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The impact of rail industry restructuring on incentives to adopt innovation: A case study of Britain.

Chris Nash, Bryan Matthews and Andrew Smith

Institute for Transport Studies, University of Leeds, Leeds, LS2 9JT

C.A.Nash@its.leeds.ac.uk

1. Introduction

The reforms to Europe's railways since the mid-1990s have been aimed at revitalising the performance of railways across Europe through enhanced within-mode competition. To facilitate this, some form of vertical separation is required by law, either full, legal vertical separation (for example, as in the UK or Sweden), or a holding company model (for example, as in Germany and France). As competition has increased the number of companies operating across Europe's railway systems has also increased both in terms of open access train operators, and also train operators providing services through franchise contracts for a fixed number of years. Intermediate structures, such as alliances have also emerged to encourage co-ordination between companies in separated environments. Performance regimes and other contractual mechanisms such as track access charges also play an important role.

At the same time, European and country-specific rail research is targeted at bringing about a step change reduction in overall rail system costs. The Shift2Rail Joint Undertaking, set up to fund and develop European rail research over the ten year period from 2014-2024, therefore faces the challenge of developing new innovations that will meet the cost and other challenges (e.g. on capacity and carbon).

However, fragmented rail structures, comprising multiple companies with different incentives and differing regulatory structures, create a potentially significant obstacle to the implementation of some of the innovations that emerge through research of this nature. For example, costs may be incurred in one part of the system (say the infrastructure manager), but with the benefits felt by train operators (or the other way round). Alternatively, innovations may require up-front investment with pay-back periods that exceed the length of rail franchises or which are hard to manage within regulatory or other multi-annual funding agreements between Transport Ministries and rail infrastructure companies where funding may be constrained. More widely, the ability of rail systems to optimise from a whole life cost perspective may be impeded by the complex array of incentives existing within railway systems.

A frequent complaint about the rail industry is that it is insufficiently innovative and too slow to implement the results of research. In establishing the Shift2Rail programme, the European Commission acknowledged problems associated with rail innovation in Europe, stemming from fragmentation of R&I efforts, low leverage of EU R&D investment, limited and uncoordinated participation of stakeholders along the value chain and high costs, risks and lead-times of R&I investment.[1]

Similarly, in the UK context, the Railway Safety and Standards Board (RSSB), identify four further related difficulties: a fragmented industry structure where costs and benefits frequently sit with different organisations, a project and technology-led culture which is focused on outputs rather than outcomes, high aversion to risk, making the approval process complicated and long and limited resources for testing and developing new ideas.[2]

To a degree the slow rate of innovation in rail may have good reason in the priority given to safety and the need for compatibility with existing equipment, but other sectors such as air transport share at least some of these characteristics and yet appear to achieve a much faster rate of innovation[3].

The structure of the railway in all these countries (except Slovenia) is described in Nash et al (2016)[4].

In what follows, we firstly consider the two big issues regarding incentives which arose from the interviews, namely fragmentation and short time horizons. We concentrate particularly on the experience of Britain, which has more fragmentation, with most passenger rail services franchised out to new entrants, but also has done more than most other countries to address issues of incentives through its sophisticated track access charges, performance regime and regulatory system. We then consider four approaches to overcoming these which have been adopted in the various countries we examined, namely the holding company model, government leadership, longer franchises and control periods and sharing of costs and revenues, before reaching our conclusions.

2. Causes of incentive problems in the European rail system.

2.1 Fragmentation

European rail policy requires a separation of infrastructure and operations, with separate management and accounts, and open access for freight and international

passenger operators.[5] Under the Fourth railway package this will extend to domestic passenger operators and public service contracts will be awarded by competitive tender[6], but some countries have already partially or completely implemented these provisions – Sweden already has open access for domestic passenger services and competitive tendering of public service contracts, Germany has open access and competitive tendering for an increasing proportion of public service contracts whilst Britain secures provision of most domestic passenger services, commercial and subsidised, under competitively tendered franchises and has open access subject to new services attracting new business to the railway rather than simply abstracting revenue from the franchisee.

There is ongoing debate regarding the pros and cons of vertical separation versus integration in a number of industries in which part of that industry's activity is competitive and other parts exhibit monopoly power. The concern is that an integrated monopoly will exercise its market power to restrict supply and raise prices or that it will, in short, behave anti-competitively. Typically, this concern is expressed in relation to network industries in which the network infrastructure exhibits natural monopoly, whilst services on that infrastructure may be provided competitively. Examples include telecommunications, electricity and gas, as well as airlines and railways.

The principal arguments on either side are well-rehearsed. In favour of separation, it is argued that it enables competition and, thereby, provides incentives for cost reduction and innovation. Moreover, many argue that it is only with a wholly vertically separated structure that non-discriminatory access to the infrastructure can be assured, thereby enabling that cost-reducing and innovation-stimulating competition to occur. On the other hand, the principal argument in favour of integration is that it promotes system optimisation[7]. This is seen as being particularly important for railways given the high degree of interaction between operations and infrastructure, especially on densely used lines[8]. The key ways in which it does this are identified as being by reducing transactions costs, although there is evidence that these are only a relatively small share of total systems costs[9], and, more importantly, by removing misalignment of incentives[10].

In a situation in which there are many train operators and these are separate from the infrastructure manager, the organisation which bears the costs of introducing innovations may not be the one getting most of the benefits. For instance, innovations in vehicle design which reduce track wear, or which enable freight trains to travel faster may benefit the infrastructure manager by reducing maintenance and renewal costs and the amount of capacity needed on a route sharing passenger and freight traffic. Sophisticated track access charges and performance regimes help give the right

incentives in these cases; for instance track access charges which distinguish between types of vehicle according to the damage they do and which distinguish between types of train according to the capacity they take up should give the right incentives in these cases. Track access charges in Britain do distinguish between different types of vehicle and incorporate a capacity charge, although the latter relates to the costs of unreliability and does not distinguish between types of train according to speed or by time of day11. Charging regimes in many countries do not even incorporate appropriate incentives to this degree; for instance, in both France and Germany train operators are simply charged a fixed rate per train kilometre with limited differentiation by type of train.

But even where appropriate charging systems exist, there remain many cases where the correct incentives are not transmitted even by sophisticated track access charges and performance regimes; for instance, train operating companies have inadequate incentive to work with infrastructure managers to reduce the fixed costs of the infrastructure if they do not bear those costs, or to adopt sophisticated real time control systems to reduce the impact of delays caused by the infrastructure if they are fully compensated for them under the performance regime. It has been argued that for this reason train operators should bear the full costs of the infrastructure, but where there are many operators that leaves room for some train operators to try to free ride without cooperating to reduce fixed costs, and if this is achieved by a mark-up on

variable charges, it raises charges above marginal cost, leading to inefficient reductions in services which are willing to pay marginal costs (Sanchez-Borras et al, 2010)

[12]Particular problems arise where innovations in signalling systems or smart monitoring transfer costs between infrastructure managers and train operators, for instance through the use of on-board monitoring systems. The most major example of such a development is of course the European Train Control System, which will ultimately replace track side signals with onboard equipment.

2.2 Short time horizons

The second major difficulty identified is that of short time horizons, meaning that railway companies do not consider life cycle costs and revenues when selecting assets, but rather adopt designs which are most economic in the short run and have least risk of failing to perform reliably immediately. Inevitably these tend to be tried and tested designs rather than innovative ones.

In a primarily franchised system such as the rail passenger network in Britain, this may be a serious problem, particularly if franchise length is relatively short. In Britain currently seven years is the norm. Given lead times for ordering new rolling

stock, this means that a franchisee will only have a very small proportion of the life of the train within its franchise period, and whilst rolling stock is usually owned by rolling stock leasing companies which should have a longer time horizon, it seems rolling stock is typically selected by train operating companies[3].

Freight and open access passenger companies do not have the same constrained lives as franchisees (although freight operating companies may have similar issues arising from the length of the contracts with their customers), but they may still adopt short time horizons due to the marginal profitability of many of their operations and uncertainty about future developments.

By contrast, the infrastructure manager in Europe is invariably a public sector company which should be better placed to plan for the long term and to bear risk. Here the problem of short time horizons may actually be imposed partly by the regulatory system, whether this comprises cost reduction targets for a five year control period as in Britain, or similar targets incorporated within a similar length multi annual contract between the ministry and the infrastructure manager as in Germany. Of course, pressure on costs may itself be an incentive for innovation, and the British regulator does expect to see asset management plans based on life cycle costs rather than simply concentrating

on five year targets. But clearly when the infrastructure manager is faced with binding cash limits, as is currently the case in Britain, it may have no choice but to adopt what is the cheapest solution in the short run, rather than investing in new technology.

3. Possible solutions

3.1. Vertical integration

Vertical integration of infrastructure manager and train operator(s) would create an organisation with incentives to optimise the rail system as a whole, and therefore overcome the problem of fragmentation. But it has already been noted that such an integrated system is not permitted under European legislation, as it would mean halting new entry, and again, new entry may itself be an important way of encouraging innovation in the rail system.

What is still permitted is for the infrastructure and the train operations of the major operator to still be managed by separate subsidiaries of the same holding company. In such a structure, the holding company itself may encourage innovation and capture benefits to both infrastructure manager and a major share of train operations.

For instance, in Germany the holding company allocates funding specifically for research and innovation, and requires its subsidiaries when appraising projects to undertake appraisals from the point of view of the organisation as a whole. Of course, the infrastructure manager is still required to comply with the legal requirement for non-discriminatory access to the infrastructure by other operators, and the larger their market share, the less effective the holding company model as a way of integrating the railway will be. The degree to which the holding company model serves to overcome problems of fragmentation will also vary with the extent to which the holding company plays an active role in achieving these ends; for instance, it is understood that the relatively new holding company in France does not play such an integrating role.

For franchised services, vertical integration might also be achieved by letting vertically integrated franchises under which the franchisee takes control of the infrastructure for the length of the franchise. Such an approach has not yet been used in Europe, although it has been a feature of the long freight franchises let in South America, and was suggested for passenger services in Britain by the McNulty Report[10]. Obviously, again, it would have to be organised in a way which did not discriminate against other operators using that part of the infrastructure.

3.2 Greater role of the government

A long run systems wide consideration of innovation may be achieved by placing the relevant decisions in the hands of the government. For instance, in Sweden the infrastructure manager is seen as a government agency taking decisions on the basis of social cost-benefit analysis and for which short term regulatory targets would be inappropriate. The problem here is whether in the absence of such regulatory forces there is adequate pressure on costs. In Sweden rolling stock too is provided by central or regional government owned agencies; this is also a growing trend in Germany, whilst several recent rolling stock procurement exercises in Britain (Inter city express, Thameslink, Crossrail) have been government led. Where the franchising authority takes the lead in infrastructure decisions as well as train services and rolling stock, this body should be in a position to optimise the system as a whole; to a degree this is the case in Britain, and particularly in Scotland the franchising body, Transport Scotland, seeks to play this role. The British government also plays an important part in encouraging innovation through finance research and innovation programmes, as of course does the European Commission at a Europe wide level. In some countries, including Britain, the government is directly funding the infrastructure manager to finance installation of European Train Control System equipment on the trains. In Britain, the Rail Safety and Standards Board (an industry wide body) plays an important

part in funding innovations, including administration competitions for the award of grants and approving proposals for use of the innovation fund that all franchisees are now required to set up. However, it has been argued that these processes are too slow and bureaucratic, and questioned whether a body such as this, which was initially set up largely to deal with safety and standards is the appropriate body to promote innovation[13].

3.3. Longer franchises and control periods

Longer franchises would increase the incentive to look at life cycle costs and benefits when investing and thus boost innovation. Britain adopted a policy of longer franchises in the first years of the century under the Strategic Rail Authority but promptly reversed the policy after only one twenty year franchise had been let (Chiltern Trains). The McNulty[10] report again advocated such a change and the latest vision statement[14] suggests franchises of up to fifteen years. Similarly some regulators have adopted longer control periods than the five years adopted by the British rail regulator. Britain has now adopted the alternative that the expenditure controlled by the regulator through the periodic review is limited to operations, maintenance and renewals; enhancements are subject to separate approval and control by the Department for Transport, and so can be brought forward when the business case is established in terms of full life costs and benefits.

An objection to longer franchises and control periods is always the difficulty of forecasting, although this can be mitigated by appropriate risk sharing arrangements. There is also concern that less frequent franchise competitions may reduce competitive pressure on the train operators.

3.4. Cost and revenue sharing

Britain had the ultimate in cost and revenue sharing in one franchise for three years in the form of the Wessex Alliance. This was an alliance between South West Trains and the relevant subdivision of Network Rail, which effectively merged the staff of the two under a common Managing Director. Any deviations from forecast costs and revenue was shared equally between the partners, thus creating incentives for both to work towards systems optimisation. However, the alliance was at most going to be a five year one, because the franchise would then come to an end, and it did not formally cover renewals or investment, although it is argued that because of the joint management team integration on these issues was also improved.

It is not clear how successful this alliance was, as costs continued to rise and performance to deteriorate. However, it has been argued that this was inevitable due to the poor state of the infrastructure, and that the achievement of the alliance was to achieve a big increase in maintenance and renewals in a cost effective way. It was argued by an interviewee that deterioration of performance had been worsened by decisions of the infrastructure manager such as to cease tree cutting and ballast cleaning; these decisions were reversed by the alliance.. The alliance also facilitated timetable changes to give longer possessions for renewals; these would otherwise have been the subject of compensations payments under the performance regime had Network Rail required them.

The alliance was terminated after three years, apparently because neither party wished to continue to bear financial risks arising from the other's forecasts; the train operator did not want to bear the risk of increases in infrastructure costs and the infrastructure manager did not want to bear risks arising from passenger revenue forecasts. Some functions continued to be managed in common however, and that has continued following the award of a new franchise to a different operator.

A number of other alliances for specific purposes exist, but only in the case of Scotrail does this extend to a common Managing Director for both the train operating company and the appropriate subdivision, or route, of the infrastructure manager. Although only one or two functions are managed as a common team, and there is no revenue or cost sharing agreement, it is argued that meeting together under a common managing director facilitates cooperation. More recently, it has been announced[14] that all new franchises will be let under partnership arrangements between Network Rail and the train operator. It is not clear exactly what form these arrangements will take; one element seems to be an independently chaired supervisory board of the infrastructure manager and all train operators. Whilst this must be helpful in identifying opportunities, of itself it will not deal with the problem of incentive alignment, although perhaps ad hoc arrangements to share costs and revenues in a way which overcomes the problem may be made, provided that the regulatory arrangements permit this. To a degree this development mirrors on a regional scale the setting up on the recommendation of the McNulty Report of a coordination body at a national level, the Rail Delivery Group, which brings together the infrastructure manager and passenger and freight train operators to develop long term plans and investment proposals for the railway system as a whole.

There have been other revenue and cost sharing measures such as the route-level efficiency benefit sharing (REBS) mechanism[15]. This incentive was designed to strengthen the alignment of incentives between Network Rail and train operators through the development of a default mechanism in CP5 for Network Rail to share efficiencies with train operators in order to support greater co-operation to drive down industry costs. It works by allowing efficiency gains or losses to be shared between Network Rail and its customers (i.e. operators) on an annual basis.

It appears however that REBS has not been very successful. Train operators dislike the mechanism because they have to pay if Network Rail's costs rise above the baseline, even if they – the train operator - have no way of influencing them. Whilst train operator liability under the scheme is capped, Network Rail costs are currently so far above the baseline that train operator contribution is, in every case, at the cap. In this situation, there is no impact on train operators as a result of marginal changes in costs. Consequently, any incentive effect is largely removed.

In future, it is anticipated that the REBS will be reduced in scope to make outcomes more specific and achievable. For instance, it might be replaced by a scheme relating specifically to expenditure that a train operator can influence (e.g. renewals). In

this case, however, any incentive will impact on a lower proportion of expenditure.

4. Conclusion

In this paper, we have examined documentary evidence and presented information from interviews in several countries on the subject of incentives for innovation in rail transport. Britain is the country that has paid the most attention to incentives, through sophisticated track access charges and performance regimes, through various schemes ranging from sharing benefits of efficiency gains on a particular route to deep alliances sharing all costs and revenues for a particular train operator, and through many specific innovation funds.

In many other cases there is no attempt to design track access charges and performance regimes to align incentives. For instance, neither France nor Germany has a performance regime, and in both countries track access charges are levied per train kilometre, with no attempt to differentiate according to gross weight and other aspects of track friendliness.[

In general, it was concluded that major reasons for a lack of incentives to innovate derived primarily from two sources:

Fragmentation of the industry, with the result that the organisation undertaking innovations may not be the same as the one receiving the benefits, alongside inadequate use of mechanisms such as appropriate track access charges to ensure appropriate incentives exist.

A short term emphasis in regulatory and franchising arrangements, giving too little incentive to achieve long run benefits and too much attention to immediate performance and costs. Of course, the infrastructure manager does have long time horizons, so this is particularly a problem with relatively short franchises. For instance, when choosing rolling stock, the incentive on franchisees is to select rolling stock that will enter service quickly and reliably rather than considering innovations which may only have longer term benefits,

But regulatory systems that place particular emphasis on targets for limited control periods or multi annual contracts may distract from the longer term, whilst binding cash limits which apply even to cost-reducing investments may make it impossible to consider longer term impacts if they add to current costs. On the other

hand, a failure to use such regulatory instruments may reduce pressure to cut costs in what remains a monopoly supplier of infrastructure.

Both effects may be mitigated by specific arrangements in one or more of the countries examined, but these arrangements themselves have disadvantages as well:

The presence of a holding company in Germany which plays an active role in ensuring that activities by one part of the group are appraised in terms of the impact on the group as a whole, and which is very much concerned with the long term future of the business, including promoting innovation. But the presence of such a holding company has been seen as a potential barrier to competition; at the least it makes the task of the regulator in ensuring no discrimination more difficult, and the larger the share of the market taken by competitors, the less effective the holding company will be at taking a comprehensive view of the industry. Vertically integrated franchises raise similar issues where other operators are present on the tracks of the franchisee.

The government or franchising authority may take the lead in innovation through its control of the infrastructure manager and (through franchising) of passenger train operations. It may also provide specific funds to encourage innovation.

Longer franchises and control periods would improve the incentives for innovation; they also bring problems in terms of difficulties of forecasting and increased risk, but risk sharing arrangements can reduce the problem.

Cost and revenue sharing arrangements between the infrastructure manager and the train operator may correctly align incentives but such arrangements have been difficult to negotiate on a voluntary basis. They may now become a required feature of all franchises, but again this arrangement raises issues if other operators are present.

In short, holding company arrangements or long vertically integrated franchises or deep alliances seem appropriate solutions where one company dominates operations, or where franchising systems can be arranged to create this result. Governments or franchising authorities may also take the lead where they have close control on all operations in an area and can control investment in infrastructure and rolling stock. But where a number of competing commercial passenger and/or freight operators share the same tracks, achieving correct alignment of incentives to innovate is very much more difficult. Having some sort of coordination mechanism whereby possible innovations may be identified is obviously helpful, and ad hoc cost and revenue sharing agreements

may still be negotiated provided that regulatory arrangements do not preclude this, but there remains a risk that the incentives for innovation will be inadequate, and this issue must be borne in mind when rail industry structures and regulatory arrangements are designed.

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