ARTC was established to overcome these problems by providing rail operators with a one stop shop.' (Productivity Commission 2000, p. 113)

77 This arrangement is formalised in the ARTC–Westrail Infrastructure Owner Agreement. The agreement was transferred to WestNet Rail under the Rail Freight System (Transfer) Order 2000.

Unlike other network industries, there is no Commonwealth pricing code for the rail industry. In general, however, the ACCC is opposed to making additional guidance on pricing more explicit within TPA Part IIIA; it concludes that 'introducing pricing specific principles would tend to over emphasise pricing issues at the expense of other, equally important, terms and conditions of access' (ACCC 2001c, p. 27). Those other terms and conditions, which appear to be equally diverse across Australian regimes, are:

> new and replacement investment; quality of service; incentive mechanisms; information provision and disclosure; negotiation of connection agreements; structural and accounting separation; dispute resolution; and an enforcement mechanism. (ACCC 2001c, p. 27)

The conclusion that can be drawn from these comments, then, is that the price-setting environment is so complex that it is not realistic to be specific about a given pricing structure or principles.

The NCC similarly argues that there is a need for price flexibility, recognising the wide variation in capacity to pay across rail freight categories (NCC 2001, p. 118). The NSW Minerals Council supports pricing flexibility *across* train types. The Council noted, in particular, that the ARTC Draft Undertaking may be appropriate for the non-bulk movements on the existing ARTC network. However, the Council argued that the pricing principles were not appropriate for the bulk-freight traffic that ARTC would inherit if it took control of the Hunter Valley railways. ARTC's freight pricing is based on strong intermodal competition and an acceptance that economic costs could not be recovered; neither assumption is relevant to bulk freight (NSW Minerals Council 2002, p. 7).

Access charges are intended to be established, in the first instance, through negotiation—in the event that negotiation fails, charges are set by arbitration, within a 'floor–ceiling' price band. The WA regime is based on negotiated prices, underpinned by 'costing principles'; nonetheless, there remains scope for considerable variance between the floor and the ceiling. However, uncertainty is still great as the variance between floor and ceiling can be too great to provide useful pricing signals for operators or a practical limit on the access charge[78]. To offset this, ARTC and QR have set 'reference' tariffs (published by ARTC; and QR, for its coal traffic and a separate two-part tariff for its Brisbane–NSW border line). These tariffs reduce operator uncertainty by forming the *basis for negotiating access charges*.

Within the negotiation process, charges may involve an element of combinatorial pricing (see footnote 74). That is, whatever the agreed cost recovery level and cost elements, the agreed costs recovered would be distributed amongst train operators in proportion to their use of the track. In fixing access charges, this may involve the access seeker submitting forecasts of

78 See, for instance, FreightCorp 2002, p. 6. ARTC 2002c provides indicative floor and ceiling *revenue* limits. For instance, the floor limit on the Pt Augusta–Whyalla line is $0.4 million while the ceiling limit is $3.6 million.

track use (traffic). That is, the level of charges may be explicitly derived from *projections* of track use. Victoria's Essential Services Commission accepts Freight Australia's conclusion that 'access pricing will be highly dependent on these forecasts' (Office of the Regulator-General, Victoria 2001, p. 6). This provides strong incentives for different parties to boost or underplay such forecasts. Although the relevant regulator has the power to adjudicate, it is unclear how consistency in forecasting processes within and between regimes can be achieved. Indeed, where actual traffic exceeds the forecasts, an operator will have overpaid access charges (as the line costs can be spread over more traffic). Equally, where actual traffic is less than forecasts, a process should be available to set additional charges after the event. (See, for instance, the WestNet Rail proposals on overcharging, WestNet Rail 2001b.)

Thus, while there are common features of access pricing *across* jurisdictions in Australia, these belie important areas where significant differences in pricing formulations arise:

- first, where the train operator moves from a negotiated price to an arbitrated price (within a floor–ceiling band) under a given regime; and
- secondly, when seeking access across more than one regime. Where a price is regulated, different approaches (such as the asset valuation in a regulated ceiling) become more relevant.

The following section reviews the differences.

Regulated floor price

Most regimes have adopted a regulated floor price, based on a line segment's avoidable costs, and a regulated ceiling price, based on the line segment's full economic cost. However, across regimes, there are differing interpretations of those limits. We should note, in any case, that subject to access seeker consent, ARTC charges may be negotiated outside of the ceiling or the floor. By contrast, the WA regime (for instance) sets negotiation *within* the floor–ceiling band.

One aspect of the floor price (and the ceiling price) is the application of a combinatorial test. That is, the floor or ceiling price for a given line segment is established from the *combined* floor or ceiling *revenue* of *all* the operators on that line segment. In most cases, the test also considers the floor (and ceiling) cost of providing the *individual* service on an incremental cost (and stand-alone cost) basis. The basis for this additional individual train test is to ensure that cross-subsidisation across individual trains does not occur. In this context, by contrast with most other regimes, the ARTC Undertaking is set on the basis on the combinatorial test only (QCA 2001b, p. 69; ACCC 2002, pp. 141–42).

In principle, the floor is based on some form of marginal cost plus the incremental costs for maintaining the relevant segment of railway to be used by the access seeker. As noted above (page 53), however, there is considerable

trading-off between infrastructure provision and maintenance costs and imprecision in understanding the link between infrastructure usage and costs (as discussed in ORR 1999, EC 1999a)[79]. Inevitably, there is then debate over apportioning common costs across track users. IPART has observed that 'Cost allocation involves using judgement to select the most appropriate means of attributing common costs between multiple users' (IPART 1999, p. 13). These users can require different types of infrastructure and, therefore, different maintenance costs[80].

Thus, calculation of marginal and incremental costs is subject to interpretation; this is one reason for the variance across Australia's regimes. The regimes also differ in the components that are included in the respective floor prices. In NSW, for instance, the floor price is based on the marginal costs imposed over a twelve-month period (although incremental costs are the preferred desired floor price). By contrast, the WA regime has two prongs to the floor charge: an operator's marginal costs and the operator's share of incremental costs. The Victorian regime does not have a floor price; the combinatorial price is calculated on the average cost.

The regimes also differ in their treatment of depreciation costs in the floor price. The WA, Queensland and the AustralAsia regimes incorporate depreciation costs in the floor price calculation, while the NSW and the ARTC regimes do not. Further, by contrast with other regimes, the AustralAsia regime's floor price accounts for the capital costs of existing assets that are used by the third party.

The differences between the floor definitions are set out in Table 6. The table illustrates the degree to which the interpretation of the regulated floor differs.

Regulated ceiling price

The access regimes also encompass a range of regulated ceiling prices. The Victorian regime sets regulated average access charges which, therefore, represent a de facto ceiling price. Even within the regime, however, there is different treatment of assets. Victorian intrastate track charges allow for a rate of return on post-privatisation infrastructure investment but exclude a rate of return on capital assets existing at the time that the intrastate infrastructure was privatised. However, the terminal access charges at Dynon [Freight Australia] and South Dynon [Pacific National] *include* a rate of return on capital assets

79 In this context we note the discussion between the NZ Government and Tranz Rail over just what is meant by 'maintenance'. See *The New Zealand Herald* (2002)

80 An example of this is where passenger services are improved by canting (slanting) the track alignment. This track profile requires higher maintenance work than standard track. Further, heavy freight trains are likely to impose far greater marginal costs on canted track than on conventional track. Thus, imposition of this track profile could lead to higher freight access charges although the freight operator may not receive any practical benefits from the new profile.

TABLE 6 AUSTRALIAN ACCESS REGIMES: FLOOR

Regime	*Floor*
NSW	**Required minimum for individual train services** The charge is equivalent to the costs that vary with usage over 12-month period plus an estimate of the 'levellised' (smoothed) variable 'major periodic maintenance' activities (re-railing, rail griding and resurfacing). Excludes depreciation costs **Objective minimum** The access charge should be set so that revenue from all Access Seekers on a line sector (or group of sectors) should cover the incremental costs of providing the sector(s).
Queensland	Expected incremental cost—costs of providing access, including capital renewal and capital expansion costs—incurred over the life of the Access Agreement.
South Australia	To reflect the lowest price at which manager could provide the relevant services.
AustralAsia	Incremental cost, consisting of maintenance costs, capital consumption costs attributable to the individual service and some signalling costs. • maintenance costs of v cents per gross tonne kilometre (estimated from variable maintenance costs of $w million divided by x million gross tonne kilometres freight task); • capital consumption costs of y cents per gross tonne kilometre as the estimated depreciation charge; • interest charge of z cents per gross tonne kilometre.
Western Australia	Incremental costs, comprising the operating costs, capital costs and overhead costs that would be avoided in the 12 months following the access: • Operating costs comprise train control costs, signalling and telecommunications, train scheduling, emergency maintenance, information reporting, maintenance costs of infrastructure averaged over the maintenance cycle, costs incurred if infrastructure was replaced using modern equivalent assets. • Capital costs comprise depreciation costs (using Gross Replacement Value) and risk-adjusted return on the relevant infrastructure (using the Weighted Average Cost of Capital).
Victoria	No floor price
ARTC	Floor price is equivalent to the incremental costs of the given line Segment or group of Segments. Costs are the costs avoided if the Segment was removed from the Network. Costs include Segment-specific costs and non-Segment-specific costs relating to: • maintenance (track, signalling, communication) • costs of supervising maintenance contracts and project management • train control and communication • train planning and operations administration • system management and administration Costs exclude depreciation and return on assets of Segment-specific assets and Non-Segment-specific assets.

Sources: Parliament of South Australia 1997; ARTC 2002; QR 2001a; IPART 1999; Office of the Rail Access Regulator [WA] 2001b; Victoria Government Gazette 2001; Parliament of South Australia 1999.

existing at the time that the intrastate infrastructure was privatised (Victorian Government 2001, p. 22). The South Australian regime, based on 'light-handed' regulation (SA Government 2001, p. 7), notes that prices should be fair and are based on the economic cost of the facilities used by the access seeker, net of anticipated income from other users of those facilities.

In estimating the regulated ceiling charge, the Depreciated Optimised Replacement Cost (DORC) of the assets utilised is generally applied[81]. The WA State regime, however, uses an asset valuation based on Gross Replacement Value (GRV)[82]. It has been argued that the GRV does not allow for the current depreciated value of the asset (NCC 1999b, p. 45); consequently, it would result in a higher access charge than appropriate[83]. The NSW regime bases the ceiling price on a DORC asset valuation but this is relevant only for coal lines; for other lines (94 per cent of the route kilometres), the assets are regarded as having no value for the purposes of setting the ceiling: the access charge is not set so as to recover capital costs. The Victorian regime uses averaged charges but this valuation excludes historical asset values—the asset valuation is zero. However, the charge is set to recover expenditure on post-privatisation capital assets. Similarly, while Australian regimes normally base the return on assets on the Weighted Average Cost of Capital (WACC), the Victorian regime is set at the Australian 10 year bond rate plus a margin.

Where a ceiling level is specified, the starting point is usually the full economic cost—the cost incurred if the train operation was the only operation that was given access by the infrastructure manager. From this cost is netted the actual or forecast access income from other line users—the prevailing rail demand affects the ceiling access charge. The concept of the full economic (or 'stand-alone') costs generally refers to the capital costs, operating costs and the overhead costs arising from provision of access. As Table 7 indicates, however, there are different interpretations of the application of those costs, for instance, the duration over which the cyclical maintenance costs are considered and the form of the allocation of non-line specific overheads. The variation may also extend beyond those highlighted in Table 7; the principles may be applied in different ways.

We should note the potency of pricing structure in affecting the outcome of applying ceiling limits. The regulated ceiling price may be applied as a two-part

81 Under DORC, assets are valued at the cost of replacing them; asset optimisation implies that replaced assets would not necessarily be identical with the original assets.

82 'GRV is the gross replacement value of the railway infrastructure, calculated as the lowest current cost to replace existing assets with assets that- (a) have the capacity to provide the same level of service; and (b) are, if appropriate, modern equivalent assets.' (NCC 1999b).

83 WMC notes that setting the access value using GRV is inconsistent with setting maintenance costs based on existing track: if GRV asset valuation is used, the maintenance costs should be based on maintaining new track (WMC 2002, p. 3).

TABLE 7 AUSTRALIAN ACCESS REGIMES: CEILING

Regime	*Ceiling*
NSW	Access charges set to a level such that revenue must not exceed the stand-alone cost of a line sector; includes non-sector-specific overhead costs • Asset value based on DORC • Return on assets based on Weighted Average Cost of Capital (WACC) • Straight-line depreciation, based on original DORC value 94 per cent of route km (i.e., the non-coal lines) have a nought asset value.
Queensland	'Revenue limit' based on stand-alone cost and including contribution to overheads • Asset value based on DORC • Return on assets • Based on efficient costs, including overheads Capital costs considered are those for the period of the Access Agreement.
South Australia	This is the price that matches the full economic cost of the minimum services and facilities required, net of other actual or notional sources of access revenue.
AustralAsia	The ceiling is the stand-alone cost • Asset value based on DORC* • Return on assets with a risk premium (to be decided) • Depreciation, based on DORC • Recovery of efficient operating costs, including overhead costs and maintenance.
WA	Ceiling based on the total costs of the relevant route and infrastructure • Asset value based on GRV (Gross Replacement Value) • Return on assets, adjusted for risk, based on WACC • Depreciation, based on GRV • Recovery of efficient operating costs and overheads Maintenance costs based on spread of costs over the maintenance cycle, calculated as an annual cost.
Victoria	No regulatory band.
ARTC	Access charge for a line sector are to generate revenue sufficient to cover the economic cost of the sector • Asset value based on DORC • Return on assets, based on WACC • Depreciation Non-sector costs are allocated on the basis of the access seeker's task and infrastructure usage—on gross tonne kilometres, track kilometres and train kilometres.

Sources: Parliament of South Australia 1997; ARTC 2002; QR 2001a; IPART 1999; Office of the Rail Access Regulator [WA] 2001b; Victoria Government Gazette 2001; Parliament of South Australia 1999.

Note: *The initial asset value includes government-contributed assets used to promote the line's construction (ESCOSA 2002, p. 20).

tariff. The total revenue for a given route is capped at the infrastructure costs (with return on capital). This means that if an additional operator accesses a given route, the ceiling price level falls. Freight Australia points out that derivation of ceiling prices with two-part tariffs 'does not adequately determine ceilings for rail operations' (Freight Australia 2001a, p. 4). This is because the impact of the rates will be a function of the length of the train: a high flagfall charge will, for instance, generate a relatively high ceiling price for operators running smaller trains. For this reason, Freight Australia calls for the fixed and variable components to be determined in advance.

There is inconsistency across regimes in indexing the ceiling, to account for either inflation or for potential efficiency gains. In some regimes there is no explicit consideration. The ACCC have accepted ARTC's approach to index its DORC valuation of assets by the CPI[84]. By implication, technological advances are assumed not to have a marked effect on the cost of replacing assets (though ACCC accepts that efficiencies will be apparent in lower costs of ARTC's 'Major Periodic Maintenance' tasks (ACCC 2002, p. 150). By contrast, it is proposed that the WA regime will uplift the ceiling of its route sections by CPI-x, where, initially, the 'x' will be set at one-quarter of CPI, with the view being that

> some form of discount from the index may be warranted to provide WNR with some added incentives to further increase operational efficiency in network management and overheads, and technological improvements in maintenance that could result in lower unit costs. (Office of the Rail Access Regulator 2002, pp. 36–38).

Charging framework

The regulated prices form the lower and upper limits of negotiated access charges. The charging structure is typically based on a two-part tariff basis though the basis for the rates may vary. For instance, for the ARTC and QR's Brisbane–NSW border line, the 'fixed' (or 'flagfall') charges are based on a rate per train; for ARTC, this varies by section of track and type of train and reflects the line section length. By contrast, for QR intrastate (non-coal) lines, the fixed charge may consist of an up-front fee and a regular periodic charge (QR 2001a, p. 41); while the WestNet Rail flagfall is expected to be a rate per route kilometre (Freight Australia 2001a, p. 4).

The pricing diversity identified here is further complicated by the multitude of access pricing regimes, by the three avenues of formalisation of access systems (undertakings, declarations and certifications) and by the general (rather than prescriptive) pricing principles laid down. Further, there are other subtle, but crucial, differences of treatment. For instance, an important issue

84 In practice, ARTC charges are normally below the ceiling so indexing the ceiling will have no practical impact on the charges. This can contrast with other regimes, where bulk haulage lines may be charged at the ceiling.

of indemnities and liabilities, the ARTC Undertaking requires operators indemnify for *all* potential claims (irrespective of any blame or negligent act) whereas in the Queensland Undertaking it is restricted to wilful default or negligent act or omission (QR 2001a, p. 148).

We noted in Chapter 2 that infrastructure usage cost drivers have not been clearly established. Consequently, there is a range of ways in which the different regimes have derived cost-based charges. Different types of freight trains have operational differences and the freight carried faces varying degrees of intermodal competition. This implied that differential pricing across freight movements (principally, bulk and non-bulk) should be applied. Different industry structures alter infrastructure managers' incentives for provision of access and striving for productive efficiency; for this reason, also, access charges should not be uniform. Varying access charges by freight movement does not mean, however, that there needs to be a multiplicity of regulatory regimes and their associated different pricing systems. Ultimately, this multiplicity affects on-track competition and contestability, through setting up separate barriers to entry where the rail network crosses jurisdictions. These barriers consist of the extra transaction costs and uncertainty in dealing with additional authorities.

THE PRICE-SETTING PROCESS

In this section we consider the process by which access charges are set. Four main issues are considered:

- whether charges are 'posted' (set in advance) or derived through negotiation;
- whether charges are used to manage track capacity or whether the capacity is set through administrative processes;
- whether charges are varied to reflect differences in the quality of paths actually supplied when the train runs or varied to reflect variance in the cost (infrastructure wear) when the operator uses the path; and
- whether charges are regulated in a way to encourage infrastructure managers to improve their productive efficiency.

These issues are now considered.

Posted versus negotiated prices

Access charges in Australia are generally settled through negotiation between access seeker and access provider. This price-setting is an alternative to 'posted' (fixed, published) price-setting, where prices are generally based on identifiable costs. There can be two key elements to the price negotiation process:

- a floor–ceiling price band; and
- reference tariffs.

Arbitrated pricing within a price band

Access pricing in the Australian regimes are typically set within a regulated 'floor–ceiling' band of prices. The price band is especially important where access charges are market-based rather than cost-based. The access seeker and infrastructure manager are free to negotiate their own terms (and this might include a charge that lies outside of the band). However, in the event that negotiation fails, an arbitrated charge will fall within the price band. This band provides a degree of certainty regarding the outcome: this is the essence of the 'negotiate–arbitrate model'[85].

A further concern is that although the floor–ceiling pricing band gives some certainty in outcome, the band is typically wide. Thus, it provides a weak signal of the likely access charge. For instance, the floor price in the South Australian regime is around one-sixth of a reference tariff while the ceiling price is more than seven times that tariff[86]. The function of the band, however, is primarily to present the cost-based pricing band within which an *arbitrated* charge will fall.

In the absence of provisions that ensure equal treatment of incumbent and third-party operations, however, negotiated charges under an integrated railway structure may frustrate on-rail competition. For instance, the WA regime allows the infrastructure manager to adopt market-based charges—'costs are only one input to pricing decisions' (WestNet 2001, p. 2). This raises the potential for the incumbent to apply price discrimination and, thereby, favour its own train operations over third-party operators. NECG warns, also, that the WA regime allows the infrastructure manager, WestNet, to set charges at the ceiling; the consolidated rail group would then cross-subsidise its train operator, thereby dampening opportunities for above-rail competition. This would ensure that the incumbent rail operator retained its traffic (NECG 2002a, p. 6). NECG argues that applying the Competitive Imputation Pricing Rule, as adopted for the AustralAsia regime, can ensure competitive neutrality[87].

The process of negotiation-based pricing provides the infrastructure manager with a greater degree of flexibility than with posted pricing—though it comes at a price. SCT argues that the 'present non-prescriptive approach does not provide operators and access seekers with the certainty they require for access', where the certainty of access promotes intra-modal competition (SCT 2002, p. 5). The issue here is the trade-off between a price-setting process using prescriptive (posted) access charges and the resulting certainty compared

85 See National Competition Council (NCC) 2001, pp. 30–31 for a discussion of criticisms of the model.

86 The band width in the ARTC regime varies. For instance, the 2002/03 floor limit on the Adelaide (Dry Creek)–Parkeston segment, is $25.9 million and the ceiling limit is $87.7 million. By contrast, on the Pt Augusta–Whyalla line, the floor is $0.4 million and the ceiling is $3.6 million. The divergence in band width will reflect the combinatorial nature of the estimation of the limits. See ARTC 2002c.

87 The competitive imputation access charge is the difference between the competitive rail shipper tariff and the incremental above rail costs.

with a general, more flexible access charge that is associated with greater operator uncertainty. In this context, a key benefit of the flexibility is that the negotiation is integral to enabling the infrastructure manager to price discriminate between access seekers. This makes possible the Ramsey-type pricing that facilitates allocatively-efficient infrastructure cost recovery (albeit that it can undermine competition objectives). RIC, for instance, states that reference prices could not form a starting point for negotiations: it has its 'own assessment of capacity to pay in different markets and we set our opening bids in negotiation along those lines' (Productivity Commission, 1997, p. 121–22). Thus, we must recognise the important trade-off between the train operator uncertainty arising from pricing discretion and the benefit of that discretion in facilitating infrastructure cost recovery.

Finally, we should note that the negotiate–arbitrate model is not costless. Negotiated and, especially, arbitrated prices can use considerable resources in labour input and time. Indeed, Toll have expressed the view that the model is 'fundamentally flawed' (ACCC 2001, p. 58) because while the transport sector often needs to respond quickly to market opportunities, the company's experience is that deliberations are protracted. However, access pricing is only one of the terms and conditions: access terms such as indemnities and insurance may take a disproportionate amount of negotiating time.

Reference tariffs

Some regimes include reference tariffs, as a guide to the charge that the access seeker might expect to be levied within a price band. One benefit of the setting and publication of a reference tariff is that it can reduce uncertainty. A set of reference tariffs may be published to set a benchmark from which negotiation commences. The Queensland and ARTC Undertakings publish such tariffs. These charges, set within a price band, can provide pricing signals and some degree of certainty on pricing negotiations. In addition, in publishing these charges, operators may derive some comfort of fair and equitable access charging on the same line segment and in similar commodity markets.

Where negotiated (market-based) pricing is applied, the reference tariffs, if accessible, provide train operators with a degree of information about the likely charges. We note that the RIC reference charges have limited benefit, however—they are not published. ARTC publishes its reference tariffs, which it differentiates by different train types (defined by maximum train speed and axle load) for different line segments. Inevitably, the more that an infrastructure manager publishes access charging differentials (or 'modulations') for varying train configurations, the lower the train operator's uncertainty with the likely charges that will follow any negotiating process. ARTC comments that this is its objective in setting the reference charges:

> the process needs to be flexible to suit specific circumstances and [ARTC] is willing to tailor the process in consultation with the Applicant. However, ARTC also recognises that the industry seeks

> some certainty and provides this framework to satisfy that need. (ARTC 2001f, p. 5)

A second benefit of the tariffs, stressed by the QCA, is that such tariffs also reduce the transaction cost of negotiating access agreements. A third benefit of the tariffs is that, depending upon how they are established, they may provide greater transparency in price-setting (in a similar way to the cost-based posted prices). For instance, QR reference tariffs for coal traffic link tariffs explicitly to cost drivers; this provides a greater degree of transparency for access seekers in understanding access charge costing (QCA 2001b, Appendix 1, p. 5).

However, there are a number of concerns about reference tariffs, which we now consider.

(1) Price escalation

The infrastructure manager may apply significant increases in the charge when the train operator's service varies from the standard train operation underlying 'indicative' and other reference charges[88]. For instance, ARTC notes pricing for such non-standard trains will vary in accordance with the 'characteristics of the non-indicative service, commercial and logistical impacts on ARTC, and the cost of any additional capital requirements' (ARTC 2003, p. 2).

One issue is whether the basis for price escalation is unambiguous. For instance, QR is likely to vary its actual coal access charges from the reference tariff to reflect differences in capacity consumption. This difference is composed of two capacity elements. One capacity element is the actual transit time capacity used and the second element is the incremental capacity lost due to the interaction between the operating characteristics of the reference train and the non-reference train. The issues are whether that incremental capacity usage be unequivocally determined and valued and whether the reference train operating characteristics are a fair and efficient benchmark.

(2) Basis for price regulation

Some reference tariffs, particularly the ARTC tariffs, are rooted in market perceptions rather than in costs. Nonetheless, although these reference tariffs have a somewhat arbitrary base, they may be used for applying efficiency-based revenue regulation.

88 In the case of ARTC, it indicated that just under two-thirds of its access revenue is derived from services matching 'indicative' characteristics (ARTC 2001c, p. 15). These characteristics, which relate to 'high' tariff classed trains, include an axle load of 21 tonnes, a given maximum train length and a maximum and average train speed.

ARTC argues that its indicative charge is set to enable the train operator to provide services that are price competitive with road[89]. The ACCC received a number of submissions to its inquiry into the ARTC Draft Undertaking that objected to the ARTC's indicative charges because 'they bear no relation to cost' (ACCC 2001d, p. 25). Variance from the indicative charge would be based on factors such as technical features of the train and the perceived market value of the train path used (ACCC 2001d, p. 24). The efficiency-based regulation would then focus on an annual uplift of these 'market-based' indicative charges. As noted in the ACCC submissions, the implication of this approach is that there is a systematic (cost-based) underpinning to the charge.

(3) Price flexibility

In principle, train operators can use the reference tariffs to negotiate prices at more favourable terms. In the case of ARTC, however, the Undertaking requires that a consequent discount must be offered to other users that operate under the same general terms and conditions. This case shows that while reference tariffs provide greater certainty, the regime may be framed in a way that reduces the infrastructure manager's ability to vary prices. The ability to vary prices can be an important tool to the infrastructure manager, for instance, in providing incentives to train operators to commit themselves to long contracts, reducing the infrastructure manager's investment risk. (Note that, in this instance, for ARTC's access Undertaking, the limits on price differentiation (set out in Clause 4.3(b)) do not prevent different charges for different contract lengths.)

Another important area of price flexibility is in volume discounting. There is no indication that this has been adopted in any access agreement. Indeed, by the terms of the approved Undertaking, the ARTC Undertaking would appear to prohibit such terms. Affleck observes that:

> Above-rail operators would like normal commercial practice to apply [to access charges], in particular discounts for volume and growth. These 'loyalty' inducements are normal practice between above-rail operators and their freight forwarder and other customers. … For track access providers, however, there is little or no history from which to assess the value of such price discounts in promoting business growth and market-share growth. (Affleck 2002, p. 10)

Such volume discounts might be argued to be justified, in any case, by combinatorial pricing, where high-volume train operators contribute disproportionately to the access seeker being able to provide lower access charges (see footnote 74). While such flexibility might therefore be desirable from the access provider's perspective, one effect may be to reduce the competitiveness of services offered by small operators. A consequence could then be to undermine on-track competition.

89 'The pricing was considered such as to enable rail to be competitive in the interstate, intermodal transport market.' (ARTC 2001c, p. 15)

Priced versus administered capacity management

There are important price–capacity issues. In particular,

- are prices used if there is an excess demand for capacity?; and
- are prices varied to reflect the differences in path quality (train speed and train priority)?

Freebairn (1998, p. 286) has concluded that in most cases, Australian railway infrastructure is characterised by excess capacity. Nonetheless, excess demand exists at particular points in time and particular locations. What role do access charges play in allocating capacity? Are charges varied to encourage track usage away from peak freight demand times?

Path allocation processes

The process for assigning infrastructure capacity between train operators is critical for facilitating fair and equitable on-track competition. In general, access charges are *not* the main instrument used for allocating capacity:

- Passenger operators generally have priority in path allocation (notably, in the Sydney area, where there are limited paths available for freight);
- Incumbent operators tend to have 'grandfather rights' in allocation. The operator is expected to use the paths if those rights are to be kept; and
- Competing demands may, alternatively, be allocated on the basis of which operator first requested the path (as adopted by WestNet Rail) (WestNet Rail 2001a, p. 9)

Access charges generally exclude pricing the passenger trains to reflect the opportunity cost of the capacity priority given to those services[90]. In general, access charges can be used to ensure that priority access goes to the users that value it most. This may be passenger trains. However, the absence of appropriate 'priority charges' implies a hidden subsidy for passenger trains[91].

In principle, most capacity is allocated on historical use rather than prices. Patrick Rail has noted that 'New operators are left with train paths that do not meet their operational or commercial needs but still cost the same, or possibly more, than paths purchased by established operators' (Neville Committee,

90 The 'Super Premium' reference tariff levied on the Sydney–Melbourne XPT train on the ARTC-leased track between Melbourne and Albury is an exception to this pricing pattern. See, for instance, the charging process for CityRail and CountryLink in NSW, below (page 97).

91 A related issue is that a rail line used by passenger trains might be provided and maintained at a higher standard than would be the case if the line was used only by freight trains. Thus, unless these additional costs are incorporated within passenger train access charges, passenger trains would be cross-subsidised by freight users.

p. 91). There are some exceptions. For instance, ARTC has adopted an *income*-based allocation system: where there are competing demands for paths, the path will be allocated to the operator generating the greatest value (NPV) of revenue (and taking account of a range of cost and revenue factors, including the revenue risks of each operator). (This might result from a higher negotiated access charge or a higher level of traffic at any given time or over time.)

Auctioning

More generally, ARTC has advocated moving to price-based allocation using an auction system when a feasible system can be developed. The ACCC has warned that auctioning does not guarantee efficient outcomes (ACCC 2001b, p. 116). Selling paths to the highest bidder or those offering the highest revenue NPV may, for instance, work against new, small operators and thereby frustrate efforts to foster on-track competition. This is because, as the Productivity Commission has noted, 'Large incumbent operators with 'deep pockets' could dominate the market by outbidding smaller or new operators' (Productivity Commission 2000, p. 183). SCT has argued that auctioning favours larger companies and thus reduces competition (ACCC 2001b, p. 117). The ACCC disagrees, noting that a large company's outbidding can reflect the higher value that the company places on the path; this may reflect economies of scale. That is, there is no fault in the auctioning mechanism (ACCC 2001b, p. 117). A consequence may, however, be that on-rail competition will diminish. ACCC warns that the auctioning system may also lead to the infrastructure manager capturing scarcity rents where capacity is short; this could lead to monopoly rents to the extent the manager seeks to restrict capacity.

SCT has also argued that auctioning paths would increase a degree of uncertainty in train operation as to threaten their investment:

> …you'd be pretty hard pressed to build a $10 million terminal now with ARTC's threat to auction train paths. I mean, how do you know you're actually going to have, for example, in a year's time, the particular train paths that you are now offering to your customers? You don't know. If you're a financier, you're certainly not going to lend $10 million on that. (ACCC 2001d, p. 357–58)

The potential exists for some pricing of paths where secondary trading of paths is permitted. However, there is divergence between access regimes in the policy of secondary trading of paths should the access seeker find that it no longer needs the path. The ARTC regime will allow transfer of reserved paths (which seems appropriate, given the seeker incurs a relatively large 'flagfall' charge when the path is reserved) [92]. The Queensland regime will 'allow part or all of an Access Holder's Access Rights to be traded with other Access Holders or Access Seekers in a secondary market, provided QR is not financially

92 This represents around 33 per cent of ARTC's total access revenue (ACCC 2002, p. 109), ranging between 20–40 per cent of charges for freight and 45–60 per cent of charges for passenger services on average (ACCC 2002, p. xvi).

disadvantaged as a result of such trading' (QCA 2001b, p. 8). By contrast, the WA regime specifies that 'An Operator may not sell the rights to use a Train Path to another Operator' (WestNet Rail 2001a, p. 9).

Consequences of 'grandfather' rights

We noted that SCT is critical of the uncertainty generated by an auction system. The company does, however, recognise that there is varying value of train paths. In this context, the company is critical of the Victorian regime: 'The regime is flawed in that it has been drafted on the basis that all train paths, whether spare or not, are of equal quality' (SCT 2001a, p. 3). That is, some users are given a competitive edge over others by virtue of the path allocation process.

In considering capacity allocation systems, we should note that pricing mechanisms are most crucial where the demand for competing train services is greatest. However, where the potential for competing train services is greatest is also where the principles of non-priced capacity allocation between train operators are put to the test. By contrast, where traffic levels are low, pathing conflicts are unlikely to arise or can be readily resolved through negotiation.

Non-priced systems can perpetuate inefficient capacity allocation and inhibit competition. Incremental train path use is effectively set on the basis of spare paths available after 'grandfather rights' to paths have been allocated. However, capacity might be better utilised through restructuring paths. This can impact on competition, for instance because new train operators are likely to be allocated the least commercially-attractive train paths.

Capacity allocation with vertically-integration and asset-owners' rights

For the vertically-separated ARTC and RIC, who do not run their own commercial trains, train paths are allocated on the basis of unwritten grandfather rights of their customers. For integrated operations, however, there is the *additional* issue that the incumbent (the track manager) also has asset-owning rights.

The asset owner's *rights* of path usage (and, therefore, allocation) are different under an integrated structure. This has important implications for on-track competition and for contestability. SCT has observed, in the context of the Victorian regime, that the access provider can be 'forever holding those train paths that give it a competitive advantage' (SCT 2001a, p. 3). The Department of Infrastructure (Victoria) has, however, interpreted the national access regime to concern only 'the allocation of genuinely *spare* capacity'. Further, the Department notes that Clause 6(4)(i)(i) of the Competition Principles Agreement states that 'the owner's legitimate interests and investments in the facility must

be taken into account' (Department of Infrastructure 2001a, p. 29). (It is not clear whether long-term leasing of track or land affects the 'legitimate interests'.) There is a clear conflict of objectives and principles in this context: the need to protect the integrated owner's property rights (and, thus, incentives to invest and, indeed, incentive to be an integrated operator rather than also be a third-party operator) against the objective of achieving fair, on-track competition. If the integrated operator has first claim on train paths, it follows that third-party access arrangements cannot guarantee fair and equitable competition.

While it is important to protect the owner's rights, there is still cause for concern with capacity management under an integrated operation because of how it may impact on on-track competition. In relation to the integrated Freight Australia operation, Pacific National has argued 'the most critical area of ring fencing requirements are in relation to time path management. This is a critical issue as it presents significant scope for self-preferment' (Pacific National 2002). That is, the company raises the issue of whether ring-fencing is needed to ensure transparent and equitable treatment. We should observe again, nonetheless, that there is a policy tension here between protecting the rights of the integrated operator to use its capacity and ensuring the integrated operator does not apply spoiling techniques to prevent use of the 'spare' capacity. Earlier (page 67) we noted this policy tension in the context of terminal capacity (such as ARG's in Adelaide) and the extent to which the owner's efficiency may be undermined in accommodating third-party operators.

The integrated operator's property rights may also create an important impediment to bringing competition and contestability into the haulage contract business. In these contracts, a train operator bids for exclusive rights to haul a bulk-goods producer's traffic. One example of problems with the 'spare capacity' issue has been given by Freight Australia. The company argues that the WA regime is deficient because a non-incumbent haulage bidder lacks the certainty of access when bidding for a haulage contract that is currently run by the integrated train operator. At the time that the non-incumbent bids to win a haulage contract, the train paths are *not* spare. Nonetheless, the integrated operator's train paths will almost inevitably become 'spare' to the incumbent if the non-incumbent wins the exclusive haulage contract. However, this apparent uncertainty means that the shipper potentially puts its business at risk unless there is certainty that the non-incumbent will take the paths from the incumbent (Freight Australia 2001a, p. 2). Thus, this can undermine market contestability.

The entrenched path allocation can work against on-track competition in other ways. An example is provided by Alcoa, which seeks reviews of scheduled train paths (in the integrated operation in the WA regime) when a line approaches capacity (Alcoa 2001, p. 8). Restructuring of path allocation can reduce capacity utilisation by juggling train schedules to align train speeds and passing points. We note that inefficient utilisation of capacity can, however, be in the interests of the incumbent operator to frustrate efforts by new operators in accessing the network. More generally, we note that the absence of systematic capacity

reviews can frustrate on-track competition: it can lead to the incumbent retaining the most valuable paths (without paying for the implicitly higher commercial value that is attached those paths).

In a related case, the Queensland Competition Authority (QCA) has noted that the incumbent's use of the track sets a track usage profile that is a 'potential barrier to entry' (QCA 2001b, Appendix 1, p. 4). For instance, high capacity utilisation can be achieved where trains follow other trains at similar speeds but if a new train operator introduced a train with different speed characteristics, that train uses up a disproportionate amount of the spare track capacity due to the conflicting train types. An access charge based on the use of a *new* operator's incremental capacity usage would then be relatively greater than that charged to the incumbent operator. In the light of the objective of on-track competition, however, the QCA does not believe that the new operator should bear such conflict-related capacity costs:

> the QCA is of the view that any conflict-related capacity costs should not be borne by new entrants, at least in the early stages of the development of the competitive above-rail market. Such costs are considered to be those incurred in the pursuit of competition. (QCA 2001b, Appendix 1, p. 5)

The QCA concludes, therefore, that the competition benefits exceed the capacity loss. This issue is yet to be considered by other regimes.

In summary, then, the Australian regimes face ongoing issues related to capacity allocation—notably, incumbent path allocation and protecting integrated operators' property rights. In addition, if access charges incorporate a component that reflects capacity usage, it is unclear just how that usage should be assessed.

Path supply and usage compliance incentives

We have noted above (p. 19) that separate ownership of tracks and trains alters the incentive structure of the industry players. This can affect how infrastructure is provided and used. Thus, to what extent do Australian rail access systems set prices that vary in response to deficiencies in the supply of rail infrastructure and in the use of that infrastructure 'on the day'? It is not clear that Australian reforms have adequate mechanisms to compensate for the impact on incentives that arise from those changes.

Some Australian access pricing systems do not, for instance, include 'real time' pricing mechanisms that either penalise train operators for train delays they generate or penalise infrastructure managers for any train delays caused by faults in the infrastructure. On real-time pathing, the WA Government Railways Commission calls for WestNet Rail to accept all cost over-runs in operating its passenger trains that result from delays caused by WestNet Rail (WAGRC 2002). Similarly, NECG (on behalf of Toll-Patrick) suggests a reduction of the ARTC flagfall in the event that the proportion of on-time trains falls below a

benchmark (NECG 2002, p. 17); such an approach would obviously need to account for operator-originating train delays.

A related issue to real-time variance in charges arises when train operating parameters are varied without compensating variation in access charges. One train operator, Silverton Rail, illustrated this point, noting that it had agreed '… a five-year contract with a customer based on six to seven hours' transit time and then the RIC placed speed restrictions of 20 km/h on the track, lifting transit times by several hours' (Lloyds List 2001b). Patrick Rail also noted that 'we don't get a discount in the rate for the sub-standard path' (ACCC 2001, p. 32). Austrac also made a call for access charges that reflect the actual standard of the infrastructure supplied: if the standard of infrastructure falls, the access charge would similarly fall. The company notes the direct impact on its own competitiveness and productivity of being forced to run trains at low speeds due to poor track standards (Austrac 2001). Train delays resulting from the infrastructure manager's actions typically result from a failure to maintain infrastructure or, for instance, scheduling maintenance work when it costs least to undertake rather than when it minimises train operator disruption[93].

One price-setting mechanism that can re-introduce infrastructure–operating incentives, is performance regimes. The approach rewards and penalising for delays caused by the manager or train operator. This approach is not generally adopted in Australia[94]. We note, in any case, that the monitoring and apportioning of blame and expenses between the parties may be administratively costly; these costs are likely to rise disproportionately with traffic as the matrix of track provider and users increases. (See, in particular, the British (Railtrack) scheme, page 141.)

In a similar way, the Australian pricing systems generally lack a degree of 'real time' costs of track usage, such as where vehicles with wheel defects are used on the track, inflicting more than the assumed wear-and-tear. While such costs to the train operator can be considerable, there can also be very large incremental infrastructure costs. (Exceeding the assumed axle load can also cause disproportionate wear-and-tear costs; the ARTC Undertaking includes penalty payments for exceeding the axle load (ACCC 2002, p. 199).) On-track monitoring devices (as installed by ARTC[95]) may be used to detect defective vehicles and overloaded vehicles. The withdrawal from service of a train that has defective wheel sets or the setting of a schedule of damage restitution for

93 A more significant example in March 2003 is the issue of compensation or access charge discounts arising from re-routing of Sydney–Melbourne traffic via Illawarra and Parkes (instead of the direct route via Campbelltown), due to the Menangle Bridge closure.

94 The issue is, however, being examined. For instance, QR intends to establish a Key Performance Indicators-based regime for its central Queensland coal services.

95 ARTC has introduced Wheel Impact Load Detectors and a Rail Bearing Acoustic Monitor.

identified wheel defects may provide incentives for operators to supply compliant vehicles.

In summary, then, pricing in the Australian regimes may not fully tackle the change in the incentives in supply and usage that arises from the separation of ownership of infrastructure from train operation.

Regulation

While the train operating environment may be made competitive, the infrastructure segment of the railway industry remains dominated by the monopoly infrastructure manager. Consequently, the setting of access charges may be regulated. This may occur in two ways. First, the access charges may be reviewed to ensure that the charge lies within a given price band: this seeks to reduce the extent to which cross-subsidisation of train operations occurs and excess (monopoly) pricing. We considered the regulation of (diverse) pricing floor-ceiling bands earlier (page 73). Secondly, price revisions may be regulated to put pressure on the manager to seek out productive efficiency gains. Price-capping, through 'CPI-x' single-till revenue regulation, can be used to encourage infrastructure managers to improve their efficiency relative to a world benchmark perception of what productivity gains are achievable.

In principle, competitive forces can be introduced to infrastructure provision by setting competitive bidding for contracts to undertake specific areas of work. Consider, first, the two vertically-separated managers. ARTC outsources its track maintenance (ACCC 2002, p. 109); the competition for such contracts is assumed to generate the necessary incentives for productive efficiency of the activity. ARTC's outsourcing contrasts with RIC, where the corporation's maintenance and renewal activities remain essentially in-house (Productivity Commission 2000, p. 136). In the case of RIC, then, there is less evidence of efforts to reduce costs. Further, there is the issue of the extent to which efficiency regulation is required in price-setting. The two infrastructure providers can also be contrasted in the nature of their freight traffic: RIC's is largely bulk freight while ARTC's is essentially non-bulk. In *principle,* RIC's customers' markets seem to be less price-sensitive (though this may not be true of RIC's customers' customers, e.g., the coal and grain producers). As a result, RIC may not see the direct consequence of its own inefficiencies. As we noted in Table 1 (page 10), this has implications for the extent to which performance-based regulation is required. By contrast, ARTC has argued that it has the incentive to be efficient on the basis that its customers' traffic is essentially non-bulk traffic. The Corporation argues that such interstate, non-bulk customers are highly price-sensitive so, to retain custom, it is required to undertake its own activities in the most efficient manner.

There is validity in the principle that ARTC has less opportunity to pass on its inefficiencies where there is strong intermodal competition in the freight movements: passing on inefficiencies can mean that the train operators lose

custom that translates to ARTC losing custom. ARTC may nonetheless have commercial leverage where operators have committed significant 'sunk' investment in infrastructure related to the rail network. With this leverage, ARTC may thus have muted incentives to improve efficiencies rather than pass on costs. ARTC's argument also breaks down if freight traffic is relatively insensitive to freight rates, such as with bulk freight (as with Broken Hill–Port Pirie ores), for which road movement may be neither a practical nor permissible alternative. It cannot be presumed that ARTC will not have more customers like this in the future. For instance, ARTC may acquire control of Hunter Valley coal lines; it may also have new bulk goods customers such as Aulron (operating from north of Tarcoola, through to Pt Augusta, over ARTC track). Therefore, in the longer-term there is a case for using CPI-x regulation to encourage efficiency. Consequently, ACCC has accepted ARTC's undertaking that its indicative access *charges*[96] will be capped using a CPI-x price cap and where 'x' is a positive number; the ACCC accepts that this cap can stimulate the firm's efficiency:

> Because prices are not linked to actual costs over the duration of the price cap, the business can increase profits by reducing the costs of providing its services (ACCC 2002, p. 134).

This same regulatory process is to be applied to setting access charges of the private, vertically-integrated operations in Victoria and Western Australia. We argue, however, that there is a greater risk that the regulation will worsen overall efficiency, notably, efficiency in provision. Third-party access charges will be based on the efficient costs of operating a rail network with modern equivalent assets. The reason for regulating charges for the Victorian and WA operators is that the freight traffic is, as with RIC, essentially bulk goods, which does not face strong competition from road. (In the case of some freight movements (such as grain), over relatively short distances, this is not necessarily true.) This means that there can be reduced commercial pressure to drive costs down[97]. The issue is, however, whether CPI-x efficiency incentives can be applied to an *integrated* operation and still bring about an allocatively-efficient solution as well as a productively-efficient outcome. While the risk of regulatory failure—setting the wrong benchmark of efficiency—is the same under integrated and separated models, we argue that the consequences of regulatory failure are higher under integration.

The integrated operator may adopt a less efficient short-term approach to productive efficiency so as to balance investment in higher productive activities against the uncertainty of the long-term use of its infrastructure. Where the regulator perceives infrastructure provision to be inefficient, however, it can

96 Note that it is the actual indicative *charges* that are being capped here; this contrasts with *revenue* capping, as applied to Britain's Railtrack/Network Rail. See page 127.

97 Again, note that some activities have been outsourced, e.g., WestNet Rail has contracted track maintenance to John Holland.

reduce the infrastructure manager's access charge. In this case, it may be that the integrated operator is a more efficient above-rail operator. The consequence of the regulation, however, is that its effective access charge to its own train operator will be higher than the charge set for the third-party access seeker. Should this occur, the mandated access might have the effect of allowing the less efficient operator to capture the traffic.

The efficiency regulation is, therefore, an additional aspect of access price-setting. There is no consistent regulatory model adopted in Australia, with some managers facing this regulation and others not. Despite the development of access reform and of the formal access regimes over a number of years, however, the application of arbitration based on assessments of efficiency are yet to be tested. This conclusion also applies to the other aspects of price-setting; the negotiate–arbitrate model, the systems of capacity management and real time pathing and costing.

COST RECOVERY

The separation of infrastructure provision activities from train operations provides greater insights into the economics of railways. A major issue with rail access pricing in Australia is that in general most infrastructure managers' current access charges are unlikely to generate sufficient cost recovery for long-term financial viability. Consequently, a critical parameter is how the infrastructure costs are allocated between the train operators (through access charges) and the infrastructure managers (and public funding (?)). We concur with the Productivity Commission view that access prices should

> generate revenue across a facility's regulated services as a whole that is at least sufficient to meet the efficient long-run costs of providing access to these services, including a return on investment commensurate with the risks involved (Productivity Commission 2001, p. 204).

Cost recovery level

Achieving cost recovery has been a major issue for Australian public (common-carrier) railways. Most of Australia's railways have been owned by the public sector since their construction. The operations have generally lost money and in recent years, under corporatisation, have received considerable government remuneration for providing non-commercial train services and infrastructure. For instance, Community Service Obligation (CSO) payments[98] for below-rail and above-rail operations totalled over $1.1 billion in NSW in 1997–98, $380 million in Victoria, $546 million in Queensland and $100 million in WA (Productivity Commission 2000, p. 263). Most of this government support has underpinned the passenger train operations. In some cases, the

98 These payments are also known as Transport Services Contracts—such as in Queensland.

remuneration is routed by funding train operations (such as with government-subsidised State Rail Authority payment of 'commercial' access charges to RIC). In other cases, the access charges paid by train operators are insufficient to fully recover its economic costs and the remuneration is routed by funding the infrastructure manager.

In recent years much of the Australian rail industry has been privatised as well as subject to mandated access. State and Commonwealth freight train operations, including integrated operations, have (QR apart) been privatised. Can private sector management generate the cost savings and revenue gains that free the industry from the need for State aid? There are signs that productive efficiencies are being achieved through privatisation; the industry is generating operating profits in the short-term. For instance, we note the following financial results:

- Tasrail was sold to ATN in 1997. In 1999/00 Tasrail made its first-ever profit (Parliament of NSW, p. 24);
- V/Line Freight was sold to RailAmerica in 1999. From an earnings loss of $2 million (before interest, tax, depreciation and amortisation) in 1998–99, the company recorded earnings gain of over $34 million in the following year (Parliament of NSW, pp. 23–24);
- Intrastate operations in SA broke even in 1996/97; they were sold to the ARG in 1997 and currently record profits (Parliament of NSW, p. 25; Genesee & Wyoming 2002);
- ARG also took over Westrail, in 2000. In 2001, the Group operations (WA *and* SA) earned US$16.9 million;
- Of the vertically-separated managers, we note that ARTC recorded a profit of $20 million in 2000/01. We note from the ACCC assessment, however, that this is a return that is below full cost recovery (ACCC 2001b, p. x) and that 'ARTC's returns appear to be well below the full economic cost of providing services' (ACCC 2002, p. xvii). ARTC concludes that it is not in a position to price at levels that recover the full economic costs of its assets (ARTC 2002a, p. 5). One study of the ARTC business suggests that (using a DORC asset valuation) its return on assets was 0.92 per cent in the 2000/01 financial year. The return varied widely by interstate route, ranging from 3.8 per cent on the Adelaide–Melbourne route to a negative return of 2.1 per cent on the Crystal Brook–Broken Hill route (NECG 2002, p. 19). (Note that the level of the return is highly dependent on the underlying asset valuation assumed; NECG estimate a return of 6.7 per cent on the *book* value of the assets.)

We also note that access revenue from non-urban, generally government-supported passenger train operations can be an important part of a privatised operator's revenue. For instance, track access charges received from V/Line Passenger in 2002 represented 15 per cent of Freight Australia's transport revenue (RailAmerica 2003, p. 10).

There is, however, insufficient information from these results to deduce whether these financial returns are sufficient to ensure long-term viability. One important aspect about railway infrastructure is that they:

> … can continue to carry substantial volumes of freight in spite of a long period of underinvestment. The decline in the capital stock takes years to become obvious in the productivity and capacity of the railroad. (The Conference Board of Canada, p. 3)

In this context, the ACCC expresses 'concerns regarding the sustainability of the [ARTC] Network infrastructure. If ARTC is not able to generate sufficient cash flow to replace assets as becomes necessary, the longer-term viability of the industry is compromised' (ACCC 2002, p. 123). In the case of some integrated operations, the farming sector represents a significant portion of the freight traffic so, in particular, adverse weather conditions could affect the viability of the operations. For instance, ARG's grain operations in WA and SA represent around 27 per cent of its operating revenue (Genesee & Wyoming 2002a, p. 13) and agricultural products formed 40 per cent of Freight Australia's revenue in 2002 (RailAmerica 2003, p. 11). We should also note that most of these financial data we have at hand exclude the impact of mandated access, which may weaken the infrastructure manager's incentives to invest. Given the Australian freight market, is it possible to set access charges that maintain both train operator and infrastructure manager viability?

Pricing above marginal cost

The access charges form a major component of train operators' operating costs, so access charges have a significant impact on the competitiveness (and thus viability) of the business. One Australian operator has estimated that its ARTC access charges are around 33 per cent of its operating costs (SCT 1998)[99]. ARTC estimates that its interstate freight operators' access charges average about 15–20 per cent of the operator's costs. Another operator estimated its RIC access charges at 13 per cent; this relatively low level[100] probably reflects the poor freight market for the operator and the poor condition of the track used (Austrac 2001). Hitherto, in the absence of regulation, open access infrastructure managers have set market-based access charges, that is, charges that enable train operators to set shipper tariffs that are competitive with road. Note that, in the context of ARTC, Toll/Patrick

99 We acknowledge that the share of access charges is highly dependent on which costs are included: for instance, if terminal operating costs are excluded, the access charge inevitably becomes a dominant charge of what are then line haul costs. Thus, other things being equal, given access charges will represent a higher proportion of the costs of a terminal-to-terminal operation than for a logistics company's door-to-door costs.

100 Compare this proportion with some overseas estimates—see page 159.

dispute just what that 'market-based' charge should be, calling for lower annual changes in the charge so as to maintain intermodal competitiveness (NECG 2002, pp. 23–24). In this context, ACCC concludes that a significant proportion of ARTC's traffic (that is, interstate, non-bulk) is relatively price elastic (ACCC 2001b, p. 97). ARTC argues that it sets charges that encourage volume growth on the track that can then lead to lower, per-unit charges, fostering train competitiveness. It warns, however, that its 'long-term viability (replacement) of the network is likely to only be achievable on a commercial basis through significant growth in rail volumes' (ARTC 2001, p. 26).

The establishment of access prices reflecting road competitiveness can lead to shipper tariffs that are considerably lower than tariffs for road shipments. This may need to be undertaken to offset train service deficiencies (such as longer rail journey times, lower reliability and absence of door-to-door service). On this point, the ACCC has noted (with reference to ARTC) that

> …historically, prices for rail track services have not be[en] determined with reference to costs but are essentially market based; ie reflective of prevailing demand. Recent increases in rail volumes and rail's share of the freight transport market on the east-west corridor are consistent with this view. (ACCC 2001b, p. 102)

In setting the level of cost recovery, we recognise the importance of prevailing market conditions. We also stress the role of rail traffic volume in setting the overall level of access charges. Some regimes (such as the WA and ARTC regimes) set some charges for an operator in relation to the total level of actual or forecast traffic[101]. Thus, if rail traffic increases, the train operator may face a lower access charge. In this way, the greater volumes of rail freight act to improve the competitiveness of all train operations. It is in this context that ARTC's current access charges do not necessarily achieve full economic cost recovery. However, in setting highly competitive charges, ARTC seek to attract further rail traffic, facilitating low access charges and which will ultimately generate more access revenue.

The ACCC's assessment is that ARTC 'is not expected to achieve full recovery of economic cost in the short to medium-term' (ACCC 2001b, p iii). This issue draws attention to how the balance is set between the costs recovered through access charges and the costs underpinned by the taxpayer.

ARTC's corporate strategy involves two important strands. First, the Corporation is currently setting access charges to generate revenue which, in total, is below the full economic costs of the line segment. Secondly, ARTC's strategy is to invest in specific network enhancements (such as lengthening

101 For instance, in the case of the WA and SA regimes, the ceiling price is set with reference to the full economic cost of the infrastructure, net of revenue from other sources. Similarly, the ARTC ceiling prices takes account of the level of revenue from other traffics. These are 'combinatorial' price settings: the total revenue from all operators cannot exceed the full economic costs.

passing loops that provide train operators with the opportunity to make productivity gains and, hence, reduce the effective unit cost of track usage. ARTC therefore assumes that, over time, these pricing and investment strategies will bring about an 'elastic' response. That is, lowering real access charges will reduce ARTC's access revenue and there will be additional investment costs. However, the corporate strategy is based on ARTC's lower unit revenue and higher costs being more than offset by the additional revenue arising from traffic attracted to rail due to the lower unit costs. That is, with price-elastic demand, a 'low' effective access charge would bring traffic growth which would then (in the longer-term) enable ARTC to set a (consistently low) combinatorial access charge that nonetheless achieved full cost recovery.

Ramsey pricing

The adoption or rejection of Ramsey pricing may be a critical issue for access pricing in Australia. For instance, the ACCC has concluded that Ramsey pricing is desirable because it could assist ARTC's cost recovery and also assist market entry (and, hence, above-rail competition, by offering low fixed—entry—charges). The ACCC voices its concern about the viability of the industry due to the inability (or at least the inability of ARTC) to recover its economic costs:

> … in circumstances where ARTC is constrained by market forces to pricing below the levels necessary to recover the full economic cost of providing services, the Commission has concerns regarding the sustainability of the network infrastructure. If ARTC is not able to generate sufficient cash flow to replace assets as becomes necessary, the longer term viability of the industry is compromised. The Commission notes that in these circumstances, *a degree of price discrimination, even between different users operating the same type of service*, may be a desirable practice [emphasis added]. (ACCC 2001b, p. 103)

Although there is nothing in the ARTC regime that prohibits price differentiation, ARTC has undertaken *not* to price-discriminate amongst train operators providing like-services in the same end market: 'like' charges will be set for 'like' services (Clause 4.3 of the Undertaking). What defines 'like' services is, however, a matter that retains the potential for ARTC to exercise latitude in pricing[102]. Thus, although variance will not be in 'regard to' the identity or characteristics of the operator, 'in formulating its Charges, ARTC will have regard to a range of factors which impact on its business' (ARTC 2002, Undertaking Clause 4.2, p. 17). These factors include the term of the access agreement, the credit risk of the business and the potential for growth of the business.

'Unlike' services provides the basis for Ramsey pricing across goods markets (such as disproportionately higher charges for express freight relative to low-speed freight) but it may prevent Ramsey pricing across customers, such as small, new operators *unless the customer is perceived to be providing an 'unlike'*

102 Clause 4.3 (b) of the Undertaking reserves ARTC the right to determine whether services are alike.

service. Thus, under the ARTC approach, if a new entrant was given favourable access terms within a market, incumbent operators would be entitled to negotiate similar terms. This may undermine the infrastructure manager's cost recovery although we need to recognise that a new operator *might*, in the long-run, generate more access revenue than would be lost through suppressing *all* access charges.

In the RIC system in NSW, access charges generally do not achieve long-run economic cost recovery. An exception is coal movements, which covers around 6 per cent of the NSW route kilometres and for which DORC asset valuation is used[103]. For the remaining route kilometres (94 per cent) of the system, a zero asset valuation applies. RIC has adopted Ramsey pricing across [FreightCorp's] coal customers though two coal customers in the same geographical area might expect to face similar charges (Productivity Commission 1997, p. 127)[104]. The NSW Minerals Council objects to such pricing because of its impracticality rather than its theoretical soundness (NCC 1999, p. 13). The Council argues that predictions of elasticities are 'never accurate' and that pricing based on fully-distributed costs would incur less efficiency loss than those resulting from inaccurate Ramsey prices (NCC 1999, p. 15).

A major user of RIC's train paths is the NSW Government-owned State Rail Authority, which runs passenger services under the 'CityRail' and 'CountryLink' brands. IPART notes that, in 1997/98, 21 per cent of RIC's total revenue came in the form of a CSO payment[105]. At the same time, 60 per cent of RIC's access revenue came from State Rail. Given the Ramsey pricing basis for RIC's access charges, it is significant to note that the access charge level for State Rail 'was brokered by Government (NSW Treasury) and set at a level which was forecast to allow RAC [predecessor to RIC] to 'breakeven' on a cash basis.' (IPART 1999, p. 73)

In the case of integrated operations, there is limited Ramsey pricing. Ramsey pricing is undertaken across goods markets in government-owned Queensland Rail: price differentiation would be permitted across geographic areas—within a geographic area, prices should only vary on cost or risk bases or a change in market circumstance (QCA 2001c, p. 125). Although data are not available, it is likely that, apart from coal and mineral lines, the access charges are unlikely to achieve full economic costs. Of the privately-operated, integrated,

103 These Hunter Valley coal line assets were subsequently valued. See IPART 2001.

104 Where a mine is a relatively long distance from the export port, RIC might have set lower access charging rates (relative to shorter coal movements) that enabled FreightCorp to service the mine while 'maintain[ing] the overall profitability of the mine' (Productivity Commission 1997, p. 126). On the issue of whether there is consistent access charges *within* a geographical area, see *Ibid.*, p. 128.

105 The proportion of CSO payments was also 21 per cent in 2001/02—see RIC 2002, p. 25.

operations, WestNet Rail sets 'market-based' access charges and, as such, the costs of provision are only one factor determining the charge (WestNet Rail 2001, p. 2). This integrated operation, together with those in SA/NT, Victoria and Tasmania, arose from the acquisition of government facilities in the late 1990s. Only in the longer term is it likely that we can judge whether these operations are making sufficient tariff and access revenue to cover their economic costs.

Amongst these integrated operations, which form the bulk of Australian company structures, there is, however, little opportunity to undertake price discrimination. This represents, again, a conflict between objectives of competition and cost recovery. While Ramsey pricing is desirable for vertically-separated infrastructure managers such as ARTC and RIC, there are difficulties in applying this to integrated operations. The issue is one of transparency and fair and equitable treatment of train operators. If Ramsey pricing is permitted, an integrated infrastructure manager can offer preferential terms and charges to its own train operator. This is a major difference between third-party and open access regulation. Under integrated management it is not possible to use price discrimination across access seekers *within the same market* while still maintaining that there is transparency and equity of treatment of an integrated firm's train operations and that of a third-party operation. We might even query price discrimination across goods markets given the possibility that higher mark-ups are set in markets in which the integrated operator is not involved. The implications of this for policy is that, if rail viability is a predominant concern and there is sufficient downstream freight traffic to warrant the subsequent transaction costs, vertical separation may be a prerequisite condition for permitting Ramsey pricing. Conversely, we have noted the Productivity Commission view that integration is to be preferred over separation when there are low traffic densities (page 9).

Two-part pricing

Access charging mechanisms can achieve high cost recovery; some approaches are less allocatively inefficient than others. A two-part pricing structure (with or without Ramsey pricing levels) can be relatively efficient. The debate over the different pricing approaches has yet to be concluded. The ACCC notes that it:

> has previously encouraged the use of two-part tariffs in undertakings. Two-part tariffs may have the advantage of allowing an asset owner a reasonable rate of return on investment without constraining capacity in an undesirable way. By allowing for short-run marginal cost pricing, it can provide an approach to recovering common costs while minimising allocative efficiency losses. (ACCC 2001b, p. 108)

There are, however, some concerns about the two-part pricing structure:

- can the structure exclude small/marginal operations?;

- is the fixed/variable structure/split consistent with train operator economics?; and
- is the charging structure consistent with the efficient use and provision of infrastructure?

We consider, first, allocative efficiency issue—whether the system excludes marginal operations. Two-part pricing can be allocatively inefficient and hamper on-track competition. The ACCC warns that, in two-part pricing, there is 'the potential for a uniform up-front fee [fixed charge] to exclude some users from access despite such users being prepared to pay an access price above marginal cost' (ACCC 2001b, p. 108). The consequence of ARTC's fixed (flagfall) charge, for instance, may be that there will be fewer operators, running longer trains than may be socially optimal[106]. This flagfall represents around 20–40 per cent of the total access charge and is therefore a significant part of the total charge[107]. ARTC intends the flagfall–variable mix to encourage existing users with a flagfall that is sufficiently high to operate longer trains but sufficiently low that it still encourages new entrants. The ACCC notes that to encourage new entrants and smaller operators, ARTC may, in fact, have incentives to vary its charges across users, that is to undertake Ramsey pricing (ACCC 2001, pp. 108–09).

The further issues the two-part prices is their ability to generate productive efficiencies for in both infrastructure use and train operation. Thus, ACCC notes that ARTC's incentives to promote efficient infrastructure use are 'embedded in equitable two part pricing… [providing] a level playing field for above rail competition, encouraging maximum path utilisation to minimise the cost of access (ACCC 2002, p. 132). However, while the charging structure (*or* the relative fixed–variable charge split) therefore encourages optimum track use, it *may* work against the economics of some *train* operations. Different train operations can have different trade-offs between train frequency and train length; the variance can reflect factors such as terminal economies and train (commodity) weights, which can set practical (maximum) limits to train length. Further, to meet the needs of some commodities, freight customers may prefer 'short' trains, with frequent delivery times, to irregular 'long' trains.

Thus, train operators' 'optimal' train length can be determined by technical, efficiency and market factors and this can influence the fixed–variable split in two-part charges. For instance, the NSW Minerals Council 'in principle supports two-part tariffs' but for its Hunter Valley coal movements it has concluded that

106 This can have investment implications, also, and we should note that the ARTC Audit incorporates extensive funding for lengthening passing loops to accommodate longer trains.

107 We should note, in any case, that although the ACCC sees merit in two-part tariffs because the variable component of the tariff can correspond to the short-run marginal cost (and thus minimise allocative efficiency losses), the ARTC variable component does not correspond to short-run marginal cost.

'maximising train lengths may not result in the most efficient utilisation of the Hunter rail network'. The Council argues that a two-part tariff needs to be 'consistent with the capacity characteristics' of the network (NSW Minerals Council 2002, p. 7). In their submission to the ACCC inquiry into the ARTC Draft Undertaking, FreightCorp/Toll's (FCT) questioned whether the weight placed on the flagfall component was correct, arguing that:

> To some extent train operators already have incentives to operate longer trains as the crew cost per tonne of freight carried is reduced with longer trains. There are practical reasons for not wishing to make the incentive to run longer trains too strong. Operators sacrifice the flexibility to accommodate casual or variable freight movements when they are constrained to run long trains. This loss of flexibility may make it impractical to accommodate on rail some freight flows which would otherwise be winnable. Additionally, long trains impose additional terminal costs, as longer marshalling tracks and a greater degree of train splitting and rejoining is required to run long trains. Ultimately these terminal costs and terminal size constraints will determine maximum train lengths, irrespective of access price signals. In the view of Toll and Freight Corp, the current weighting on the flagfall in ARTC's reference tariffs is too heavy.' (FreightCorp & Toll 2001, p. 26)

A consequence of ARTC's structure is that, if it is practicable and efficient to do so, train operators will seek to operate 'long' trains. An important element of the long-train incentive (that arises from the fixed—that is, per-train—charge) is that the charge complements other infrastructure parameters. Not only can the long train facilitate train operator economics; it can also facilitate efficiency in infrastructure use. For instance, running few, long, trains can be a more efficient use of the limited capacity that arises from single-tracked infrastructure with low technology signalling and communication systems. Put another way, running more, shorter, trains would create more interactions between trains and lead to signalling that would improve track capacity utilisation. However, the long train incentive comes with its own demands on the infrastructure: on single track, train lengths are constrained by the length of passing loops. Thus, in setting charges that can reinforce (some) operators' economics for running long trains, it leads to pressure to invest in lengthening passing loops. It is apparent, then, that the charging structure plays an important part in the economics (and, thus, cost recovery) of train operators and infrastructure managers alike[108].

WHAT HAS BEEN ACHIEVED?

Reforms in rail access in Australia are still in their infancy. For instance, it was only in 2001 that the Victorian and WA regimes commenced. By mid-2002, only the AustralAsia Railway, QR and ARTC regimes had been approved. Nonetheless, since the adoption of mandated access policy in the mid-1990s,

108 As was identified in footnote 59, there is, in any case, a need for a detailed assessment of axle load economics.

much work has been undertaken to develop formal regimes. We should also note that third-party access (and, with it, competition) has been in existence since the mid-1990s (with National Rail trains running over the interstate network and subsequently with SCT running competing trains over what is now ARTC track and WestNet Rail track). What conclusions can be drawn about efficiency objectives in competition in train operations, train coordination and in cost recovery?

As we noted in Chapter 1, the competition objective needs to be measured by more than simply the number of competing train services. Indeed, competition can be in the form of competing train services or in the form of competition for haulage contracts. Much of Australia's non-interstate rail traffic is in bulk freight, so we might expect the *principal* form of competition will be for haulage contracts. (Single-customer bulk goods are usually more efficiently carried by a single operator than by multiple operators[109].) Nonetheless, there can be competing bulk freight movements, such as in southern NSW, where bulk export freight can be moved to different ports—and by different operators. This is a characteristic of much of grain freight movements.

However, whether the competition has arisen from competing services, or from competition for haulage contracts, there is evidence of tariff reductions to freight customers. Of course, to the extent there is a question over the long-term viability of much of the rail network, the need to raise returns on infrastructure investment may mean that tariff reductions cannot be sustained. The Australian Wheat Board has reported that *competition* from two additional operators in this region has led to freight cost savings of $4 a tonne (Productivity Commission 2001, p. 49). The NSW Minerals Council and Rio Tinto have said that *access regulation* has brought about lower freight rates for Hunter Valley coal exporters (Productivity Commission 2001a, p. 53). The ability of the freight forwarder to choose their own train service provider has also been shown to generate benefits. For example, SCT reported in 1997 that competition for its 'hook-and-pull' contracts (to haul its Melbourne–Perth trains) had reduced charges for that service as well as improving reliability and transit times (NCC 1997, p. 19).

Freight forwarders can introduce competition for haulage contracts for their (principally interstate) non-bulk freight[110]. The efficacy of the rail reforms should then be seen in the ability and fairness of bidding processes for contracts:

109 That is, it will be more efficient for a single mine to be serviced by a single train operator. However, this efficiency is not as evident where there are multi-customer bases, goods origins and multiple port destinations, as in bulk grain produce. That is, there is the potential for multi-operator bulk movements in grain traffic, as found with competing Freight Australia and Pacific National services in southern NSW.

110 QRX is a major rail freight user on Queensland's narrow-gauge (intrastate) system. QRX is a rail division of Toll–North (formerly known as Carpentaria Transport).

the *contestability* of the haulage contract market. For these forwarders and logistics firms (Toll, Patrick and SCT) lies the evidence that in the recent past the existence of alternative train operator and rolling stock markets (with some existing terminal facilities) point to barriers to entry being low in some circumstances. However, we have noted concerns about the ability of train operators to bid for bulk freight contracts under integrated infrastructure as the required train paths are not technically free until the incumbent loses the haulage contract. The third-party also requires an fair and equitable access charge from the competing incumbent bidder.

Apart from these freight forwarders, we might expect to find multiple service providers in interstate, non-bulk, freight. However, the presence of strong economies of density in train operation—and some terminal, rail gauge and rolling stock barriers to entry—may mean that the long-run market structure, with *limited* prevailing freight corridor traffic, may result in, at most, only a few service providers. (Expectations of strong, competing services should not be great, given that, with many times Australia's freight volumes, Canada and USA each still have only two transcontinental operators[111].) We note, in any case, that such an outcome would still face competition from other modes—which limits the potential access reform benefits. Finally, if barriers to entry are not prohibitive, the market should be a contestable rail market.

Thus far, there has been limited development of competing train services. One rare example of where such a competing service has commenced is the ARG Adelaide–Sydney freight service, which commenced in 2001; the service competes with a Pacific National service[112]. Between 1995 and 2002 a few logistics and freight forwarder companies (SCT, Toll Rail, Patrick Rail) developed their own transcontinental freight services in lieu of using (what was then) NRC's services. That is, they shifted their existing NRC freight on to their own trains; the incremental risk involved in this action is clearly much less than a train operator developing its own service without an established customer base.

Although SCT, Toll Rail and Patrick Rail ran their own services, the trains were crewed by other (State-based) operators (Freight Australia; ARG and Freight Australia; and ARG, respectively). (In July 2002, the Toll Rail and Patrick Rail operations were fully integrated with the NRC and FreightCorp businesses, under the Pacific National entity.) There are a number of other types of contracts. For instance, Pacific National (FreightCorp) has a haulage contract

111 Canadian Pacific Railway, Canadian National, BNSF and UPSP. We note that, even here, in the absence of regulatory intervention, there would be greater consolidation of the railways. (For instance, Canadian National and BNSF were recently refused permission to merge.)

112 The ARG service operates via Broken Hill while the Pacific National service operates via Melbourne.

with NRG to run coal trains over the NRG-controlled Leigh Creek–Stirling North line. Similarly, while Victoria's integrated Freight Australia runs open access grain trains to Victorian ports from silos on RIC track in southern NSW, Lachlan Valley Rail Freight is contracted to provide the crew for the NSW portion of these operations.

What can we say of the objective of service coordination? The development of a coordinated (interoperable) rail network (and on-track competition–contestability) are impeded by the multitude of access regimes. It is inevitable that, with multiple regimes, the diversity of views of infrastructure usage cost drivers and the different measures and interpretations of asset valuation and risk, there should evolve a range of access charges. These differing pricing levels and structures will give conflicting signals for operator incentives as well as increase risks and transaction costs when dealing with multiple access regimes.

The negotiated price-setting environment has yet to be extensively tested in Australia. However, operators would appear to prefer the certainty of reference charges *or* prescribed charges rather than negotiation within a wide 'combinatorial' floor–ceiling price band. That said, reference tariffs have been advanced as the basis for performance-based regulation. Given performance-based regulation is rooted in costs–efficiency, however, while the reference tariffs are market-based, this approach would result in a misuse of the tariffs.

A primary benefit of negotiated charges, however, is that they can facilitate price discrimination and, hence, improve cost recovery. The application of Ramsey price discrimination under both integration and separation is difficult to apply, however. For integrated operations it inevitably creates doubt that the incumbent's train operation is favoured over a third-party; for separated operations, the discrimination may act to undermine on-track competition. Despite this, regimes such as in WA appear to permit price discrimination; this helps cost recovery but may hamper perceived impartiality. If the potential for above-rail competition is limited by a 'thin' freight market, however, then the competition benefits of facilitating impartiality by vertical separation may be outweighed by the costs associated with that separation. We note, however, that while ARTC follows the separation model, it has undertaken *not* to Ramsey price discriminate. This undertaking reduces both the prime merit of the negotiation process itself *and* it limits the degree of cost recovery.

A deficiency of negotiated charges relative to prescribed charges is that this may blur the pricing signals. Pricing levels and pricing structures provide powerful incentives on how a train operation is developed. Train speed, service frequency, train length and axle loads are some of the parameters that need to be matched against access charges, which may represent between one-third and one-half of all the operator's costs. Of course, at its crudest, it can be the charging *level*

itself (rather than the charging structure) that generates a powerful disincentive to third-party access—as has been asserted in South Australia[113].

Capacity management issues are largely not addressed in Australia's regimes. In general, prices are not varied to shift track use from periods when there is very limited spare capacity. Further, once we acknowledge the reservation of paths for passenger services, the primacy rights for paths of integrated operators and the apparent 'grandfather rights' of operators on vertically-separated systems, the resulting less valuable residual capacity can inhibit new operators' competitiveness. We also note that the quality of train paths actually delivered (real-time pathing) and the real-time cost of path usage are not addressed in access charges. The ARTC's track-side wheel defect monitors do, however, provide a process for detecting rolling stock deficiencies and therefore to provide incentives for train operators to operate 'healthy' trains. The quality of the paths is also likely to be an important issue when a third-party operator wins a haulage contract from an integrated operator; the supply of deficient paths could materially undermine the economics of the contract and, thus, undermine the bidding process.

The impact of the mandated access on infrastructure managers' cost recovery is yet to be realised. There are no significant examples where the incumbent integrated operator has lost a haulage contract[114]. Nonetheless, the mandated access comes at a time that closely follows the privatisation of a number of the operations. Implicitly, the value of the purchase price of each business incorporates an assessment of the impact and risk associated with the third-party access. Nonetheless, to the extent that the new owners inherited infrastructure with a backlog of maintenance and renewal, any subsequent investment uncertainty brought about by mandated access may mean that the consequences of private sector under-investment would be clear much sooner than later.

113 The access charge level *may* be set at a fair commercial level but *that* level may be sufficient to dissuade third-party access. For instance, it has been noted that third-party access on the Eyre Peninsula rail system has not come about because 'Whilst rail operators have attempted to gain access for grain haulage in South Australia, these efforts have failed due to an inability to achieve outcomes that would generate a commercial position for the access seeker'. That is, the charges were too high for viable third-party access. (Transport SA 2002, p.7)

114 ARG suffered a significant loss to its total business when the Leigh Creek railway coal traffic (which it inherited at the time it took over Australian National's' SA operations) was awarded to FreightCorp. The operation was important for diversifying the SA traffic base, which is dominated by grain haulage. Note, however, that the Leigh Creek line is not an ARG line; it is leased by NRG from the SA Government.

chapter 4

INTERNATIONAL RAIL ACCESS PRICING SYSTEMS

In this chapter, we consider international experiences with rail access pricing systems. Our review of rail systems includes a range of countries that have adopted open access or third-party access and countries with limited or no access. In that context, we consider a number of European countries, where access reforms have evolved over the last decade. We contrast these developments with industry experiences and policy developments in Canada and USA. We also consider developments in countries such as Japan, Mexico, New Zealand and Argentina, where reforms have been undertaken during the last decade, although those reforms have not been in the form of mandated access.

We do know that Australia is in the vanguard of countries that have adopted mandated access policy. We seek to identify the extent to which the international railway reform environment are similar or different from Australia's. In studying these international experiences, however, we can identify common strengths and weaknesses in each system and identify potential solutions. We can also gain insight from assessing the extent to which overseas lessons may not translate to Australia—to where a strength (or weakness) identified elsewhere may not have the equivalent impact here.

This chapter begins with a review of the *primary* objectives of access pricing: in some cases, the price levels or structures differ from those set in Australia, reflecting different objectives. For some countries, those objectives are common to those we considered in Australia: reforms that bring on-track competition and coordinated operations. As with all railway reforms that have been adopted in recent decades, the objective is also to improve railway finances, to improve cost recovery.

Thus, the basic outline is that which we adopted in the last chapter. First, we consider the competition environment, looking at the rights of access to the infrastructure. We then consider the policy framework for achieving improved coordination of railway services. In the context of the European economic federation of countries, we endeavour to draw parallels between the multitude

of access regimes and pricing diversity found on that continent, with the range of regimes and pricing diversity found in Australia.

In the subsequent section we examine aspects of the price-setting process, including negotiated pricing and posted pricing, capacity pricing systems, pricing for quality and usage variation and performance-based regulation. In the light of mandated access, we then review the experiences of cost recovery in the various railway systems. This includes consideration of the impact of varying pricing structures and how, in seeking given cost recovery objectives, the pricing structures can then impact on the other reform objectives, notably, on competition. We seek to illustrate the way in which the different rail reform objectives conflict with each other.

POLICY ENVIRONMENT

As in Australia, four principal approaches have been adopted in the last decade[115] to improve railway efficiency around the world:

- competitive neutrality;
- budgetary;
- access reform; and
- status quo.

We now briefly consider each of these approaches and then consider issues of policy conflicts.

Competitive neutrality

In some countries, notably in Scandinavia, access charges (with structural separation of trains from track) have been introduced to improve allocative efficiency. The separation of infrastructure costs from train operating costs facilitates cross-modal (road–rail) cost transparency. Charges have been based on marginal social costs. Note that this policy has complemented productive efficiency objectives in these countries, through competitive access.

Budgetary

Railways in Mexico, Japan, Argentina and New Zealand were privatised in the early 1990s. All four systems were kept vertically-integrated but, in the case of the first three railways, the rail networks were *horizontally* separated into

115 We note the extent of change in the European Commission's approach to seeking improvement in railway finances, which faced a 'profound financial crisis'. For instance, between 1970 and 1990, overall rail freight traffic fell by 10 per cent, unit revenue was static but unit costs were rising (ECMT 2001,p. 45). Knill and Lehmkuhl note that despite the EC's and Member States' efforts to reform the railways, by the end of the 1980s, there was still 'little progress' (p. 3).

regional-based systems. In the case of Mexico (the 'Mexican model') policy also sought to infuse competition: the rail network was geographically split in a way that provided customers with competing private train operators, albeit that the (export) goods would be conveyed to different destination ports. The change of ownership was intended to reduce call on public funds, sustained through productive efficiency gains in private-sector production. This was also the primary objective in Great Britain (not on-track competition) and, in this case, it was adopted with vertical separation and with some open access.

Access reform

This objective, which seeks to bring about productive efficiency gains in train services through on-track competition, has been followed in three principal forms:

- **Productive efficiency gain through vertical separation, with open access**. The objective is to improve production efficiency in train operations through on-track competition. This has been adopted in a range of countries, including Denmark, Finland, Sweden and Norway.
- **Productive efficiency gain through integration, with third-party access.** A second approach is to seek to improve production efficiency through on-track competition *while still remaining* fully vertically integrated and avoiding additional transaction costs of interactions between the incumbent's train operations and infrastructure management. This is the approach used by SBB in Switzerland; third-party operators gain access through charges based on incremental costs.
- **Productive efficiency through interconnection and interoperability of networks**. With access reform, train operators can work towards seamless service provision across railway jurisdictions. This seamless objective applies to both infrastructure provision and train service provision. Rail services can then be more readily provided on journey lengths where rail freight has a comparative advantage; it also reduces multiple handling of goods across agents, that is, it shortens the logistics chain. The primary EU access reform objective is to achieve greater rail competitiveness through a higher quality of service—seamless operations. Cooperation between rail operations, rather than competition between them, is seen as the way to make rail more competitive relative to other modes (ECMT 2001, p. 45).

Status quo

The USA and Canada, in particular, have essentially applied a conservative policy to leave the railway structure and the rights of access essentially as they are. This is an industry form based on vertical integration *without* the presumption of a right of third-party access. We note, however, that the USA has recently

ended a 20–year period of successive mergers (horizontal integration) of railway operations, leaving just four major railway companies. The ECMT concluded that the reason for this policy was that,

> for mergers between companies in different regions of the country, the benefits to shippers of one company providing through services are likely to outweigh the potential loss of efficiency through reduced competition (ECMT 2000, pp. 5–6).

On access issues generally, there has been no policy shift in Canada and the USA. That said, we note there has been discussion and policy debate in both Canada and USA about broadening third-party access beyond the current limited voluntarily-agreed and individually-enforced agreements[116]. In setting out its policy framework, in 2003 the Canadian government opted not to change its current policy stance against mandated access, concluding that the costs exceeded any potential gains:

> … given the lack of evidence of a systemic problem in the rail industry; the significant productivity gains achieved from a less interventionist approach; practical concerns about access fees; the substantial regulatory burden involving regulated running rights; the availability of a number of other regulatory remedies to address specific problems; and possible adverse impacts on system efficiency; the government believes that the current running rights provisions should be retained. (Transport Canada, p. 32)

We should note, however, that North American railways differ from most railway networks elsewhere in the world. In particular, the volume of (freight) traffic over long distances enables a high level of rail capacity, to the extent that a degree of competing rail infrastructure routes is offered on the major transport corridors. The resulting competition is most effective on transcontinental routes[117]. The traffic volumes have facilitated a long history of profitable, private ownership[118]. Thus, one key policy force that exists elsewhere—the need to improve railway finances—is absent from these railways. More to the point, the objective is to ensure that the companies *remain* viable, private companies. Elsewhere, the financial crises in European rail systems (in particular) has provided one strong impetus to reforms.

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116 See, for instance, the report by the Canadian Transportation Act Review Panel (2001a and 2001b). The heightened debate in the USA follows the impact of parallel rail mergers on competition and developments in other countries. See, for instance, Grimm and Winston, p. 45.

117 For instance, a shipper could choose between CN and CP for a transcontinental movement; at a more local level, given origins and destinations may be served by only one company. Shippers have some leeway, however, in 'interswitching rights' between railway companies where competing tracks meet—at competitive rates.

118 We note, however, the major north-eastern USA railway bankruptcies in the early 1970s, notably Penn Central Railroad. These failures have been attributed to a number of factors, but dominated by excessive shipper tariff regulation and difficulties in abandoning loss-making lines. The major non-urban public railway is the trunk route between Washington and New York, owned by the publicly-funded Amtrak passenger train operator.

Policy balancing

In the USA, the railway policy can be described as one of '*revenue adequacy*'. This policy objective needs to be balanced with the objective of providing competition in the industry and avoiding monopoly abuses. Nonetheless, the balance remains in favour of ensuring viability. The rail regulation is limited to avoiding severe anti-trust abuses and accepting that efforts to stimulate competition between train operators is limited in favour of ensuring that the railways can generate sufficient revenue to remain commercial[119]. The policy was reviewed between 1998 and 2000 though the Surface Transportation Board's (STB) 1998 views remained essentially unchanged at the end of the review. See, for instance, STB 1998a.

In Canada, also, a balance is sought. The Canadian Transportation Agency (CTA) concludes that it:

> does not pursue competition at all costs. It does not somehow subordinate all of a railway company's interests and assets in favour of competition. The CTA, and the national transportation policy in particular, create a balance between the public interest, in competition for example, and private property rights. (Canadian Transportation Agency 2001a)

On access charges themselves, the CTARP also noted that that 'current national transportation policy recognizes that the financial viability of carriers is a relevant concern, along with those of enhancing competition' (CTARP 2001a, p. 49).

There are other countries with similar concerns as Canada and USA. For instance, in Japan,

> opening of the rail network to third parties remains an exception because "it was feared that any further increase in existing competition between the JR [Japan Railways] passenger companies and private railways would threaten business stability" (Obermauer 2001, p. 27).

However, we can say that there is a strong policy trend favouring access reform, essentially as a means of bringing about productive efficiency in train operations. Scandinavian countries have also set access charging levels to mirror charging structures used on roads, facilitating competitive neutrality as well as on-track competition.

What is clear, however, is that many countries adopt multiple objectives for their reforms. Not all objectives can be pursued with equal force at the same time. As Nash warns, setting multiple policy objectives may not work if the consequences are irreconcilable:

> … the debate on rail infrastructure charges has failed, as it inevitably must, to throw up an approach which adequately reconciles efficient use of the existing infrastructure withcost recovery objectives and avoidance of barriers to entry.

119 The Federal Railroad Administration paraphrases part of the *Surface Transportation Board. Reauthorization Act of 1999* thus: 'Under current law, the Board must maintain standards for establishing revenue levels for rail carriers which are adequate to cover expenses and to provide a profit'. (FRA web site)

> In this situation, a choice has to be made. Charging systems can be designed to meet two of these three objectives but not all three. (Nash 2001)

For instance, a charging structure may set alocatively-efficient charges and low barriers to entry, but fail to recover significant levels of costs. Conversely, a charging system may achieve a high degree of cost recovery but, nonetheless, fail to achieve productive efficiency in suppressing on-track competition by impeding entry into train service provision.

The inevitable compromise between policies that is required here is also apparent in the key EC policy, where, since 1991, *both* competition *and* coordination objectives are sought. The comments of the EC Commissioner for Competition Policy reflect this compromise: 'If co-operation between [rail] flag carriers restricts competition, we have to be satisfied that it has beneficial effects; that it is indispensable; and that it does not completely eliminate competition' (Monti, 2002). The ECMT believes, in fact, that the principal impact of access reform will be more directly on consolidation of Europe's rail industry[120] and a lower cost, coordinated operation rather than on competitive forces bringing down prices (ECMT 2001, p. 10). In this context, the ECMT noted nonetheless that an 'explicit policy at the European level towards mergers needs to be developed…'(ECMT 2000, p. 6).

The EC recognises this compromise, placing the objective of consolidation (which facilitates coordinated or integrated rail activities) ahead of enhanced competition:

> Creating on-track competition through open access was a means to achieving this objective, rather than an objective in its own right. (ECMT 2001, p. 45)

The recognises that consolidating rail's logistics chain improves productive efficiency of the door-to-door product but that such coordination may be at the expense of on-track competition. Nonetheless, the improved logistics chain enhances rail's competitiveness relative to road freight. Already, the EC and the ECMT have noted new alliances and mergers between traditional European rail operators (EC 2002a, p. 3; ECMT 2001, p. 15). This consolidation and coordination is sought in both above-rail and below-rail activities. In this context, the EC is encouraging greater cooperation between infrastructure managers, to facilitate seamless operations and to coordinate investment on international links. Thus, in 2001, they issued a new directive that permits infrastructure managers to establish joint organisations to facilitate movements across infrastructure managers, through coordinated investment actions on rail corridors and coordinating path allocation and timetabling[121].

120 This applies to both train and track operations. See, for instance, ECMT 2000, p. 6.

121 Later in 2001, the open access infrastructure managers of Sweden, Denmark, Norway, Finland, Great Britain, Portugal and France formed the association of the European Infrastructure Managers.

We should, however, recognise an important observation about European access reform. The policy instruments have evolved over the last decade. An initial 1991 Directive[122] on railway reform (91/440/EEC) has been followed by further directives in 1995 (two), 2001 and 2002. It is apparent that the early EC Directives were not specific enough or strong enough to achieve their objectives. The first Directive (1991) considered accounting separation of above-rail from below-rail activities; it was 1995 before the EC addressed capacity allocation and operator licensing and it was 1996 before inter-operability was considered. These Directives have been revised in the 2001 Directives (EC 2001a, 2001b, 2001c and 2001d) and access pricing principles have moved closer towards a prescribed charge. The Directives in 2001 and 2002 reflect the EC's tacit admission that access policy has not achieved its objectives:'There is still very little competition on national and international rail freight markets' (EC 2002, p. 38).

Thus, European Economic Area (EEA)[123] rail access reform policy *has* failed to deliver. An important aspect of the implementation of the policy, however, is the rolling delivery of Directives since 1991, reacting to the evident impotence of policy. These policy reinforcements include:

- improving transparency in access to infrastructure. Capacity allocation and timetabling, operator licensing and access charging are now required to be undertaken independently of train operation;
- regulation. The EC now requires a regulator. The regulator's role is to oversee capacity allocation as well as the provision of incentives to infrastructure managers to reduce costs;
- licensing. It is intended that a licence valid in one regime will be valid in all regimes;
- capacity allocation. The EC has sought to strengthen principles for capacity allocation though they remain essentially principles rather than a specific process;
- safety certification. The remit of a new European Railway Agency includes facilitating mutually-recognised safety certificates and common safety methods;
- access charges. The EC seeks consistency in pricing, by advocating marginal cost-based charges though it still accepts (variable) price mark-ups; and

122 An agreed directive is European legislation that must be transposed into Member State laws through Parliamentary Acts in each of the EU Member States.

123 The EEA consists of the 15 countries of the European Union together with 3 European Free Trade Agreement countries (but excluding EFTA member, Switzerland). The rail liberalisation policies do, in fact, extend beyond the EEA countries. Countries seeking accession to the EU (such as the Czech Republic, Slovakia, Poland and Hungary) have also introduced rail liberalisation laws that mirror the EU directives.

- investment. Variation in access regime frameworks is permitted to facilitate new infrastructure.

Thus, we can observe that within the rail access reform policy framework across the world lies a range of objectives, which necessarily embody a degree of trading-off. Further, even where a primary objective has been pursued, the instruments have been found wanting. We revisit these issues in the following sections.

COMPETITION ENVIRONMENT

The defining legislation (Directive) that initiated European railway access reform was approved in 1991. As we noted above, this policy has been gradually extended and strengthened. We now consider the competitive environment established in overseas countries in the last decade.

Infrastructure access

One important contrast we should note is the *extent* of widened access in Europe (in particular) with those now established in Australia. Even to this day, we note that there is limited cabotage on the EEA railway network. Indeed, it will be 2003 before defined international routes are open to international freight and it is likely to be 2006 at the earliest before there is legislated access for all freight movements across the network. Even with these measures, only some classifications of international passenger trains will be free for a degree of mandated access. Further, the EC has identified domestic rail services as an area where access rights could be restricted to a single train operator[124]. The proviso for adopting this restriction is that an operator wins its operating licence via a competitive process (franchise) (European Commission 1996, p. 17).

A general issue is whether that operating licence (with underlying safety credentials) is needed for the purchasing or reserving of train paths. Berkeley (2002, p. 40) argues that freight customers themselves should be given the option to reserve paths and then seek tenders from train operators to provide traction.

We should note the nature of the European railways, where access has been mandated. Access reform policies have been applied, in varying degrees, across both publicly-owned and privately-owned infrastructure owners. Widened access to the infrastructure can impact on, or at least heighten the risk of, full cost recovery. There is a contrast between Australia's policy environment and that in Europe: in the European environment, while widened access is legislated, the integrated and separated rail operations are funded or underwritten by taxpayers

124 Access for domestic freight service provision by non-national operators is currently enshrined in national law in Austria, Italy, Germany, the Netherlands, Sweden and Great Britain (EC 2002, p. 21).

to varying degrees. That is, subject to public funding, the access charges are not set, or need to be set, at levels that *ensure* full cost recovery.

There was one European network that was an exception to this cost recovery. In 1996, the railway infrastructure previously run by British Rail was privatised. The infrastructure provider was known as Railtrack plc. The company's objective was full cost recovery; its revenue was overwhelmingly dominated by track access income from publicly-funded private passenger train franchises. Railtrack was regulated by the Office of the Rail Regulator (ORR)[125], whose mandate was to ensure that the company achieved sufficient revenue from access charges to achieve full cost recovery and, as a result, to maintain the network. The railway network still requires considerable subsidy but the initial approach taken was to subsidise the train services (enabling the operators to pay Railtrack fully-commercial access charges) rather than to subsidise Railtrack's infrastructure provision.

In spite of this, however, mismanagement at the company encouraged the government to place the firm in administration in 2001[126]. Since that time, the network licence and assets have been acquired by Network Rail, a Company Limited by [government] Guarantee (CLG)[127], in 2002. Railtrack illustrated a contrary European view; its viability being based on regulated access charges that was intended to ensure that the company was a self-funding infrastructure manager.

Freight operations over Railtrack (now Network Rail) were unrestricted though we note that rail's domestic freight competitiveness is so low that the government has to provide substantial subsidies to the operators. The British Government, however, imposed an indefinite moratorium on Railtrack's sale of paths for passenger trains: this is the policy of 'moderation of' passenger train competition. The restriction reduces incumbent passenger franchisees' revenue risk and this then reduces the public subsidy required to be paid to them.

125 During 2003, the functions of the Rail Regulator are being transferred to the Office of Rail Regulation.

126 Following the Hatfield railway accident in 2000, Railtrack concluded that there was a systemic fault with its maintenance of some of its rail lines. Over succeeding months, a very costly replacement of many hundreds of kilometres of rails was then undertaken. This action fundamentally affected the company's cost base. Initially, the Government underwrote loans that enabled the company to fund this cost base. In the light of these higher costs, Railtrack could have requested that the Rail Regulator review its access charges, to ensure that the company remained commercially viable. The Government lost confidence with Railtrack 's management of the system. Thus, in October 2001, the Government refused further underwriting. Before Railtrack or the Rail Regulator could belatedly initiate a review of the access charges, the Government then applied to the courts to have Railtrack placed in administration.

127 One further characteristic of CLGs is that they tend to be financed entirely by debt—the company does not have funding by equity (shareholding).

Apart from the former Railtrack, private railways are operated in the North American Free Trade Agreement (NAFTA) countries. Because (almost uniquely in the world) there are parallel routes on the largest primary intercity corridors in Canada and USA, a degree of on-track competition occurs without the need for third-party access. Where parallel competition does not exist in these countries and Mexico, legislation has sought to provide shippers with some degree of competitive rail options (Pittman 2002a, p. 17). For instance, in Canada, a shipper may be reliant on the railway at the origin, but, if a competing railway lies within a geographic bound of that origin, the freight wagons can be switched to that alternative railway; this is designed to put downward pressure on freight rates. Similarly, in Mexico, alternative rail lines, serving a single origin but alternative export ports, provide shippers with a degree of competition. As Pittman notes, the resulting competition 'is not perfect, but it is "workable"' (Pittman 2002a, p. 17).

Because of this background and because of the dominant concern to maintain railways' viability, access by third-party operators is not mandated by government legislation[128]. NAFTA third-party access generally occurs through negotiation. The USA and the principal Canadian and Mexican railways operate on about 202 000 route miles, of which about 29 000 route miles (14 per cent) are run over other rail companies (AAR 2002). The charges for access are typically settled by mutual agreement rather than by arbitration. We conclude that under such negotiated access, the agreed charges are of mutual benefit to access provider and access seeker.

Mexico has, however, experienced negotiation problems with its access charges. The Ferrocarriles Nacionales de México (FNM) was privatised, with most of the assets being grouped into three, geographically (horizontally-separated) railways as well as jointly-owned (with some residual public shares) terminal facilities (such as in Mexico City). However, there were significant differences in the valuations for each railway. A consequence was, as Campos noted, huge differences in the bids 'and, particularly the lack of a detailed methodology on how to translate these differences into the access charges'. This made it difficult for the operators to agree to bilateral access—even when the operators were required by law to provide mutual access over certain lines (Campos 2001, p. 93). Similarly, Campos noted that asymmetry in traffic volumes over the shared facilities in Mexico City was likely to create problems.

Widened access provides the potential for spreading the common and fixed cost overheads across a greater level of traffic; the existence of voluntary, negotiated access in NAFTA railways illustrates that such gains exist. Third-party access may, however, lead to the incumbent losing capacity and traffic to the third-party and reduce freight tariffs; such an event would reduce the

128 Access may be mandated as a condition of railway mergers, where a third railway operator is granted access over a merged railway operation as part of the approval of the merger.

benefits of third-party access to the integrated infrastructure manager. The terms of NAFTA access differ from most of those set elsewhere in two important respects:

- access is negotiated; *and*
- the terms of access are limited.

In particular, the access typically limits the access seeker to running *over* the provider's track but not soliciting for traffic *along* that track. (Variants of these rights are known as running rights, trackage rights or overhead rights.) Importantly, the restricted access rights limit the effect of third-party access on the incumbent's revenue. This limitation also inevitably increases the likelihood that there will be mutually-beneficial terms of access[129]. If, however, there is no spare capacity, the incumbent will have fewer incentives to negotiate mutually-beneficial terms of access (unless it can be agreed that access charges must incorporate incremental costs for new capacity).

In Table 8 we present how this NAFTA form of access and ownership sits in comparison with other rail systems, including Australia's infrastructure managers. Even where we have listed third-party or open access as being permitted, there are, in fact, restrictions for certain types of trains or operators. For instance, in terms of the EU, we note the restrictions on various types of international and domestic freight and passenger trains.

Access rights are topical in Canada and USA. Consideration has been given to extending access rights so as to improve on-rail competition. The aim of such a change would be to ensure shipper tariffs for bulk freight are competitive. The concept is one of 'enhancing competitive access'. In Canada, the consideration of enhancement revolves around the concept of 'public interest'. At present the regulated running rights access are determined on the basis that the onus is on the access seeker to prove it is in the public interest to permit access; the issue that was considered was whether to reverse this onus. As the Review Panel of the Canada Transportation Act (CTARP) noted in 2001, however, 'public interest' is not defined. The Panel did consider 'full open access', that is, that there is no public interest to consider and that access is effectively automatic (CTARP 2001a, p. 48). We note, however, that despite the Review Panel's recommendation that there be enhanced third-party access, by permitting traffic solicitation, nonetheless the presumption remains *against* access, unless the access seeker can prove that it is in the 'public interest'.

In USA, there is pressure for enhanced access. ECMT reports that Congress was considering the introduction of 'administered third party access rights'

129 For instance, in 2001, the Canadian National and Canadian Pacific railways signed 'co-production' agreements, for track sharing in Canada and USA. The benefits included the ability to rationalise tracks and to establish uni-directional track running over each other's tracks, to use the best route for uphill and downhill gradients. (Canadian National 2001)

TABLE 8 OWNERSHIP AND ACCESS RIGHTS, BY COUNTRY

	Ownership of infrastructure access provider		
Access rights	*Public*	*Private (leased)*	*Private*
open access[a]	Australia (ARTC, RIC) Great Britain (Network Rail)[130] Sweden (BV) Finland (RHK) Denmark (BS) Norway (JBV) France (RFF)[b] The Netherlands (ProRail)		
third-party (solicitation permitted)[a]	Australia (QR) Germany (DB AG) Switzerland (SBB) Italy (FS) Austria (ÖBB)	Australia (ARG [WA, SA[d]], Freight Australia)	Australian private cos.?[131]
running/trackage ('overhead') rights		Argentina[c] Estonia (EVR)[c] Mexico Australia (ATN Tasrail)[d] New Zealand (Tranz Rail)[f]	Canada[e] USA[e] Japan (passenger)[c]
no statutory access	Spain (RENFE)[b]	Australia (ATN Tasrail)[d] New Zealand (Tranz Rail)[f]	

a In European countries, the open and third-party access may be restricted to domestic freight operations (with access by foreign train operators on a country-reciprocal basis) or to international freight operations.

b France has only nominal open access; Spanish new lines only are provided by a new infrastructure provided (GIF) while the Austrian parliament and railway administration continue to debate vertical separation—open access provision.

c In Argentina and Estonia, third-party access is limited to passenger trains operating over freight lines—(freight) traffic solicitation is therefore not permitted. In Japan, third-party access over passenger lines is limited to JR Freight, that is, passenger traffic solicitation is not permitted.

d To be precise, ARG [SA] and ATN Tasrail own the infrastructure but lease the land on which the infrastructure sits.

e In Canada and USA there are also 'haulage' rights, with similar conditions to running and trackage rights but where the track owner hauls the access seeker's wagons. Note, also, that while Amtrak is a passenger train operator, and thus does not in principle compete for the same traffic as the freight train track owners, it nonetheless has increasingly moved into the area of moving mail and express freight, raising objections from freight railways. (See The Dismal Scientist 1999)

f To be precise, the terms of Tranz Rail's lease of the railway infrastructure from the government stipulate threshold levels of freight and passenger traffic below which government may grant access by third parties (Productivity Commission 2001, p. 298) It is proposed (2003) that New Zealand's railways will be vertically-separated, with the infrastructure reverting to public ownership (as 'TrackCo').

130 The UK's National Audit Office (NAO) has ruled that Network Rail, a Company Limited by Guarantee (CLG), is a public body, to be treated as a subsidiary of the Government's Strategic Rail Authority (SRA). See NAO 2002.

131 The status of access to Australia's private railways, such as those in the Pilbara, is still ambiguous. See, for instance, the case of Robe River's application for access to Hamersley Iron's Pilbara railway. References include Productivity Commission 2001, p. 10 and 28. Note that under the (*Iron Ore (Hamersley Range) Agreement Act 1963*), Hamersley Iron agreed to carry WA Government freight and to allow third parties on its line.

(ECMT 2001, p. 103). We should note the source for these pressures. They will inevitably have arisen, in part, from the observation of access reform in other countries. Further, however, there have been domestic issues. In particular, pressure arose following the mid-1990s merging of major railway companies—such as between Burlington Northern Railroad and Atchison, Topeka and Santa Fe Railroad (becoming BNSF) and between Union Pacific Railroad and Southern Pacific Railroad. The poorly-executed management of the merging of the businesses heightened a perception (or conclusion) that such mergers, irrespective of their potential for production efficiencies, have compromised intra-modal competition. A few developments stemmed from this:

- A rethinking on access resulted from this experience, leading to the rejection of the proposed merger of the BNSF and Canadian National railways.
- Consideration of strengthening shipper rate regulation and enhancing access rights. One immediate consequence has been the Surface Transportation Board's (STB) decision in 2001 to refuse major railway mergers unless they actually *enhance* competition. While it may be presumed that any merger (particularly a merger within a geographic area) would lead to loss of competition, this may be offset by a combination of a sale of some lines to another railway or by offering trackage rights *over specified sections of track*[132] to a third-party. One example of where this has been undertaken is where Union Pacific and Southern Pacific merged: a competing railway was granted 'trackage' (third-party access) rights over the merged railway at locations where Union Pacific and Southern Pacific had formerly competed (see Kalt, undated).
- As railways consolidated, there was increased pressure for reform of shipper rates where a railway customer faced 'bottleneck' access (See Jahanshahi, pp. 77–78). The physical bottleneck arises where electricity generator operators can choose between coal that is sourced from mines serviced by multiple railways but where the power station is served by only one railway. In three cases brought before the STB the utilities sought a separate shipper rate for the power-station (monopoly) end of the transport and for the right to choose another operator on a line haul where alternative rail infrastructure was available. The STB rejected the three cases that were submitted.

There is wide variation, therefore, in the current state of mandated access, with third-party access remaining limited in NAFTA countries and with access terms and charges being dominated by voluntary agreements. In Europe, even with a decade-long process of access reform, most European regimes retain considerable access restrictions. There is little evidence of unrestricted access;

132 That is, the third-party access is limited to the line sections that may alleviate losses of competition from a merger, rather than access over the entire network.

widened access is, in any case, almost invariably restricted to operations part-funded by taxpayers.

Ancillary infrastructure issues

A key objective of access reform policy is to bring about greater on-track competition. Despite setting such an objective, however, little uptake of the rights of access may eventuate. As we have discussed, this may arise because of the size of the freight market, the economies of density or market barriers to entry. The responsiveness to the access rights also depends, in part, on the presence of existing railway or train operators. Thus, it is important to note that in Europe the exercising of access rights has generally been by existing small, integrated operators and by large manufacturers such as IKEA and BASF (through partly-owned operator, rail4chem), rather than by operators providing competing train services to shippers. Notable amongst the existing integrated operators are the private branch lines, such as those in Germany[133] and freight forwarders rather than entirely new operators. There are more than 100 such operators on the infrastructure manager's network in Germany although in total this represents only 5 per cent of all train kilometres (Improverail 2002a, p. 150). The generally poor uptake of access rights on most networks in Europe may, of course, be because there is limited freight traffic. Other impediments can include difficulties in getting train paths (as in Italy) or, simply, that the access charges are prohibitive: this is argued to be a major impediment in Germany. It may also be, however, because there are other impediments to entry.

Concerted action for wider access has been undertaken over the last decade in the EEA. Despite this, the EC concluded in 2002 that 'there is still very little competition on national and international rail freight markets' (EC 2002, p. 38). The EC recently identified a number of barriers to entry for freight operators working over national networks[134]. These include:

- Restricted access to service facilities. In some jurisdictions, for instance, third-party access to terminal facilities is 'reserved' for the national operators through long-term contracts.
- Absence of a well-functioning traction market. There are few markets for purchasing second-hand locomotives or leasing locomotives. These

133 Ironically, the relaxation of rail line abandonment regulation in Canada in the mid-1990s—has led the two major railways (Canadian Pacific and Canadian National) to transfer around 8 500 km of track to new branch (or 'short') line operators. This has increased the number of these operators to around 65 (Research and Traffic Group, p. 1) and this increases the pool of operators who, potentially, will seek access over the main lines.

134 However, as in Australia, a market in qualified railway staff has developed, notably by using laid-off staff or staff who have retired from incumbent operators. See, for instance, the German company, MEV (www.m-e-v.de).

markets, themselves, are hampered by varying and restrictive certification and admittance procedures, which can restrict where locomotives are used. Main line signal systems also require in-cab facilities that are costly to retro-fit. It has been noted, for instance, that German national railways (DB AG) have sold vehicles subject to clauses that they will not be used in competition with it and required that scrap dealers do not on-sell vehicles to potential competitors. To meet national technical standards, access seekers are often faced with renting traction from the integrated incumbent[135].

- National technical standards prevent development of pan-European interoperable rolling stock. The result is that the absence of common standards ensured that an effective Europe-wide pool of stock has not been able to develop. That is, the absence of inter-operability provided a barrier to entry.
- Staff certification and regulation. There are different national regulations on driver certification (reflecting different driver training) so drivers generally do not cross jurisdictions (EC 2002, p. 45). Further, Italian third-party access seekers have had difficulty in accessing the system as they have been unable to obtain the necessary certification, which is issued by the incumbent integrated national operator (Stehmann 2001).
- Safety. Dutch operators have reported difficulties in obtaining essential safety equipment, due to the monopoly–monopsony relationship between the incumbent operator and the single equipment supplier. Equipment costs were perceived to be unnecessarily high and third-party operators were given lower priority (NERA 2000b, p. 58).
- Licenses and insurance. At present, each national system requires an operator to have a license and national insurance. For instance, IKEA has developed a Sweden–Germany train operation. To operate, it requires 5 Swedish licences, 4 Danish licenses and 3 German licenses and €33 million insurance in Sweden, €34 million in Denmark and €10 million in Germany (EC 2001g, p. 37).
- Rolling stock maintenance restrictions. Wagon owners are required to return their vehicles to their home workshops for maintenance; there is no mutual recognition for work undertaken. (EC 2002, pp. 44–46)

The EC concluded in 2002 that

> Often there is a risk that the independent railway undertaking does not obtain the service for a competitive price or not on the same conditions as the national rail operator (EC 2002, p. 27).

135 Stehmann points out that obtaining traction from other countries is not a practical option: 'The purchase of a second hand locomotive from a foreign undertaking does not offer an option as the procedure to adapt the locomotive to the national technical standards and to obtain a 'general admission' would cost almost as much as the locomotive itself.' (Stehmann, section 5.2)

The EC's 2002 'second railway package' has proffered a range of measures to counter these barriers. These include reinforcing the powers of the national regulatory bodies to ensure non-discriminatory access and financial and administrative support for logistics operators transferring traffic from road to rail. The EC also proposes that the European Railway Agency will promote mutual recognition of workshop qualifications and certification, to enable stock maintenance to occur away from an operator's base (EC 2002, p. 44). It is notable that there is no standard approach to management of service facilities. For instance, although Denmark's railways have been vertically-separated, the national train operator is still responsible for terminals. Similarly, in Germany, DB Netz is responsible for track but the national freight operator, DB Cargo, is responsible for terminals. A different approach has been adopted in Mexico, where three separate integrated operators require terminal access: the government required that the three operators each take out a 25 per cent share in a joint company that owned the facilities; the government holds the remaining 25 per cent stake[136]. The objective of this approach is that the operators resolve their conflicting requirements within this joint-stock company; as noted above (p. 114), this approach has not been without problems.

Rail access has also been frustrated by lack of compliance with legislation. In 2003, Italy's Lombardy regional government brought an action before the Italian cartel commission, alleging that the ring-fenced FS infrastructure subsidiary was refusing terminal access to a private operator and that access was only being given to the FS train operator. Also, in 2001, the EC warned FS that it was obstructing access by an international partnership that was seeking to run an international passenger service between Germany and Italy. FS did not provide either a suitable train path or an access price for the use of the track between Switzerland and Italy (European Commission 2001f).

It is clear, therefore, that granting rights of access and setting appropriate levels and structures of access charges may not be sufficient to generate on-track competition.

SERVICE COORDINATION

A key policy concern in the European federation of States, as in Australia, has been efforts to develop a single, integrated, rail market. The focus on rail's under-performance in the European economy has been heightened by the rapid spread of road congestion (EC 2002, p. 20). The problem is acute where rail flows across rail administrations. For instance, on key north-south cross-border flows, the EC refers to the 'appalling performance of rail freight', caused by lack of coordinated delivery of traction when freight passes between rail systems (EC 2002, p. 24). The economic and environmental consequences of these deficiencies form the heart of the EC coordination policy. Similarly, the

136 The company is Terminal Ferroviaria del Valle de Mexico.

NAFTA countries (Canada, Mexico and USA) are working towards closer economic links, with consequences for pricing and regulatory inconsistencies. In this section we therefore examine the issues surrounding the policies.

The number of regimes

Access reform has been adopted in a range of countries. Members of the European Economic Area (EEA) and Switzerland have adopted a range of access systems. The number of access regimes in the EEA essentially mirrors that of its Member States.

As in Australia, one approach to facilitating access across regimes is to establish one-stop-shops. The Swiss Federal Railways (SBB) have, for instance, established a one-stop-shop to sell cross-administration train paths at posted prices. The shop offers a single quote, a single invoice and a single point of contact. European one stop shops differ from the primary ARTC approach, however. In Europe they operate as path consolidators rather than as infrastructure managers. Further, while European one stop shops seek to market the train paths by offering a single shop front, ARTC's approach additionally seeks to manage the track over which it sells paths.

To date, however, there has not been 'any significant demand' for the services of the one stop shops; one reason for this, the Swiss argue, is due to the 'still too big differences in national regulations'[137]. IKEA's pan-European train operations run between its Swedish base and Germany. Another large manufacturer, BASF, recently established a railway joint venture, Rail4Chem, to operate its own international freight trains. More generally, however, cross-jurisdictional freight movements still do not attract custom due to the failure to provide efficient cross-jurisdictional interfaces, such as paper-based transfer of data on the goods (EC 2002, p. 39). The adoption by the European Council and Parliament of the 'first railway package' has, however, led to the opening (from March 2003) of a defined cross-border network for third-party freight access.

An EU initiative has been the 'Freight Freeways', involving infrastructure managers grouping train paths on three specified international routes. Access charges are published for the entire route and with simplified cross-border, cross-railway administration movements[138]. More recently (September 2002) most west European countries have agreed to participate in a new 'RailNetEurope' organisation, which is an expanded form of the Swiss one-stop-shop system, in offering international coordinated paths from a single

137 SBB 2000; *International Transport Journal* 2001a reports that the North-South Freeway through Switzerland has had 'very little business'.

138 European Commission Communication COM(97) 242 on 'Trans-European Rail Freight Freeways'. See, for instance, the Belgian–Italy/Spain Belifret operation described at <http://www.belifret.lu/index_uk.html> and the North–South link between northern and southern Europe, at <http://www.freightways.com>

source. The organisation goes further, however, in that it also aims to remove operational and administrative barriers (CER 2002).

The EC accepts, however, that in the few years that they have been available, the Freight Freeways have not been an unqualified success. The EC conceded this year that 'little use was made of this open access' (EC 2002b). It argues that the main reason they have not been used is that the access charges are too high. The European Council of Ministers of Transport, ECMT, concludes that such initiatives may prove insufficient because *other* barriers to entry persist (ECMT 2001, p. 12).

In 2002, the EC advocated the establishment of the European Railway Agency, which will provide advice on safety and interoperability issues at the federal level. It is intended that the Agency would provide advice (but not regulation) on areas that will facilitate operations across jurisdictions.

The NAFTA countries (Canada, Mexico and USA) do not have the same historical precedence nor supra-national policy and legislative umbrella as are set by the EU. The 2001 Canada Transportation Act Review (CTARP) and the 2001 Surface Transportation Board railway merger review have, however, raised issues of consistent treatment across the NAFTA countries. As the CTARP noted, 'Canadian and US railways and their customers compete today in an increasingly integrated marketplace. This raises the question of whether, and to what degree, Canadian regulatory policies need to be harmonized with those of the United States' (CTARP 2001a, p. 28). Thus, the absence of harmonised regulation in NAFTA countries arises less because it impedes rail transport than because it can distort the rail flows between different member countries.

Diversity of pricing

Each western European country's national railway institution has a national access regime, each with its own access charging structures and cost recovery objectives. This diversity has implications for train service coordination: each national system incorporates different incentives for train service formation and frequency.

More generally, the diversity of pricing reflects a combination of two factors. First, as we noted in Chapter 2, the diversity reflects differing interpretations of the relationship between track use and the resulting infrastructure costs. Secondly, the diversity reflects differing objectives and institutional arrangements. For instance, the public ownership can be associated with less-than-full cost recovery; private ownership cannot. In Table 9 we illustrate the diversity of *track* access charges in a number of countries.

Depending on what infrastructure access is provided, however, it needs to be remembered that rail access charges can relate to *much more than just track*

usage charges. For instance, in Germany, the infrastructure charges consist of pricing structures for three components:

- **passenger station access** (payable to DB Stations und Service AG);
- **ancillary facility use**—such as marshalling yards (the 'Anglenpreissystem', payable to DB Netz); and
- **track use** (the 'Trassenpreissystem', payable to DB Netz)[139].

Similar pricing structuring is also undertaken on the Swiss Federal Railways and on Network Rail[140]. The following discussion concentrates on the diversity in the track cost elements though it should be noted that part of the pricing diversity includes whether or not non-track resource costs are also being priced.

In Table 9 we can see that the link between track costs and access charges has been interpreted in a range of ways. Although EEA countries have been required to institute widened access, they have been given considerable latitude in applying the terms of that access; the diversity of pricing is wide. Cost recovery objective *levels* range from marginal cost in The Netherlands, marginal social costs in Denmark and Sweden, through 'high' cost recovery in Germany and full cost recovery in Great Britain.

Each pricing approach has different impacts on incentives and viability of operators and infrastructure managers. Table 9 illustrates how the charging *structures* vary considerably across regimes. We should note, however, that in recent years the diversity of structures in the EEA has been reduced. In Germany, Sweden and Austria, for instance, the two-part tariff structure has been replaced by a fully-variable structure while in France, the fixed component is now a relatively small charge.

A consequence of these variations is that, for instance, in terms of charge levels, on the German Freight Freeways, the main line access rate was €3.80 per train kilometre while on Danish Freight Freeways, the equivalent rate was €1.17 per train kilometre (in 2000). Scherp reports that the variation in train kilometre charges in the EU varies by a factor of about 1 to 7 while marginal cost estimates vary by a factor of 1 to 20 (Scherp, p. 4).

Charge structures are equally diverse. Gustaffson and Knibbe summarise the diversity of pricing parameters used across Europe; these are reproduced in Table 10. The international industry body, the UIC, has argued that the variety of approaches taken by EC railways forms a major barrier to success in international (cross-jurisdictional) rail freight (as reported in Nash and Matthews, p. 3).

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139 See, for instance, Improverail (2002a, p. 151).

140 Network Rail (and, previously, Railtrack) has commercial arrangements for access to track, to stations and to most passenger (and some freight) depots. In most cases, the station and depot facilities are leased to a single train operator. See OPRAF 1996, sections 4.2–4.6.

TABLE 9 SUMMARY OF TRACK ACCESS CHARGES BY COUNTRY

Country	*Number of pricing systems*	*Open or third-party*	*Freight/Pass. differential?*	*Variable charge*	*Fixed charge/formula for split*
Sweden	2	Open		Maintenance/gross tonne km; Accident/km; Diesel/litre	-
Germany	3	Third-party		Rate per track km, varied by route [speed] quality, train product quality, goods train weight, timetable flexibility	-
Great Britain	3	Open (freight only)	Yes	Freight: Incremental cost; Passenger franchise: per vehicle mile	Per passenger vehicle mile and per passenger revenue
The Netherlands	2	Open	Yes	Rate per train km, converging to marginal cost by 2007	-
Finland	1	Open (freight only)		Rate per gross tonne km and per net tonne km	-
Italy	1	Third-party		Rate per train km, to cover variable costs, varied by time of day, track quality and rolling stock	-
Denmark	1	Open	Yes	Freight/passenger: Rate per train km, varied by main line or other	Freight: Rate per route km used, per annum
France	2	Open (notionally)	Yes	Rate per path km and per train km	Fixed charge per km of accessed line per month
Austria	2	Third-party		Rate per gross tonne km and per train km	-
Estonia	-	Limited running		-	
Norway	1	Open (freight only)		Maintenance/gross tonne km; Accident/km; Diesel per litre; train marshalling fee	-
Switzerland	1	Third-party		Marginal-cost-based: Rate per train km and per gross tonne-km; junction charge plus contribution margin	
Canada	Ad hoc	Limited running		Commercial	
USA	Ad hoc	Limited trackage		Rate per train or per wagon	Annual fixed charge
Mexico	-	Potential third-party		'Fixed' fee per service	
Argentina	-	Limited running		-	
Japan	-	Limited running		Avoidable cost	

TABLE 10 PRICING PARAMETERS USED IN EUROPE

Activity variable
Train kilometres
Gross tonne kilometres
Modulating parameters
Average train speed
Technical features of the track
Axle load of the vehicles
Total gross weight of the train
Traffic density
Peak/off-peak usage
Timetabling flexibility
Reservation lead-time
Relative speed
Required punctuality
Downstream market (freight, urban passenger, etc.)
External effects
Regularity of service
Contract period

Source: Based on Gustaffson and Knibbe, p. 20.

The table reflects the diversity of interpretation of the usage–cost link. Where freight operations move across networks with differing cost recoveries and pricing structures (as in Europe's and Australia's federations), there are three important effects of the inconsistent pricing:

- **Transaction costs are raised.** The ECMT reports that the 'wide range of prices charged for the use of rail infrastructure in EU countries is proving a difficulty in price negotiations for international movements of freight'. It also contrasts this with the single point of contact that has been used for many years in USA for negotiating pan-national freight movements (ECMT 2001, p. 38).
- **Conflicting pricing signals for train operators'** behaviour. For instance, where the core variable charge is train kilometres, there will be a stronger incentive to operate long and heavy trains than where the core variable charge is gross tonne kilometres. As Gustaffson and Knibbe note, the train operator will find it difficult to develop a clear strategy for running international trains (p. 20). Equally, we should note that the subsequent induced infrastructure usage will differentially influence the provision of capacity across jurisdictions—such as differing lengths of passing loops and axle weight provision.
- **Train operator responsiveness.** The diversity makes it difficult to provide last-minute quotations for freight movements. Consistent and transparent costing enables operators to provide a fast response time to shippers. Thus, while road transport offers origin–destination charges, rail offers a sum of unrelated charges.

The EC concluded in 2001 that its earlier directives on access charges and capacity allocation (91/440/EEC and 95/19/EC) 'have not prevented a considerable variation in the structure and level of railway infrastructure charges and the form and duration of capacity allocation processes'. With reference to both differing rail access charges and differing charges across modes, the Commission seeks 'to minimise the distortions of competition which may arise, either between railway infrastructures or between transport modes, from significant differences in charging principles' (EC 2001a). The Commission recognises that 'Any charging scheme will send economic signals to users. It is important that those signals to railway undertakings should be consistent…'. To this end, it requires that infrastructure managers 'record and establish the valuation of their assets and develop a clear understanding of cost factors in the operation of the infrastructure' (EC 2001a).

The EC has consequently produced a new directive in 2001, Directive 2001/14/EC. Despite the aforementioned Commission pronouncements, however, this directive still maintains considerable latitude in interpretation of the level and structure of access charges. Following on from the 1998 EC White Paper on transport charging, the lowest access charge that is to be set is marginal social cost. Nonetheless, price mark-ups can still range from marginal social cost, up to full cost recovery (including a rate of return). The directive gives discretion to charge up where capacity congestion emerges and the option to discriminate (Ramsey price) across goods markets. Given the EC's previous concerns with the different pricing systems, we should interpret this continued broad diversity of price-setting as reflecting the political failure of the Commission and European Parliament to agree on common pricing principles rather than the preferred efficient outcome.

THE PRICE-SETTING PROCESS

In this section, as in our review of the Australian regimes, we consider the process by which access charges are set. Thus, we consider negotiated and posted price-setting processes; pricing and administrative systems of managing capacity; systems for quality and cost variation from contracted standards; and systems of regulatory oversight. These issues are now considered.

Posted versus negotiated prices

In our review of access terms in a range of countries, we found that the majority of prices were posted, cost-based, rather than market-based, charges. One important consequence of this is that there is relatively little leeway in the charges, which are therefore not subject to negotiation. (Note that this does not preclude negotiations over the allocation of train paths.) For instance, Scandinavian countries have adopted (varying interpretations of) marginal social cost pricing in setting charges, for which there is not need for negotiation on charges.

Thus, many of the access charges are fixed: posted tariffs are set *and* published. In some cases, there is variance around the posted charge to approximate the scarcity value of the train paths sought or the degree of congestion. More generally, differential congestion charges are incorporated into posted pricing. The EC does not permit price discrimination across operators (though it is permitted across goods markets). To ensure that discrimination does not occur, Member States of the EU are required to provide regulatory supervision where charging negotiations are undertaken between access seekers and infrastructure managers (Directive 2001/14/EC). It has been reported that third-party German rail operators favour the certainty of access prices in this way; they have called for all prices and price-relevant information to be published (Link 2000, p. 161).

Thus, the ability to *post* the charges is also a function of the extent to which price discrimination is permitted: where it is intended to discriminate across users, charges are generally not published and charges are set by negotiation. Great Britain is the only European country that has undertaken (some) access charges by a negotiation process (EC 1998, p. 40). The overall revenue from access charges is, however, subject to 'RPI-x' (CPI-x) regulation[141]. The original intention of Railtrack's freight access charges was that they would be based on negotiated Ramsey pricing across the six privatised companies (operating in different goods markets). In the event, five of the companies were merged, making it impossible to price discriminate. Passenger train access charges are set, in part, by negotiation; this includes negotiation over congestion charges.

Railtrack's use of negotiations created significant problems in train operator incentives and it clearly exacerbated problems associated with the high fixed charge component in its access charges (as used between 1995–2001). The negotiations, based on a demand-insensitive (largely fixed) congestion charge, led to intractable conflicting capacity demands with attendant high transaction costs of negotiation[142]. The delays also made it difficult for freight operators to quote for conveyancing when the access charges were not known—negotiations were 'slow and complex' (ORR 1997a, p. 3). The Rail Regulator investigated the process and agreed to a 'simplified charging structure enabling EWS [English, Welsh and Scottish Railways] to respond more quickly to customers' requests for prices' (ORR 1997a, p. 3). This involved Railtrack providing EWS with a formula that enabled it to provide instant price quotations to its customers (Jahanshahi, p. 75).

141 Regulation is split between the Rail Regulator, the Strategic Rail Authority and HM Railways Inspectorate (for safety issues).

142 The Rail Regulator expressed his concern in 1997 that 'transaction costs associated with these relatively frequent but financially small negotiations is high' (ORR 1997, para. 5.4).

More generally, Railtrack's problem with the negotiations was exacerbated by the absence of a clear process for congestion charging[143]. It also did not facilitate the development of establishing priorities for competing demands for track capacity. The replacement access charge (2001+) place greater reliance on posted, but (line- and time-) stratified congestion charges rather than negotiation. Where posted pricing cannot be used (notably, when a train goes much faster or slower than the predominant flows on a route), the use of 'bespoke' estimation of these charges are to be 'limited and strictly contractually defined', while still being 'calculated using a consistent methodology' (ORR 2000e, p. 9). (See ORR 2000e for a technical analysis of the congestion charges.) This new system is expected to reduce the transaction costs, with the Rail Regulator concluding that

> … the replacement of negotiated congestion costs and negotiated share of net benefits with a predetermined capacity charge and volume incentives should reduce transaction costs. (ORR 2000a, p. 78)

In support of this approach—and consistent with the German research on operators' preference for certainty in prices (p127), the Rail Regulator found that 'Most respondents [train operators] supported the view that transparent and predictable tariffs are preferable to negotiated charges' (ORR 2000, p. 77).

Where European States price above marginal cost, the charges are structured in a way that both reduces the need for negotiation and removes a bias against a given size or type of operation. ECMT have noted that some charges have been established that reduce the impact of fixed charges on smaller operators. For instance, one pricing framework is structured so that the level of fixed charge is a function of the portion of the network that is used rather than a charge for the entire network (ECMT 2001, p. 37). Similarly, charging structures (rather than negotiation) need to account for incremental costs imposed by a given operation:

> Capacity allocation and charging schemes may need to take account of the fact that different components of the rail infrastructure network may have been designed with different principal users in mind. (Directive 2001/14/EC)

A distinctive example of posted access charges is exemplified by the current German system (coded 'TPS'01')—see Figure 10. Perusal of the charging structure indicates that the freight access charges are not differentiated by the type of goods hauled.

Negotiated access charges are ruled out in European countries (Great Britain apart)—a function, in part, from the decision not to price-discriminate across operators. By contrast, negotiation forms an integral part of setting freight rates in the USA, where Ramsey price discrimination has been used as an

143 The congestion costs were derived from the expected increase in Railtrack's performance regime payments arising from increased congestion. These costs are not necessarily the total costs of the additional congestion.

FIGURE 10 THE CURRENT GERMAN TRACK ACCESS PRICING STRUCTURE

ILLUSTRATIVE PRICING STRUCTURES: GERMANY

Track access charge =*

Track quality (variable rate per train km)	X	Train type (capacity use) (uplift)	X	Special train (uplift)	X	Regional factor (uplift)	+	Train weight surcharge (variable rate per train km)
-Long-distance trains modulated by 6 line speed categories -Local trains modulated by 2 line speed categories -Urban express no modulation *-Above factors uplifted by 20% where line is congested*		-Passenger trains modulated by 3 train qualities -Freight trains modulated by 3 train qualities		-Unusual trains modulated by uplift for steam, out-of-gauge movements		-Uplift for regional lines, depending on cost of retention of line. Factors range from 1.1 to 2.45		-Gross train weight modulated by 5 gross weight categories *and* Special rate for extra high axle loads etc.

* There are additional charging structures for use of ancillary facilities (e.g. terminals) and for passenger stations.

essential tool for cost recovery in the integrated operations. In Canada, freight rates, and access charges for some running rights, are settled through regulatory decision (the binding Final Offer Arbitration), though this occurs only when negotiation between access seeker and access provider fails. If running rights are granted, the guest and host are expected to negotiate compensation. The Review Panel of the Canada Transportation Act concluded that access terms should be settled through negotiation and, only if agreement was not reached, through arbitration:

> The Panel believes that encouraging commercial negotiations is the right approach but is cognizant that agreement may be difficult to achieve. The Agency should therefore continue to have authority to set compensation if no agreement is reached. (CTARP 2001b, p. 81)

The process has been criticised, however, for the time taken and expense in reaching an arbitrated settlement (CTARP 2001b, p. 35). The Review Panel is pessimistic about negotiation where rights of access are *imposed*; the Panel concludes that if running rights are imposed, successful negotiated settlements are unlikely, resulting in the need for a government agency to set the access charges (CTARP 2001b, p. 60).

Kieran notes that, in Canada where an integrated operator seeks to run over another operator's tracks, the access charge is kept simple and, due to the incentives of reciprocal track usage, the settlement is straightforward:

> The only topic for negotiation in bi-lateral arrangements is the sharing formula and the minimum payment provision. ... The principal motivations are operational and involve an expectation of mutual gain. ... Agreements are kept simple (% of costs, fixed fees, or $/car). Thus measurement is also

> simple and verification of charges in not an onerous task for either party. … reciprocity is a key consideration in the long run, and it is not in the interest of either party to initiate a provocative or retaliatory action with ensuring consequences. (Kieran, p. 24)

Such charges are cost-based, therefore, and given the mutual benefits in exchanging track access, there is little benefit in the incumbent pricing up or obstructing access. Thangaraj, et al., note that where Canadian agreements are subject to negotiation, however, the process used to reach a settlement, and the resulting agreements themselves, may not be efficient (p. 3). Adjudication may resolve a disagreement on the basis of regulatory rights rather than on factors such as mutual distrust—which can break down the assumption that the parties behave rationally. The consequence is an outcome based on regulated rights rather than the optimum solution (where there is mutual gain).

We note, then, that where access charges are not subject to price discrimination, there is a strong case for posting the charges. This reduces information costs, creates operator certainty, establishes clear and consistent signals for operator and infrastructure manager incentives on usage and provision and reduces transaction costs. Even where price discrimination is undertaken, however, *comprehensive* reference charges can be used to provide both a degree of certainty and the correct signals and incentives to operators and infrastructure managers alike and reduce the transaction costs associated with negotiation. As the earlier Railtrack congestion charge illustrates, negotiation involved considerable resource costs; these costs could be compounded where the charging framework, upon which the negotiations rest, did not provide the right incentives for operator and infrastructure manager alike.

Priced versus administered capacity management

The efficient allocation of infrastructure capacity can be critical for achieving on-track competition. Ideally, pricing should be used to allocate track capacity amongst users. As discussed in Chapter 1, however, the rail industry shares a number of the characteristics of other network industries. Nonetheless, the rail industry differs from other network industries in important respects:

- In the allocation of finite capacity at a given physical location and with the unique nature of the commodity being shifted across that network; and
- in that rail is a 'heterogeneous' product and train operators have differing infrastructure and capacity needs. Gómez-Ibáñez illustrates the problems incurred on upgrading Britain's West Coast Main Line, where operators' track capacity needs are patently different from each other. Operators need to agree not just 'whether the line should be upgraded but on which types of services should be favored in the design. Operators of slower freight and regional passenger services needed different track, signal and power distribution systems than the operators of the high-speed passenger services.' (Gómez-Ibáñez 1999a, p. 78) Subsequently, operators

may then be forced to pay higher access charges for infrastructure upgrades that (at best) give them no benefit.

This uniqueness of each item being transported, and the varying infrastructure standards, therefore adds to the focus on capacity and the difficulty of setting market-clearing access charges. Moreover, railway routes that have sufficient potential traffic to enable on-track competition are also likely to be routes where spare capacity for that competition is least. For this reason, capacity management is key to the success of aims for on-track competition. As capacity usage reaches saturation, therefore, path allocation and access charges that manage capacity, can lead to disproportionate increases in transaction costs. This is especially the case under vertical separation.

Here, we consider how different jurisdictions allocate capacity; and how capacity is managed when there is congestion—that is, where train services are likely to be affected by other, close-running, services.

In Great Britain, due to the complexity of train paths—their varying standards, in particular—the access charge is a payment for *rights of access*, not a payment for specific train paths. What is bought may therefore differ in quality by factors such as the maximum journey time, by timetable flexing rights[144] and by whether the paths are available as 'clock-face' timings (Bolt 1998). There are, however, various problems with capacity allocation that have not been satisfactorily resolved in Great Britain or any of our other surveyed countries. The problems include:

- limited capacity available after government-procured train services are operated; and
- inadequate development of a *transparent* capacity allocation system.

The British experiences with capacity utilisation under multiple train operations have led to a rethink on the level of competition sought. In the London area, there are limited amounts of spare capacity in primary flows and the high transaction costs involved in trying to resolve capacity demand conflicts. The Strategic Rail Authority (SRA) perceives there are few potential opportunities for competition while the costs of different (but not competing) train operators at given London termini are excessive. Consequently, the intention is, in these situations, to abandon potential opportunities for open access passenger train competition (SRA 2002).

One principal finding is that, for most countries, there is an absence of pricing that reflects the availability of spare capacity. For most systems, capacity is

144 'Flexing' refers to the degree of variance of the path actually provided from that path originally sought. Thus, high path flexing may mean that the train schedule is one hour earlier or later while a low flexing is a smaller variation from the desired time.

administratively allocated. This absence of pricing is then compounded by the universal priority that is then given to passenger trains which then do not face an access charge that reflects their premium capacity usage.

Limited capacity is acute in many European countries where high-intensity passenger trains are given this first priority in capacity allocation. Passenger trains in Canada, USA and Argentina are also given priority, although the intensity of passenger train operations in these countries is generally much lower than in Europe. Even in third-party access regimes, however, implicitly at the least, the potential third-party operator only gains access after the vertically-integrated operator has allocated its own trains—the access seeker gains the *spare paths*. Successive EC directives (91/440/EEC, 95/19/EC and 2001/14/EC) have sought to strengthen capacity allocation in EEA countries. This process still lacks prescription, however, beyond recognising that the governments have first option on capacity for 'public interest' requirements (EC 2001a, Articles 14,22).

Where the latest EC charging and capacity directive (2001/14/EC) is important, however, is that it seeks to improve transparency in capacity management. It requires, in particular, that infrastructure managers prepare a 'network statement', detailing the nature of the infrastructure, the related capacity charges and the capacity allocation and coordination principles used. Rules of capacity re-allocation (which is undertaken when train paths are not used for a given period) are also set out. This directive is still in the process of being implemented into EEA members' legislation. The transparency objective appears to go some way to meeting train operators' concerns. For instance, a survey of 55 access seekers in Germany revealed an 'indifferent' view to German Railways' (DB AG) general access rules but the operators regarded transparency in allocation as being the 'most serious problem' (Link, p. 158). A recent EC directive seeks greater independence and transparency in capacity management. The infrastructure manager, not the train operator, must undertake timetabling. If the undertaking is vertically integrated, the allocation must be undertaken by an independent entity.

What is clear from country review, however, is the general absence of price-based capacity management, although there are also few alternative allocation processes. The EC recognises that capacity management is a problem. It seeks, however, to identify routes where freight will have priority: 'Step by step, **a network of railway lines must be dedicated exclusively to goods services** so that, commercially, railway companies attach as much importance to goods as to passengers' [emphasis in original] (EC 2001e, p. 10). The EC 2001 transport White Paper also points to freight path priority on shared lines for 'efficient' international trains: **'efficient international train paths will have to be allocated to freight, either in the form of infrastructure or as time slots**' (emphasis in original, EC 2001f, p. 32). Fulfilling this policy, Scherp reports that from 2003 international trains have priority path allocation over domestic trains (Scherp, p. 6).

The EU provides no concrete advice on how this these priorities should be established apart from the fact that the distribution of paths should be transparent, 'fair and non-discriminatory'. It does warn, however, that 'grandfather rights' 'do not exist. Infrastructure managers may conclude framework agreements with railway undertakings to give some multi-annual guarantees on capacity' (EC 2002, p. 54). That said, there appears to be no guidance on how existing paths would then be re-assigned.

There is also a pseudo-priority signal in that services for which purpose-built infrastructure has been built should be given priority use of that infrastructure. Thus, in countries such as Great Britain, the freight services are threaded around government-franchised passenger services. In Finland, priority is normally given to long-distance passenger trains. In The Netherlands, the passenger services take precedence in peak and shoulder periods while freight services are given precedence during the night; the country is constructing a freight-only line, the Betuweroute line (German border–Rotterdam), to overcome capacity constraints on the existing lines congested with passenger operations. In Italy, priority may be given to a service in order to assist financing new infrastructure. This is the key approach that underlines the investment in the Channel Tunnel—the infrastructure owner has priority use for its own services and for those services it has already sold (that is, to the French and British governments). In France, the concept of third-party access is blatantly undermined by the priority allocation of paths to trains 'for which the lines were originally built'; the national train operator still allocates the capacity, which 'it still considers to be its own network (Improverail 2002a, p. 136). Similarly, in Spain, priority is given to 'existing services on dedicated infrastructure'. In Japan, the JR Freight operation is based on using paths inherited from before its vertical separation from most of the infrastructure. In Norway, paths not allocated to public service and dedicated-line services are allocated based on long-standing prior (grandfather) rights. In reality, this is the process implicitly adopted in all the surveyed countries. We note that the imposition of new incremental train services on such established rights of paths is unlikely to generate the most efficient use of track capacity: higher utilisation of capacity may be achieved by restructuring train timetables.

One exception to the arbitrary train path allocation rule is that adopted by Denmark. The train path allocation is systematic and transparent though still not based on price. As elsewhere, public services receive priority. However, the Danish rules dictate that if capacity is scarce, *additional* train paths are only granted to the public service when capacity has been expanded. At subsequent capacity reviews, existing non-public service operators are entitled to keep 80 per cent of their paths; freed-up paths are available for new operators. There is also a systematic approach to resolving conflicts over train paths by ranking trains in terms of their task performed. Although this is the form of regulation in Denmark, it is unclear just how much this system has been put to the test.

There are several price or revenue-based allocation procedures that have been proposed or adopted in various regimes. These are:

- path auctioning;
- service franchising;
- revenue maximisation;
- flexing; and
- congestion pricing.

These are now considered.

Path auctioning allocation

Given that the capacity is finite in time and location, a first-best approach to capacity allocation might be to undertake a path-auctioning system, involving capacity allocation based on bids of the highest net present value of a time stream of access revenue. Gómez-Ibáñez indicates that auctioning is sometimes advocated in railways because the heterogeneous characteristic of the train path provides a significant complicating factor in access price setting:

> Heterogeneity makes it harder to use prices as a coordinating tool by making it much more difficult to model infrastructure capacity and congestion. With heterogeneous products, infrastructure capacity and performance are harder to define because they have so many more dimensions. And predicting the effects of additional output on infrastructure performance becomes more difficult because each type of service is likely to have a different effect … The difficulties of calculating congestion prices on railroads have encouraged some economists to propose auctioning track and station capacity as an alternative. (Gómez-Ibáñez 1999a, p. 78)

We did not, however, find any infrastructure managers that have adopted path auctioning even though there is precedence for such an approach, in airport slot allocation. Dodgson notes, however, that due to the complex interactions between train services, rail paths need to be considerably more precise than the 15-minute slot periods allocated to airlines (Dodgson 1998, pp. 120–21). (This is precisely why Railtrack sold access *rights* rather than *paths*.) It is notable that the EC has not considered an auctioning system in its 2001 access-charging directive. While allocating paths *without* prices is difficult, an auctioning price mechanism has also proven difficult to devise.

Allocation by franchising and contracting

A variant from the direct path auctioning has been adopted in Argentina and Great Britain, through bidding for franchises to acquire access rights and to provide train services with those rights. In the case of Argentina, bidding processes were undertaken for the exclusive rights to operate freight trains over six regional groupings of railway lines.

In Great Britain, franchising was seen as a second-best solution; as part of the rail reforms in Great Britain in 1993–94, the Government first considered path auctioning. In his study for the UK Department of Transport, Starkie proposed that 'a system of tradeable property rights is established and that packages are both tradeable and divisible, thus allowing particular train-specific slices of track capacity to be bought and sold between companies in a secondary market' (Starkie 1993, p. 62). As Starkie has noted, however, 'if a market process is used, such as inviting bids for track capacity, it is perceived that the interdependence of train paths will produce conflicts that can be resolved only after considerable and complex negotiation' (Starkie 1993, p. 62).

Recognising such complex inter-linkages between the existing train services over its dense network, the British Government instead opted for franchise bidding. Access seekers bid for access rights to run (typically) subsidised passenger services. The objective of on-track competition to facilitate productive efficiency is obviously very difficult where capacity utilisation is high, as there is little spare capacity to generate a viable alternative service. With franchising, by contrast, competitive bidding *for* the sole access rights is intended to provide alternative incentives for firms to provide efficient train services[145].

Contracting represents a similar model to franchising. One difference from the British model lies in the revenue risk: in the case of franchising, the operators take the cost of provision risk and the revenue risk for the (passenger) traffic. With contracting, operators take the cost risk but not the revenue risk for the traffic. The other principal difference between the British franchising model and standard haulage contracts, however, is that a successful bid for the franchising secured the necessary train capacity.

Revenue maximisation

DB AG uses revenue maximisation as a guide to allocation amongst conflicting uses. As a first step, it bases its allocation on seeking consensus over path usage. If consensus fails, however, resolution occurs through awarding the path to the party willing to pay the most. By contrast with auctioning, it is not an iterative bidding process. Thus, even though the access price itself does not vary, the temporal stream of potential income forms a revenue-based rule for path allocation. Given that the German operator is integrated, however, it is unclear how this allocation process can be transparent as long as the integrated operator is still responsible for path allocation (which the EC requires must end in 2003). This approach is also likely to favour the established operator over the new operator, which is less likely to be in a position to make long-term commitments.

145 See, also, Cox, et. al.

Timetabling flexibility

Given the constraints on capacity, it is notable that the German access pricing structure has offered an access charge rebate for train operators prepared to permit flexibility ('flexing') in which train paths it receives. Similarly, where there is inflexibility—such as where an operator requires train paths at set times or frequencies (such as departures at the turn of the hour)—higher access charges are set. This principle is also adopted in France and in Great Britain (See, for instance, ORR 2000a, p. 85 and ORR 2000e, p. 8). In essence, if there is *sufficient* (that is, accurate) variation in the structure of access charges to generate incentives to shift demands, this can facilitate conflicting claims on paths as well as improve cost recovery. Accepting flexibility also reduces the need for costly negotiations, facilitates better capacity utilisation (timetable optimisation) and improves coordination of activities. For these reasons, the access charge rebates may provide useful incentives that facilitate path allocation.

Capacity management under congestion

Timetable flexibility surcharges and rebates form part of a wider application of pricing that reflects capacity utilisation. It is part of a more general issue about how access providers manage capacity when there is congestion and what incentives there are for the access provider to expand capacity. One approach would be to simply add a congestion charge into the access price; this approach may help to reduce the demand at busy times and therefore the path allocation process would require less arbitrary intervention. The congestion charge would reflect the disruption costs and the opportunity costs of the incremental user[146]. There are few access charging frameworks that incorporate congestion charging; Great Britain is an exception.

The Railtrack 1996–2001 access pricing structure was based on access prices that were largely invariant with demand for train paths; this included an essentially-fixed congestion charge. The result was that network use was encouraged, exacerbating capacity shortages and raising disruption costs. An important aspect of access charges is that they should provide the correct investment signals to infrastructure managers. Gómez-Ibáñez and Kalt observed that transaction costs escalated as key points in the network approached capacity. They observed that with a charging structure that did not give the right incentives, the consequential problems of 'negotiating shared access to the infrastructure as it reaches capacity limits and, especially, investments to expand capacity and improve infrastructure have been large' (Gómez-Ibáñez and Kalt, p. 21). Such problems—where Railtrack, indeed, would have little financial

146 We need to remember, nonetheless, that while the congestion charge is intended to price for the externality that is caused through the infrastructure use, the train operator may merely be generating delays on another of its own trains. That is, the congestion externality is, in fact, internalised.

incentive to resolve a capacity constraint given the low incremental revenue that would be earned—led to protracted negotiations between a train operator, Railtrack, the Rail Regulator and the Franchising Director and, therefore, to costly transaction costs. Gómez-Ibáñez comments that the costs of coordinating access could be very high, even for simple issues:

> Even very simple projects involve at least three parties—a TOC [Train Operating Company], Railtrack, and the Regulator—and often a fourth—OPRAF [the passenger train franchiser]. And many projects are far more complex because they affect more than one TOC or they are too expensive to be recouped during the franchise period of the TOC. Negotiated agreements are not impossible… However, the cost of negotiation may discourage many other worthwhile projects that would have been undertaken by a vertically integrated firm. (Gómez-Ibáñez 1999a, p. 45)

This latter problem identified by Gómez-Ibáñez, that projects would be discouraged, undermines a key tenet of access charges: that they encourage efficiency in infrastructure provision.

As we noted above (page 131), Britain's SRA has identified this problem with coordination and proposed to reduce the number of passenger train franchises using a given London terminus. SRA sees greater benefits in reducing transaction costs by removing contractual interfaces and simplifying timetable planning than losses from potential competition between operators (Strategic Rail Authority 2002).

The (1994–2001) British access charge system for passenger franchises incorporated an element of congestion pricing albeit that it was essentially a fixed charge, which did not rise in response to greater capacity utilisation. The consequence was that overall demand for capacity did not decline and there was minimal incremental capacity. The UK Rail Regulator noted on that charging system that

> … the variable charge which is currently included in access agreements for track usage does not reflect the cost of increasing capacity on those parts of the network which are congested. The effect of this is to remove economic signals about where demand for developing the network is sufficient to justify expansion, and would guide efficient use of the existing capacity where it is scarce. (ORR 1997, Paragraph 5.5)'

The negotiation process was a further impediment to train operation due to the resources required to agree upon an appropriate congestion charge when an operator sought to introduce a new service (ORR 2000a, p. 83). Where track was near capacity, Railtrack was reluctant to permit further track usage. This reluctance arose because:

- incremental access revenue was low;
- extra services reduced Railtrack's ability to recover lost time; and
- the extra services increased the probability of delays

The consequence was that the impact of additional services on train punctuality could be high and to net losses to Railtrack on its performance regime payments. Thus, given the low incremental revenue, Railtrack was likely to face net losses from permitting additional services. (See Gómez-Ibáñez 1999a, p. 36, ORR 2000e, p. 1.)

The new Railtrack/Network Rail access charging structure from 2001 included an additional charge that has some variation (50 per cent) with the level of congestion on the track. It is unclear, however, whether this charge is imposed if there is only one operator on the relevant track; the remaining congestion costs are then added to the Regulatory Asset Base (RAB) in 2006 (when the regulated access charges will be next subject to revision). The Rail Regulator has deferred this cost component in order to moderate the impact of higher marginal costs on incentives for traffic growth (ORR 2000a, p. 83).

There is a good reason for not finding capacity-based pricing in some of our surveyed countries. This is because, in countries such as Finland and other Scandinavian countries, capacity utilisation is relatively low. For this reason, the Scandinavians' ('low') marginal cost-based charges are sustainable without causing a major congestion problem. In many other countries, rail reforms are in their early stages. Thus, the only congestion is that faced by the incumbent. In this case, the operator makes its own trade-offs between running fewer trains to remove congestion and running the extra trains and incurring self-inflicted congestion. That is, the single train operator internalises the costs of congestion.

In countries such as Germany and France, the detailed access charge framework consists of the cost-based charge, which have capacity-based differentials. Thus, at periods of high demand (peak times) there are higher rates. For instance, French passenger trains on urban track pay a reservation fee of €14.77 per kilometre of path in peak but €2.95 per kilometre of path in off-peak. Similarly, the German system grades lines by intensity of use and prices accordingly; it also includes an uplift of 20 per cent at locations of specific congestion. Inevitably, such charges may discourage usage but they do not necessarily clear excess demand. In other countries, such as Italy, the problem is acknowledged, without a solution being offered:

> … the current procedures for allocating train paths… need application criteria to solve, on one side, the congestion of network sections and junctions of greatest commercial interest and, on the other, to meet the necessary non-discriminatory and assurance requisites for all railway market players… (Italian Transport Ministry 2001)

For most countries, generally, there is no clear model for capacity management, with little use being made of modulated prices. This is explained, in part, in that on-going capacity allocation is dominated by traditional public interests (notably, passenger trains) while for many other operations, paths allocation is based on grandfather rights to traditional freight users. Thus, new third-party

entrants and new open access entrants are given access on residual capacity that exists after the incumbent has allotted its pathing needs. Some countries seek to manage capacity through blanket higher charges at times and routes where demand is high. Great Britain has experience with congestion charging though the passive (fixed) charge adopted there provided little in the way of incentives to either invest in additional capacity or reduce demand for congested capacity. These approaches adopted work against competition objectives.

Path supply and usage compliance incentives

In Chapter 1, we identified that the process of separating ownership of infrastructure from train operations alters the incentives for infrastructure managers to provide access and for train operators to use the infrastructure. However, depending on how the access charge is structured to share benefits and costs, the wheel-rail ownership interface may still lead to divergences in behaviour—different incentives on:

- operators' infrastructure use;
- infrastructure performance standards; and
- investment.

There are three main areas of concern: the wheel–rail interface and incentives for optimal track and train technology and the sub-optimal usage and supply of infrastructure.

In principal, wheel and rail are interdependent—they make the same physical contact. Thus, each can benefit from improvements made in the way they physically interact.

Some of these issues can arise even within a single, fully-integrated railway: in some systems there are privately-owned or leased rolling stock. Thus, new, low-impact wagon bogies bring operator benefits in bogie maintenance, wheel wear-and-tear and train fuel consumption as well as benefits to infrastructure managers in reduced track wear and tear and maintenance costs. However, around one-half of rolling stock in the USA is privately-owned (Tuzik 2001) and insufficient benefits may accrue to wagon operators to encourage them to update their fleets.

Other divergences can arise, in particular, because under the varying degrees of vertical separation, if the infrastructure manager fails to comply with certain standards of infrastructure performance, that failure no longer impinges directly on the infrastructure manager's financial return. However, the converse can also be true with train operators, to the extent that incentives to supply or maintain their rolling stock are muted by not facing the direct costs on infrastructure of reducing those standards. This might lead the infrastructure manager to under-maintain its track or set lower infrastructure standards: access providers have

some incentives to reduce their quality as long as they do not perceive that it fundamentally undermines the viability of their customers.

Access pricing schedules can set out differential charges that match the quality of rolling stock riding standards; these can provide pricing signals to encourage operators to run low-impact vehicles. The standard of actual wagon riding may be less easy to price, however. In some cases, wheel defects can lead to derailments—leading to a high operator cost; this gives a strong incentive to optimise this incidence. In other cases, however, the operator may have less incentive to optimise wheel condition *or* that optimality is lower than for the infrastructure manager. The divergence in this optimality occurs because, in the absence of detection, the train operator does not bear the direct infrastructure costs of running defective or overloaded rolling stock.

There is little evidence in our survey of countries that train operator incentives have been addressed in charging regimes, in incentives regimes or in monitoring with punitive consequences—despite being an integral aspect of a viable charging regime. TCCI notes that wheel flats lead 'to very high dynamic loads that can cause serious damage to track including broken rails, concrete sleepers and fastenings' (TCCI, pA-29). The Office of the Rail Regulator in Britain commissioned a report on the incidence of rail defects on Railtrack, *prior* to the serious accident at Hatfield in 2000 (which arose, in part, from faults in the processes of track maintenance and renewal). The report noted the asymmetry in infrastructure–operator incentives that arises when open or third-party access users are on the track:

> While wheel irregularities are known to lead to track damage… there is less evidence that they adversely affect the vehicle structure… Thus in a railway system where vehicle owners and maintainers are insulated from direct track damage costs (such as the situation that now exists in Britain), there is less pressure on the mechanical side to maintain wheels in good condition. Railtrack believes that the incidence of wheel irregularities has increased since 1994 [when track and train activities were separated], and that these increased numbers have led in part to the increase in broken rails. … A recent report commissioned by Railtrack from AEA Technology Rail concluded that "a sustainable reduction in rail breaks could be achieved by effective management of the wheel impact population." (TCCI, pA-30)

A report by Booz Allen & Hamilton, for the Rail Regulator, similarly noted that:

> In particular, we consider track quality to be at the heart of the relationship between rail users and Railtrack. A performance incentive regime should incentivise users to present their vehicles in good condition, such as not to impose undue costs on Railtrack… (ORR 1999, para. 241)

These defects in the pricing and incentive structures of the reformed railway industry are still being addressed[147].

147 See, for instance, Footnote 14, which outlines the establishment of train–infrastructure 'System Authorities' in UK and elsewhere in Europe. See, also, ORR 2002a, which outlines consultation issues for a new review of the (Network Rail) access charges and a recognition of the need for further research into cost causation (p. 39).

There are few examples where either access, or other, charges have been varied to reflect variance in quality or usage although the EC has indicated that performance regimes be instituted:

> Infrastructure charging schemes shall through a performance scheme encourage railway undertakings and the infrastructure manager to minimise disruption and improve the performance of the railway network. (2001/14/EC)

After this Directive, the EC announced in 2002 that it will impose a Regulation that sets out the terms of compensation for non-compliance under this performance scheme. Importantly, the EC has outlined that the regulation will introduce service quality incentives for both infrastructure manager and train operator (EC 2002, p. 27).

In Britain, a punctuality-based performance regime existed between Railtrack and the train operators from 1995. The regime provided financial incentives for both Railtrack to minimise disturbance to train timetables and for train operators to use train paths efficiently (Kain 1998, pp. 250–51); a (similar) 'possessions regime' existed for Railtrack's planned (timetabled) track possession for maintenance and renewal activities. In this latter regime, the compensation payments to train operators have been estimated to be upwards of 40 per cent of total costs of track upgrading costs. (These arrangements have been inherited by Railtrack's successor, Network Rail.) The base rate per minute of delays is derived from estimates of the value that passengers place on avoiding a minute of travel delay (Gómez-Ibáñez 1999a, p. 34). One new benchmark established in 2002 intends to match the level of Railtrack's compensation for its track possession with the loss in the train operator's revenue (ORR 2002, p. 3). There are concerns regarding the approach, however:

- **Benchmark-setting.** If the benchmark is set too low, then relatively costless improvements in infrastructure performance can be rewarded with significant payments from train operators to the infrastructure manager;
- **Running cost.** Such a system is not costless to operate. Resources are needed to monitor and to measure the various parties' performance. In the case of Railtrack and the train operators, more than 300 staff have been employed to apportion responsibility for delays. (Financial Times 2001);
- **Penalty and reward levels.** The levels of rewards and penalties need to be realistic. It has been noted, for instance, that the Railtrack regime does not give incentives to operators to make up time lost by the infrastructure provider. Thus, it has been noted that there are reported that a train operator may not be incentivised to recover from delays—compensation for late running caused by Railtrack can be greater than the impact on revenue. (ORR 2000d, p. 8)

A different punctuality-based performance regime is being established for part of the Channel Tunnel Rail Link high-speed line in Britain. The infrastructure manager and train operators will each have an 'account' of funds, which are

drawn down when an infrastructure or train failure occurs. Compensation is not paid, however, to other accounts. As a result, the industry players retain an incentive to maintain their standards and to recoup time.

A punctuality-based performance regime exists between the USA passenger train operator, Amtrak, and freight infrastructure owners to the extent that freight owners are rewarded and penalised for variances from an agreed standard of time keeping. Performance regimes also exist in other jurisdictions such as between SJ (Swedish Railways) and the access provider, BV; between Swiss Railways (SBB) and third-party access users; and between Japan Railway Freight and the passenger infrastructure managers. ProRail (Dutch infrastructure manager) has general conditions for incident compensation. These are limited to cases where the party incurring the damage 'can demonstrate the damage was caused' (ProRail 2003), subject to a minimum damage claim of 10,000 Dutch Guilders and exclusive of non-supply of infrastructure that arise from the need for urgent repairs that could not reasonably have been foreseen.

Regulation

A key issue in access reform is the extent to which the access charge price-setting process occurs within a regulatory process. We found three main forms in which regulation is an input into the price-setting process:

- individual settlements (e.g., arbitrated settlements);
- the level of overall access charges (reflecting monopoly concerns and promoting productive efficiency); and
- the structure of access charges (to ensure fair competition between operators)

In addition, we note that there are other access-based regulations, such as on ownership (for instance, whether Railtrack could be financially linked to a train operation) and on asset 'stewardship'—regulating to ensure that the infrastructure is maintained at a given standard. The latter regulation has also been applied to Railtrack and formed part of the regulatory process of the access charges. (In part, it was the regulator's inability to ensure reasonable stewardship that led Railtrack's network licence to be transferred to a 'not-for-profit' public quango, Network Rail, in 2002.)

We have seen in the Australian reforms that there is a basic structure of a regulated floor–ceiling price band. If negotiated prices cannot be agreed upon, the floor-ceiling prices form the band within which an arbitrated charge between an infrastructure manager and access seeker will fall. This band would itself be subject to regulatory scrutiny to assess the actual infrastructure costs relative to 'efficient' costs. The basis for this intervention lies in that, while on-rail activities are assumed to generate productive efficiencies through

competition, below-rail activities remain dominated by monopoly provision. This is, perhaps, of greater concern where the infrastructure provider is a public corporation or is privately owned rather than a government department (which can impose any desired 'public-interest' solutions): under the corporations and private ownership there is focus on price regulation (to prevent monopoly abuses) and the efficiency incentives.

There have been limited developments in price regulation of below-rail provision in our survey of countries. Regulatory focus is on preventing abuse of power by the monopoly infrastructure manager and, in the absence of direct competitive pressure, to ensure that regulatory incentives can be used to encourage productive efficiency by that infrastructure manager, through revenue capping regulation. Most of the infrastructure entities in our surveyed countries are government departments or corporations; government sets or endorses the level of access charges. The level of charges are set by the transport ministries in Denmark, The Netherlands, Switzerland and Spain, centrally by the Swedish government and set by the infrastructure manager but approved by government in Austria, Italy, Belgium and France (Obermauer, p. 28). The regulation is therefore clearly important where the infrastructure managers are given broader commercial freedom to set charges. This is the case with public corporations (such as DB Netz in Germany) and, more importantly, private entities, where the market discipline is greatest. In this context, Railtrack and the Canadian and USA private operations provide regulatory examples.

We should note, however, that the North American railways remain integrated and effectively closed to non-voluntary third-party access. There is, however, 'light-handed' freight rate regulation in the USA. A broad band of rates, using price discrimination, are permitted; regulatory intervention occurs when a shipper submits a formal allegation that the rate has breached a ceiling cap. The USA's Surface Transportation Board sets a jurisdictional threshold revenue-to-variable cost ratio of 1.8 as a first rule in demarcation of captive versus competitive traffic (Bitzan 2000, p. 97).

In Great Britain, the overall level of access charges of (Railtrack, and its successor, Network Rail) is regulated. This is justified because the infrastructure manager is a monopoly provider and because the government has a stake in the company's performance. In particular, through its franchised passenger train operations, the Government is a major infrastructure user and thus that regulation is in the 'public interest'. Since the company was formed in 1994, its access charges were subject to revenue capping, underpinned by assumptions about cost savings generated through efficiency initiatives. By contrast, with other (public) operations outside North America, the charges were regulated to *ensure* they generated sufficient returns to fund infrastructure renewals and investments. As a private company, with shares sold on the stock exchange, Railtrack relied upon its access revenue to undertake investments. Despite this apparent private status, however, Railtrack received a considerable level of government subsidy: for instance, in 2001, the level of direct subsidy was around

one-third of all access charges (and was projected to rise significantly thereafter (The Guardian 2001)). Its regulation consisted of three main components in building up the revenue requirement to fund the operation:

- the expenditure required to operate, maintain, renew and enhance the network to deliver the baseline outputs; *plus*
- the required return on the company's assets—the RAB; *minus*
- single till revenue projections from stations, property, freight, open access and miscellaneous sources.

The expenditure required for the network was reviewed in two aspects. First, it was framed around an agreed task and, secondly, the regulator took a stance of the efficiency gains that it believed could be achieved. The 'allowed' expenditure was therefore deflated by the assumed productivity gains. The initial RAB was derived from the Treasury's franchise budget. Subsequent additions to the RAB (whether sunk or other fixed costs) required approval of the Regulator. In this way, while the Regulator did not necessarily specify *where* investment would be undertaken, the Regulator certainly specified what will *not* be considered as a part of the regulated assets against which charges could be set. A return on the RAB was then estimated, allowing for a determined risk embodied in the cost of capital. Having taken these views on achievable efficiency gains of production and a return on an acceptable level of RAB, and deducting ancillary income, a figure for required revenue was derived. The annual change in that revenue then determined the regulated aggregate increase in access charges.

Thus, the Regulator determined Railtrack's access charge level, its charging framework and its incentive structure. It could be argued that Railtrack's incentives for productive efficiency were dampened by the high degree of regulation and the fact that there were few market pressures—most of the company's income were public funds. The company's move into administration in 2001 occurred when the Government blocked the reassessment of the company's expenditure. (The Rail Regulator was required to set access charges that effectively *guaranteed* the commercial viability of the company.) Railtrack reassessed the safety of its rail maintenance strategy, which had contributed to a serious accident near Hatfield in England; the company's maintenance and renewal expenditure subsequently escalated during 2000–01. In refusing to allow the Rail Regulator to review the expenditure, the Government ensured that there would not be sufficient revenue for the company's viability.

The third area of regulation in the price-setting environment is in the access charging structure. We consider this point further in the next section on cost recovery: the charging structure impacts on the ability of the infrastructure manager to recover costs but it may have consequences for on-track competition—especially where the prices are being set by an integrated

operator. In this context, competition regulators (in particular) input into the price-setting process.

COST RECOVERY

Access charge levels and structures are critical to on-going viability of infrastructure managers; they are also critical to train operators' operating incentives. Table 9 summarises a range of access charging structures. These have different impacts on cost recovery and on train operation. It is apparent from the table that there are different ways of recovering costs—indeed, even in the space of a few years, some jurisdictions have had a few different charging structures. We review these pricing systems and consider their implications for train operator incentives and infrastructure managers' cost recovery.

Cost recovery level

It is appropriate to consider what is meant by 'cost recovery'. With a large proportion of rail infrastructure having a life of 50 years or more, a firm may be viable in the short to medium term even if it cannot earn a return on historical investments or earn sufficient funds to replace the infrastructure. The cost recovery objective of Britain's Railtrack (and its regulator) was to ensure that there are sufficient funds to maintain and to renew its assets *as and when* that renewal occurred. Thus, as Gómez-Ibáñez has noted, the company did not earn a return on the replacement value of its entire network—it did not need to; it needed only to earn a return on investments in renewals when they became necessary (Gómez-Ibáñez 1999, p. 44). This was undertaking by adding approved investment expenditure to the RAB. This was not the only approach adopted to bring about investment and renewals:

- **Negotiated agreements.** In the late 1990s, Railtrack undertook complex and prolonged discussion with Virgin Trains (culminating in a revenue-sharing agreement) to renew and upgrade the primary rail corridor, the West Coast Main Line. Railtrack would share incremental revenue resulting from its incremental investment upgrading. The transaction costs of negotiations and legal issues were so great, however, that (as Gómez-Ibáñez has noted, 1999b) 'there are modest enhancement needs all over Railtrack' network, and many may simply never get done if the high cost of negotiating agreements outweighs the benefits from the investments'.
- **Special Purpose Vehicles.** Latterly (2001), the UK government created Special Purpose Vehicles (SPV) to help finance (subsidise) specific infrastructure renewal projects: in this case, the revenue was funnelled directly through the SPV rather than through the access charge (via the RAB).

The government also provided substantial investment grants to the company[148] as well as a degree of underwriting of bank loans[149]. This underwriting was undertaken on the back of the government's grants to Railtrack for new investment: the underwriting was offset against future government investment grants . That is, the government paid a significant proportion of Railtrack's investment costs.

To finance those investments, Railtrack primarily raised bank and euro bonds on the London Stock Exchange. It has also been argued that financiers' lending was on favourable terms (on the presumption that the government underwrote the public service), that is the risk was not transferred and the lending rates were correspondingly lower (Financial Times 2002).

The foregoing discussion therefore undermined the credentials that Railtrack had as the only valid private sector open access provider that achieved full cost recovery through commercial processes; its subsequent demise also undermines the notion that it recovered sufficient costs for a viable future. For new railway investments, however, there is considerable scrutiny on the ability of the investment to achieve full cost recovery. Thus, it is important to note that new ('green field') investments and reconstruction investment invariably involve unconventional access charges to facilitate cost recovery and reduce risk. Access charges for major rail projects in Europe have each involved specific charging structures: this includes unique charging systems for the Channel Tunnel, the Storebælt, the Øresund and the Channel Tunnel Rail Link[150]. Apart from being relatively high charges, the pricing structures can incorporate high fixed components. For instance the French and British Governments purchased 50 per cent of the Channel Tunnel capacity for their freight and high-speed Eurostar passenger trains. An access charge for the Eurostar trains is based on a toll per passenger, subject to a minimum annual level of passenger throughput.

In Table 11 we illustrate the range of access pricing objectives that have been adopted. Of the countries that price for full cost recovery, only Railtrack (Great Britain) provided any degree of open access—the other countries are either closed to (third-party) access or allow that access only on voluntary, negotiated terms.

148 For instance, the majority of the £6 billion–£10 billion West Coast Main Line renewal project is to be paid by grant.

149 It was the Government's refusal to underwrite further bank loans to Railtrack (on the back of future investment grants) that led to the company's insolvency in October 2001.

150 Similar issues can apply to upgrading and renewal of existing infrastructure. For instance, the financing needed for the renewal and enhancement of Britain's West Coast Main Line, and the re-opening of Scotland's Stirling–Alcoa line, have led to alternative charging systems. In the line re-opening case, the Scottish government is proposing to levy a toll per train that is additional to the normal track access charge.

TABLE 11 SUMMARY OF INDUSTRY STRUCTURE AND ACCESS PRICING OBJECTIVES

Pricing objective	*Industry structure*	
	Integrated	*Separated*
Marginal cost	Switzerland[f] Japan (passenger)	Sweden Finland Denmark Norway Japan (freight) The Netherlands
Above marginal cost	Italy[c] Austria[c] Germany[e]	France[a]
Full cost recovery	Canada USA Mexico (excluding FIT)[d] New Zealand[d] Argentina[d]	Great Britain[b]

a The independence of RFF from SNCF appears notional; it is therefore debatable whether the French railways are separated.

b Based on considerable State intervention in the level of access charges and the substantial grants directed to Railtrack, it is arguable whether Great Britain's pricing objective was ever 'commercial'. Freight charges are, in any case, set to incremental cost levels—incremental operating and capital costs. Passenger services are essentially franchised, subject to minimum subsidy requirements.

c The Italian, Austrian and Spanish governments are undertaking vertical separation of their railways.

d Integrated railway operations in these countries have been franchised.

e German national rail infrastructure is owned by holding companies that also own train operators; debate is continuing on the ultimate ownership and structure.

f Swiss Railways includes some margin above marginal costs though the objective is primarily marginal cost coverage.

Thus, outside Australia, Railtrack (now 'Network Rail') represented the only application of the model of mandated access with full cost recovery. Of course, this company was regulated to ensure that it obtained enough revenue from access charges—primarily, from indirect government subsidies—to maintain and renew the infrastructure; it had the 'stewardship' of the national asset (SCETRA 2001, para. 16). The structure of the charges also ensured that Railtrack was reimbursed for inherently unprofitable rail lines. Thus, access charges incorporated line-based or regional-based costs, which were spread over the operators and operations. The consequence was that lightly-utilised rail lines generated relatively high access charges (for which the passenger train operators were compensated by commensurately high franchise

subsidies[151]). In this way and with public underpinning, Railtrack therefore had an incentive to retain costly and lightly-utilised facilities, which are indirectly funded through the passenger train subsidies.

In a sense, then, where government financial input is significant, the issue of cost recovery can be little different than for publicly-owned infrastructure, in that the degree of cost recovery that the infrastructure manager seeks can be somewhat arbitrary. Thus, a converse picture emerges in France, where the ability of France's infrastructure manager, RFF, to charge the national train operator, SNCF, is capped (Dunn and Perl, p. 51). This, then, becomes a form of off-balance sheet subsidy to SNCF.

Third-party access in the USA is generally cost-based—especially when the charges are arbitrated rather than negotiated. The approach reveals a somewhat different basis for cost recovery. Access is typically based on trackage or haulage rights of access (use of the track but not solicitation along the track) rather than 'traffic solicitation' (plying for trade along the host railway's tracks). Despite these curtailed access rights, nonetheless the access fee incorporates a degree of compensation for foregone traffic. The Surface Transportation Board (STB) has used the 'SSW Compensation' decision to determine that the level of 'trackage rights' access charges should be compiled from three component costs[152]. These are:

- the variable costs of usage;
- a pro-rata apportionment (based on each operator's wagon-miles) of total annual maintenance costs; and
- a return element on the value of the relevant rail properties used (STB 1998).

This calculation includes an estimation of the indirect (opportunity) costs associated with traffic lost by the host railway because of granting trackage

151 The apportionment of incremental costs was undertaken by considering what physical *assets* would no longer be needed as each operators' services were withdrawn: a given asset change was allocated to a single operator. Note, however, that this procedure still leaves a significant proportion of common costs across the operators: the use of the term 'residual' here is somewhat misleading as it has been noted that these 'residual' costs are around half of the fixed access costs (Dodgson 1998). The residual common costs are distributed amongst the franchised passenger train operators in the following way:

- *sub-zone* costs are distributed on the basis of each operator's budgeted passenger vehicle miles; and
- *zonal* and *network* costs are distributed on the basis of budgeted passenger revenue (before subsidy) (Cole and Holvad 1999, p. 479).

152 A significant application of the SSW compensation approach occurred in 1998. As one condition for CSX's purchase of Conrail track in north-east USA—which would then reduce intramodal competition in that area—the STB required CSX (railway) to grant haulage or trackage access rights to Canadian Pacific over certain New York State tracks. The two railways could not agree on the access charges so the STB set the charges, based on the SSW approach.

rights (Carlson et al p. 11). *Arguably,* this is a form of the application of the Efficient Component Pricing Rule (ECPR)[153]. This pricing has been criticised because it perpetuates the non-competitive prices of the incumbent (Jahanshahi, p. 79). The return on the current market value of the infrastructure[154] represents the economic costs of assets required or consumed in access. This represents more than 60 per cent of the total charge and so can be a critical component in setting cost-recovery access charges (Cairns 2001, pp. 15–16). Cairns stresses, however, that the SSW approach differs from the ECPR. This is because, if the third-party operator secures contracts on demand-elastic and demand-inelastic traffic, the access fee is identical in both cases even though the incumbent rail operator loses more contribution to overheads from the demand-inelastic traffic than the demand-elastic traffic (Cairns, p. 17).

We now consider the different levels of cost recovery sought, namely pricing based on recovering marginal costs and pricing that seeks to also recover some degree of the overheads and common costs.

Marginal cost pricing

As is apparent from Table 9, there are varying interpretations of the relationship between rail infrastructure usage and resource costs. This may reflect the varying 'science', or it may reflect pure judgement. The objective of any such pricing system is to translate the costs into charges that *relate* to how the usage costs arise. (This assumes, as we noted above, that train operators are compliant in maintaining and using vehicles in a way that minimises track damage.) As noted earlier (Chapter 2), there has been a long-term development of principles in the USA that relate cost variability to track usage: this is formalised in the Uniform Railroad Costing System.

Even where knowledge of cost causation improves, however, the translation of those costs into access charges generates debate. In Britain, Railtrack and the Rail Regulator did not agreed on the process for identifying the relationship: Railtrack favoured a 'bottom-up' (cost-based) causality and the Rail Regulator favoured a 'top-down' causality (such as econometrics-based relationships). The top-down approach was endorsed because it was seen to be comprehensible and 'a practical, cost effective and transparent mechanism is required which will provide the correct incentives to users and to the infrastructure supplier' (ORR 1999, para. 240). By contrast, the Regulator considered that the bottom-up approach was complex and of limited applicability for pricing.

153 Nolan and Fulton note that 'the relative merits of ECPR are still under considerable debate in the regulatory literature' (Nolan and Fulton, p. 84).

154 Note that the asset value is taken from the 'fair market value, rather than book or replacement value' (Cairns, p. 17).

By contrast with road cost attribution processes, cost attribution in the rail industry seems unclear; a general conclusion is that there is a strong linkage between axle load and train speed and *track* maintenance (ORR 1999, para. 39) but cost relationships for *lineside structures* are unclear. More to the point, however, our survey of different charging systems illustrates that translation of that infrastructure usage to an access charge remains subject to considerable interpretation. We should also acknowledge the time scale with which the costs are being considered. The access provider may consider the short-term marginal cost of a single train running over a track or may consider longer-term costs that incorporate the resource costs of incremental infrastructure that is required for the access seeker.

Marginal cost pricing or marginal social cost pricing has been (or is to be) adopted in a range of countries. With the industry being dominated by a high proportion of fixed and common costs, the cost recovery from marginal cost pricing can be as low as 10 per cent. While marginal cost-based pricing is allocatively efficient, nonetheless it requires substantial on-going public funding.

While the *objective* within these countries is consistency across modes at the margin, however, there is a range of pricing structures and variation with track quality. As we noted earlier, passenger trains almost invariably receive priority in path allocation even though the paths are also highly valued by freight operations. Despite this, the following charging principles ignore or inadequately account for passenger trains receiving the higher value paths, notably even in the presence of congestion:

- In The Netherlands, ProRail, the infrastructure manager, sets a price per train kilometre (with a charge per station stop), with some differentiation by freight and passenger trains—see ProRail 2003, p. 14.
- The Finnish track owner seeks to cover marginal *social* costs, covering infrastructure maintenance, external accident[155] and environmental (diesel emission) costs (Thomas, p. 14). The price structure is in two components: first, a charge per gross tonne kilometre and, secondly, a charge per net tonne (ECMT 2001, p. 56).
- Sweden and Norway have similar access pricing systems, with environmental objectives, though the structures vary. See, for instance, Nilsson (1992) for a discussion of the objectives of Sweden's Transportation Policy Act and the social marginal cost-based pricing of rail and road. In the pre-1999 Swedish structure, an annual fixed fee was levied on locomotives and rolling stock, rated in accordance with the number of vehicle axles; there was also a variable gross tonne kilometre-

155 External accident costs are defined by the exposure to accident risk. Thus, passengers and train personnel are aware of the personal risk of riding a train: these costs are internalised. By contrast, it may be argued that to a degree, accidents at unprotected level crossings are external costs as 'careful behaviour may have not prevented the incident' (Thomas, p. 14).

based charge, with rates varying by rolling stock type, handling costs, catenary usage, accident costs and fuel usage. There were also variable ancillary charges for traffic control and consumables. The present structure is fully-variable, set with *marginal* rates—a rate per gross tonne kilometre for maintenance, a rate per kilometre for accidents and a charge for emissions set on a the level of diesel consumed. The level of the emissions charge is based on estimates of Nitrogen Oxide emitted, differentiated by type of diesel locomotive. A similar structure has been adopted in Norway.

- The Swiss Federal Railways access pricing is based on marginal cost pricing, though it also sets a 'contributory margin'. The base price includes components for overhead energy consumed (a rate per kilowatt-hour), a performance-related maintenance charge (a rate per gross tonne-kilometre), a staff-related charge (per train-kilometre) and a station-staff and maintenance charge per station used. The pricing structure seeks, as far as possible, to identify individual tasks so, while there is the base price for the core activities, there are also detailed additional charges for identified uses, such as use of marshalling yards, stations and use of personnel. The system also charges where higher infrastructure performance is sought, such as keeping train paths free for permissive services and for use of loading facilities.
- In Denmark, the objective is marginal social cost recovery though the freight operators face a fixed fee per route kilometre and a rate per train kilometre. In terms of the preceding discussion, such a rate per train kilometre does not reflect the damage inflicted by freight trains, where the damage varies mostly with tonnage. The per-train kilometre rate is, however, differentiated by line definition (broadly, between 'main' lines and 'other' lines). Passenger train operators pay a marginal rate per train kilometre, differentiated by main or other line classification, but they do not pay a fixed fee.

It should be noted that the marginal cost systems are generally set on a simple rating of gross tonne kilometres as the basis for establishing prices. This rating may, of course, vary with the type of line used. The gross tonne kilometre access price rates are worth comparing (while accepting that each system has differing cost bases). In Sweden, the rate is €0.33 per thousand gross tonne kilometres; in Norway and Finland it is €1.75 per thousand gross tonne kilometres while for the Swiss Federal Railways, the core activity rate is €3.40 per thousand *net* tonne kilometres.

Pricing above marginal cost

Some railway systems set access charges above marginal costs though only Railtrack in Great Britain sought to price to achieve a return on investment; the Canadian and USA integrated operators use their *shipper tariffs* to this end.

To the extent that infrastructure managers seek full cost recovery, however, there are different measures of just what those costs are. One consequence is the practical limitations of setting access charges using given principles. Thus, for instance, Carlson et al., point to evidence from the USA that 'indicates that there are large information and computational costs associated with conducting an SAC [Stand-Alone Cost] style test' (Carlson et al., p. 11). We have noted that there is no single system of marginal cost calculation; equally, there is no single system of asset valuation. The Canada and USA approach contrasts, in particular, with the system adopted in Great Britain. This is understandable: there is a clear capital–maintenance trade-off. Other things being equal, maintenance costs may be higher where capital invested is low; similarly, there can be higher maintenance costs associated with higher train operating performance[156].

In Canada and the USA, the rate of return component is established by applying the railway *industry's* cost of capital to the value of the line and then spreading this fixed sum evenly over each car-mile that the line is expected to carry (that is, a form of combinatorial price-setting). When a railway is acquired and trackage rights are negotiated in the USA, the Surface Transportation Board uses the value implied in the amount paid for the earnings stream to assess the asset value. The value of the line is derived by looking at the amount paid for a company's network relative to the network earnings, compared to the earnings on the individual line for which access is sought. These approaches contrast with that used by Railtrack when it was privatised. Railtrack's *access charges* were determined by the pool of money available to the Government's Franchising Director for subsidising passenger franchises. Based on a nominated rate of return that the Regulator decreed that Railtrack was to receive, this pool then implicitly determined the value of the assets. As we discussed above, subsequent approved investments were added to the RAB. A key issue in Britain has been the extent to which infrastructure renewals are considered as valid expenditure for inclusion in the RAB: the regulator is likely to include renewal costs where it includes *enhancements*.

In Chapter 2, we noted the impact of different pricing structures and systems on allocative efficiency. We consider how effective these systems are at recovering costs and also their impact on train operator incentives.

Ramsey pricing

As noted in Chapter 1, Ramsey pricing allows full cost recovery, being efficient in allocative terms relative to other full-cost pricing systems; prices vary in inverse proportion to the users' demand elasticities—the lower the own-price elasticity, the higher the mark-up above marginal cost. From a practical position, Ramsey prices are difficult to apply, as they require appreciation of users'

156 An example of this is ARTC's upgrading of the Melbourne–Albury standard gauge track. Selective capital and maintenance work has improved operating performance: higher speeds and axle loads.

TABLE 12 ESTIMATED REVENUE-TO-VARIABLE COST RATIOS IN USA

(Shipper rates revenue relative to variable costs of train operations)

Commodity	*Revenue-to-variable cost ratio*
Farm products	1.27
Food and kindred products	1.40
Coal	1.57
Non-metallic minerals	1.62
Petroleum and coal products	1.64
Lumber and wood	1.67
Chemicals	1.98
Metallic ores	2.41

Source: Derived from table 9, p. 99, Bitzan.

sensitivity to prices. Further, we note that Ramsey prices may distort on-track competition, to the extent that the productively-efficient operator may face higher access charges than the marginal, inefficient operator.

Before mandated access policies, Ramsey pricing referred train operators discriminating in *rate (tariff)* setting for moving goods on behalf of shippers. It underpins the rate-setting by private integrated operations in Canada and USA. (See, for instance, General Accounting Office 2002, p. 4 and passim.) In Table 12, we illustrate how tariffs vary by commodity: the revenue-to-variable cost ratio increases where as goods are increasingly captive to the rail system

While such Ramsey pricing is undertaken widely in setting freight *rates*, it is less widely undertaken by infrastructure managers in setting *access* charges. The attitudes of governments such as the European Union is that discriminatory access charge pricing above marginal cost is not allowable across train operators within a goods market though, by implication, it is allowable across freight traffic markets (commodities or quality of service):

> Infrastructure managers shall ensure that the application of the charging system results in objective, equivalent and non-discriminatory charges for different railway undertakings that perform services of equivalent nature in a similar part of the market (European Commission 2001).

In vertically-integrated systems, the train operations were used to impose price-discriminating tariffs on shippers to cover fixed costs. There is little evidence from our surveyed countries of third-party access train operators being levied differential access charges except in terms of the goods being transported. Such pricing is present, however, where ECPR-based pricing is considered; the Canadian Transportation Act Review Panel has proposed such a demand-based access pricing system for an enhanced access system in that

country (CTARP 2001, p. 84). Their argument was essentially that current infrastructure cost recovery is based on differential shipper tariffs; if mandated access led to infrastructure managers to gain their revenue by access charges rather than shipper tariffs, then there should also be differential access charges:

> ...competitive access must retain elements of differential pricing while permitting additional competition. Although it could be complex, the Panel sees no alternative to requiring a commodity- or traffic-based access charge, where the access fee bears some relation to the existing revenue contribution of the traffic that is subject to competitive entry. This would approach the ECPR rule but need not conform exactly. (CTARP 2001, p. 84)

We stress, however, that to ensure even-handedness of treatment of the integrated operator vis-à-vis the access seeker, such discrimination would need to be either service-quality or freight market-based, not operator-based.

There is little evidence of *any* vertically-separated infrastructure manager undertaking Ramsey pricing. The passenger train market in Great Britain cannot use Ramsey pricing. The Rail Regulator has noted, 'Pure Ramsey pricing would not be a feasible solution, since all variations to franchise charges are paid from the [Government] Consolidated Fund and so the price elasticity is effectively zero' (ORR 1998, para. 45).

Railtrack's freight access-charging regime up to 2001 provided a hint of discrimination by Railtrack, between the three freight operators (EW&S, the container-based Freightliner and DRS). Freight access charges were established through individual negotiations. The objective of using negotiations was to

> permit Railtrack to negotiate a share in the high value placed on transportation associated with certain types of freight—differential demand-based pricing. (Cairns 2001, p. 3)

Nonetheless, we note that the discrimination was limited to conveyed products not to customers as the approach should 'not provide different operators with substantially different fees, to the extent of distorting competition' (Cairns 2001, p. 3). This restriction on Railtrack's charges reflects that policy tension between ensuring competition *and* ensuring infrastructure cost recovery. As it was, any such attempts at price discrimination across operations ended in 1997, when five of the freight operators were merged within EW&S and with Railtrack's supply to EWS of a formula that would enable it to readily calculate access charges rather than agree on charges through negotiation. In his 2000–01 review of freight access charges, the Rail Regulator noted:

> Some safeguards would be required to ensure that there is no undue discrimination. Deviations from the reference charge would therefore need to be justified in terms of differences in cost and would be available to other operators in similar circumstances. (ORR 2000b, p. 7)

To ensure that discrimination *across train operators* is *not* occurring, the *new* (2001+) freight access regime in Britain has been made public, to ensure transparency and, therefore, equality of treatment (ORR 2001, p. 1). Deviations in access charges from 'reference charges' are permitted only because of

justified cost differences. The Regulator has, however, set inter-modal freight access charges at a level that recovers only short-run marginal costs—unlike other freight markets, there will be no recovery of any degree of fixed costs. The reason for this pricing is based on awareness of elasticities: as the Rail Regulator noted in 2001, it was argued that

> in markets where it is difficult to keep the cost structure of rail operations below that of road (or other competing modes), a small variation in access charges may make a large difference to rail's competitive position. It therefore proposed that ***intermodal*** traffic should not generally be required to make a contribution to fixed costs but that other traffic should be required to pay for these costs (ORR 2001b, p. 31). [emphasis added]

It should be noted that this discrimination is likely to favour primarily (or entirely) one train operator as intermodal traffic is almost entirely provided by just one company, Freightliner.

At a more general level, access price variations across different train groups that are not related to the cost of the resources can be regarded as price-discriminating. We note the widespread access charge differential between passenger and freight operations. For instance, the French infrastructure manager, RFF, provides a discount of 50 per cent for the 'reservation' (congestion) charge for freight operations in peak time. Finland, The Netherlands and Great Britain also differentiate access charges by passenger and freight operation. The Rail Regulator in Britain argues, however, that the differential is cost-based: the railways are essentially maintained for passenger operation, so freight should bear only its incremental costs. Thus, the common costs are attributed only to passenger franchises, whose services are almost all subsidised by the government.

In conclusion, however, there is little evidence of using differential access charging within freight operations to facilitate infrastructure cost recovery. The evidence of the efficacy of Ramsey pricing in the rail industry is limited to its application to freight rates in the private railways of Canada and USA.

Distributed (average) cost pricing

Under distributed cost pricing, common costs are distributed across users that may recover costs in full but which will result in a greater loss of allocative efficiency than when pricing above marginal cost using Ramsey pricing. Of our survey countries, average cost pricing has been adopted in Germany, Italy and Austria, where cost recovery beyond the marginal cost level are sought. Cost recovery is nonetheless well below the full cost recovery.

Distributed (average) pricing is necessarily arbitrary in nature: if it were possible to apportion the fixed and common costs to individual train operators, this would be more efficient and less contentious. While it is not possible to undertake this approach, average costs can still be based on similar measures of usage. As we noted in Chapter 1, costs can be apportioned in terms of each

operator's relative output, gross revenue, attributable cost or technical cost. The essential point here is that each approach involves its own distortions on operator incentives, which affects train operation. For instance, distributing costs based on the underlying marginal costs of a train operation will impact disproportionately on heavily-loaded bulk train operators (where the marginal costs are relatively high). Such operations may be relatively small, but they would bear a disproportionate share of the costs. Which approaches have been adopted is now reviewed.

Relative output: The relative output measure for freight usually consists of either gross tonne kilometres or net tonne kilometres set at a rate above the marginal cost level. In Great Britain, the current (from 2001) access pricing structure uses a combination of a relative output measure and a gross revenue measure. The system allocates some proportion of the fixed costs—the costs at the Railtrack's sub-regional levels—amongst operators in proportion to their respective *vehicle* miles. The Swiss Federal Railways have adopted a train-kilometre system for allocating costs of its passenger services. As we noted earlier, Eurotunnel's third-party (Eurostar) passenger train operations through the Channel Tunnel is comprised of a marginal cost plus a variable levy. The variable element, however, is subject to a 'minimum-usage' traffic projection (of between 10 and 12 million passengers though the Channel Tunnel), based on agreed traffic forecasts.

The Eurotunnel access charge illustrates a deficiency of the average costing, however; it sets incentives that are likely to conflict. Specifically, it is likely that Eurostar's profit-maximising traffic level (which may mean yield maximisation rather than passenger maximisation) may not converge with Eurotunnel's profit-maximising access charge level (which will be based on maximising passenger throughput).

Gross revenue: The gross revenue system has not been widely adopted in the countries surveyed. It does form part of the complicated Great Britain passenger franchise access pricing system, however. Railtrack's regional zone and network common costs were distributed on the basis of the passenger operator's (gross) budgeted revenue (before subsidy).

Attributable cost: The attributable cost system has a number of parameters. Some can be measured relatively easily, if only highly detailed, such as use of track points and whether a train stops at a station or passes through the station. Swiss Federal Railways have adopted this. In principle, the pricing system differs from relative output measures in that it uses a range of infrastructure uses (rather than a single output measure) *as the basis for setting mark-ups from marginal cost.* The primary attributes used to apply average costs are:

- Track attributes, such as the quality of the infrastructure (track for high-speed trains, for instance);

- Physical train attributes, such as the train speed, the weight of the train, axle loads or number of axles and the train length; and
- Market train attributes, such as time periods, market segments and traffic density.

In France, for instance, where cost recovery is set above marginal costs, charges are varied by the *track attributes*. The current RFF fixed charge per month ranges from no charge on secondary (branch and non-main) lines through to €9818 per kilometre of high-speed line. The Italian (FS) access charges are also varied by the track quality supplied.

Physical train attributes are also adopted as a basis for apportioning costs. In Germany, for instance, the new (2001) one-tier access pricing structure is based on train path types—the regularity and speed of the train. *That is, these are capacity-based allocation processes* rather than cost-based processes. Premium-priced paths are those that involve long-distance, regular and fast trains while normal-priced paths include irregular and slower trains.

Market train attributes that are used to apply average costs often include differential pricing for passenger and freight operations. The French infrastructure manager, RFF, adopts a differential pricing system depending on the time of day (peak, normal and off-peak) though this pricing differential is attributed to congestion costs rather than price discriminating to recover average costs. The British infrastructure manager, Railtrack, intended to introduce a time-differential cost, alluding to underlying congestion; there will be 13 time bands across the week; it also planned to introduce train speed-based charging.

Technical cost (or 'prime user' charging): Technical cost allocation of common costs has been applied in Great Britain. In the charging structure used between 1992 and 1994, common costs on a given railway line were allocated to the 'prime' or principal (usually passenger) track user, with incremental users incurring only their marginal costs. In the 2001 pricing structure, Railtrack recovered freight operators' marginal costs; in addition it is normally permitted to recover costs for maintaining infrastructure retained specifically for freight operations, that is, for incremental freight costs. The common costs are generally apportioned across passenger train operators. The Japanese access pricing system is based on this prime user concept, with trains or train types being ranked according to the technical and organisational demands on the infrastructure: trains with the highest demands bear the *total costs* except for the incremental costs caused by other users. Almost invariably, it is the passenger train operators that pay this cost in Japan (Aberle 1998, p. 22); JR Freight pays the avoidable costs[157]. Amtrak, the passenger operator

157 However, Kasai argues (p. 179) that, in practice, JR Freight pays well below its true avoidable costs. For instance, on the Tokaido Line, annual freight train damage is estimated to be ¥30 billion but the access charges are only around ¥3.5 billion.

in the USA, pays only the incremental cost when it uses freight companies' lines; the freight operators are, therefore, de facto prime user payers.

Two-part tariff pricing

Two-part tariffs can be structured in a way such that a fixed (entry) fee could be used for recovering fixed and common costs while a variable fee could be used to cover marginal costs. In principle, such tariffs can result in allocative efficiency. Given the high proportion of common costs in rail infrastructure, however, the entry fee will necessarily be large relative to the variable fee if full (commercial) cost recovery is to be achieved. Germany and Great Britain have used a two-part framework, with 'high' fixed fees, to achieve high cost recovery. In both cases, however, problems emerged in response to the high entry fee.

The German access pricing system used between 1998 and 2001 was replaced because of its anti-competitive impact. The pricing framework consisted of two separate pricing systems: a two-part charge and a totally-variable charge. The totally-variable price option was aimed at irregular and small operators, for whom a large fixed charge would be an impediment to entry. As we discussed in Chapter 2 (p. 38 and Figure 6), however, two-part tariffs *may be* second-degree price-discrimination if the effective volume discount does not reflect the costs of provision (that is, the provider's supply curve). In the German system, the totally-variable pricing option inevitably translated into a higher variable and average rate than the comparable two-part tariff. (Despite this, we should note that the infrastructure manager is effectively subsidising the low-volume operator relative to the high-volume user.) Most of the integrated operator's (DB AG) competitors did not provide sufficiently large operations that enabled them to switch to the lower (two-part) charge (Link, p. 156). The German Cartel Office found, for instance, that the structure generated charges for the incumbent's regional passenger train operator that were, on average, 25 per cent lower than those of third-party operators. The Office subsequently ruled that the charging structure was anti-competitive. The new charge is essentially a set of variable rates, differentiated by distance/train speed, route importance and, for passenger trains, the seat occupancy rate.

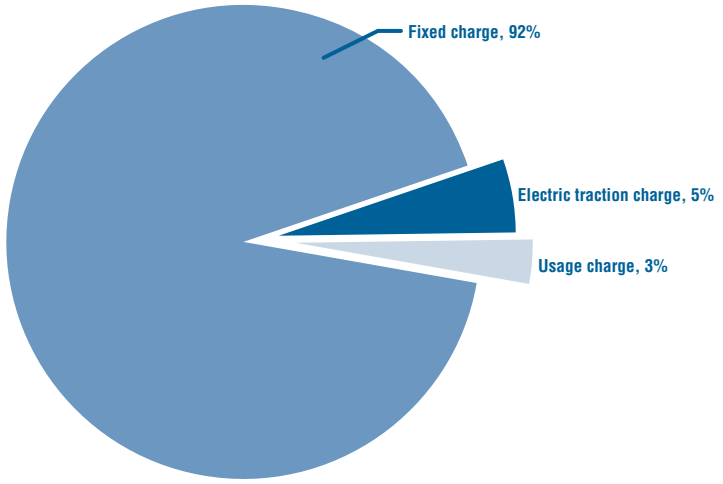
The Railtrack two-part tariff, used for British passenger train access between 1995 and 2001, was set around a very high fixed charge and a marginal-cost based variable charge. The high fixed charge had been based on research that suggested that, on average, around 92 per cent of costs were invariant with traffic. See Figure 11. This was consistent with German data suggesting that marginal costs are around 2 per cent of total costs (EC 1999a, p. 15) and consistent with Goergen's estimate that 87 per cent of infrastructure costs are independent of traffic (p. 33). The essential point, however, of a large fixed charge is that operators' access costs were then largely invariant with usage (thereby encouraging marginal use) and, equally, that Railtrack's revenue (and, therefore, investment incentives) was largely invariant with usage: there were

asymmetrical incentives for demand for capacity and supply of capacity. Specifically, we note that:

- Passenger train operators faced variable cost-based access charges for their non-franchised services; freight operators' charges were based on marginal or incremental costs. The variable charges were therefore set at around 10 per cent of franchised charges; with access charges normally forming around 45–55 per cent of a passenger operator's operating costs, this meant that a non-franchised operation could be run for around half the cost of a franchised operation. With this lower non-franchise cost threshold, there was a strong incentive to run additional trains.
- There was little incentive for Railtrack to accommodate additional trains within the existing track capacity. The congestion charge was essentially fixed while the access charges for additional services were based on variable costs. At the same time, however, Railtrack could lead to additional penalties for additional delays caused by the incremental trains.
- The high fixed component had inevitable disincentives on Railtrack to expand capacity: there was relatively low incremental revenue arising from additional traffic.
- Because of the high fixed component, Railtrack did, however, have reduced exposure to major reductions in revenue arising from a *decline* in train miles.

We should note that it *was* intentional that the high proportion of fixed income would provide Railtrack with some protection from declines in train services. In the event, however, following Railtrack's establishment in 1994, strong

FIGURE 11 SOURCE OF RAILTRACK ACCESS REVENUE, 1995–2001



economic growth (with correlated stronger growth in car usage and, hence, road congestion) has stimulated passenger rail patronage (which has increased by over 30 per cent). In conjunction with the negative investment and usage implications noted above, therefore, the access-charging framework has proved inadequate. A pricing structure based on static or declining traffic has all the wrong incentives built into the charging system when traffic is growing. In particular, the charging structure has exacerbated the surge in rail traffic. We stress, therefore, that an access charging structure needs to be flexible enough to accommodate industry outcomes that differ markedly from those assumed.

Irrespective of the access charging structure, there was a key issue about the degree of variance in access charges in response to train movements. We have noted that the 'science' of railway cost causation at the outset of access charging systems was crude. Excluding electric traction charges, the Regulator's initial (1994) view was that Railtrack's marginal costs were around 3 per cent of total costs. This research on the marginal–total cost proportions then formed the basis of the access charge structure subsequently adopted, as shown in Figure 11. That is, the pricing structure was based on a very low marginal charge and a large, residual, fixed charge. However, later Railtrack research suggested that the marginal costs were in the region of 10–15 per cent of total costs (EC 1999a, p. 15). Railtrack's eventual view in 1999 was that 30 per cent of its costs were 'variable' in the short-run (Railtrack 1999, p. 10)[158].

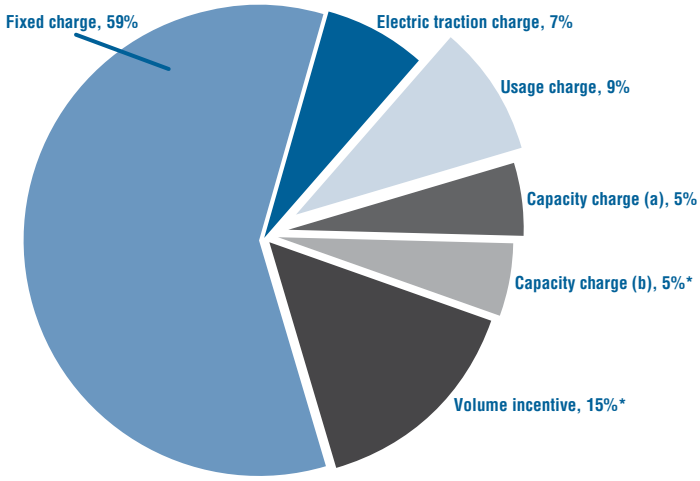
The 2001 passenger track access charge incorporates a variable component that is applied when train operators run additional trains. The passenger track access charge remains essentially fixed, however (around 80 per cent). This approach, which maintains the high fixed costs, illustrates the trade-offs in setting the fixed–variable ratio: the Regulator considered that increasing the variable/fixed charge ratio 'could have a significant effect on some operators, particularly freight' (ORR 1999b). As freight operators do not pay common costs, however, the two-part tariff problems: most freight operators are charged only its marginal costs of operation plus the recovery of fixed costs that are directly attributable to its operation, i.e., its incremental costs.

The 2001 pricing structure illustrates the importance of access charging structures in influencing access provider and operator incentives—especially when the access charges represent such a high proportion of the operator's costs. The new structure therefore sought to overcome clearly-evident investment disincentives and the incentives to operate marginal trains that, nonetheless, generated congestion. Railtrack's implied variable costs for passenger trains was around 21 per cent; this included a capacity (congestion)

158 The company also argued for access charge modulations that reflected the magnitude of marginal costs. That is, the marginal cost levels varied strongly in proportion to the type of vehicle used, the standard of line (track speed) and whether the line was electrified. Railtrack noted that applying these modulations would improve train operator incentives.

charge. The average apportionment of charges is shown in Figure 12. The Regulator set the charges with an asymmetrical structure, however, such that the 'volume incentive' and the 'capacity charge (b)' were fixed charges for the train operators but were variable charges for Railtrack[159]. That is, the structure built in an additional revenue source for Railtrack, should it expand capacity to cater for more volume and offset congestion. In essence, Railtrack's regulated asset base (which formed the basis for RPI-x regulation), for its next regulatory period, would be adjusted in concert with growth in train miles and fare box revenue (ORR 2000a, p. 88). In this way, the structure seeks to provide incentives to respond to congestion by expanding capacity rather than simply to price up and choke off demand (ORR 2000a, p. 83, 88). We note, in this context, the need for these regulated charges to be in harmony with the underlying government policies that seek to cater for rail-based traffic (which is intended to suppress road traffic growth).

FIGURE 12 RAILTRACK RAIL ACCESS PRICING STRUCTURE, 2001–



*Note that, in practice, the capacity charge (b) and the Volume Incentive will be fixed charges as far as train operators are concerned. That is, the fixed charge for operators will average 79%.

Italy, Denmark, France and Eurotunnel use systems with fixed charges. The Council of the European Union agreed in 1999 that access prices could incorporate variable prices based on mark-ups on marginal cost as well as

159 This asymmetry is achieved through adding costs for volume enhancement into the Regulatory Asset Base. Had the volume enhancement been added to variable costs, it would have affected train operators' incentives to operate trains. Half of the estimated marginal congestion costs are added to the fixed cost component of train operators' charges while the other half is added to the Regulatory Asset Base at the end of the regulatory review period for the charges—in this case, in 2006.

allowing fixed charges (ECMT 2001, p. 54). EC Directive 2001/14/EC requires that such mark-ups should not deter traffic that could pay the marginal costs. Germany, Austria and Sweden have moved away from two-part tariffs, to fully-variable tariffs; France has reduced the level of its fixed cost.

In the limited cases of voluntary access agreements in the USA, two-part tariffs form the basis of charging. The voluntary nature of access provision (and, often, reciprocation of rights between operators) means that there can be mutual benefits of access. Thus, two-part charges are less likely to be structured in a way that would deter access. Valletti and Estache note (p. 25) that USA's structure is '…generally a two-part tariff with an annual fixed charge to cover non-variable capital costs and a variable charge depending on the number of trains or wagon to cover variable costs and wear and tear on the track'. A lower access charge may be agreed, however, as part of a wider benefit to the incumbent (e.g., as a basis for the Surface Transportation Board agreeing to a merger). Cunningham and Jenkins suggest that the terms of these voluntary agreements do vary widely, however, depending on the business needs and priorities of the parties (Cunningham and Jenkins 1997, Section 'Open access' proposals). We should note, however, that in the more recent development in the USA of charges where access is mandated (for whatever reason), the STB applied the 'SSW Compensation' approach, which does *not* use a two-part structure. Rather, this approach uses an incremental cost approach, with a maintenance cost (based on the relative use of the track by incumbent and third-party) and an approximation of the economic (opportunity) cost of the access. That is, this mandated structure is fully variable.

As we noted in Chapter 1, an important aspect of the 'fixed' charge component in any two-part tariff is the make-up of that fixed component. For instance, in its access pricing structure, ARTC's fixed charge is actually a 'flagfall'—a charge *per train path reserved* (ARTC 2001c, Section 4.1) although the length of the reservation period and the penalty for non-use of the path may, in practice, make the charge very 'fixed'. By contrast, other fixed charges may be fixed for a period of time per unit of track used. For example, in France, the fixed charge is a per-month rate per kilometre of line used while in Sweden the pre-2000 pricing system included an *annual* fixed charge levied on the number of vehicle axles in a train operator's fleet of vehicles. While such an annual charge could provide an entry barrier (for infrequent users), the Swedish fixed charge was relatively low and, in linking to the rolling stock size, the charge varied with the size of the undertaking. As such, it reduced the potential entry barrier for small operators. The German pricing structure used between 1998–2001 ('TPS'98') offered a fixed cost per distance-based geographical block of network used per period. Thus, the critical factor with these systems is the way in which train operators are locked in to the fixed charge. In fact, in Aberle's terminology, the 'flagfall' would probably not be regarded as a 'fixed' charge:

> The system [fixed] charge represents an option price and works like a quantity rebate, since it does not depend on the number of slots demanded per unit of

> time (year, for example) or part of the network (and may be related to the whole network). (Aberle 1998)

With a flagfall, the average cost *per train* will *not* decline with increasing number of trains run. The operator does, however, have an incentive to run *longer* trains with a flagfall, as the flagfall cost per tonne declines. (This will impact on the infrastructure demanded, notably, a demand for longer passing loops.) With the genuine fixed charges, however, such as those previously found in Germany and Sweden, the average cost per train declines as the operator introduces more trains. It may be that such fixed charges form a greater impediment to new entrants than flagfall charges, as (especially if the charges are large) it can require a certain minimum train frequency to allow the operator to offer competitive freight rates. Further, as the fixed charges are effectively pre-paid, it locks in the operator's commitment to the train paths. Conversely, however, the fixed charge found overseas will (arguably) enable the infrastructure manager to achieve a higher cost recovery than with a flagfall charge, by committing the operator to a higher level of infrastructure usage. In this same context, the fixed charge is a stronger contractual commitment between train operator and infrastructure provider, providing greater certainty for the infrastructure manager in undertaking investment.

Thus, depending on just what the fixed charge is levied against, the two-part tariffs, with high fixed (entry fee) components can therefore achieve high cost-recovery. This can come at a cost, however. The fixed cost component, acting like a sunk cost to train operators, can:

- encourage high track use;
- reduce incentives for infrastructure manager to invest;
- discourage new train operators; and
- give competitive advantage to larger firms.

As noted earlier, therefore, the policy maker needs to accept that there is a degree of conflict between objectives such as on-track competition and cost recovery for infrastructure provision.

OVERVIEW OF EXPERIENCES

The necessity for rail access pricing is a consequence of a movement towards widened access to railway infrastructure. The common primary objective of reforms in other countries in the last decade has been to improve railway efficiency. We have seen that there are different ways in which this objective is pursued: corporatisation, privatisation and access reform.

There are three principal goals of access reform: on-track competition and coordination and improved cost recovery (principally, in infrastructure provision). However, multiple goal-setting does incur conflicts. For instance, improving train service coordination may involve surrendering a degree of

competition between train operators. On this, however, the EC policy is clear: the primary objective lies in improved rail service coordination, to bring about a single, pan-European integrated railway system. Indeed, the ECMT sees 'somewhat limited' effect of the reforms on rail prices, due to the already-intense competition from road (ECMT 2001, p. 10). Widened access is a means to achieving that end.

Equally, the USA and Canadian policy set a primary objective in ensuring that there is sufficient cost recovery to sustain the rail network; this primacy occurs against a background of concern that there may be inadequate (intramodal) competition *between* the private railway companies, notably, in bulk freight movements. For this reason, to the extent that mandated access is seen as a potential threat to the viability of the integrated operators, a very cautious view is taken.

The application of widened access has been a learning process. The application of access reform policy in the EU has been an iterative process of application and review. Still, a decade after the initial access reform directive was issued, the EC noted that there is little third-party access and this has formed the impetus for the current package of reforms. The reforms seek to strengthen and widen the requirements for reform and policy prescription is layered onto the policy principles. What this means is that there is more than a decade of policy experience from Europe but very limited practical application of the policy.

As access in Europe is generally regulated, there is inevitably some degree of regulatory oversight. In the case of publicly-owned systems, government departments or parliaments provide oversight and approve the broad pricing levels. In Railtrack's case, the private company was subject to price-capping regulation, to ensure that it faced incentives to be productively efficient. In spite of this, the rail regulator was also required to set charges that ensured its access charges generated sufficient revenue to maintain and invest in new infrastructure. We noted, however, that in some cases, new investment projects were financed from sources outside of access revenue; we found that funding of other major new infrastructure projects is similarly underpinned by bespoke access charging systems.

To date, the coordination of rail activities has largely met with failure. The Swiss national integrated operator has established a one-stop-shop to sell packages of train paths over its own infrastructure and paths in other countries. It has done this against a background of the diverse pricing systems and national infrastructure standards. These differences are amongst the reasons cited for the lack of success of the concept to date. It is in this context that there is much hope placed in the recent commencement of pan-European trains hired by IKEA (and crewed by third-party train operators).

Where that policy application is greatest is in individual countries such as Sweden, The Netherlands, Germany and Great Britain. Of these countries, it is in Germany and Great Britain that the access rights and pricing levels and

structures have incurred the greatest challenges. Between 1994 and 2002, Germany set three different access charging systems for its national (integrated) infrastructure manager, DB AG. The competition regulator found that the first two pricing systems were unfair for small operators. Even where the second pricing system offered a choice between a fully-variable pricing structure and a two-part pricing structure, the consequence was that small and infrequent users incurred high *average* charges relative to large operators. In itself, this structure facilitated high cost recovery and would have encouraged commitment to regular use. Nonetheless, this acted against fair and equitable access—which is a particular concern when the incumbent operator also sets the terms of access. The latest access charge structure is fully variable and is posted, based on costs. In being seen to be equitable amongst users—and, in fact, the latest charges may even favour small train operations—the structure, to an extent, appeases those who seek a full separation of ownership between DB AG's train and infrastructure management.

In most European cases, we found that access charges were posted; in North America, by contrast, the charges are set by negotiation, reflecting the common voluntary agreements on access, while the access terms are limited (principally, running rights rather than solicitation rights). The posting of prices means, of course, that Ramsey pricing is not generally adopted though freight rates in North America are based on using negotiations to price-discriminate. In both Germany and Great Britain there was evidence that train operators had a clear preference for posted prices over negotiated prices. The posting was seen to be transparent, timely, fair and equitable, and incur far less resources. The Railtrack charges were set, in part, through a negotiation process. The process has typically been lengthy and efforts have been made to minimise its need and duration.

As in Germany, the level of access charges that are levied are high, to achieve high cost recovery. This means, however, that deficiencies in the charging structure are magnified, in terms of its incentives on infrastructure managers and operators. Thus, as in Germany, the Railtrack structure of access charges (again, related to two-part pricing) has been problematic. Specifically, the very high fixed cost component—which allegedly mirrored the actual cost apportionment—generated strong incentives to operators to use the track, to the extent that congestion (which was inadequately priced) arose. Conversely, while Railtrack generated sufficient access revenue for cost recovery, the pricing *structure* gave insufficient incentive (i.e., marginal revenue) to encourage the company to undertake invest to expand track capacity. That is, the British experience shows that it is *not* sufficient just to have access charges that achieve full cost recovery; the structure of those charges should also send the signals for appropriate investment. The current British charging structure has lower, but still relatively high, fixed charges while a more-responsive congestion charge system has been introduced to discourage marginal traffic and encourage incremental investment.

These are not major concerns for many of the (publicly-owned) European rail networks, where the level of cost recovery has been based on marginal costs. Even where networks agree on such cost recovery targets, however, the varying interpretations of the link between track usage and the costs results in different pricing structures. The pricing diversity has consequences for efforts to coordinate services and to stimulate competition. The still-wide diversity raises transaction costs; lengthens the operator responsiveness to respond to freight-carrying opportunities; sends conflicting signals to train operators on track usage and train configuration and, therefore, also sends conflicting messages to infrastructure managers about the need and type of infrastructure that should be provided.

Some pricing systems include pricing modulations that reflect some perception of the capacity used or the capacity constraints. For instance, some geographical (essentially urban and main line) track and track used in busy (peak) times can incur higher access charges as do specific locations that are subject to congestion. Other systems (such as in Scandinavia) do not face the same degree of capacity problem so charges are not modulated to reflect capacity concerns. Even where there is an element of capacity charge, the pricing structure does not necessarily 'clear' the market of excess demand for paths. Further, we note that the traditional path user generally remains in control of the path—which become effective 'grandfather rights' over those paths—even though the EC does not recognise such rights. Given the capacity concerns in much of the heart of Europe, however, the structure of the access charges is significant more in the *absence* of capacity modulation than in the presence of processes. The absence of systematic capacity allocation (such as might be achievable through capacity pricing—or path auctioning) removes transparency in transactions and raises suspicions of inequitable treatment (especially when the access provider is also a competing train operator). The EC has therefore sought to improve the availability of information on capacity, to facilitate transparency.

Also absent from pricing systems is resolution of the potential conflict between operators on the quality of infrastructure required and the access charge that reflects that upgrade. This issue has arisen with the upgrading of Britain's West Coast Main Line: should operators that derive no benefit from an upgrade be expected to pay the higher charges that result from that upgrade?

Most rail systems exclude charges that reflect non-compliance with an agreed standard of train path or an assumed use of the infrastructure. Thus far, Railtrack's 'performance regime' has been one exception. The EC intends to impose a regulation that will require such pricing mechanisms. The Railtrack experience has, however, indicated the high transaction costs incurred in allocating 'blame' for under-performance; this cost is magnified by the large level of interface between operators and the extensive interaction that occurs on a highly used (and congested) network. Setting the appropriate benchmark performance standards and the appropriate levels of compensation are critical

features in ensuring that the regime has the prices that bring about the right operator and infrastructure manager incentives.

From the foregoing, we can therefore see is a clear pattern of the uptake of access reform and access charging. All European systems with mandated access are publicly-owned and are reliant on public funding to sustain their businesses. The North American systems are privately-owned, with access generally limited to voluntarily negotiated access terms. In that context, we now identify international lessons arising from access charging that are relevant for Australia.

chapter 5

LESSONS FROM INTERNATIONAL EXPERIENCES

We have considered a range of frameworks of widened access to rail infrastructure in various countries. We have reviewed a range of systems of access charges and regulations that have evolved from this. In this chapter we compare and contrast the main issues in Australia and overseas that relate to rail access pricing. We draw lessons from the experiences.

POLICY OBJECTIVES

Rail access reform in Australia has its roots in the National Competition Policy—to promote competition in markets using essential infrastructure facilities. If we are to learn lessons from mandated access in other countries, we need to appreciate *the extent to which those countries seek similar objectives*.

One conclusion of this report is that, despite the widespread adoption of widened access, the reforms mask a range of sometimes-conflicting policy objectives. The objectives play an important role in access charge setting. In recent years, the primary principle has shifted from allocative efficiency to productive efficiency. Within these principles, however, lies a range of primary objectives. These include:

- making rail funding transparent so as to facilitate inter-modal equity (as in Scandinavia);
- reducing the call on government funding (as in Great Britain);
- encouraging interoperability across rail jurisdictions (as in European Economic Area);
- ensuring revenue adequacy (as in the USA); and
- increasing competition in above-rail operations (as in Germany).

In recent years, Australia has sought productive efficiency improvements through privatisation policy which seeks to use private sector discipline and the ultimate sanction of non-viable business: this is the case with the privatisation of National Rail and FreightCorp train operations and the Westrail and intrastate Australian National integrated operations. Against this pioneering

policy (for Australia), which relies on the new businesses achieving cost recovery, the country, like Germany (amongst others), also seeks improved productive efficiency through increased on-rail competition (such as through National Competition Policy). Finally, Australia *also* seeks to improve rail service coordination (essentially, done through the ARTC one-stop-shop concept). In this context, access charges then become a key parameter in achieving the key objectives of competition, coordination and cost recovery.

Nonetheless, we agree with the view of Valletti and Estache (p. 23) that, in some regimes, 'the charge is often performing too many tasks'. For instance, a two-part access structure charge used in Germany in the late 1990s facilitated high cost recovery but, despite complex variations in the structure to assist small operators, the German Cartel Office concluded that the fixed component led to unfair on-track competition (favouring the incumbent). Similarly, Railtrack access charges were rooted in, and structured from, estimates of marginal costs of access (which were only 3 per cent of the total access charge). The consequence was actually that while the firm achieved 'revenue adequacy', nonetheless, the charging structure did *not* give incentives for investment. While pricing for marginal use on this basis therefore had some economic legitimacy, it nonetheless had adverse implications for efficient provision of infrastructure and (through the high fixed tariff component) for on-track competition. Other objectives can conflict: for instance, improving interoperability across rail operations can enhance the logistics chain but this can be at the expense of on-rail competition.

We observe, in any case, that increased competition in above-rail operations can be pursued in different ways:

- **Rival operations.** On-track competition between train operators retailing rival freight train services (as with GB Railfreight and EW&S freight services in Great Britain; and ARG and Pacific National services between Adelaide and Sydney);
- **Contracting.** Competition between train operators in tendering for contracts to haul the shipper's traffic (as with contracts for IKEA Rail traffic between Sweden and Germany; and contracts for moving Leigh Creek coal traffic for NRG Flinders Power in South Australia). (Any revenue risk lies with the shipper.); and
- **Franchising.** Competition *for* the franchise to provide train services (as with passenger train franchises in Great Britain and in Melbourne). (It has been suggested that that the revenue risk is intended to lie with the franchisee.)

Contracting or franchising can be applied in circumstances where it is not feasible to split bulk movements between rival operators or where there is insufficient downstream traffic to sustain more than one operator. They can also resolve the issue of capacity allocation: the winning bid for the task also wins

exclusive use of the track. We should also note that, ideally, even where the above forms may not encompass actual competition, the market may, nonetheless, be contestable.

An important issue is the dynamics of the policy instruments. In particular, the implementation of EC access reform policy has evolved significantly, as inadequacies of early policy instruments became apparent. Since the adoption of its initial access regulations in 1991, the EC has had to reinforce its regulations. The EC has learned from the evident failure of policy—few new operators and clearly-evident jurisdictional obstructions—that further policy instruments are required. Thus, for instance, the EC's 1991 Directive required only the separation of above-rail accounts from below-rail accounts. A succession of regulations has led to greater and more prescriptive requirements: the EC now requires the separation of infrastructure and train operation management (though these management can remain within a common holding company). The EC also seeks mutual recognition on safety certification and licensing, and greater specificity on access charges.

In conclusion, then, we have identified a range of objectives in policies undertaken to increase rail efficiency. In practice, more than one objective is pursued—notably, enhanced competition, greater interoperability and improved cost recovery. Objectives may conflict, however. A consequence of this conflict is, in particular, that 'the danger exists that none of the objectives are ultimately met and moreover that some form of decay of the railway system may follow' (Improverail 2002a, p. 98).

COMPETITION ENVIRONMENT

In principle, we might assume that traditional integrated railway owners would welcome additional rail operators so as to spread the high fixed and common costs across more users. This incentive is often muted, however, because those same access seekers can also be competitors for traffic and scarce capacity. As a consequence, the infrastructure owner will often be reluctant to encourage access or have the incentive to agree upon a mutually-acceptable access charge.

Unusually for the rail industry, major transport corridors in USA and Canada have competing rail routes, providing intramodal competition on exclusive (rival) tracks that is absent in other countries. In addition, around 14 per cent of route kilometres in the USA and the principal Canadian and Mexican lines are subject to some form of bilateral third-party access. This is undertaken essentially on a *voluntary* basis, however—there is a presumption against mandated third-party access. It is relevant to note, however, that the access provided in these cases also typically excludes 'traffic solicitation' rights (the right to ply for traffic *along* the host railway). When solicitation is excluded from the access provisions, the access provider receives a degree of protection from direct competition for traffic on its own route. This provides a greater incentive for the infrastructure manager to negotiate access on mutually-acceptable

terms. (A railway may also be persuaded to negotiate with third-party operators in exchange for approval of a railway merger.) Canada has reviewed the case for 'enhanced' (mandatory) access where it is deemed to be in the 'public interest' (which is undefined) though the Review Panel regarded even the imposition of running rights (that is, without traffic solicitation) as being an 'extraordinary measure' and stated that transport policy recognised that railways' financial viability was a concern as was enhancing competition.

We noted earlier that the extent to which the level and structure of access charges impacts on train operator incentives is highly dependent on the extent to which the access costs form a major part of overall train operating costs. For this reason, some of the experiences of rail systems where charges are based on marginal costs (e.g., Denmark) are of less relevance than operations where relatively high costs feed in as a major train operator cost. It is *also* true in the USA that the impact of high access charges on a branch line operator's costs rise as the distance over a host railway rises relative to distance over the branch line. Thus, even relatively high access charges may not inhibit access if the distance involved is small[160].

Outside North America, widened access terms are mandated, against a background of traffic solicitation. This inevitably affects the infrastructure manager's incentives to provide access on mutually-beneficial terms. Because the access provider is forced to agree upon access, there is greater incentive to obstruct access. For this reason, access regimes emphasise processes that facilitate transparency in transactions and, hence, perceived fair and equitable terms. This emphasis has led to increased pressure for vertical separation, to strip out disincentives brought on by rivalry for traffic solicitation and capacity. A number of countries have adopted separation to ensure equitable access but RIC and ARTC are the only overtly for-profit separated access providers.

While there is legislated access in most European countries, varied restrictions remain (until at least 2006) across jurisdictions and on widened access for most passenger trains and some domestic freight trains. Further, although Railtrack was formed to ensure transparent open access, the regulator imposed a 'moderation' of competition clause. This clause restricted Railtrack's sale of train paths to open access passenger train operators. Thus, it is clear that Australia is at the vanguard of unrestricted (legislated) rights of access.

Other access rights and conditions

A key objective of access reform is to introduce on-track competition. Setting access charges that provide the right usage and investment incentives is key. Australian experiences point to the importance of access to rolling stock and

160 For instance, Massa (2000, p. 2) notes in the context of north-east USA trackage rights that the impact and relevance of the access price 'becomes more marked as the relative length of the haul over the other railroad's lines increases'.

terminals in developing on-track competition as well as interoperability. Equally important, however, is that mandated access in Australia is limited to *genuinely spare* capacity: to the extent that third-party terminal access materially affects the productivity of the incumbent, it can be argued that the terminal capacity is not 'spare'. Thus, to the extent that Australian transport corridors have sufficient traffic to sustain competition, viable competition may be inhibited by the limits to terminal capacity. That capacity may be required only at the initial stage of establishing services—most operators in the longer term probably seek control over their own vital terminal activity—but it may, nonetheless be an impediment to competition or contestability.

We contrast the implicit strength of the property rights in Australia—albeit still to be ultimately tested on privately built lines such as in the Pilbara—with those in continental Europe. Ownership of these latter rail firms ultimately lies with the State. Thus, the surrender of their train paths to third-party rivals potentially forms less of an obstacle to equitable competition than in Australia, where integrated firms' property rights protect train paths that, ultimately, give them a competitive edge over new operators. (In reality, European incumbents still retain these more valuable paths.)

Despite these more favourable terms and a decade of access reform directives, the EC concluded in 2002 that there is still very little on-track competition. As in Australia, the EC has identified problems with access to terminals and shortcomings in the rolling stock market. Some problems (such as those identified in Italy) are more blatant: the integrated operator has simply refused to provide access. In others (such as in Germany) the national operator has sought to impede the development of the rolling stock market by requiring that its redundant vehicles are not used in competition with it.

The EC has sought to overcome these impediments principally by distancing train operations management from infrastructure management, though it has held back from requiring vertical separation. It has sought greater transparency in path allocation and access charge setting, which are to be undertaken by management that is removed from train operation. An independent national regulators must now be established to ensure that access is non-discriminatory. A central European Railway Agency will deal with initiatives designed to facilitate interoperability, harmonisation of working practices and standards and mutual recognition of licenses.

European experiences therefore point to the need to continually review progress in on-track competition—to the extent that there is sufficient freight traffic to cater for multiple rail operators. Despite a decade of reforms, however, there has been so little on-track competition that it is still premature to conclude that the measures are either right or adequate.

SERVICE COORDINATION

At present, Australia has seven different access regimes (ARTC, NSW [RIC], Victoria, WA [WestNet], SA [intrastate], QR and AustralAsia Railway). The charter of ARTC provides a counterbalance to these structures by providing a way of coordinating the infrastructure as if into a single network. Multiple regimes increases transaction costs and reduces the potency of competition policy—through increasing the costs of competing, increasing uncertainty and reducing the degree of contestability. It also lengthens the logistics chain. This is not unique: freight markets overseas also involve fragmented regulatory oversight. *It is clear that rail industry centred on the infrastructure manager's tracks is increasingly out of synchronisation with freight markets that face relatively low jurisdictional borders*. Road freight is not constrained to the same extent. The experiences in the EC reflect similar concerns. The EC's *primary* objective (ahead of on-track competition) is to remove those borders for the rail industry. Thus, it seeks

- consistency in regulation;
- seamless train operation through coordination between operators across borders;
- technical interoperability; and
- consistency in access charging.

The EC has pursued this by increasingly specific directives that EEA countries must comply with. Agreement has not been reached on access charging consistency: while the EC prefers marginal cost-based pricing, 'mark-ups' are permitted up to full cost recovery. The EC has also supported the development of one-stop-shops, which market train paths across regimes. However, the shops have failed to attract business. This stems, in part, because other barriers exist. Switzerland has a one-stop-shop; it argues that the initiative has failed because differences in national regulations are still too great. The furniture retailer, IKEA, which is seeking to switch a significant proportion of its traffic to rail through its own IKEA Rail operation, has stressed the administrative and technical hurdles it has faced and the absence of interoperability. The company argues that the absence of interoperability makes it 'otherwise extremely expensive to go cross-border'.

The EC's solutions in 2002 include the establishment of a central European Railway Agency, which will work to facilitate operations across jurisdictions and provide advice on interoperability. We should also note that a number of train operators have merged or established joint ventures; this should reduce the logistical costs in the above-rail area; the vertically-separated infrastructure managers have established an association to represent them and the EC has encouraged them to work together more closely. In this way, technical inconsistencies might also be reduced, for instance, with consistency in axle limits on primary main lines.

ARTC's one-stop-shop for access faces similar obstacles on technical and operational differences, which the Commonwealth and the States are working to remove. Multiple regimes, nonetheless, generate additional transaction and coordination costs and risks to operators. These costs and risks therefore form a barrier to seamless operation and, thus, to rail's competitiveness.

Diversity of pricing

Transaction costs between infrastructure managers and access seekers rise through both the number of access regimes *and* the diversity of pricing systems used. Prices may be set with differing objectives:

- to achieve allocative efficiency, using marginal cost-based pricing;
- to charge on the basis of incremental costs of usage (which includes costs of capital provision that can be identified with a given train operator);
- be set to achieve high levels of cost recovery through distribution of common and fixed costs;
- to recover marginal and overhead costs and opportunity costs; and
- on the basis of the strength of intermodal competition (market-based).

The diversity of charges arises, in part, from the number of regimes. It also arises, however, because the link between costs of infrastructure usage and access charges is subject to diverse interpretation. Thus, we have established that even where two different access providers set the same objective (for instance, marginal cost pricing) infrastructure usage are measured in different ways and the charge varies accordingly.

Access charge levels and structures differ widely across Europe. Critically, these differences generate different incentives for train operators and infrastructure managers to use and maintain the infrastructure. Thus, even when a one-stop-shop is established, it encourages varying commercial behaviour. This diversity also increases transaction costs in negotiating and causes delays in making quotations for freight movements.

The EC has identified this as a problem, though, in seeking agreement over reforms, it has been unable to either agree on principles of cost recovery or on the pricing structure. In Australia, negotiation forms the basis of much access charge setting. Diversity is reflected in the *measurement* of costs, which comes into play, in particular, when regulated floor and ceiling prices are considered. This applies especially to valuation of infrastructure and to the investment return (including risk) on it. The absence of consensus in cost measurement may not impact directly on infrastructure usage but it will impact on regulatory deliberations and, hence, on access seeker and provider uncertainty.

THE PRICE-SETTING PROCESS

Posted versus negotiated prices

The primary basis for access charge setting in Australia is intended to be through a negotiate–arbitrate system: arbitration is used only if the negotiation is unsuccessful. While this approach is adopted in Canadian and USA rail freight tariffs, it is not undertaken extensively in access charge setting, for the following reasons:

- in many regimes the charges are set on the basis of costs rather than market-based—there is no basis for negotiating charges; and
- many railway operations are integrated—it is arguable whether transparent, fair and equitable terms of access can be *negotiated* under an integrated operation.

In principle, if negotiation is to be undertaken, it should therefore occur with vertically-separated infrastructure management. Our survey identified a number of such managers, though these were generally remitted to set marginal cost-based prices while most access charges are posted. The charges are structured so as to reduce most of the need for negotiation. Posting the charges also reduces information and transaction costs and uncertainty and also provides clear and consistent signals.

Negotiation does, however, facilitate differential pricing. Initially, Railtrack had sought to negotiate terms for open access. The consolidation of the rail freight industry into just two companies meant that it was difficult to negotiate prices without it been seen as favouritism or abuse of market power and unfair trading.

Another role that Railtrack used for negotiation was in setting some congestion charges for passenger operations. Railtrack could use the negotiation process to counter the simplistic fixed–variable structure and to apply knowledge of specific bottlenecks in deriving price and allocation solutions. Considerable transaction costs arose however, while the congestion charges failed to instil the right operator incentives as the charges that resulted were essentially (unresponsive) fixed charges.

Experiences in Canada and the USA with setting charges by negotiation point to some deficiencies with the negotiation process. Freight rates and negotiated access charges are subject to negotiation; this is the key way in which Ramsey pricing can be applied. Where a regulator decrees that a railway must provide third-party access, access charges are set by negotiation; in the event that the parties cannot reach agreement, charges and conditions are subject to arbitration. As in Australia, arbitrated decisions are cost-based. The arbitrated decision is made on the basis of the 'Final Offer' tariff submitted by each party. The process is designed to give parties an incentive to compromise. Shippers and access seekers see deficiencies in this, however, due to the time delay and

expense in reaching an arbitrated settlement. These concerns in themselves can undermine the original aim of the arbitration as it can discourage the access seeker from seeking access. The delay and cost can in itself provide an incentive for the shipper or access seeker to come to an agreement; there may be an asymmetry in this, however, to the extent that the access provider has little incentive to resolve a dispute. These disputes can be expensive: Thangaraj, et al., surveyed Canadian railways and found that up to 1 per cent of railway companies' expenditure was associated with resolving regulatory disputes (Thangaraj, et al., p. 9). Recently, the Canadians sought to reduce this shortcoming in their tariff-setting arbitration by expediting the process and simplifying the cost calculations for small ($CAN750 000) disputes. It is not yet known how successful this process has been.

Thus, while negotiate–arbitrate lies at the heart of most Australian regimes, the process is not adopted in Europe while, in North America, the trend has been away from negotiation. The perceived benefits of the alternative (posted prices) approach lies in its transparency, equality of treatment, lower time and manpower transaction costs and certainty of charges. While the intermediate pricing system (*reference* tariff) provides some degree of price certainty, there is, nonetheless, the risk that when the train operator seeks access that is at variance with the reference terms, the non-transparent variation terms may provide the opportunity for significant price escalation.

Priced versus administered capacity management

In principle, access pricing systems can be used to optimise the use of available track capacity. However, we typically found that capacity usage-based charging was absent; non-priced capacity management systems are generally used. Akin to the variance from reference tariffs, non-priced capacity allocation systems can be, at best, somewhat arbitrary and, to the extent of being non-transparent, can provide opportunities for inequitable treatment.

The absence of capacity pricing systems means that subsidies to passenger train operations can be hidden. Thus we found that in international systems, as in Australia, significant portions of track capacity are used for passenger services. Often the passenger train use coincides with where freight operators' demand is greatest. Nonetheless, because the access charge does not reflect this competing train path demand, the true cost of the priority given to passenger trains is not reflected in the passenger train subsidy. This allocation process can means that pricing signals are confused. The comment made by the NSW Minerals Council about passenger train usage is, perhaps, equally true for most access charging structures: 'in practice coal traffic has the lowest priority of all traffic, even on lines where it pays all fixed costs and non-coal traffic pays only variable costs'. (Productivity Commission 2001, p. 45) We note that passenger train path priority with underpriced pathing are endemic in rail systems worldwide.

Generally, we did not find any clear rules for allocating the track capacity available after passenger train paths have been reserved. As discussed above, the incumbent *integrated* operator has property rights over the train paths it needs: the national access regime applies only to genuinely spare capacity. SCT has rightly argued that this leaves the competitive edge with an (integrated) provider (SCT 2001a, p. 6). Nonetheless, if the integrated operator lost its slots, this would remove any advantage that the operator would have in managing the infrastructure—the integrated operator needs to see value in its ownership of (and, hence, investment in) infrastructure.

Under most regimes, on-track competition could be inhibited to the extent that incumbent operators have de facto 'grandfather rights' to paths. To the extent that integrated operators' property rights are inalienable, these rights are a practical limit to achieving a level playing field in on-track competition. It is less clear, however, what inhibition exists on open access (ARTC, RIC) regimes. The Neville Committee noted that 'AN Track Access acknowledged that, given the existence of 'grandfather' rights there may be little that can be done to make prime time train paths more contestable in the short to medium term.' (HRSCCTMR 1998, p. 92) For incumbent freight customers, such as members of the Queensland Mining Council, the use of grandfather rights to allocate capacity—'a first-come-first served approach to allocating access capacity'—are naturally favoured (Queensland Mining Council 2000, p. 14). This can undermine reform objectives in fostering on-track competition. There is some contrast between Australia and Europe. An ECMT conference concluded that 'it would be aberrant and contrary to the spirit of railway liberalisation if the traditional carrier enjoyed preferential rights over certain paths' (ECMT 1998, p. 207). Perhaps because European railways remain predominantly publicly-owned, their governments may have less concern with protecting incumbents' grandfather paths than Australia's now-largely privatised operations.

Irrespective of the EC's own pronouncement that there is no such concept as 'grandfather rights' over train paths, there appears to be no mechanism that allocates or reassigns paths away from current users. Of our surveyed countries, only Denmark thus far has adopted a structured approach to capacity (re)allocation. The approach endeavours to give access to new applicants, to international freight and to operations running the 'most traffic'. This process also attempts to enable new operators into the system. This approach to capacity allocation (in lieu of explicit pricing) is also practiced in airport slot allocation; hierarchies of authorities' 'preferred' uses of paths and airport slots are sometimes considered so as to pursue the policy makers' desired outcomes with new, additional and regional operators. Explicit allocation processes would appear to go some way to fulfilling the demands of the NSW Minerals Council that there:

> is a need for rail users' rights to the track, where conflicts with other users are possible, to be clearly spelt out. This should be done by means of publicly available Operations Protocols. (NSW Minerals Council 2000, p. 6)

This call for protocols is echoed in the EC's 2001 Directive on access charging and capacity allocation: there is a need for transparency in transactions. This point has also been embraced by ARTC, who recognised that it 'must have a transparent way of dealing with the conflicting demands' (ACCC 2002, p. 88). If a pricing process for capacity management cannot be or will not be developed, then a transparent allocation process will, at least, provide some assurance of equitable treatment. Indeed, while a survey of 55 access seekers in Germany found that access seekers were indifferent towards the access rules themselves, the respondents were nonetheless adamant about the need for transparency in path allocation, which they regarded as a serious problem. To this end, the EC now requires that a body that is independent of train operation must undertake capacity allocation. The EC also requires that managers provide a network statement of the nature of available capacity; and each regime must set out rules of capacity allocation. As in much EC directives, however, the system remains general rather than prescriptive. Specifically, scheduling and setting train priorities *generally* remain areas of crude principles rather than specifics in the open and third-party access process.

Given this mechanistic approach, is there progress with establishing price-based allocation systems? We have noted that some systems (such as in France and Germany) incorporate capacity components: their charges are differentiated by time of day or by intensity of line usage. These charges are not necessarily market clearing, however: operators can be are excluded that would otherwise pay their way or there remains excess demand for paths that then leads to complex negotiations (that is, high transaction costs). Nonetheless, these broad pricing signal can influence demand for paths, assisting in resolving capacity conflicts. Other pricing signals that have been applied in Great Britain, Germany and France have set discounted charges where timetabling flexibility is permitted or set surcharges where demand for paths is inflexible. Such pricing mechanisms supply incentives to operators to adopt a flexible approach in seeking paths. If flexible path allocation is established, it also facilitates the timetabling of flighting of trains—bunching of similar trains together. That is, it increases efficiency in line utilisation.

Using pricing signals within access charges can reduce the need for costly and lengthy negotiations. We noted that if consensus over competing demands for capacity fails in Germany, the path is then awarded to the operator prepared to pay the most. This is a crude form of auctioning.

ARTC has suggested auctioning train paths. We found no evidence, however, that this system has been used in practice elsewhere (successfully or otherwise). The ACCC view that auctioning represents an efficient way to allocate scarce capacity to the operator that values it most is valid (ACCC 2002, pp. 87–88). SCT argues against auctioning which, it suggests, would favour large companies over small companies and thereby reduce competition (SCT 2001, p. 7). The ACCC disagrees with this view, arguing that the higher valuation may result from the benefits of [train operating] economies of scale [what we call in this

report 'economies of density'] (ACCC 2002, p. 139). This point is equally valid, though recognising the scale/density economies seems to point to an industry with only one or two dominant train operators. If this is the predisposition of the industry economics, then it may be that on-track competition (or contestability) may only be preserved (if that is what policy makers want) by *not* adopting processes that reinforce the predisposition towards a single provider (or duopoly) structure. This is the trade-off.

We need to recognise, in any case, that in some situations both auctioning and negotiation systems can be impractical forms of capacity allocation. The British government recognised the shortcomings of complex auctioning and the impracticality of extensive negotiations that would be required if it allocated open access providers over the British Rail network. They opted, instead, for franchising of passenger services through competition *for* the provision of services, *not* competing in the provision of services. Importantly for capacity allocation, the successful bidder would also win the rights to use the train paths.

Finally, we should note that capacity management includes issues of congestion, where path utilisation is so high that delays in services impact on adjacent operations. This is a notable problem for freight operations in the Sydney urban area; even with a well-functioning congestion charge, this area of congestion would not be resolved without further investment: there is insufficient *spare* capacity after the urban passenger service paths have been allotted. In this context, we note that the EC has identified the need for dedicated rail routes for goods services. In general we did not find any clear pricing system for capacity management under congestion. Importantly, the congestion charge was an important part of the access charging structure that enabled Railtrack to achieve full cost recovery[161] and an adequate return on assets but, nonetheless provided the company with little incentive to expand capacity. The consequence was excess demand for paths, congested tracks, no pricing mechanism to entice operators to reduce or shift their demand and no incentives that would entice Railtrack to invest to resolve conflicts. This structure (used through to 2001) therefore provides useful lessons on the impact of a poorly-designed pricing structure, complete with significant transaction costs. The 2001–02 structure provided a useful case study. The asymmetrical incentives that were introduced were intended to provide Railtrack with increased incentive to respond to congestion while introducing a variable capacity charge that reduced train operators' incentives to seek additional paths where there is congestion.

161 Despite this 'full cost recovery', the company nevertheless went into administration. See footnote 126 for further discussion.

Path supply and usage compliance

Australian access regimes do not incorporate processes or pricing structures to take account of variance in the quality of train paths actually provided on the day of operation. The regimes also do not account for variance in the physical or capacity cost that a given train will make on the infrastructure, notably, where the operator runs a slower train than assumed or runs defective vehicles. An integrated operator has appropriate incentives to optimally trade-off sub-standard train paths and vehicles.

EEA countries are now being instructed to provide penalties and bonuses for operator and infrastructure performance within their access charging schemes. Great Britain adopted a such a system in 1994, from which we can derive a number of lessons:

- considerable transaction costs were incurred in apportioning blame;
- unless the standard benchmark is set correctly at the outset, one party may find it too easy or too hard to meet the standard;
- the valuation of costs imposed by the system may be too high or too low; and
- the system is regarded as adversarial and therefore not conducive to cooperation between different parties in the industry.

In the Railtrack experience, it has been reported that over 300 staff were required to apportion responsibility for sub-standard pathing, i.e., delays due to train operations or due to sub-standard infrastructure. This staff level represents a significant transaction cost. It may also be the case that the incidents being pursued were too often too small to warrant the transaction cost. We stress, however, that such transaction costs are inevitably magnified with the number of operators, the degree of capacity utilisation and the extent of interaction. These factors are set against a complex British network and dense operating environment. The transaction and coordination costs are therefore disproportionately higher than smaller, less complex systems. That is, transaction costs may not be significant in low density operations. There were, in any case, indications that the initial performance regime benchmarks were set too low: it was too easy for Railtrack to raise its standards and receive bonuses for supplying high standards. The compensation payments themselves were such that train operators often preferred to receive compensation from Railtrack or the offending operator rather than seek to recover time that would benefit the operator's customers. Other incentive processes are about to be adopted (such as for Britain's Channel Tunnel Rail Link), which are worth further investigation.

Defects with Railtrack's system lay in benchmarks and incentive payment levels. This, in itself, does not undermine the principle of providing incentives. As we have noted, elsewhere, however, the complexity and intensity of the British network did, in relative terms, lead to a disproportionate rise in transaction

costs that would not be apparent in a simpler system. This is an important issue that requires further exploration, should Australian regimes decide to adopt performance charging.

There remains a general lack of access pricing systems that provide price-based incentives to replace those that are lost when infrastructure ownership and train operation are separated. We have not identified any rail system that uses access charges based on actual damage inflicted by a train—that is, a system that provides incentives for operators not to use defective vehicles. Two reports to Britain's Rail Regulator expressed concern about the asymmetry in incentives at the wheel–rail interface; one of the reports recommended introducing a performance regime to give incentives to operators to present their trains in good condition. We note that ARTC has introduced vehicle monitoring systems; side-lining the train in the event of detection of a defect is, in itself, a powerful incentive for operators to run 'healthy' trains. This is an important concept that has yet to be addressed adequately in other access regimes.

Regulation

Regulation of access charges can embrace a number of factors. First, the regulation can be used for setting prices of individual operator, notably, in the case of arbitrated settlements; this is essentially restricted to arbitrating on freight rates in North America and access charges in Australia (set around a floor–ceiling price band). The *level* of access charges can also be regulated, as with Railtrack, to stimulate productive efficiency and to ensure that monopoly prices are not set. Finally, the *structure* of access charges can be regulated, for instance, in Germany, to ensure that the charges do not inhibit competition or favour the incumbent.

Six of Australia's seven rail access regimes incorporate floor and ceiling price regulation, to prevent cross-subsidisation of train services and to prevent monopoly pricing. In addition, the tasks underlying these price bands (and Victoria's average prices) can be assessed using 'efficient' prices rather than the actual prices, in a way that encourages the efficient supply of the infrastructure. An issue is whether the vertically-separated infrastructure managers, RIC and ARTC, should be regulated to provide incentives for productive efficiency and to prevent abuse of market power. This regulation approach (*revenue* capping) was adopted with Railtrack though, as a private company, the regulatory sanction was on the company's profit; it is unclear that such sanctions would generate the same level of incentives in public corporations. ARTC's indicative charges are set to decline at a rate of CPI-x, where 'x' is a positive number. While ACCC concedes that ARTC provides 'little justification' (ACCC 2002, p. 134) for the value of 'x', the approach gives train operators a 'reasonable degree of price certainty' (ACCC 2002, p. 127) and provide an incentive to reduce its costs of provision (ACCC 2002, p. 134). Further, ARTC adopts competitive tendering for its track maintenance

contracts, which can provide impetus for efficiency gains. By contrast, there has been limited application of this tendering process in RIC.

The ARTC believes, in any case, that as its customers operate in a competitive or contestable market, it is not in a position to either set excessive (monopolistic) prices or to be inefficient. However, once above-rail customers have made sunk investment expenditure in ancillary rail facilities, then ARTC has leverage over those customers. In this context we note that despite the poor competitiveness of rail freight in Britain, Railtrack's freight access charges were regulated and the company was subject to single-till revenue capping.

Regulation of integrated operations in Australia will encompass CPI-x based efficiency price-capping incentives. This regulation of integrated rail operations is unique: integrated overseas railways are not regulated in this way. This absence of regulation derives, in part, from these railways being publicly-owned with their prices being effectively set by a form of government decree. Thus, there are no-like examples outside Australia of private, integrated rail operators who face the efficiency incentive regulation that is proposed for Australian integrated systems.

COST RECOVERY

Over the long term, profitable railways have been limited to systems in Canada and the USA. In Canada the railways' freight task hauls two-thirds of all the country's freight (in tonne-kilometres—see Erara, p. 2) and in the USA, the railways carry around 40 per cent of the country's (intercity) freight. However, despite the size of the task in the USA, the aggregate rate of return on investment in the has consistently been less than the cost of capital[162]. In the case of these railways (and Australia's ARTC) the issue is therefore whether access charges (or tariffs) can recover long-term costs. Put another way, is there sufficient profit that would justify the construction of the lines already built?

page 183

There is another relevant issue about North American railways: they have not adopted mandated access. Thus, given profitable railway systems are limited to North America, lessons about access prices are necessarily being drawn from systems that rely (directly or indirectly) on government support for their long-term operation. This highlights the extent to which access charge setting by private Australian systems are working in 'unchartered waters'.

162 Annually, the Surface Transportation Board estimates the railways' cost of capital. This enables the Board to make a statutorily required 'revenue adequacy determination'. The Board is then 'directed to make an adequate and continuing effort to assist the carriers in attaining revenue levels prescribed in that provision'. Despite this, however, 'American railroad companies can point to the fact that they chronically fail to earn their cost of capital determined by the STB' (Flicker, p. 15).

The long-term viability of infrastructure provision is therefore a key issue. Injections of public funds are required to sustain or renew infrastructure. It also means that access charges are not being set to recover all costs. Indeed, some public infrastructure managers (such as RFF in France) have access charges constrained; this provides a hidden off-balance sheet subsidy to the public passenger train operator. Similarly, we noted that State Rail in NSW pays a *level* of access charges that enables RIC to break even on a cash basis. Such flexing of balance sheet results is inevitable when access charges simply form the conduit of internal trading in public authorities. In Britain, it was explicitly decided that, given the railway would require public subsidy, the channel for subsidy would be through the train operators. That is, the government would subsidise these operators sufficiently to enable them to pay a level of access charges to Railtrack that would enable it to achieve a commercial return.

But when the public corporation offers services in the private sector, what level of cost recovery are access charges set to achieve? ARTC's cost recovery uses market-based access charges, which enable train operators to be competitive with road operators. Here, the economies of density *implicitly* play an important role in the strategy for setting the access charges. In particular, the level of market-based access charges is intended to attract higher traffic levels at low marginal cost that would then generate relatively high revenue, enabling the regulated lower real access charges to be sustained. In the case of RIC, its charges are based on full cost recovery for coal freight but seek only incremental cost recovery for other movements. Such charging approaches, which are intended to reflect operators' demand elasticities, are allocatively efficient to the extent that operators that could pay their marginal costs are not excluded.

As we discussed in Chapter 2, there are four principal forms of access charges (though elements of one form can be used in other pricing forms). There is Ramsey price discrimination and two-part pricing and there are marginal and fully-distributed cost-based charges.

There is little evidence of the use of Ramsey price discrimination to achieve high cost recovery. We note that Ramsey pricing of freight rates, by commodity or operator, has been a central feature of the improvement in viability of USA's railways since tariff deregulation in 1980. Infrastructure managers have not adopted this approach in setting access charges. In principle, of course, there are difficulties in applying price discrimination to access charges under an integrated structure: can the incumbent be trusted to set fair access charges to third-party access seekers? Where we might have expected to find Ramsey pricing, however, is in vertically-separated operations. Most of the vertically-separated operations in Europe are in Scandinavia, however, where cost recovery seeks to recover only the marginal social costs. Railtrack intended to undertake Ramsey pricing in Britain but the rapid concentration of the rail freight market into just two operators in 1996–97 made it difficult to apply price discrimination. In fact, the extent to which the charges could be

differentiated (through cumbersome negotiations) was to have been constrained to the extent that it did not distort competition (Cairns, p. 3). Subsequently, Railtrack's 2001–02 access charges were *posted* rather than negotiated, with the objective of ensuring transparency and, thus, equality of treatment. We note, however, that the Rail Regulator ruled that intermodal traffic incurred a lower access charge than other freight due to its less competitive position relative to road freight. We also point to the widespread application of differential access charging between passenger and freight operations—differentials that seem unrelated to underlying costs.

We found a number of charging structures with a marginal cost pricing objective. We note, however, that there is no consensus on just how infrastructure usage translates into costs and, hence, into access charges. For this reason we found a range of marginal cost-based charging structures. Each structure will generate differing incentives how trains are operated.

There has been a range of pricing structures adopted under fully-distributed cost pricing. Pricing may, for instance, be based on tonne-kilometres, on gross revenue, on mark-ups of attributable costs. Each system embodies different incentives for operator and infrastructure manager alike. For instance, the German access charges apply mark-ups based on track attributes and physical train attributes. In this way, premiums can be applied to high-value services (that is, a form of price discrimination) and to services using high-value infrastructure. That is, the mark-ups consist of a fusion of discrimination and cost-based factors. In this way, the pricing structure can incorporate incentives.

Two-part tariffs (whether price-discriminating or not[163]) use a significant fixed (entry) fee to recover fixed and common costs, while a variable fee *can* be used to cover marginal costs. That is, a primary attribute is their ability to achieve high levels of costs. Experiences with this charging structure in both Germany and Great Britain (amongst others) have indicated a number of problems with train operator and infrastructure manager incentives. The fixed cost component can dampen on-track competition by discouraging new operators and favouring larger firms; it can also encourage greater track usage (increasing the potential for capacity problems). Paradoxically, while the fixed component can facilitate high cost recovery, the fixed *structure* itself can reduce incentives for infrastructure managers to invest. That is, if the pricing structure sends out the wrong signals, then achieving cost recovery in itself will be no guarantee of the long-term future of the infrastructure. With these experiences, European operators have reduced or removed the fixed charge. Inevitably, this will lead to lower cost recovery. However, as Pittman has noted (2003, p 17), if such pricing options are prohibited (to ensure that price discrimination is not occurring), there need to be alternative sources of infrastructure funding. Policy makers need to be aware that that may mean public funding.

163 See page 38 for a discussion of whether or not a two-part tariff is 'price discriminating'.

We need to appreciate the different types of fixed charge, however, and the way these different fixed charges influence operators and access providers. For instance, the large fixed component of ARTC's access charge is essentially a flagfall per train path: the cost is incurred only when train paths are reserved. The component reinforces existing above-rail incentives (such as reductions in inter-terminal crewing) to operate infrequent, long trains rather than more frequent, short trains; as intended by ARTC's charging structure, this pattern of train frequency/length also affects the way the track capacity is used. ARTC's 'flagfall' type of fixed charge can be contrasted with European systems such as the Swedish pre-2000 pricing, where the fixed charge was an *annual* charge, levied relative to the number of axles in the operator's rolling stock fleet. In this case, the fixed charge does not increase if additional trains are run. Similarly, in France, there is a fixed charge per month, calculated from the route kilometres of line used. To an extent, then, this form of charge locks an operator in to paying for fixed costs that arise while providing a contingency facility (rather than actual use). That is, in cost recovery terms, this fixed charge locking-in may more accurately reflect the ongoing maintenance costs that should be borne by both infrequent and regular train operators. Nonetheless, the consequence of large fixed charges is that operators are either discouraged from entering the rail market (as was the case in Germany) or encouraged to enter the rail market and then operate more trains than would be the case under an equivalent variable charge.

We can draw a general conclusion on two-part charges: the fixed charge can play an important role in cost recovery. Nonetheless, experience with a number of access regimes shows the power of the fixed component to affect operator and infrastructure manager incentives to the extent that they impact adversely on efficient capacity usage and on investment incentives.

In conclusion, therefore, we note the balance that operators and regulators need to make between cost recovery and encouragement of on-rail competition. That competition may improve rail's competitiveness. Despite this improvement, however, there may still be insufficient freight traffic that can be attracted to rail to generate the access charge revenue that would secure the long-term provision of railway infrastructure.

chapter 6

CONCLUSIONS

Our review of the principles and practices of rail infrastructure pricing leads us to draw the following broad conclusions.

TRENDS IN ACCESS

Reforms aimed at widening access to rail infrastructure have moved further in Australia than elsewhere in the world. While infrastructure management and train operation have been separated in a number of other countries, particularly in Europe, Australia is unique in mandating, through National Competition Policy arrangements, third party access to privately owned or managed essential infrastructure. Thus the Victorian, South Australian and Western Australian rail operators are the only private rail operators in the world that are subject to third party access.

The United States, a uniquely large national market among OECD nations, has competition between private railways over major routes (ie two parallel sets of infrastructure). Neither it, nor Canada nor Mexico have mandated access.

POLICY OBJECTIVES

Mandated access policies seek on-track competition and service coordination across rail networks and improved infrastructure viability; the outcome is intended to be more efficient train operations and competitive freight tariffs. Access and access pricing arrangements vary across countries, in part due to differences in the relative emphasis placed on the competition, coordination and cost recovery aspects.

European policy emphasises seamless logistics through mergers or joint ventures between operators, even though this may reduce the extent of on track competition. 'One stop shops' are in place for track access, as a means to market freight corridors across member states as single products. However, infrastructure control remains with each member state (in contrast to the Australian approach through the ARTC). Other than in the UK, European

regimes do not seek anything approaching full cost recovery and are maintained by public subsidy.

North American policy, by contrast, gives primacy to full cost recovery for its private railway owners; railway mergers have been permitted (even where there is loss of competition) in order to improve economies of traffic density and coordination. The primacy of full cost recovery is similarly paramount for the owners of the recently privatised integrated state-based railway operations in southern Australia. However, under third party access arrangements, there is some risk either that their commercial viability will be weakened or that the amount of new investment they undertake will be less than optimal. While state-based, these operators remain an important source of contestability on the interstate network.

PRICING REGIMES

Access charging regimes need to ensure: that existing infrastructure capacity is used efficiently; that there are the right incentives for future infrastructure provision; and that charges are consistent with efficient train operations.

Access charging experience in Britain illustrates the practical importance of keeping all of these goals to the forefront. Until recently, Railtrack's charges were structured with a high 'entry' fee and a low 'usage' fee. Thus, once an operator paid the entry fee, the additional costs of running extra trains was very low. Conversely, this meant that the track provider received little additional revenue and thus had little incentive to invest. The consequence was over-use of the track but, against rapidly rising traffic, there was little new investment.

In Australia, ARTC's access charging also illustrates how charging structures generate particular behavioural incentives. ARTC's variable component of the two-part tariff is considerably larger than the Railtrack variable (usage) charge (which Railtrack intended to approximate the marginal cost of usage) so there is not an issue of 'excessive' numbers of trains being run. Indeed, ARTC's relatively large flagfall charge per train operated will reinforce operators' inherent incentives to run *fewer,* but *longer* trains. It also reinforces operators' incentives to seek track investment that accommodates longer trains, since they will not face the cost of the additional investment. Similarly, the financial incentive for the infrastructure manager to provide the requested investment may be limited.

This two-part pricing, and Ramsey (third-degree price discriminatory) pricing, can greatly facilitate cost recovery but (as the experience with Germany's two-part pricing attests) may be perceived to be at odds with ensuring fair and equitable access for on-track competition. However, these price mechanisms minimise welfare loss compared to fully-allocated cost pricing and have much lower recourse to public funding than marginal cost-based pricing.

PRICING PROCESSES

A clear distinction between European and Australian operations lies in the extent to which access charges are published. European infrastructure managers have adopted highly transparent cost-based pricing, with charges published; negotiation is generally limited to discussion on train timing.

Most Australian pricing regimes, by contrast, are market-based (ie pricing according to 'what the market will bear'). Prices are usually negotiated within a wide floor-ceiling band, where the floor price reflects the incremental cost of the access and the ceiling is based on the full economic cost of the relevant infrastructure provision. By contrast with the published European charges, this wide band can lead to considerable uncertainty for operators and the negotiation process can involve substantial transaction costs. Nonetheless, this system may give infrastructure managers the degree of price discretion, enabling them to respond to prevailing freight market conditions. Notably, however, ARTC has in place a 'reference tariff' within the band. This would appear to reduce operators' uncertainty and the need for costly negotiations.

Explicit discretionary pricing across freight customers and commodities is used widely in North America. This secures high levels of cost recovery without turning away marginal customers. However, it appears not to be used internationally in access charging. One reason why such differential pricing is not more widely adopted may be because it is difficult for the infrastructure manager to establish the price sensitivity of the train operator's customer, given the more distant relationship than in the integrated case. Further, in third party access in Europe and Australia, differential pricing appears to run counter to competitive neutrality considerations to the extent that third party operators should be treated on the same basis as the infrastructure manager's own train operations.

CAPACITY MANAGEMENT

An important aspect of track capacity is that rival train operators may seek to use the track at the same time. In principle, access charges could be used to allocate track capacity. There is, however, a virtually universal policy for passenger services to be given priority capacity allocation over freight trains. Further, the remaining capacity is then generally allocated to the incumbent operator that has always run trains at given times.

Despite this, access charges are used to a certain extent in managing track capacity. For instance, in Germany and France, higher charges are set for busy times and locations. This approach is not as yet adopted in Australia. However, setting variable charges is no guarantee that rival claims will be resolved. Economic theory suggests that track capacity could be auctioned amongst rival operators, but no rail system (including ARTC) has been able to identify a practical way to do this, perhaps due to the network complexities involved.

OTHER ISSUES

Performance incentive arrangements are an important adjunct to pricing given the mutual interdependence between train operator and infrastructure manager. The main experience to date comes from the UK. Here the large number of interactions over a complex and congested network, the mis-setting of the base benchmark levels for the infrastructure manager's performance and for compensation for shortfalls in performance led to costly and cumbersome administrative processes and an unproductive preoccupation with attributing blame.

Rail access pricing is still in its infancy and the infrastructure usage-cost link is based more on broad judgements than on scientifically established causal relationships. It is clear that there are links between wagon suspension, speed and weight and different maintenance regimes. Nonetheless, there is no consensus over the precise relationship between maintenance costs arising from the weather and maintenance arising from a given train operation. As a result, there is a wide dispersion in usage-related charges. It seems clear, moreover, that this knowledge gap undermines pricing that promotes efficient use of and investment in rail infrastructure.

APPENDIX

COST TERMINOLOGY

The physical costs associated with railway infrastructure use and provision are defined as following:

- **Marginal (traffic-sensitive) costs.** The *short-run* costs are the costs of an additional vehicle or train, when some inputs are fixed; congestion costs and opportunity costs are included. The *long-run* costs are the costs of an additional vehicle or train when all inputs (investment) are varied. Marginal *social* costs are the firm's production costs and the external (society) benefits and costs, such as pollution costs. The duration of short-run may be interpreted as being the cost of an individual train or it may be anything up to an annual charge.
- **Non-traffic sensitive costs.** These are variable costs that arise irrespective of the level of infrastructure usage. For instance, they will include maintenance costs associated with temporal degradation of the track.
- **Incremental (or 'avoidable') costs.** This is the long-run cost of providing infrastructure for a given operation. The costs are those costs that would be avoided if the given infrastructure was closed[164]. For instance, where the train operator requires a freight siding, the provision of that infrastructure would be incremental costs. In this context, the incremental costs can include the variable (marginal and non-traffic sensitive) costs and fixed costs related to the provision of specific infrastructure. The cost is related to the long-run marginal costs of given infrastructure (see, for instance, NERA 1998, p. 73).
- **Fixed costs.** These are costs that arise irrespective of how much the infrastructure is used; in the long-run, they can be avoided by cessation of service.
- **Sunk costs.** These are (normally) fixed costs that are not reduced even in the long-run, even by the cessation of operation. Before a single train can be run, the operator must invest in land (right-of-way) and

164 See IPART (1999, pp. 17–20) for a fuller discussion of this concept.

infrastructure such as tunnels, embankments, cuttings, bridges and buildings, route and station track work. These are sunk costs, however: the capital value of infrastructure are sunk costs if it cannot be moved to alternative investment. (The assets have zero opportunity value in other uses.) A complementary definition is that investment costs are sunk whenever they cannot be fully recovered in the case of any subsequent disinvestment. This influences the investment climate, first, because the low salvage value of such assets reduces the net present value of a given investment and, secondly, because there is a greater incentive to delay irreversible decisions, waiting for further information that reduces the degree of uncertainty. Critically, we should note that in *economic* terms the value of any assets (including sunk assets) is a function of the future revenue stream generated by the assets and is not a function of the funds required to provide that asset. In practice, the extent to which an operator incorporates *any* asset value into the access price—such as by way of depreciation charges (if any) and return on assets—is generally an issue for the infrastructure manager (in setting a competitive tariff or access charge, seeking a return on investment). The regulating authority, also, needs to consider the impact of the treatment of sunk costs on incentives to invest. The approach that some regulators are taking in utility industries is to define a compromise value for the assets at a set time—drawing a 'line in the sand'. Subsequent investment may be valued differently.

- **Common costs.** As noted in Table 2, common costs include railway fixed and sunk costs as well as *non*-traffic-sensitive operating costs. Such costs can form a large pool of unattributable form of expenditure. The railway infrastructure manager can estimate the likely traffic-specific operating costs. The non-traffic-sensitive operating and fixed costs are, however, incurred irrespective of infrastructure usage.
- **Directly-attributable costs.** These are capital and variable costs that can be attributed to given operators.
- **Full economic costs.** This is the total costs of providing the infrastructure and related services (such as signalling). It includes the return on assets and depreciation of the asset base.

The relationship between cost attribution and cost avoidance is illustrated in Figure 7 (on page 47).

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ABBREVIATIONS

ACCC	Australian Competition and Consumer Commission
ARG	Australian Railroad Group
ARTC	Australian Rail Track Corporation
ATN	Australian Transport Network
BNSF	Burlington Northern Santa Fe Railroad
CER	The Community of European Railways
CIPR	Competitive Imputation Pricing Rule
CLG	Company Limited by Guarantee
CPI	Consumer Price Index
CSO	Community Service Obligations
CTA	Canadian Transportation Agency
CTARP	Canada Transportation Act Review Panel
DB AG	Deutsche Bahn Aktiengensellschaft [German Railways]
DORC	Depreciated Optimised Replacement Cost
EC	European Commission
ECMT	European Conference of Ministers of Transport
ECPR	Efficient Component Pricing Rule
ESC	Essential Services Commission
EU	European Union
FNM	Nacionales de México
FS	Ferrovie Dello Stato
GRV	Gross Replacement Value
GTK	Gross tonne kilometres
HRSCCTA	House of Representatives Standing Committee on Communications, Transport and the Arts

HRSCCTMR	House of Representatives Select Committee on Communications, Transport and Microeconomic Reform
IPART	Independent Pricing and Regulatory Tribunal of NSW
LRAIC	Long-run average incremental costs
LRMC	Long-run marginal costs
NAFTA	North American Free Trade Agreement
NAO	National Audit Office [UK]
NCC	National Competition Council
NCP	National Competition Policy
NPV	Net Present Value
NRC	National Rail Corporation
NTK	Net tonne kilometres
OECD	Organisation for Economic Co-operation and Development
ORAR	Office of the Rail Access Regulator
ORR	Office of the Rail Regulator
QCA	Queensland Competition Authority
QR	Queensland Rail
RAB	Regulatory Asset Base
RAC	Rail Access Corporation
RFF	Réseau Ferré de France
RIC	Rail Infrastructure Corporation
RPI	Retail Price Index
SAC	Stand-Alone Cost
SBB	Swiss Federal Railways
SCT	Specialized Container Transport
SNCF	Société Nationale des Chemins de Fer Français
SPV	Special Purpose Vehicle
SRA	Strategic Rail Authority [UK]
SRMC	Short-run marginal costs
STB	Surface Transportation Board
TOC	Train operating company

TPA	Trade Practices Act
UIC	Union International des Chemins de Fer
WACC	Weighted Average Cost of Capital
WAGR	Western Australian Government Railways Commission

DEFINITIONS

Above-rail activities	Above-rail activities refer exclusively to train-operating activities
Allocative efficiency	For allocative efficiency, resources are directed to production of goods and services that the economy values most.
Below-rail activities	Below-rail activities refer to railway activities relating to railway infrastructure, such as tracks, terminals, stations, signals, tunnels and bridges
Combinatorial pricing	The 'combinatorial' aspect of the pricing sets the floor or ceiling revenue to be the *combined* floor or ceiling revenue of all the operators on a given segment of line for which a specific access charge is being allocated. One aspect of the approach is to ensure that cross-subsidisation of market segments does not occur, by having each line segment free-standing.
Competitive Imputation Pricing Rule	'Under CIPR access prices are market based and set at a level where the Railway owner earns the same net income from the transport of freight on the Railway whether or not the freight is transported by the Railway owner's own "above rail" services or those of a third party.' (NT/SA Governments 1999, s. 3.4)
Contestability	Contestability refers to the ease with which a firm can enter or leave an industry. Like perfect competition, a 'perfectly contestable' market has no barriers to entry. The difference between perfect competition and perfect contestability, however, is that perfect contestability does not imply anything about how many firms exist in the industry. In fact, there may be only one firm in the market. However, due to perfect contestability, that firm has the incentive to not price excessively and to be productively efficient. This is because the real threat of competition (due to the ease of market entry) creates an incentive for the firm not to exploit its position by

	making excessive profits and not striving for productive efficiency.
Coordination costs	Coordination costs arise from coordinating activities of different infrastructure users.
CPI-x and RPI-x	CPI-x constrains increases in access prices (or total access revenue) to a specified level, x, below the consumer price index, CPI, measure of inflation. The 'x' is taken as a perception of achievable efficiency gains. The regulated firm retains any gains made above 'x' so the mechanism is argued to provide an incentive for the infrastructure manager to improve efficiency.
Economies of density	With economies of density, incremental costs are decline as usage increases. In above-rail production, increases in traffic volume occurs with less-than-commensurate increases in fuel and manpower. Similarly, in below-rail production, increases in traffic volume (over a fixed network size) occur with less-than-commensurate increases in infrastructure maintenance.
Economies of scale	Economies of scale exist in a firm when an increase in the size of the plant leads to a decrease in average costs. If a railway exhibited scale economies, an increase in the *network* size would result in a decrease in the railway's average costs.
Efficient Component Pricing Rule	ECPR is used to estimate an opportunity cost of third-party access. In essence, ECPR compensates for the income loss arising from third-party access. The ECPR price consists of, first, the contribution to joint fixed costs that the incumbent now earns on the traffic in question; and secondly, the incumbent's incremental costs arising from the third-party operator's use of the infrastructure. The crux of the system is that the access charge would provide the infrastructure manager with the same financial return whether it provides the above-rail service itself or allows the third-party rail operator to provide it (Beshers 2000).
Flex	Flex is a term used to describe the flexibility that a train operator agrees to when the track capacity manager is establishing train paths for the working timetable. If an operator agrees to allow 'flex', the infrastructure manager may provide a discount to the access charge.

Natural monopoly Some industries face large fixed establishment costs, while operating (variable and marginal) costs can be relatively low. This can result in average costs declining over extended levels of output. More critically, for natural monopolies, the average costs may still be declining *throughout the relevant range of the prevailing demand.* Even if average costs are beyond the minimum point on the long-run cost curve, such natural monopolies arise because a second firm could not produce and sell as cheaply as the first firm does. A consequence of the declining average costs is that there may be no production level where the firm can price at marginal cost and make a profit.

Open access Open access is defined as access to a vertically-separated rail infrastructure provider's infrastructure

Production efficiency For production efficiency, output is produced at the lowest cost

Ring-fencing ACCC defines 'ring-fencing' as being 'designed to assist the introduction of effective competition into markets traditionally supplied by natural monopolies. It involves putting structures into place to prevent flows of information and personnel, and inappropriate transferring of costs and revenues within an integrated utility and between related businesses' (ACCC web site, <http://www.accc.gov.au/gas/ring_fence/code_reqs_rf.htm>

SSW compensation This term refers to the USA Interstate Commerce Commission case of St. Louis Southwestern Railway seeking trackage rights over Missouri Pacific Railroad (1985, 1991). The ICC resolved that to be fair to both access provider and seeker, compensation for trackage rights must include three components: first, the provider's variable costs arising from the seeker's use of track, secondly, a portion of fixed costs and, finally, some return on the value of the infrastructure.

Sunk costs These are (normally) fixed costs that are not reduced even in the long-run, even by the cessation of operation.

Third-party access Third-party access is defined as access to an integrated rail operator's infrastructure.

Train capacity	A train operator normally purchases an 'access right' rather than a 'train path'. This right may mean that the operator gets to use the track within a given time window and at an average train speed that may vary in response to preceding trains.
Transaction costs	Transaction costs are the costs of organising production activities.
Uniform Railroad Costing System	The URCS was developed in the USA to standardise railway costs. The system was used by regulators to assess freight rate changes.
Vertical integration	One measure of vertical integration of a firm refers to the stages of production that are contained within that firm. The greater the degree to which auxiliary activities are conducted in-house, the greater the degree of vertical integration. In-house supply is to be preferred when transaction costs are high, the auxiliary market is not competitive or contestable.
Vertical separation	A vertically-separated industry involves devolving production processes to individual firms, with activities organised by formal contracts rather than (under integration) through internal liaison. In the case of British Rail, above-rail activities were separated from below-rail activities. In the former case, train service provision was further separated from rolling stock maintenance while in below-rail activities, track management was separated from track maintenance.
Wheel–rail interface	The wheel–rail interface is a term that describes the physical interrelationship between above-rail activities and below-rail activities. Each area has a physical impact on the other area.