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THE FUTURE OF RAIL

REGULATION & COMPETITION FOR AN INNOVATIVE INDUSTRY

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THE FUTURE OF RAIL: REGULATION & COMPETITION FOR AN INNOVATIVE INDUSTRY
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THE FUTURE OF RAIL

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I. INTRODUCTION

The aim of this short paper is to examine the innovation process in rail transport and to consider the adequacy of current incentives to innovate. Innovations may take the form of technological improvements in infrastructure or rolling stock, or new ways of marketing, selling, organising and delivering services. The intention is to raise issues for discussion and consideration rather than to reach firm conclusions. The next section describes the background to current concerns about the incentives to innovate in the rail industry. We then consider in turn the challenges that make innovation necessary, the implications of the current structure of the industry for the incentives to innovate, the issue of regulation, possible solutions to the problem of adequate incentives to innovate and conclusions and further research.

II. BACKGROUND

A frequent complaint about the rail industry is that it is insufficiently innovative and too slow to implement the results of research. One reason may be a lack of spending on research and development. For instance, a recent study by Wiesenthal et al (2015) found that research and development in transport is dominated by road transport and to a lesser extent air; of a total of 43b euros (2008 prices) spent on research and development in the transport sector in 2011, only 874m was spent by rail manufacturers and that by transport service providers and infrastructure companies was tiny. Reasons given for this include the relatively small size of the rail market and of firms within it compared with other modes (to this extent mergers, such as that of Siemens and Alstom rail interests, which create larger companies, may have beneficial effects. At the same time this does reduce the level of competition within the industry, although the growing competitiveness of the Chinese and Japanese industries may offset this effect). But even relative to sales, research and development spending by rail manufacturers was less than in automotive and aeronautics (Table 1). Aeronautics also benefits particularly from military research.

Table 1. R and D intensity (expenditure relative to sales) 2011

Automotive	4.8
Aeronautics	6.5
Waterborne	4.1
Rail manufacturing	3.6
Transport service provider	0.3
Infrastructure	0.3

Source: Derived from Wiesenthal et al (2015)

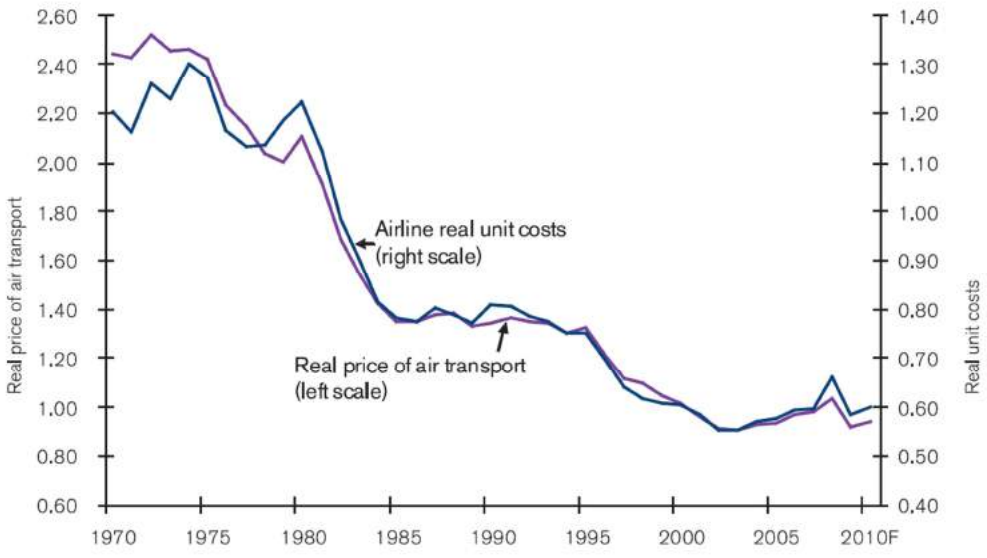
But other problems have also been identified, concerning not just the level of spending on research but also implementation of results. For instance, in establishing the Shift2Rail programme, the European Commission acknowledged problems associated with rail innovation in Europe, stemming from fragmentation 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. (EC, 2014).The Commission also argued that the market uptake and impact of EU rail R&I projects has been low and slow (EC, 2013).

Similarly, in the British context, the Railway Safety and Standards Board identify four 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. (RSSB, 2017).

To a degree the slow rate of innovation in rail may have good reason. Rail asset lives are long. Equipment needs to be compatible with the existing equipment it will be used with, and the priority given to safety means that innovatory systems require extensive testing before being placed in regular service. 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 (Nash et al, 2014). For instance, fig 1 shows the extraordinary reduction in unit costs and prices achieved in air transport over the past 40 years. This was driven by competition from new low cost airlines, with a business model driven by high utilisation of assets, use of yield management systems and online sales. But in turn the strong competitive pressure to reduce costs impacted manufacturers, with particular pressure on fuel efficiency, given the importance of fuel costs in aviation. If the growth of competition in the rail sector could achieve such a reduction in unit costs and prices, its prospects would be transformed (though in rail it is harder to allow purely commercial motives to dominate as government remains strongly interested in specifying services, at least for subsidised services).

Fig 1. Change in price (per revenue tonne km) and cost (per available tonne km) of air transport over time



The following section considers the challenges currently facing rail transport. The next two sections outline the barriers posed to innovation by fragmentation and by current systems of regulation. Finally we draw our conclusions.

III. KEY CHALLENGES

There is currently widespread support for an enhanced role for rail transport in order to combat the congestion and environmental degradation caused by other modes of transport. For instance, the most recent European Commission White Paper on transport policy sets out an aspiration for rail to be the main mode of medium distance passenger transport and long distance freight in Europe (EC, 2011). Yet there are also major challenges, some of these being set out in the S2R Masterplan (EC, 2014). Amongst these are firstly, that there are rising costs and subsidies. Subsidies amounted to 36-38b euros in 2012. In an era of low economic growth and constrained government spending, continued subsidies on this scale must be in question. Secondly, there is often dissatisfaction of passenger and freight customers at quality of service.

But surpassing all these internal issues is the possible rate of innovation of competing modes. The growth of electric vehicles combined with decarbonisation of electricity production threatens to remove much of the advantage of rail transport in environmental terms, whilst autonomous vehicles will ultimately remove the advantage of rail transport for passengers of being able to make use of the time spent travelling and for freight of only needing one driver for a rake of vehicles. The mobility as a service concept will make the private car available as needed in the same way as rail transport. Of course advances in technology offer the same sort of benefits to rail – for instance, driverless trains and virtual coupling, enhancing capacity and quality of service – and in many ways these should be faster and easier to exploit than for the road mode, since rail transport is already subject to centralised control. But implementing them will require manufacturers to develop and apply the technology, and they will only do that if there is a demand for it from train operators (and, in the case of service run under public service contracts, public authorities commissioning services) and infrastructure managers. This complex interaction, including the strong interests of government, emphasises the differences between rail and civil aviation as noted earlier.

It should be said that the impact of technological change in the road transport sector on rail is not clear cut; and developments in the Mobility as a Service (MaaS) space could lead to increased use of public transport as part of a multi-modal journey that involves the car as one part. It is also the case that electrification of the road vehicle fleet will not solve road congestion challenges.

In 2017, as part of an EC project, we undertook some interviews, predominantly in Britain but on a lesser scale in Sweden, Germany and France, on the barriers to innovation by train operators and infrastructure managers (Nash et. al., 2018). In the following sections, we consider two of the factors most often regarded as barriers to innovation in rail – the structure of the industry, and the approach to regulation.

IV. STRUCTURE OF THE INDUSTRY

Thirty years ago, most European countries had a single state owned rail company responsible for infrastructure and train operations. This company could take decisions of what was best long term and system wide, and some remarkable innovations did take place (including development of high speed trains, tilting trains and maglev technology). In many cases, the single company had an important research and development arm and sometimes was directly involved in manufacturing as well.

On the other hand, it may be questioned whether a state owned monopoly is really the best form of organisation to drive forward innovation. We have already commented on the way in which new entry in the aviation sector drove forward innovation, whilst competition within the rail

manufacturing sector may itself be an important force for innovation. Lack of competition within the sector may weaken incentives and the fact that there is a single company to take innovations forward may lead to a 'not invented here' approach to innovations coming from outside the industry. To that extent, lack of innovation may still be seen as the result of too little competition, with incumbent operators still too dominant in many countries. In many countries rail has in the past also been protected from competition from other modes, although the growth of car ownership and road haulage have provided a strong competitive threat, and the freeing of the market for air and then long distance bus, and the growth of car sharing companies such as BlaBlaCar have intensified that competition

Today, most European countries have totally separate infrastructure and train operating companies (although some countries have retained a holding company structure, and in some cases – notably Germany – that holding company may itself play an important part in encouraging innovation). Most countries also have a variety of train operating companies, and although in many cases a single state owned company remains dominant, usually its market share is declining.

Usually train operators (or franchising authorities) are responsible for choosing rolling stock, even though increasingly this is leased from rolling stock leasing companies or manufacturers, whilst infrastructure managers choose the technology for the infrastructure. This may lead to a significant barrier for the introduction of new technology where the costs and benefits are not evenly spread between the interested parties. To a degree, the problem may be overcome by appropriate systems of track access charges and performance regimes (Nash et al, 2018). The benefits to infrastructure managers of new rolling stock that reduces wear and tear on the track, or that increases capacity by improved performance, would then be passed on to train operators. But few European countries have track access charges that are sufficiently sophisticated to perform this role. One of the few that does is Britain, but there short time horizons for train operators were found to limit the extent to which rolling stock choices took account of life cycle costs (Nash et al, 2013). Even such track access charging systems do not incentivise the infrastructure manager to invest in infrastructure that reduces costs for train operators. That relies either on cost benefit analysis driven by objectives for the infrastructure manager that go beyond the purely commercial, or pressure from a holding company to take total system costs into account.

In some countries, regional services are predominantly run under franchising systems, and the fourth railway package (EC, 2013) will make that a requirement for all new contracts for services run under public service contracts (although existing contracts will be allowed to run their course and there remains provision for exceptions). Where franchises are short, but train operating companies remain responsible for choosing rolling stock there is particularly little incentive to innovate, as what train operators will want is rolling stock that performs well from the start of the franchise, whilst long term costs and benefits are of little relevance. Short franchises may be a particular barrier to innovation, then, unless franchising bodies themselves are responsible for the choice of rolling stock as in some countries (e.g. Sweden, and for some franchises in Britain and Germany).

Commercial passenger and freight operators do not have the same issue of short time horizons brought about by a given franchise length, but low profitability and uncertainty about the future may have a similar effect.

V. REGULATION

Vertical separation creates a publicly owned monopoly infrastructure company at one remove from the final customers of the rail system. There are broadly two approaches used to incentivise this company to improve efficiency and to innovate. The first is to give the regulator powers to examine efficiency and to set targets for improvements when determining revenue requirements (from track access charges and public contributions). This is broadly the approach taken in Britain. The second is via multi-annual contracts with the state which specify what the infrastructure manager is to deliver and what state funding is available to finance it[1]. This is the more common approach, and is broadly that followed in France and Germany.

In both cases, there is a need to identify the efficient cost of achieving the chosen quality, capability and capacity of the infrastructure. This requires the relevant body to take a view on the degree of innovation that is possible and desirable.

In either approach, the usual approach to achieving efficiency includes imposing short term financial constraints. This again risks emphasising short term costs rather than long run innovation, although specific measures to encourage innovation may be introduced. For instance, in Britain the regulator essentially regulates forecast life cycle costs rather than actual expenditure for the period in question (although the recent imposition of cash limits by the state works against this and emphasises actual expenditure in the period in question).

Efficiency may be promoted by contracting out track maintenance and renewals, or indeed entering into public private partnerships for provision of new infrastructure. Competition by a variety of suppliers may bring about innovation. But much will depend on the form and length of contracts; short contracts which are very prescriptive on exactly what work is to be undertaken may actually hamper innovation.

There are other aspects in which regulatory systems may constrain innovation. For instance European railways are required to follow Technical Specifications for Interoperability in investing in new or upgraded infrastructure and rolling stock. There is good reason for this in terms of achieving economies of scale in manufacture and efficiency in use of the equipment. But there is no doubt that this system may inhibit innovation.

On the other hand, there are other mechanisms and funding to support innovation. For example, in Great Britain ORR has created match funding for Network Rail's R&D expenditure. At the European level there are major programmes such as Shift2Rail. Thus it is important to take an overall view of the available funding and regulatory mechanisms with respect to innovation. What is perhaps clear, however, is that in sectors with much less government and regulatory involvement, competitive pressure combined with pure financial motivations for private firms, can be a cleaner and more direct force driving towards improved innovation. Achieving a strong culture of innovation in a complex industry like rail, with a multitude of stakeholders is clearly more challenging.

Concerning other regulated sectors, it should be noted that other economic regulators in the UK have also recognised the challenges and constraints that 5 year regulatory control periods may pose for innovation. In 2010, energy regulator Ofgem set out a new approach to regulation (RIIIO; see Ofgem, 2010). It was noted that innovation requires up-front investment and risk, meaning that companies tend to focus on shorter-term initiatives that will deliver within a 5 year control

[1] The British system includes a mechanism for the government to set out its available funding and what high level outputs it expects from the railway. Further, enhancements have now been taken out of the regulatory process and are managed by government not ORR.

period. This new approach introduced longer regulatory periods (eight years) and sought to shift the emphasis of regulation away from simply focusing on improving the efficiency of energy networks (which the previous system had been very successful at) more towards encouraging innovation and investment in new, low carbon networks. The new approach included lighter touch regulation, provided companies could show they were delivering key outputs, together with specific incentive mechanisms for innovation (including prizes for innovation).

CEPA (2018) reviewed the approach and found that to an extent it had delivered improved innovation. Some concerns were highlighted however about the regulatory approach in general, where it was seen that companies had been able to generate high returns through out-performance against these allowances. An example given was the iron-mains replacement programme, where cost allowances were based on former, more expensive approaches. Of course this example highlights the tension between lighter touch regulation that encourages innovation and out-performance on the one-hand, versus the concern then that returns are too high to be justified for a regulated entity. Some changes were announced by Ofgem in 2018 for the RIIO2 approach, including a return to 5 year control periods, but with longer periods for some investments where it can be shown that better benefits can be delivered for consumers than taking a 5 year view (Ofgem, 2018). Greater customer engagement was also introduced. Experience from other regulated sectors could therefore be useful for rail; however, again rail has the additional challenges relating to the need for government support that does not tend to apply to other network industries.

VI. POSSIBLE SOLUTIONS

Solutions need to focus both on addressing the issue of fragmentation and encouraging the industry to work together to optimise the system as a whole and the issue of timescales. Of course, both would be addressed by a return to a perpetual vertically integrated monopoly. On the other hand this would effectively remove the pressure from competition, as noted above. An alternative which might be more conducive to innovation by avoiding a single monolith would be to move to a group of geographically based vertically integrated monopolies, as in Japan. This at least facilitates yardstick competition.

In the absence of that, various forms of partial vertical integration are possible, ranging at one extreme from holding company structures, vertically integrated franchises, or deep alliances as in Britain, which both merge the management team and share costs and revenues, to more partial schemes to share costs and revenues, such as the Route Efficiency Benefit Sharing scheme, again in Britain. Efficient track access charges, which give appropriate incentives for track friendly vehicles and to use spare capacity rather than congested routes/times, and performance regimes, which encourage all parties to consider the costs and revenue implications for the industry as a whole of poor performance on their behalf, may themselves serve to encourage innovation. However, none of these measures is likely to take full effect unless the parties involved can be encouraged to take a long term view.

Clearly long franchises will encourage such a view (or for responsibility for rolling stock and possibly also infrastructure to rest with the franchising authority, which in any case may be expected to take a long run view). British franchises now require the franchisee to establish an innovation fund, to be spent in a way approved by the Rail Safety and Standards Board, the body which is financed by central government to encourage innovation. Obviously, direct availability of Research and Development funds through bodies such as Shift2Rail at the European level and RSSB in Britain may be important drivers of innovation, although there is a danger that such funds

are used for developments that are never implemented. Moreover the approach in Britain has been criticised for being too bureaucratic (Hacktrain, 2016). Specific funds may also aid implementation (for instance, ETCS is a good example of an innovation which imposes costs on train operators to benefit infrastructure managers; its implementation is being helped by specific funds to pay train operators costs, as well as discounts on track access charges for equipped rolling stock). But consideration must also be given to how to use the regulatory system to encourage long term innovation. This might involve longer control periods or multi-annual contracts, but also further development of the approach adopted in Britain of regulating estimated life cycle costs rather than simply current expenditure.

VII. CONCLUSIONS AND FURTHER RESEARCH

Encouraging innovation in the rail industry is seen as very important if the industry is to meet successfully the challenges it faces, including in particular the challenge of innovation making other modes more competitive. But there are many barriers to innovations in rail and changes to the structure of the industry involving separation of infrastructure from operations, fragmenting of operations amongst a variety of companies and short time horizons dictated by franchise length and short regulatory control periods may all have reduced the incentive to undertake research and development and to implement innovations that are developed. The ongoing strong interest and involvement of government in rail adds further challenges compared to sectors where pure commercial interests and competition can dominate.

There are a number of possible approaches to overcoming this problem, including a return to vertically integrated monopolies, less drastic measures to encourage system wide sharing of costs and revenues and changes to franchise conditions and regulatory approaches to promote innovation by encouraging longer time horizons. But many of these solutions would tend to reduce competition, which is itself potentially an important driver of innovation. In general all such measures have both costs and benefits so it is far from clear what action is appropriate in what circumstances.

We believe this is an area in which more research is needed. Such research might include further interviews on the incentives to innovate covering a wider range of countries and also extending to the manufacturing sector. It might include case studies of the systems used to promote innovation in specific countries (including Japan) and of successful and unsuccessful innovations and how they came about. Lessons from economic regulators in other network industries such as energy could also be explored in more depth. The aim of this short paper is to promote discussion of these issues and to identify ways of researching them further.

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