IEA Discussion Paper No. 50

TRANSPORT INFRASTRUCTURE:

Adding Value

By David Starkie
November 2013

iea
Institute of
Economic Affairs

With some exceptions, such as with the publication of lectures, IEA Discussion Papers are blind peer-reviewed by at least one academic or researcher who is an expert in the field. As with all IEA publications, the views expressed in IEA Discussion Papers are those of the author and not those of the Institute (which has no corporate view), its managing trustees, Academic Advisory Council or senior staff.

Acknowledgements

This publication has been made possible by the support of the Nigel Vinson Charitable Trust. The directors and trustees of the IEA thank the Rt. Hon. Lord Vinson of Roddam Dene, LVO, for both his intellectual and financial input.

The author is very grateful to a large number of people that have helped in various ways in the preparation of this paper. In no particular order these include: Doug Andrew, David Bayliss, Michael Asteris, Ted Lang, Richard Sharp, Peter Kain, David Thompson, John Dodgson, Lyn Martin and Stephen Glaister, Dick Dunmore, Cento Veljanovski, Salvatore Nava, Kate Majkut and Peter Trent. They, of course, bear no responsibility for the contents. The author's views are expressed in a personal capacity and do not reflect those of any organisation with which he is associated.

This paper is an edited version of the Institute of Economic Affairs' Beesley Lecture, 'The economics of transport infrastructure: making the right investment decisions', given by the author on 4 October 2012.

Contents

About the author

David Starkie is a member of the expert advisory panel to the UK Airports Commission, senior associate at Case Associates, London, visiting professor in industrial economics at the University of Applied Sciences, Bremen, Germany, and visiting research fellow in the school of economics at the University of Adelaide, Australia, where he was previously professorial fellow.

His former appointments include director of transport planning and research, Government of Western Australia, and director of Putnam Hayes & Bartlett Inc., Cambridge Mass.

He has been a member of advisory committees including the road transport committee of the Australian Road Research Board and a specialist adviser for a dozen House of Commons select committee inquiries including ‘Charging for Motorways’.

David has given expert testimony in a number of court proceedings including the New Zealand High Court; was economic advisor to the European Commission’s CAEP delegation, Montreal and Washington DC (1995-97) and a member of the CAA expert panels for the NATS price cap (2006) and airport competition framework assessments (2010-11).

His books feature Japanese and Chinese editions; his latest is *Aviation Markets: Studies in Competition and Regulatory Reform* (Ashgate/IEA, 2008).

Summary

- Congestion is endemic across both the rail and road networks. As a result, travellers often experience a degraded quality of service in the form of overcrowded trains or long queues of traffic.

- The government is seeking to address these problems through public spending on transport infrastructure. It is assumed that such expenditure will reap future dividends by boosting productivity and contributing to economic growth.

- Political intervention and perverse incentives mean, however, that there is a high risk that resources will be squandered on poor-value schemes. Weak control over capital costs, bad management and lack of accountability are also symptomatic of the non-commercial approach of the public sector. The problems associated with government transport investment are exacerbated by shortcomings in the appraisal methods used to evaluate projects.

- The transition from the market driven, privately promoted, risk-taking infrastructure provision prior to the 20th century, to the politically influenced welfare economics approach of today, has had the effect of breaking the important nexus that formerly existed between the choice of a project, the quality of service it was to provide and the pricing of its use.

- The public sector should learn from the continual experimentation of the private sector and address the quality issue by exploring the different preferences that travellers have for different attributes of the transport service. Consequently, when adding capacity, it should offer travellers a choice of different price-quality bundles, in the manner of the de-regulated aviation sector.

- Segmentation of the transport market and the introduction of priced options provide an opportunity to add smaller and less expensive tranches of capacity while achieving equal if not higher levels of overall benefit.

- Rail commuters, for example, could be given more choice regarding the quality of service and the cost of fares. An additional high-density ‘economy class’ section could be introduced on commuter trains, access to which would be priced during the peak at a large discount to current fares. From the resource cost point of view, there would be more passengers on a standard-length train without the recourse to high levels of taxpayer-funded investment in expensive new infrastructure.

- Motorists could also be given more choice. The development of the strategic network should allow for priced alternatives running parallel or close to congested roads. These alternatives could place an emphasis on features that add value over and above their potential for reducing travel time, for example by offering reliable, hassle-free journeys on routes or lanes free of heavy goods vehicles.

Introduction

During this period of Great Recession, the need to invest in infrastructure has become a mantra for many commentators. The government has been implored to get cracking and to get spending, on transport infrastructure in particular. The implication, of course, is that for investment in infrastructure to happen, public subsidy and thus public spending (by borrowing more) is deemed essential. And calls for big spending usually come with a shopping list of big projects. The underlying assumption is that the borrowed money, underwritten by the taxpayer, will always reap future dividends because of the inevitable boost it will give to productivity and to the nation's rate of economic growth. This paper takes a more cautious, somewhat conservative, if not sceptical, view of the need to spend on transport infrastructure, calling into question many traditional assumptions and orthodoxies.

My main theme will be to emphasise the use of market segmentation and product differentiation to add value to the provision of public sector transport services and their infrastructure and, importantly, to show how doing this has the potential to enable a more efficient use of transport capital. Product segmentation is an approach that is common in much of the market economy where there is a strong link between price, service quality (frequently manifest in a differentiated product) and quantity. In contrast, in the public sector, for the provision of transport services and much else, segmentation of the market is more restrained, if not absent. These services tend towards product homogeneity and, because the state is often a

monopoly provider, when providing infrastructure for these services there is a tendency to either under or over-provide service quality. Partly as a consequence, as I will show, there is also a tendency to over-invest.

However, before I get to that core argument, I have a few other aspects to cover. I thought I would start by reminding ourselves of the history of transport infrastructure in the UK, who was responsible for providing it in the past and how it was financed, because history provides a context and, in some ways, frames today's debates on its provision. Chapter 2 looks at how these issues were dealt with in the more distant past; Chapter 3 does so for the period since World War II. What emerges is a startling reversal in the roles of the private and public sector.

This leads me to current policy and the tensions that arise from the attempts by governments to influence the important, commercially driven, ports sector (Chapter 4). These tensions have been noted by the competition authorities and their concerns bear repeating. The state has to be circumspect before deciding to intervene and direct where private sector investment should go and how much there should be, or it risks prejudicing vital trade flows; the case for intervention has yet to be made. In passing I also note that the state does not appear to collect statistics on private sector investment in ports and logistics infrastructure and thus, arguably, is ill equipped to make considered judgements in this area.

I then outline the public sector's approach to transport investment (Chapter 5) and some important economic issues still to be resolved concerning this approach, not least the impact of changes in information technology on the productiveness of business travel time. Also highlighted is a particular need to examine how investment in transport infrastructure might change the structure of competitive markets, an issue not incorporated in the current formal economic assessment (Chapter 6). The impacts here could be large and either positive for welfare or negative, depending upon the circumstances. In another departure from orthodoxy, I also question whether the current approach with its incorporation in investment appraisals of

non-working time savings, might lead to a misallocation of resources and whether it would be better to concentrate on the potential impact of transport investments on GDP (Chapter 7). I also suggest, in this context of appraising the worth of investments, that the economics can be severely compromised by governance issues (Chapter 8).

I then turn to my basic theme and in the final part of the paper, I give specific examples of how to add value to transport networks by introducing market segmentation, first in relation to investment in rail capacity and then to road investment. The transport reference point here is the liberalised air transport industry where competition and enterprise has led to a broadening of product choice for the consumer (Chapter 9). In relation to rail, I address the specific problem of overcrowding during the peak and suggest that by investing in a new product which is sold at a cheaper price all rail commuters might benefit whist achieving considerable savings in capital expenditure compared with current investment strategies (Chapter 10). In relation to roads, I focus on the congested strategic network and suggest that road users have varying travel preferences which can be segmented to allow for the provision of more specialised road infrastructure (Chapter 11). But first, how we got to where we are today.

Infrastructure investment pre-20th century

Peter Hennessy recently recalled that Lord Butler, a long time Cabinet Secretary, argued during an address to the Royal College of Defence Studies in 2011, that ‘every Department should have a historical adviser’ (he was reflecting upon the ignorance of history among those who took the decision to go to war in Iraq) (Hennessy, 2012). I do not know whether the Department of Transport has a historical section, I suspect not. However, I think we need to start with some history because I think it is most useful to understand how we got to where we are with the provision of the nation’s transport infrastructure.

If we go back less than 150 years we find that the state had virtually no role in planning or constructing transport infrastructure. In the 18th and 19th centuries the role of the state was to enable infrastructure to be both planned and developed largely by private interests. This enabling process was undertaken through Acts of Parliament, essential because a reallocation of property rights was involved. The first notable examples were in relation to the turnpike roads which the economic historian William Albert (1983) regarded as ‘... one of the central pillars on which the industrial revolution was based.’ This was not private sector infrastructure from a contemporary perspective because the institutional framework (a trust of locally appointed commissioners) was a not-for-profit body. However, and importantly, the trust was solely dependent on private capital; debt finance, secured (mortgaged) against a revenue stream of toll

payments. Indeed, profits were not allowed by Parliament and, arguably, this had the effect of reducing opportunities for mergers (although these did happen), limiting enterprise (although there was the 'farming' (franchising) of tolls) and, importantly, the debt structure did reduce the financial resilience of trusts, which meant that in ages of austerity many ran into difficulty.[1]Nevertheless, '... their "macadamized" surfaces [were] poles apart from the miry rutted tracks of earlier times, their grand routes underpinned at crucial points by great feats of engineering, and their administration a reproach to that of the parish roads' (Dyos and Aldcroft, 1974: 237). There was no national plan involved and few turnpikes consisted of entirely new road but, as Albert remarked, local initiatives seemed to have reflected fairly well the pattern of most heavily used roads and, in a surprisingly limited period of time, an extensive national network of improved roads emerged (see Figure 1).

1 A central argument amongst economic historians has revolved around the issue of the organisational efficiency of the turnpike trusts. The Webbs (1913) were critical, in spite of which they recognised the overall utility of the turnpikes and their essential nature at the time of their development. More recently, those who have undertaken research into trust records, Pawson (1977) and Albert (1972) have formed a different view. Albert, for example, comments: 'When it is remembered that unlike most other transport improvements, they were run as a non-profit-making public service by volunteers for no direct personal gain, the fact that they performed as well as they did is remarkable.'

Figure 1: **The turnpike road network in 1770**

Source: Pawson (1977)

The toll-financed turnpikes were particularly important in the movement of agricultural produce to the rapidly expanding towns and cities of late 18th century Britain, allowing food to reach the industrial worker. But much of the heavy lifting, of coal in particular, during the industrial revolution was left to the canal system and navigable rivers. The common means of financing canals was the joint stock company (Duckham, 1983) with finance generally raised locally[2], in shares of large denominations from wealthy locals (the venture capitalists of their day). Injections from public funds were rare and mostly involved town corporations maintaining and improving river navigation.[3] Eventually, and without the aid of a statist master plan, the canals and navigable rivers also formed an interconnected national network linking industrial and commercial hinterlands to ports and harbours. Rudimentary ports and harbours, of course, predated both turnpikes and canals. There were many of them and they 'grew like Topsy', but with the expansion of trade in the late 18th century major investment took place in new ports, piers and breakwaters and then wet docks (although the world's first had been in Liverpool in 1715). Investment sources were mostly private and varied like the canals. Canal companies built a few (Goole and Runcorn for example), the owners of coalfields and other mineral deposits developed others (Whitehaven, Seaton) and the docks at Hull were built by a private company but, Hull apart, the large dock systems of the major ports required a different approach.[4] Liverpool was built by a public trust but London, which by the first quarter of the 19th century had half the country's dock space, was developed by a number of separate companies each having monopolistic rights to a specialist trade (West India Dock Company, East India Dock Co., and the Baltic timber docks of the Commercial Dock Co and East Country Dock Co., etc). As the 19th century progressed, waiting in the wings to undertake further port developments were the private railway companies.

2 A significant national market in share capital did not exist until the 1840s.
3 Exceptions were some Scottish canals and the Royal Military in Kent and Sussex, built for military purposes although used commercially on a small scale.
4 The major ports were Liverpool, Bristol, Hull and London.

The 19th century railway boom is of course well documented and well remembered, suffice it to say that the extensive network was built on the twin pillars of private equity capital and enterprising zeal that characterised the Victorian Age. As Casson (2009) has remarked, the railway industry is an excellent example of the finance and management of large projects by Victorian entrepreneurs: '[R]ailway promotion was a highly entrepreneurial activity'. Share-holders took most of the risks, but specialists took the strategic decisions, initially the consulting engineers, later company secretaries and chairmen. Again the state's role was to enact the private parliamentary bill promoting the scheme, giving the promoters powers to acquire land compulsorily, to obtain joint-stock status and limited liability. Later it had a most important regulatory role because of the fear that the market power that many rail companies possessed, with their much superior transport technology, would be exercised to price monopolistically, although its ensuing regulation was of questionable efficiency and was slow to encourage the adoption of common standards (track gauges and technical interoperability).[5] But legislation was not prescriptive in that Parliament did not impose an overall route plan for rail investment or direct where individual lines should go.

The bottom line is that entrepreneurial private capital, often raised locally, developed a very extensive national network of roads, canals, railways and ports between, roughly, 1750 and 1900. The most extensive (just) in terms of route miles were the, often overlooked, turnpikes with well over 1000 trusts controlling more than 20,000 miles of road by 1830[6]; by 1911 the route mileage of railways in Great Britain was also 20,000 miles but proportionately less south of the Scottish border in comparison to the turnpikes. Canals and improved navigations totalled a few thousand miles, so that, in total, private enterprise in one guise or another had delivered a transport network not far short of 50,000 miles in length and, in the process, achieved some amazing engineering feats often using innovative

5 Foster (1992) provides a good overview of 19th century attempts to regulate the railways. See Chapters 1 and 2.
6 This figure is from Albert; Dyos and Aldcroft (1974: 70) quote 22,000 miles. Their focus was of course on main roads; there were many minor roads untouched by the turnpikes.

technology. But it was not only the route or track which received private investment; in the case of the railways there was extensive investment in rolling stock too. And then there were the network nodes: the stations, termini, docks and harbours. Alfred Marshall writing in the 1890s summed it up when remarking that transport development was '...the dominant economic fact of our own age...'[7]; mainly due to private sector investments remunerated from tolls, dues, fees and other prices charged on users.

7 Marshall continued: '...it is they also which have done by far the most towards increasing England's wealth' (8th edition, 1946: 675).

Infrastructure investment post 1945

The period between the early 20th century and 1945 was a transitional period to a very different world. After 1945 the state replaced the private sector as the owner of most transport assets, an originator or gatekeeper of ideas for projects and a source of funding and finance. The transformation was well underway by the 1920s (experience during World War I increased confidence in the state's ability to control the economy and, no doubt, whetted the appetite of many a bureaucrat) such that an American observer writing in 1933 noted:

> '...British leaders of many shades of political opinion, empirically and sometimes grudgingly, have begun to regard the State in a new light – as the means of stimulating and controlling the economic development of the entire country.' (Dimock, 1933)

Prior to World War II this control was exercised largely at arm's length through extended and tightened regulation but after the war it was through direct ownership of transport assets; the railways, canals, and most of the docks and harbours were nationalised. At the time, roads were already under either central (or local) government control, but now control was extended to some of the commercial vehicles (buses and trucks) that ran on them. It also extended to the infrastructure of the relatively new mode of air transport. Most significant aerodromes were developed pre-war by local governments but by 1945 these were in the hands of central government and by 1947 subject to a national plan.

Given the ravages of the war and the broken economy thereafter, state control of the transport industries did not at first translate into investment in infrastructure[8]; such spending was negligible for a decade or more. It was not until the late 1950s and early 1960s that construction began with some electrification schemes as part of the Railway Modernisation Programme and then, more significantly, with a start on the motorway network. The latter, basically following a plan drawn up a decade before, has been the most significant of the state's post-war transport investments, in some small way reminiscent of the mid-Victorian railway boom a century before. The motorway network that emerged, and it emerged quickly with over 1000 miles opened by 1975[9], was the leitmotif for the new era of transport planning; it was regarded as a considerable engineering achievement and, note, '...one of the great public investment projects of all time' (Hughes, 1980).[10]

The private sector played no part in initiating and planning these rail and road programmes and this, in large measure, continues to be the case. There was the brief interlude when Railtrack was responsible for railway infrastructure but, apart from that aberration, as far as the nation's core network is concerned, there has been virtually no private investment of significance that is dependent on a cash flow from its users and is thus truly risk-bearing; only Heathrow Express (a BAA plc venture) and M6Toll[11] come to mind, although the former was included in BAA's regulated single till[12] and the specific route of the latter was largely pre-determined by the public sector; these projects add up to about 30 miles of new routes. There

8 One significant exception was Heathrow airport when the central terminal area and linking road tunnel was built.
9 The first motorway to open was the Preston by-pass (now part of the M6) in December 1958, followed a year later by a southern section of the M1.
10 Critically, it was decided that these roads would not be tolled with the government paying for road capital and operating costs out of general revenues which of course included the proceeds of fuel duty and vehicle taxes but there was no hypothecation as such.
11 This toll road went forward as a DBFO project and has a 53-year concession from the public sector as from January 2001. There is also a DBFO concession for the Second Severn Crossing and there are a few historic bridges in private hands still subject to tolls. I also consider Network Rail, a not-for-dividend company limited by government guarantee, to be in the public sector (as does the National Audit Office).
12 The inclusion of Heathrow Express in the 'single till' means that BAA is largely assured of a full return on its rail investment in line with its allowed cost-of-capital.

are also a number of private-finance related ventures where the investment is recouped through shadow tolls but the degree of risk transfer is relatively modest and the schemes were again pre-specified by the public sector. It does not begin to bear comparison with almost 50,000 miles of rail, turnpikes and canals planned, financed and built without state direction or subvention in the two preceding centuries. The contrast is quite stark.[13]

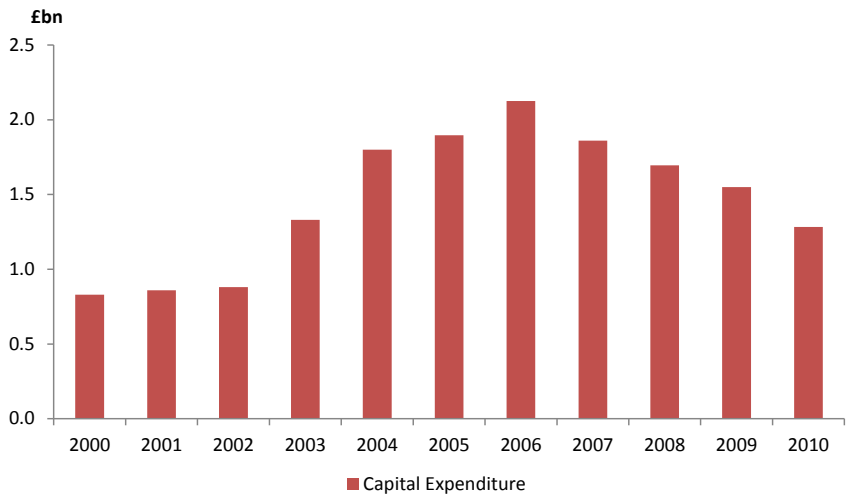
In so far as the private sector has had a role investing in transport infrastructure it has been as a fringe activity, literally but not metaphorically. It is at the edges of the network, the nodes, where it has had a real and important impact and, with the exception of some specialised port facilities and logistics centres, this had to await privatisation of the bulk of the ports and airports in the 1980s and 1990s.[14] Subsequent investment in the private ports (Felixstowe and Thamesport, for example), largely ignored by the politicians, has been significant and continues to be so, with DP World's current *£1.5bn* investment in a new Essex container terminal and Europe's largest logistics base being a notable example.

Although thought of primarily in relation to passenger movements, airports are a major gateway for trade in goods. Of Britain's goods exports, about two-fifths by value (which of course is the important metric) are via its airports, with Heathrow pre-eminent. Consequently, almost all of the nation's trade in goods (by value) is via privately owned 'port' infrastructure, a point generally ignored in the infrastructure debate that currently ensues. Since privatisation of many airports in the 1980s and 1990s, major investment has taken place in this sector, particularly into London Heathrow and Gatwick (Figure 2) but, particularly noteworthy is the truly enterprising venture in the Victorian spirit by Mowlem, the former construction company,

13 There is here a reversal of the historical picture; in the 18th and 19th centuries, limited transport investment by the public sector (local governments) focused on the estuaries and coast. Seaports (with airports) tend to be the current focus of private sector transport infrastructure investment.
14 During the early 1980s the British Transport Docks Board was privatised to become the Associated British Ports (ABP), operating 22 ports, including Southampton and Hull. In the 1990s a number of trust ports, including Tilbury and Clydeport, were also privatised. By 2012, the Major Ports Group representing most of the major ports had 9 members, all but two of which (London and Belfast) were private companies.

which resulted in a Docklands airport (London-City); it eventually paid-off for subsequent owners, but unfortunately not for its original backers.

Figure 2: Capital expenditure on UK airports, 2000-2010



Source: CRI and Leigh Fisher

The interface between private and public investment

For whatever reason, official statistics appear to ignore investment in the infrastructure of our trading gateways and logistics chains. It is difficult, however, for there to be a fully informed debate regarding investment in the nation's transport infrastructure unless there is a full picture and not just the public sector part of it. Airport investment between 2000 and 2010 was in excess of £16 billion at 2010/11 prices.[15] Figures for investment in seaports are much more difficult to come by. The trade view is that annual investment averages about £200-300 million, but with large year-to-year variation on account of the occasional major development like the current project by DP World. Including logistics parks and similar infrastructure, this suggests that total investment by the private sector in terminal facilities of one sort or another during the last decade, was around £20 billion in current prices. By comparison, capital investment by the public sector in the English strategic road network (motorways and trunk roads) over a similar period is about two-thirds that figure.

In spite of this substantial private sector investment in the 'ports', the thought that it is the government's responsibility to make the key investment decisions even in these market-driven sectors is pervasive. In 2002 the chief executive of the quoted BAA plc was

15 This statistic is based on 'additions to fixed assets' in company accounts. This was in addition to the price paid for the assets when these were privatised. In the case of BAA for example, the enterprise value in 2000 of its then three London airports was over £6bn. See http://www.caa.co.uk/docs/5/ergdocs/ccreportbaa/chapter4.pdf, p.156

quoted as saying:

> 'We are the builder of airports on behalf of the government ... It is the government's responsibility to decide how airports develop and where airports develop.'[16]

This was in marked contrast to the intent of the policy framework set out in the 1985 White Paper on airports policy whereby airport development was to be commercially driven, albeit in some cases heavily regulated and, of course, subject to planning law.

More recently, calls for the government to intervene in the largely private airports industry by formulating an airports policy have intensified, often from within the industry itself.[17] In Summer 2012, the transport secretary appeared to be rising to the occasion, pronouncing that: '[m]y job is to say, "What do we need for the next 20, 30, 40 or 50 years?"'[18], a rather impressive expression of self-confidence bearing in mind that the Soviet state planning committee (Gosplan) generally planned on a five-year cycle. But before engaging in futurology the Secretary of State might first wish to reflect on who is best placed to make decisions on the infrastructure needs of a market driven transport sector and, when doing so, to take on board comments made by the Competition Commission in relation to the former government's 2003 White Paper, *The Future of Air Transport*:

> 'The specific nature of the 2003 White Paper...blurs the boundaries of responsibility between the Government and the airport operator, particularly where the Government has commented on the type of runway configuration it supports. While the White Paper states...that responsibility for taking specific airport developments forward in a way that is responsive to users lies with the commercial airport operator, we currently find it difficult to reconcile this with a Government policy which supports specific locations for development and in some cases indicates a preference for the timing of such developments.

16 Quoted in Andrew (2002).
17 One is reminded of George Stigler's (1971) comment that: '...as a rule, regulation is acquired by industry, and is designed and operated for its benefit.'
18 'Greening hints at need for four-runway hub airport', *Financial Times*, 26 June 2012.

> There must be a risk that in practice the type, scale and timing of airport developments may not reflect market developments and customer requirements.'[19]

The Commission set up to review airport capacity headed by Howard Davies please note.[20]

Similar issues and tensions have also arisen in relation to infrastructure in the competitive ports industry and these have been expressed well by Asteris and Collins (2007) in a paper that argues that port development is determined very largely by the dynamics of the market, driven by changing trade routes and shipping technology, so that a more interventionist approach is likely to produce suboptimal outcomes, to the detriment of UK international trade. During the mid-2000s ports were threatened with the type of intervention now called-for from within the aviation industry, but in contrast to that industry, the UK Major Ports Group, a trade association, drew attention to the crucial aspect:

> '[T]he difficulty is that we are a private-sector industry and investment is market driven. A national ports policy doesn't sit alongside a market-led industry such as ours.'[21]

On this occasion, the government withdrew its proposals.[22] But it is an issue that will continue to rumble on. The port industries illustrate a tension at the interface between the roles of the public

19 Competition Commission, BAA Market Investigation: Emerging Thinking, April 2008: 227.
20 The context of the quote from the Competition Commissions 'Emerging Thinking' report is Stansted airport. Stansted provides a good example of a failed government intervention. In June 1985, the government gave the go-ahead for a major expansion of the airport, a project favoured by the Board of the then nationalised British Airports Authority. The latter corporate body was not floated on the stock exchange until 1987 by which time the project was committed. After its completion, in order to try to fill the large increase in capacity, the newly expanding low-cost carriers were offered deeply discounted charges. This resulted in an inadequate return on capital which until 2003, when the industry regulator changed the rules, did not matter because of a combined RAB for BAA's three London airports. This meant that, in effect, Stansted was supported by Heathrow in particular and to some extent by Gatwick. Stansted today, in spite of the unwinding of earlier low priced contracts, struggles to provide an adequate return on capital and, since before the start of the 'Great Recession', has experienced an exceptional, beyond trend, fall in traffic. Further background details will be found in Chapters 7-9 in Starkie (2008).
21 Quoted in 'Essex plan will keep shipping on an even keel', *Financial Times*, 12 July 2005.
22 'National container ports policy ruled out', *Financial Times*, 27 September 2006.

and private sector when it comes to investing in transport infrastructure. Private sector investment is driven by market forces and expected commercial outcomes; the public sector has wider responsibilities, but in what is generally a market economy (albeit one in which competition can be restrained) with an important trade component, the state has to be circumspect about intervening and directing where private investment should go and how much there should be; the onus is on the government to prove that it has a strong case for doing so. When reflecting upon pressures, or on an inclination, to intervene it would do well first to consider who can and will have the best information for making decisions, who will have the most incentives to do so and who will be more accountable for the outturn of the investments. With the port and airport industries and their general willingness to meet market demands, there is little evidence of a serious failure to supply the capacity needed to meet demand; indeed in the case of an extra runway at Heathrow and major port facilities at Dibden Bay (Southampton), the private sector has been thwarted in its investment plans.

An economic rationale?

As the above comment by ports industry representatives underlined, private sector investment was, and is, driven by market forces; anticipating a demand, developing often an innovative service, identifying a cost-effective option, identifying and managing risks, charging for use, producing a cash-flow and (hopefully) paying-off creditors and producing dividends for share-holders. But the fundamentals of the public sector approach differ and, in so far as there is an economic rationale to its approach (more of which later), it is to be found in the application of welfare economics, adapted for and developed in the UK in the 1960s, especially by Michael Beesley (and colleagues) in relation to the M1 motorway (1960), and by both Michael and Christopher Foster with their ground breaking joint paper on estimating the social benefits of constructing the Victoria underground line (1962).[23] These studies laid the foundation for subsequent government analysis of transport projects.[24] In the case of roads it was first formalised in the TAL (traffic and accident loss) procedure and then in COBA (cost-benefit analysis) which has now been subsumed in the modern day web-based (multi-modal) transport analysis guidelines (WebTAG).[25] Since 1998 a new framework for appraisal has been used with the

23 As an historic footnote a social benefit approach based on reductions of effort required to pull vehicles up varying gradients, was illustrated by one of Telford's engineers in the early 19th century (Paxton, 1969)

24 An excellent review of Michael Beesley's early contribution will be found in Sir Christopher Foster's (2001) paper. This issue of the Journal celebrated Michael's work in transport economics.

25 Mackie (2010) provides a good overview of both the development and current practice of transport CBA in the UK.

aim of presenting a one-page summary of the analysis ('appraisal summary table') for ministerial perusal. The economics are but one component of the formal framework and in the latest version, 'solutions' (projects) are assessed against five objects: environment, economy, safety, accessibility and integration. In turn each of these objectives has a number of sub-objectives. For the economy objective ('to support sustainable economic activity and get good value for money'), there are five sub-objectives set out thus:

- to get good value for money in relation to impacts on public accounts
- to improve transport economic efficiency for business users and transport providers
- to improve transport economic efficiency for consumer users
- to improve reliability
- to provide beneficial wider economic impacts

The Department's overall approach to economic evaluation of a project has become increasingly controversial over the years particularly with regard to its assumptions regarding *average* values of a unit of travel time saved and its calculation of benefit-cost ratios in economic appraisals.[26] Travel time savings, which are divided between time saved during the course of work and other travel time savings, are a core feature of the user benefits. For road projects, average values per unit of saved travel time, multiplied by the respective estimated quantities of time saved, are generally said to sum to about 80 per cent of the total benefits. Issues include: whether small savings of non-work time have a value and should count in the appraisal; whether unit values are non-linear so that

26 For example the Public Accounts Committee recently commented in relation to HS1: 'Some of the Department's assumptions about the benefits of faster travel are simply untenable.' http://www.parliament.uk/business/committees/committees-a-z/commons-select/public-accounts-committee/news/hs1-report/. A more fundamental criticism centred on the invariance of travel time over historic time and suggestions that the benefits of improvements to transport systems are to be found in the additional access afforded, not in notional travel time savings, will be found in Metz (2004).

time savings on long journeys count proportionally more[27], and the rate at which time values should be increased through time (the Department has now modified its approach for non-working time). More recently, because of the development of communications technology such as smart phones and the use of personal computers, the practice, particularly in the context of rail projects, of treating all business travel time as unproductive time has been questioned[28], most recently by the National Audit Office in its critical examination of *The Completion and Sale of High Speed 1*.[29] In relation to the same project Wolmar (2012) questioned the practice of valuing the leisure time savings of foreign tourists at the standard UK rate. I would also question whether the re-calibration of basic values of time saved is conducted too infrequently.

27 The latest WebTAG guidance makes some concession in these regards by disaggregating the quantity of savings by small and large increments and by length of journey, but a constant value for a unit of saved time remains in use. WebTAG comments: 'There is no evidence to support valuing time savings in these [time] bands at a different rate from time savings in other bands.' (3.1.18)

28 This was a questionable assumption for rail travel even prior to the advent of modern IT. I recall in the late 1960s, the late Gerard Fiennes, who was General Manager, Eastern Region, BR, telling me that when he wanted to do a decent day's work, he left the hubbub of his office at King's Cross station and took a rail journey to Doncaster and back. He would of course have been working in first class.

29 The earlier development of this project before recapitalisation of the PFI is covered in a very good account in Kain (2002).

Wider economic impacts

The last of the sub-objectives listed under ‘economy’ in WebTAG, wider economic impacts, is a relatively new addition to the scope of the appraisals. The Leitch committee in the mid-1970s was the first to grapple with this issue. The argument was that the economic appraisal methods, concentrating as they did on the direct travel benefits, were missing some wider economic impacts. The standard repost at the time was that they did not and the benefits alluded to were the ripples of those first estimated (mostly savings in travel time) and to include them would be to double-count. This, basically, was the conclusion of the first Leitch committee. The argument has persisted and stimulated by the theory of the so-called new economic geography, the thinking now is that there could very well be additional benefits.

One such argument is that transport improvements increase productivity by facilitating agglomeration economies; thicker labour markets lead to the better matching of workers to jobs, increased firm density leads to greater knowledge sharing and to increased specialisation in the supply chains (Venables, 2007). Graham (2007) has shown for the UK that agglomeration economies vary strongly across industries: they are proportionately smaller for manufacturing industries, larger for service industries (business services, banking, finance and insurance). His work was used by the Department of Transport to calculate the agglomeration economies for the London Crossrail project and these added about 20 per cent to benefits

calculated using the standard approach.[30] But, as an OECD report commented, it is not clear to what extent these additional benefits would be offset by losses in other jurisdictions outside of London. Apart from which, because London is a major economic centre on a world scale with a dense workforce focused on services, the significant size of the agglomeration benefits associated with Crossrail are unlikely to be repeated outside the capital. Indeed, the contrasting extreme is apparent in recent analysis undertaken by Graham and Melo for the Department of Transport in the context of the inter-urban High Speed 2 proposal. They concluded: ‘...while urban economic theory does not preclude the existence of agglomeration benefits across inter-regional distances, the empirical evidence suggests that these may be very small indeed’[31]; in relation to the cost of HS2, as calculated by Graham and Melo, they represent between 0.0006 and 0.0022 per cent.

A second argument has centred on an appreciation that the economic landscape is one of imperfect markets, not one of constant returns to scale and perfect competition implicitly assumed in the original standard scheme appraisal methodology.[32]The Department of Transport’s July 2005 consultation paper, ‘Transport, Wider Economic Benefits and Impacts on GDP’, considered these competition-related effects at length. The underlying argument in the consultation paper was that additional efficiency gains are realised through increased output either as a result of increased competition (thus a reduction of the welfare loss triangle) or as a result of transport cost reductions. Attached to increased output of the latter kind in imperfect markets is a price-cost margin (an element of producer surplus), not taken into account in the standard appraisal of a project. Following exploration of price-cost margins (a best estimate average of 0.2)

30 Worsley (2011) provides a good account of wider economic benefits in relation to Crossrail and the evolution of thinking on the subject.

31 This is assuming a transport investment that can directly affect 25% (50%) of all national long-distance rail trips, the order of magnitude of agglomeration benefits corresponding to a 25 per cent increase in travel speeds shows very small potential agglomeration benefits of 0.0006% or £8.29 million (0.0011% or £16.57 million). For an increase of 50% in travel speeds the potential agglomeration benefits are of 0.0011% or £15.80 million (0.0022% or £31.60 million).

32 A third dimension is that there are welfare benefits arising from improved labour supply. Space and time constraints prevent incorporation of this effect here.

and aggregate demand elasticities (of -0.5) it was considered that the welfare gain from a transport improvement might be 10 per cent higher (0.1) than the traditional method based on estimating business time savings and reliability, thus suggesting that benefits from these latter be increased by a tenth. However, concerning the argument that improved transport links lead to increased competition in turn leading to increased output, the report concluded that we would not normally expect to find significant benefits from this effect in the UK, basically because the UK is a relatively uniform country, densely populated and has a well-developed infrastructure.

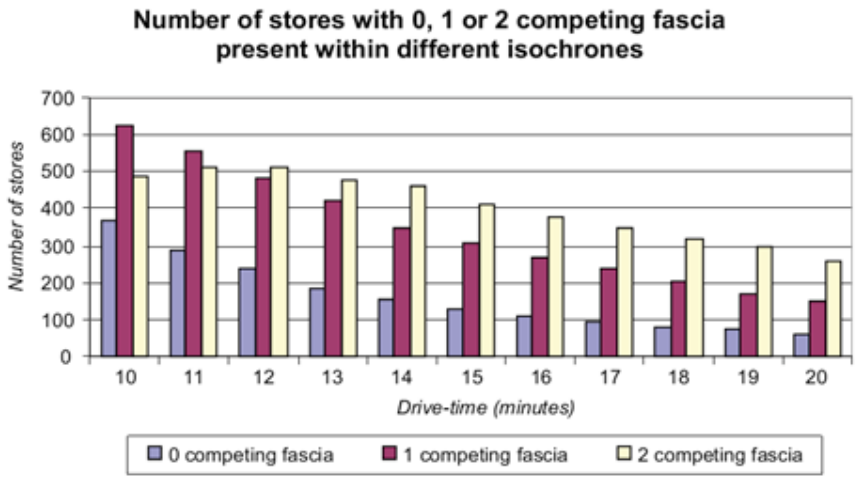
With respect to the latter argument I find two problems. Firstly, I do not accept the implication that competition basically is spatially uniform in the UK; because of variations in population density, there are significant areas and economic sectors where (local) market power is significant and, in the longer term, these could be impacted upon by transport investment. Secondly, the consequences of these impacts need not necessarily be benign. The literature of the new economic geography, which gave impetus to the general case for examining the wider economic benefits of transport improvements, places considerable emphasis on the fact that over time transport improvements interact with economies of scale to drive specialisation of economic activity. Economies of scale are viewed as particularly important; '[I]t is only the presence of increasing returns that make a large center of production able to have more efficient and diverse suppliers than a small one' (Krugman, 1993: 49). In other words, transport improvements through reducing production costs and moving firms along their downward sloping long-run average cost curves, in aggregate and in the longer term, tend to increase firm market power, in which case there is a Williamsonian trade-off between increased market power and the effect of lower average costs; in some instances it is possible that the effect of the former might be greater than the effect of the latter.

One gets an inkling of these effects in the Competition Commission's 2008 examination of the UK supermarket sector. This showed that there were a significant number of large stores with a monopoly or duopoly position in the retail market. Comparison of changes

between 2000 and 2006 showed that competition had increased in some of these areas but in the majority, monopolies were persistent and that of 123 stores in duopoly areas in 2000 (using the 15-minute drive time isochrone), 29 appeared to have become monopolies by 2006.[33] Of the 118 persistent monopoly/duopolies (over 1,400 sq metres area store size) at least 21 per cent were judged to be in areas with a population density too low to support a competing store. There are of course many factors involved in determining the overall competitive landscape for this sector, but what this analysis does suggest is that there are pockets of market power (some due to low population density hence a tendency to natural monopoly[34]); that there might be economies of scale involved (nearly a third of the largest stores with monopoly or duopoly positions had extended, or were proposing to do so) and that changes in access times are potentially significant. For example, the number of large stores judged to have no competitor fell from 368 if a 10-minute drive time isochrone was used in the analysis, to only 130 if the isochrone was based on a 15-minute drive time (see Figure 3)[35]; every minute appeared to make a difference. In other words, in the retail sector, and possibly in the service sector more generally, there are local areas in which competition is less effective and in which transport improvements might impact either by reducing market power, or by increasing market power (but not necessarily prices) if scale effects are dominant. There is a (strong) case for taking the welfare implications of these competition effects into account in the evaluation. To do this, we need to know whether transport infrastructure leads on balance to more or less industrial concentration, roughly how much and whether, and to what degree, increases in market power are likely to offset transport cost reductions when determining changes in welfare.

33 The figures are taken from Appendix 7.1 of 'The supply of groceries in the UK: market investigation', Competition Commission, April 2008.
34 Note that transport improvements have the effect of increasing population densities in spatial markets.
35 Appendix 6.1, Competition Commission, April 2008.

Figure 3: Changing levels of competition vs. drive time isochrones



Still wider issues

The foregoing are of the nature of what one might term the technical questions concerning the economic evaluation of projects, the nuts and bolts so-to-speak, but there are broader, more basic, fundamental issues concerning the context in which the evaluation takes place. In my Beesley Lecture in 2002, I expressed some concern that there was a mismatch between the neo-classic welfare-based approach to project appraisal and the workings of the wider economy, including private sector investment in transport (Starkie, 2004).[36]

By way of example, I drew attention to the fact that 'time' is a common input into many economic activities and that time lost through congestion, or in its more usual manifestation, the queue, is endemic when shopping, using banking services, visiting the cinema or sporting events or just filling up the car with fuel, prior to its use on a possibly congested road. Where the potential for queuing takes place in the context of services that are strongly competitive, market forces will tend to lead to *optimal* queue lengths, some waiting time will be competed away in the provision of better service levels, albeit at a higher price for the service (more check-outs at the supermarket, more tellers in the banks). However, there are many sectors (or parts thereof) that are not exposed to competition and hence in these cases consumers have no opportunity to trade higher prices for shorter queues.[37] As a consequence, the current

36 This issue was addressed in the hand-out which accompanied the lecture; space constraints led to the exclusion of some of the material from the published version that appeared in 2004.

37 The monopoly/duopoly sectors of the supermarket sector might be an example.

approach to economic appraisal of transport schemes, with its emphasis on eliminating or at least reducing travel congestion (traffic queues) could very well be a misallocation of resources: the public sector takes account in its road appraisals of the welfare effects of consumers queuing in cars getting *to* shops but disregards the possibility of sub-optimal queuing by the same consumers once *in* shops.[38]

The counter argument could be: the quality of the nation's transport infrastructure is fundamental to the wellbeing of the economy and, therefore, it is correct to treat it in an exceptional way. This might well be the case in a developing economy (although as we have seen, during the industrial revolution the UK economy grew into the worlds' largest without a centrally planned network or recourse to public policies based on welfare maximisation) but the UK economy is now mature and so is its extensive transport network which is increasingly supplemented, if not partially replaced, by wires, cables and internet-related technologies. It is also a strongly service-based economy of which the queue in shops is a manifestation, and much less involved with carting things around, especially big, heavy things. Our international trade is also oriented towards services and the goods we export (often through airports), such as whisky, pharmaceuticals, aerospace products and motor vehicles, tend to be more high value-added products as neatly encapsulated recently by Evan Davis (2011). Moreover, the possibility that transport infrastructure is perhaps increasingly of marginal importance in terms of the performance of the economy appears to be borne out by the, albeit limited, research into the economic impact of marginal additions to it. Even in the case of the 1960/70s motorway programme, ('one of the greatest public investment projects of all time'), the impacts appeared modest, at least at the

38 An exception in this context is queuing in some privately operated airport terminals. Queue lengths at security in Heathrow, Gatwick and Stansted are subject to regulatory oversight. Whether the regulator is able to judge an appropriate queue length is another matter.

regional scale (Dodgson, 1974)[39] and, as Botham (1982) suggested, changes in work place regulations (restrictions on drivers' working hours or daily mileage) and fiscal policy (capital allowances on vehicles and fuel duty changes), to which I would add dramatic improvements in vehicle efficiency, probably alter the pattern of accessibility as much if not more than additional infrastructure investment.[40]

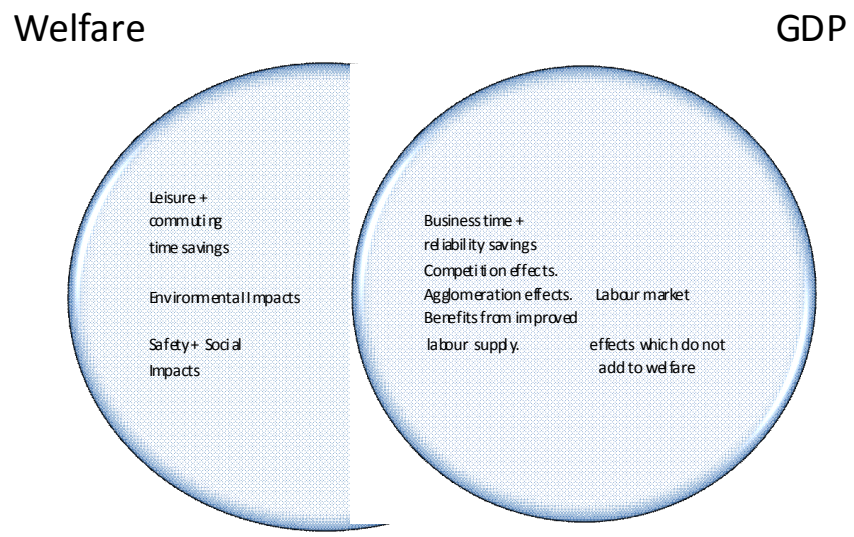
In my 2002 lecture, I made the point that there was '...an argument for adjusting the investment appraisal of [of roads] so that it reflects rather more than the workings of the market economy', and in this context I made a number of specific suggestions one of which was to: '...focus the evaluation of road projects on those inputs and outputs that bear upon the National Income accounts...' In terms of the foregoing comments, what this would mean is that the impacts of transport investment on competition and firm productivity are given more importance, but the impacts on savings in non-working time are treated with less consequence. One of the purposes of the Department's 2005 discussion paper was to facilitate the estimation of the impacts of transport schemes on GDP and the paper distinguished between the welfare effects and the GDP effects of the different components in the appraisal methodology and a summary of this is shown in the following Venn diagram (Figure 4) taken from the report.[41] It is to be hoped that the work on these lines will be taken further.

39 More recent research concerning US and Spanish highways has produced similar modest results. For example, a rough estimate is that a 1 US dollar increase in expanding capacity for interstate highways could lead to a 0.15 US dollar increase in private sector output in the long run, which would take more than a decade. See Jiwattanakulpaisarn, Noland and Graham (2012).

40 Through-out the 1950s and early 1960s the relative price of road freight transport fell but during most of the 1960s and early 1970s it increased despite the motorway programme.

41 For further details and explanation see Department for Transport (2005: 15-16) or Worsley (2011: 26).

Figure 4: The different components of welfare and GDP based appraisals



Governance and incentives

Butler (2012: 24) has made the point that: '[A] key and unspoken assumption of [the welfare maximising] approach...was that such policy decisions would be made logically and rationally, by enlightened and impartial officials, pursuing the public interest', but the Public Choice theorists have argued to the contrary, that officials too are self-interestedly pursuing their own agendas (career advancement through pursuing group interests for example).

I do not wish to pursue the Public Choice agenda as such, but it is worth noting some contrasts between the state's approach to the provision of transport infrastructure and a market driven approach and to view these differences through the lens of incentives. We can note, for example, the absence from a public sector infrastructure project of a bankruptcy constraint concentrating minds in the way it does in the private sector; when in use the project will either be free-at-the-point-of-use or the expected cash flow will not be a particularly important consideration in the decision to adopt the project. (High Speed 2 is a good example where the government appraisal suggests that the project will result in a government fiscal deficit of £9 billion in present value terms). This difference in attitude reduces the incentive for the public sector to control capital costs, which have escalated hugely in recent decades (Kay, 2012), or to undertake ex-post evaluation of projects, or properly manage the resulting assets, leading to poor accountability.[42] The excellent work

42 There have been a few ex-post evaluations by the Department and the recent meta-analysis by the Highways Agency (2011) is notable.

of the National Audit Office and Public Accounts Committee notwithstanding, there is no equivalent to the regular, continual and focused scrutiny of the private sector project and its management team, assisted by company annual accounts and AGMs. This also has a bearing on the generation of prospective projects. Although WebTAG guidance extols public sector project managers to explore a range of options, it is not entirely clear that the search is done in a systematic or especially imaginative way or, for a particular project addressing a perceived problem (overcrowding, congestion etc), to what extent broad alternatives are adequately considered. This was a criticism made in the recent Parliamentary scrutiny of High Speed 1. The creativity of the private sector is generally absent.

Interest groups have a particular incentive to advance specific projects[43] and the executive seems increasingly keen, now that 'consultations' have become institutionalised, to embrace stakeholders for advice, perhaps reflecting the increasing absence of in-house resources, skills and expertise.[44] During the industrial revolution and the Victorian era, entrepreneurs operating in the market economy seeking the prospective return on capital drove that innovative search and selection process for transport projects and in that sense the approach was probably more comprehensive; after adjusting for financial risk, the markets did not distinguish between the small and the large project for example. In contrast, it appears that there is now a tendency for the public sector to gravitate towards the large project irrespective of its economic returns as Goodwin (2010), Dodgson (2009) and the excellent report by Eddington (2006) have all noted; the *grand projet* is viewed by the politicians as better electoral PR. I also find it of concern that the executive seems no longer to be taking a dispassionate, arbitrator-of-the-public interest approach to transport projects; instead the posture appears increasingly to be that of a project advocate.[45]

43 Examples would be Greengauge 21's promotion of High Speed 2 and Lord Foster's promotion of a Thames estuary airport.
44 The Department for Transport's chief economic adviser role in the summer of 2012 was divided and partly part time.
45 See for example, 'Rail link chief accuses critics', *Financial Times*, 28 July 2012.

This is not to pretend by any means that the bygone market-driven process for developing transport networks was perfect. There was the perennial agency problem and, as already noted in the case of the railways, it was the engineers, company secretaries and chairmen who tended to take the strategic decisions; some of the major engineering feats on the railway system were driven by the engineering profession's desire for public recognition (Casson, 2009: 16). There were also the swindles and the manias and after the 1850s, following the 'Limited Liability Act', perhaps a tendency to take on too much risk leading to the rail network becoming over-extended. But, at the end of the day, it was the, often hands-on, investor who was taking the risk and the hit, not the seemingly disengaged, hapless taxpayer.

Segmented markets and product differentiation

The transition from the market driven, privately promoted, risk-taking infrastructure provision prior to the 20th century, to the politically influenced welfare economics approach of today, has had the effect of breaking the important nexus that formerly existed between the choice of a (perhaps innovative) project, the quality of service it was to provide and the pricing of its use. What the market sector was and remains good at is constantly developing a product and discovering through testing, trialling and pricing, consumer preferences for different service qualities and reflecting these in a price structure for a bundle of attributes that effectively differentiates between (sub-) market demands.[46] In the transport sector of the economy a good example of such product differentiation is to be found in the mostly private sector, largely competitive, air transport industry.

Airlines (and increasingly airports) are particularly good at segmenting markets offering passengers different product bundles at different prices.[47] A 'full service airline' like British Airways (BA), Air France, Lufthansa, on a long-haul flight can have up to four classes of travel with marked differences in levels of comfort and levels of service

46 An excellent account of this market process is found in Kay (2003).

47 There can be a large variation of prices for each product as a result of airlines using yield management techniques to price discriminate. But the price variation is constrained by the possibility of product switching and revenue dilution. Traditionally airlines have used 'fences', or conditions attached to a particular class of ticket to prevent this.

between them. A further layer of differentiation is added by route competition between airlines, each with a nuanced product on offer, so that business class in, say, the London–New York market is different on BA from the business class offering of Delta. On short-haul city-to-city routes more of the differentiation comes from competing, differentiated products rather than from a within-brand variety of price/quality bundles. For example, one can fly from London to Rome (as at July 2012) on BA, Alitalia, easyJet, Monarch and Ryanair (and, if one is wealthy enough, a private jet): BA and Alitalia offer two classes and, in turn, the BA product labelled 'economy' is quite different from the economy product of, say, Ryanair (different catering, different baggage restrictions, assigned seating on BA but not Ryanair, etc). Ryanair and easyJet, both notionally single class products, also surcharge popular seat positions in their aircraft cabins and from November 2012, easyJet, after trialling the approach, have assigned seating as well as preferred-seat surcharges, thus differentiating itself further from Ryanair. In addition, this London-Rome market is further differentiated geographically: the consumer has a choice of four London airports for arrival/departure and two airports in Rome. But this geographic differentiation is accompanied by further product differentiation, in so far as the different airport nodes offer, to use the marketing jargon, different 'customer experiences'. The airports differ in their ambience and range of facilities; they, too, are attempting to segment their product.

What one is observing in this differentiated, aviation market is a process of monopolistic competition. For the most part, there is unrestricted entry into (and exit from) the internal-EU airline market and to an extent in other aviation markets too, although here barriers imposed through air service agreements linger so that markets are more likely to be oligopolistic. Although the outcome is not the text-book benchmark of a perfectly competitive market (and a static equilibrium as a consequence), there are important gains in consumer welfare because, in the above example, the air passenger is able to consume differentiated products (at different prices) which add value; importantly, the sum of the sub-market demands exceeds that which would prevail if consumers were offered only a

homogeneous product. For the latter, imagine if competing short-haul airlines were limited by regulation to providing only an economy class service of a specified type, so that they all become, for example, clones of Ryanair; cheap, clean, good on time performance, but, nevertheless, a singular uniform, commoditised product.[48]

Public sector transport services, by comparison with the UK airline industry, are more homogenous in their characteristics and, usually, price too; there is relatively little product innovation, experimentation, or product differentiation built into their design and the absence of direct pricing in the case of roads makes this more difficult. The public sector's approach to transport provision, as befits a monopoly provider, tends to reflect a 'National Health Service on wheels': to offer every user an aspired-to standard of service that is uniform, homogeneous, although not necessarily of low quality or sold at monopoly prices.[49] There is some differentiation in the form of highway design speeds; the motorway stands out in this regard and there is some protection of service quality on motorways by restricting access, thereby excluding specific types of vehicle likely to impede the general flow of traffic. But such restrictions are fairly limited; the small family car still 'mixes it' with the juggernaut lorry on a motorway which is free of direct pricing. For domestic rail travel, the standards of which are still controlled through the Department of Transport, it is not usual for the price of the rail ticket to distinguish on any particular route between slow and fast services.[50] An exception would be the high-speed services using High Speed 1 tracks in Kent which charge a premium for travel into a (different) London terminus in comparison with the slower classic

48 This is not as far-fetched as it might sound. The old IATA prescriptive controls on international aviation did specify standards for economy class in great detail, not only the pitch and size of the seats but also what an airline could serve during meals (e.g. one entree and two veg. or an entree, one veg. and a salad).

49 Spence (1975) showed that an unregulated monopolist, faced with an information problem regarding the value attached to quality, will set quality too low or too high depending upon whether the average value of a quality increment exceeds or not the marginal valuation.

50 Such a distinction is common in Germany for example where access to express trains is at a premium fare. In the UK differences in rail prices relate more to the time of travel (which, of course, is true also of airline prices).

trains, but offer only a single class of travel.[51] Elsewhere on the rail network there is little conscious attempt to differentiate the product. The few open access rail operators that have been allowed onto the network have made some attempt to do so, but these attempts would be considered to represent, to use the economic jargon, horizontal rather than vertical product differentiation. For the latter we have to look to a few legacy services that still operate sleeper trains.

What I now want to show is how more product differentiation can be introduced into surface transport, even if the state remains a singular provider, and by offering the rail traveller and road user more distinct price-quality options, it is possible to add value (and ease congestion problems in the process). This added value can also come from offering some travellers a *lower* level of service at a lower price than the current standard offering, as well as offering a higher level of service at a premium price. The object is to more closely match service quality to the preference functions of different groups of individuals. Importantly, the process of disaggregating market demand in this way could, in certain circumstances, also ease network capacity problem and potentially reduce the scale of rail and road investment required in specific cases. Additionally, by providing a quality-of-service menu with different prices attached, there might also be an opportunity for private risk capital, remunerated from a revenue stream, to invest in the transport network, a prospect of significance in the light of the current public expenditure constraints.

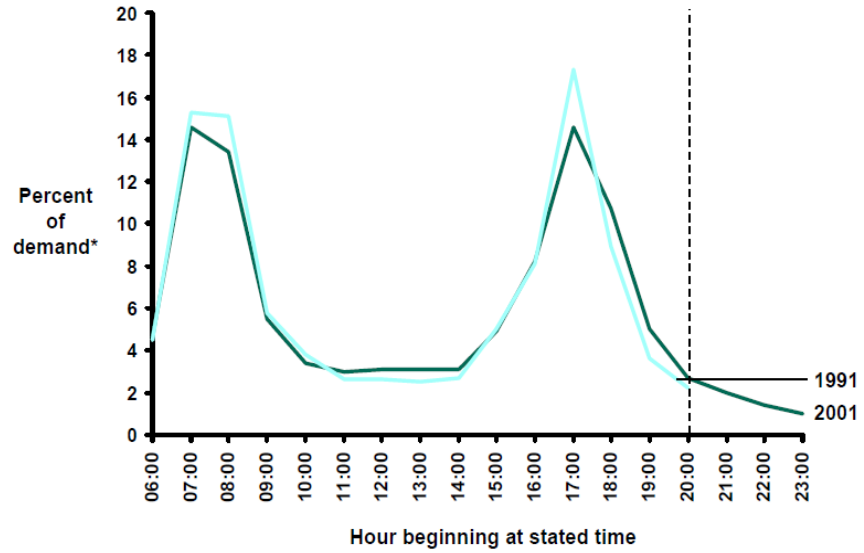
51 In the 19th century there were usually three classes for rail travel including the legal requirement to provide third class. In addition to first class, there were exclusive carriages on certain long distance services introduced by the Pullman Car Company after 1874. I understand that there can be up to four classes on some Chinese rail services. There are three classes on Eurostar trains using two seat layouts.

Rail congestion and investment

The railways are a good example of where the price/investment/quality nexus is mute. An aspect of rail concentrating minds at the current time is how to increase network capacity, especially into London.[52] London dominates UK rail travel with approximately three-quarters of all the country's rail journeys starting or ending there. Pressures on available capacity on lines into London are especially severe during the peak which is of limited duration (see Figure 5).

52 High Speed 2 is part of the broader strategy for increasing rail commuter capacity into London.

Figure 5: Distribution of London and South East demand for rail across the day



To the economist the obvious remedy is to introduce marginal cost based pricing so that fares reflect the high costs of providing peak capacity thus leading to an attenuation of peak demands. But, as with roads, political constraints preclude any serious move towards the adoption of such a policy. Instead, a programme of, largely geographically-based, Route Utilisation Studies (and Strategies) (RUSs) has been attempting to address the peak-period capacity shortfall.[53] The result is an expensive programme of works, which focuses on squeezing in more train paths and lengthening trains, basically to form 10- and 12-car formations on suburban lines.

53 As London First has pointed out in its recent submission to the Transport Select Committee inquiry, *Reform of the Railways*, data on overcrowding is not systematically collected but available data suggests that half of rail passengers travelling to London in the rush-hour do so in conditions that are classed as overcrowded, although the definition of over-crowded is somewhat arbitrary. See: http://www.londonfirst.co.uk/documents/Transport_Committee_Inquiry_-_Reform_of_the_Railways_London_First_submission_(18_April_2012).pdf

This seemingly simple investment 'solution' does however have other implications; many station platforms need to be lengthened, generally throughout the route (sometimes with re-positioned signalling), the power supply for electric traction needs to be upgraded and depots re-jigged or rebuilt to accommodate additional rolling stock. And then, of course, there are major reconstructions of bottlenecks at approaches to London termini, of which the complicated track widening at London Bridge is a good example.

The cost of this programme is difficult to determine. Data on investment costs is at a disaggregated level and it would need much analysis to come up with a definite amount, although a sum well in excess of £1 billion is involved.[54] But, is such investment expenditure really needed in the short and medium term when the problem can be approached in a rather different and less expensive manner using market segmentation? More than a decade ago Peter Kain and I suggested an approach to this congestion problem that exemplifies the argument that first one should study the heterogeneity of travel preferences and then offer a choice of quality/price options reflecting those preferences (Kain and Starkie, 1998).

The idea is to introduce more quality/price trade-offs for the rail commuter by introducing an additional high-density section to commuter trains, let us say of three carriages, access to which would be priced during the peak at a *discount* to current fares of, let us say, 20 per cent, (perhaps less of a discount for shorter distances but more for longer commutes). The interior layout of the high-density section of the train could be modelled on that of the new rolling stock (see Figure 6) used for the London Overground service (although the lateral seating would be replaced by flip seats)[55], and is probably best located at the front end of the train.[56]

54 This figure is based on analysis of some of the RUSs by the RAC Foundation. See Dodgson (2009).

55 The flip seats would be available during the off-peak. During the peak they could be locked-out, possibly using a magnetic lock device controlled by the driver/guard.

56 This rolling stock, Class 378, is based on the Electrostar family of trains, used extensively on Kent services. A new carriage costs about £1 million.

Figure 6: The interior of Class 378 rolling stock

It is the currently the norm for the front carriages of a peak-hour train as it approaches its final stop, to have many standing as well as seated passengers, sometimes in spite of the rear carriages having seats to spare (even though the train might be classed as overcrowded on the basis of the passenger/available seat criterion). This is because of an incentive for some passengers to get through the ticket barrier first; it does illustrate the willingness of some to sacrifice comfort for ease of exit on arrival. One can also observe that the pattern of loading on peak-period trains evolves as they progress towards London and that, as one might expect, standing at the front of the train generally occurs from stops closer to London, so that standing time in such cases is relatively short. Consequently, on the longer distance commuter trains - those starting from the Sussex and Kent coasts for example - we would expect the proposed high-density lower-fare carriages to be less used, although even at these longer distances some might choose to trade-off the

discomfort for a cheaper fare; the opportunity to do so would at least exist. The loading pattern could be expected to change at intermediate stops closer to London, especially at places like Bromley South, Croydon, Watford and Woking with proportionately more of the commuters choosing the high density section. Middle distance or outer suburban services, for example trains starting at places like Gillingham and Dartford, might be expected to have the high-density coaches well used from the start of the journey.

So, what are the gains compared with the existing proposal to lengthen trains? From the resource cost point of view, there would be more passengers on a standard-length train without the recourse to high levels of investment in additional rolling stock, station lengthening etc., although there would be some costs involved in modifying existing rolling-stock. There might be some savings in traction costs. Stripped of seat furniture train carriages would be lighter. Although there could be more passengers per train during the peaks, adding to the weight and offsetting the absence of seat furniture, this would be for a relatively short period of the day. It is also probable that boarding/alighting times would be cut (substantially) so that it might be possible to speed-up services and/or add to their resilience and thus service reliability. In the shorter term until traffic expands further, it might be possible to remove one or two trains from the crowded timetable also adding resilience and increasing punctuality, although if this were done there would be the disbenefits to the passenger of a slightly reduced frequency.

From the consumer surplus viewpoint there would be an increase in benefits to passengers because the introduction of an additional level of service would lead to the better matching of preferences, not only for those choosing the new (economy) class but also for those seated passengers who will enjoy higher service quality not having to share their space with standing passengers. It might also be possible on the longer distance services to have the trolley catering service in standard class during peak times; at the moment these are restricted to the off-peak. The new choice package might itself generate new traffic (and thus consumer benefits) or divert existing users of car and commuter coach, the latter mode being

important for those currently commuting from north Kent for example (in which case there would be a small loss of producer and consumer surplus if coach frequencies are trimmed). There are also some potential gains in the off-peak because disabled passengers and cyclists will be more easily accommodated in coaches with uninterrupted floor space.

From a cash-flow/revenue standpoint, in spite of the discounted ticket price for use of high density carriages during the peak, the revenue effect could be limited: slightly negative or even neutral. There might be some revenue dilution as a result of first-class passengers diverting to what would now be a more pleasant standard class but, on the other hand, the traffic generative effect of more rail travel options will bring in more revenues. And one might expect better revenue protection because the guard/conductor would be able to move more freely through the seated passenger areas; discount passengers holding the cheapest tickets would be self-regulating in so far as they had a ticket at all, but the latter issue, of ticket avoidance, arises in any case in existing crowded conditions affecting *all* sections of the train.[57]

The forgoing is, of course, based partly on conjecture without access to data: on overcrowding patterns, investment costs and much else, but the speculation does seem to accord with observed commuter behaviour.[58] The next steps would be to obtain more transparency on the costs of the existing process of lengthening platforms etc. and on train loading patterns, to be followed by a formal analysis comparing the two approaches, importantly supported by

57 Bear in mind that the discount will apply only in peak periods. With, say, three economy-class carriages, much less than half the train load would be on discounted tickets and with a discounted price of, say, 20 per cent, compared with the current situation, the gross revenue loss per train would be less than 10 per cent. Gains from generated traffic or better revenue protection might offset much of this loss.

58 Note also that it can be trains immediately outside the peak that are the most crowded as passengers seek cheaper off-peak fares at the expense of a higher probability of standing. This behaviour is particularly noticeable on long distance trains out of King's Cross and Euston after the evening peak-fare restriction.

experimentation on one of the commuter lines.[59] There would be a particular requirement to examine the extent of the 'economy class' price differential needed in order to manage and balance demand across the different train sections (that is, to obtain more information on the cross-elasticities with respect to comfort), but discussion with commuters from the Medway Towns in Kent suggests that my starting assumption of a 20 per cent discount on the standard class fare looks reasonable.[60] A discount of this amount would place the price of 'economy class' about mid-way between the standard class rail fare and the fare for commuter coaches.

What would be inexcusable would be for *some* elements of the approach to occur by default if planned infrastructure spending did not materialise; for quality to be degraded generally so that standard-class passengers are faced with a still uniform but an even lower quality of service at the standard price. There has been a tendency for this to happen since the 'economy-class' idea was first put forward more than a decade ago. For example, in standard class, one can pay for a particular journey exactly the same fare for five-across as opposed to four-across seating (with the different seat configurations sometimes to be found on the same train).

59 The Dartford - Charing Cross service might be a suitable candidate. It was subject to an experiment with quasi-double-decked carriages from 1949 until 1971. It was found that station dwell times were much increased because of the difficulties of boarding and alighting. See: http://www.bulleidlocos.org.uk/(S(150q2a3pumudrtcaeuhuwml1))/_oth/4_dd.aspx

60 A point made by one commuter was that the potential saving in infrastructure investment from having economy class would give him some confidence that commuter fares would increase more slowly than they would otherwise do.

Road congestion and investment

Roads are another example of where the price/investment/quality nexus, evident in a rudimentary way in the old turnpike industry and its many 'firms', has long since ceased to exist. As a consequence, excess road congestion has been a perennial problem since before World War II. There have been many studies suggesting the general introduction of congestion-related road user charges.[61] With such a charging scheme, investment in the network takes place when, for a particular section of the highway, the user charge exceeds the incremental cost of expanding that part of the network. Thus far, political opposition has prevented the introduction of direct road pricing except for in central London.[62]

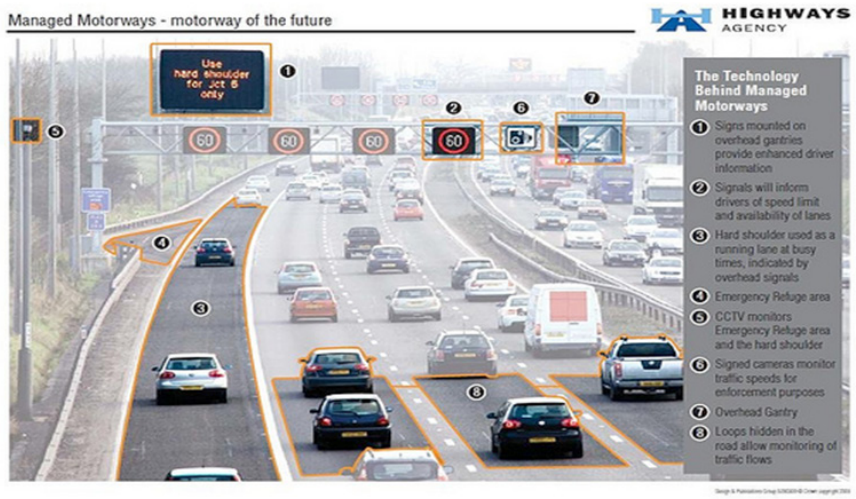
In relation to the congested parts of the motorway network the emphasis of current investment policy is two-fold: to widen existing motorways (the widening of much of the M25 mostly from the original dual three-lane to four, with some sections dual five/six lanes, is the prime example of this approach) and to introduce a

61 In 1962, more than a half century ago, the then Ministry of Transport set up a panel of experts to consider the economic and technical possibilities for reintroducing direct pricing of road users. Michael Beesley was a member. It found that direct charging for the use of the roads was superior to other methods for reflecting motoring externalities. Fifty years later, in May 2012, a study commissioned from the Institute of Fiscal Studies by the RAC Road Foundation, argued that the case for widespread direct road pricing was 'compelling'.

62 The rather inexact pricing scheme for central London was a major foot in the door but, unfortunately, the scheme's effectiveness has waned under the burden of exemptions, multiple objectives and price stickiness.

management system based on active traffic management, namely dynamic speed limits and use of the hard shoulder during the peak period. However, given the apparent effectiveness of early managed schemes[63], the high unit cost of widening and the constraints on public expenditure, more emphasis is now placed on active traffic management (Figure 7).

Figure 7: An illustration of active traffic management



Nevertheless, the policy of either motorway widening or active traffic management on motorways is still one of 'more of the same', aiming to provide a uniform level of service to all uses irrespective of the fact that individual driver preferences for journey time savings and other journey attributes will vary, probably considerably, across the population of motorway users at any one time. This in turn reflects the fact that the preferences of an individual road user will vary according to immediate circumstances. Sometimes speed is of the essence, sometimes the emphasis will be on stress-free driving, or, when the opportunity exists, to use a route through more attractive countryside, or to stop en-route at a favoured spot. In researching

63 This followed trialling on the M42 and shows the benefits of testing and experimentation.

for this presentation I came across a paper that used techniques from experimental economics to reveal for road users these different preferences (Powell and Davis, 1996). Their data suggested that the degree of predictability of a trip would be a more representative argument in a driver's utility function than time saved and that drivers may treat part of work travel as leisure time, particularly the return business trip. And the authors commented: '...individuals do not maximise utility from time savings alone, but instead, appear willing to increase the amount of time on the road in order to gain utility from other factors.'

These findings in experimental economics together with the commonsensical view that users of a particular stretch of road at a particular time have individual values for saving time that are distributed, probably widely, around a mean value for all users, imply that if we had a market in road services and road supply was infinitely flexible (or what Alan Walters (1968) called 'putty roads') we might have different roads from A to B offering different attributes and levels of service to different user groups each at a different price. In contrast to the generally common-user provision of today's roads, the consumer in a roads market would have the opportunity of selecting from a number of road-quality/price bundles; there would be a choice, just as there is in the current air services market between London and Rome.

There does in fact exist a prototype of this type of approach to road provision: it is to be found in the West Midlands and the M6/M6Toll corridor; M6Toll being of course Britain's only tolled highway. As strategic highways the two motorways run in rough parallel allowing long distance traffic to pass through the West Midlands conurbation on a south east/north west axis; long distance traffic has a choice of route. Because access to one route has to be paid for, motoring costs between the two motorways differ as do, as I argue below, their quality attributes.[64]

64 What I have long found surprising is that the Department has not used this example of the 'revealed preference' of road users to cross check and possibly re-calibrate values used in economic appraisals.

M6Toll opened in December 2003 after a long gestation period. It was originally planned as a standard motorway scheme during the 1980s, with a public inquiry taking place in 1989. Later that year it was announced that it would go forward as a privately constructed and operated concession (for 53 years from the commencement of construction) the costs of which would be remunerated by toll charges, (unregulated except for a limit on the number of annual increases in tolls allowed). Following minor changes to the original scheme and a further inquiry, a go-ahead was given in 1997 and construction started in 2002. M6Toll runs for 27 miles and provides an alternative to the heavily used section of the M6 between Junction 4 to Junction 11A thus by-passing the notorious 'spaghetti junction' where the M5 links to the M6 (see Figure 8).

M6Toll is subject to the same regulations as other motorways and was constructed to the same standards, being dual three lanes. Arguably, as a government designed traffic relief scheme with tolls superimposed, in effect as an afterthought, it is over-engineered: the third lane is unnecessary even at originally anticipated traffic volumes, apart from which, charges can be used if necessary to control volumes and service quality. And even with a third lane, with the road subject to the usual traffic regulations which ban heavy goods vehicles from the outside lane, it is questionable whether this lane needs to be of the same width as the inside lanes; it is a point germane to standard three-lane motorways and of relevance when engineering current motorway widening schemes.[65] Another aspect adding to both construction and operating costs is the frequency of intermediate junctions: there is one on average every 5 miles, and given the low usage made of some of these it is arguable that their incremental benefits exceed the additional costs involved in providing them, including the costs of tolling the junctions. Thus,

65 It seems that heavy vehicles played a part in the choice of the current 12ft. lane standard. Charlesworth (1984: 219), a former assistant director of the Transport and Road Research Laboratory, comments: 'The early standard of 11ft for the width of a lane was also brought into question, particularly by the possibility then under consideration of permitting...[wider] goods vehicles and buses. There was very little firm evidence available from experience in other countries as to desirable lane widths but there seems to have been a consensus among highway engineers that 12ft was probably about right and that was adopted in Ministry standards.' Heavy vehicles have impacted on other design parameters.

if designed from the outset as a dual two-lane tolled road it is possible that significant savings on construction costs could have been realised (resulting in lower financing costs).

Figure 8: Route of M6Toll

Source: Macquarie Atlas Roads

Table 1 summarises the performance of M6Toll in terms of usage and revenues since mid-2000. Average daily traffic reached a maximum in 2006 and then declined particularly between 2007 and 2008 at the onset of the recession and then remained reasonably steady until 2010 at which point there was another marked decline. During this period, it has been the policy of the owners, Macquarie Atlas Roads, to broadly track increases in CPI (hence regular small changes to the toll rates rather than irregular larger changes)[66]; in 2011 for example rates were adjusted upwards by slightly less than the combined increase in CPI and VAT rates.

66 Source: personal communication with Macquarie Atlas Roads.

The marked decrease in volumes between 2010 and 2011 is attributed by the owners partly to increased competition from the public highway network as a result of active traffic management schemes[67] and it is to be expected that the current Birmingham Box Phase 3 scheme, introducing hard shoulder running between junctions 5 and 8 on the M6, will further impact volumes on M6Toll when it is completed. There is no reason in principle why the active traffic management programme should avoid impacting the toll road but it is important that the policy is implemented fairly, with those projects with the highest returns selected first within the budget constraint. There is no way of knowing if this is the case from published information but there are some indications that in the case of the Phase 3 scheme that the scheme appraisal could have led to an overly optimistic outcome.[68]

67 The MD commented in personal communication: 'we bought a business that the vendor could compete with'.

68 The published 'appraisal summary table' for this scheme appears to ignore its economic impact on the toll road; there is no explicit mention of the loss of producer surplus as a result of traffic diversion from the M6Toll to the M6 nor the loss of indirect tax revenues (VAT) from reduced toll revenue. This suggests that another impact could have been neglected: any diversion of traffic from M6Toll, *ceteris paribus*, could be expected to have some impact on toll rates which in turn will lead to further diversion to the M6, casting doubt on the size of the net journey time savings from the managed motorway project assumed in the appraisal, although without precise information on the traffic modelling exercise it is difficult to be certain. In addition, and importantly, one would have expected the average values of saved travel time used in the standard appraisal methodology to have been adjusted downwards in this particular appraisal because high value-of-time users are more likely to be using M6Toll rather than the M6.

Table 1: M6 Toll, summary of performance (2005-2011)

12 months to December	2005	2006	2007	2008	2009	2010	2011
Traffic							
ADT	44,779	48,261	45,898	40,512	38,541	39,781	35,715
Financial (GBPm)							
Toll Revenue	45.73	52.91	57.38	57.10	56.85	60.10	55.90
Other Revenue	1.65	2.09	2.56	2.50	2.42	2.62	2.44
Total Revenue	47.38	55.00	59.94	59.60	59.28	62.72	58.33
Operating Expenses	(11.24)	(9.21)	(7.83)	(7.50)	(7.51)	(7.61)	(7.80)
EBITDA	36.14	45.80	52.11	52.10	51.77	55.11	50.53
EBITDA Margin (%)	76.30	83.30	86.90	87.40	87.30	87.90	86.60

In terms of my basic argument, that the provision of road services too should be viewed in terms of price/quality options, an important point emerges from the statistics on the mix of traffic using M6Toll and these are shown in Table 2. Also shown in Table 2 is average composition of traffic on motorways generally in 2011. From these statistics, it is apparent that the traffic composition on M6Toll is quite different from the average for other motorways. There is negligible heavy traffic on the tolled route; in essence M6Toll comes close to being a car-only road with cars accounting for more than 90 per cent of the traffic flow. Combined with the low density of traffic, the outcome is a motorway with quality attributes quite different from that of standard motorways. M6Toll's traffic composition, flow rates and predictable journey times (Atkins, 2004) are consistent with a high quality of service and it is these broader qualities, not just journey time savings *per se*, that the road user is purchasing when paying the toll for access.

Table 2 – Traffic mix on M6 Toll and other motorways (2011)

Vehicle Class	Vehicle Type	M6 Toll	Motorways
Class I	Motorcycles	0.2	0.3
Class II	Cars	91.1	75.4
Class III	Cars with trailers	0.4	N.A.[1]
Class IV	Vans/Coaches 2 axles	4.2	13.0[2]
Class V	HGVs/Coaches > 2 axles	4.1	
Class VI	HGVs > 6 axles	0.0	11.2

1. Not available.
2. Includes light vans (12.5%) and buses (0.5%).
Note: Motorway figures based on 2011 vehicle miles statistics.
Source: Macquarie Atlas Roads Analyst Pack and Highway Statistics

An attribute of M6Toll's quality of service which can be inferred from these features, is that driving on it is relatively stress-free. An element of the latter is that the journey time is predictable, but another is the absence of heavy vehicles. As studies have shown many car users find that mixing with heavy vehicles on motorways intimidating (and that they are willing to pay to avoid these circumstances).[69] In this instance, more by accident rather than design, by using the M6Toll they are able to avoid most of this stress. The saving in journey time will also be important for many, but by no means all users, and the well frequented service station and rest area at the northern end of the toll route seems to confirm that journey speed is not of the essence for large numbers using M6Toll: the fact that those not seeking to save time are also willing to pay the toll appears to confirm that other quality attributes are of some import.[70]

The policy prescription which follows from the forgoing argument and from the evidence of how M6Toll is utilised, is that the development of road infrastructure, particularly the development of strategic routes, should allow for priced alternatives running parallel or close-to congested routes. These alternatives should also place an emphasis on features that add value over and above their potential for reducing travel time *per se*. In 2004, the Department of Transport consulted on an outline proposal which matched this prescription fairly closely. This proposal was for a dual two-lane tolled expressway running parallel with the existing free access M6 between Birmingham and Manchester.

The consultation document set out a number of significant advantages associated with a tolled 'expressway' parallel to an untolled M6. These advantages included: more choice; faster more reliable

69 A detailed analysis of this issue, including stated preference surveys incorporating drivers attitudes to heavy goods vehicles will be found in: 'A Study of the Feasibility of Light Vehicle Roads' for DG Transport, EC; see Marcial Echenique (1987).

70 Pointing in the same direction is the behaviour of drivers on a Sunday. Prior to the opening of M6Toll there were no delays on the M6 northbound on Sundays. There were delays southbound during the late afternoon and early evening but these were generally less than during weekdays. After M6Toll opened proportionally more car traffic diverted to M6Toll on Sundays than weekdays with the outcome that Sunday journey times were almost identical between the two roads (Atkins, 2004); this implies that at the margin those paying the toll were benefiting in ways other than just journey time savings.

journeys (for all, including those still using the M6); a reduction in the impact from M6 road works (because of the alternative route); and more strategic capacity at less cost. Reference was also made to a road with fewer junctions that would give greater reliability and improve the flow of traffic. It was conceived, however, as a road for both light and heavy vehicles and in my response to the consultation, I emphasised the potential for increasing benefits and reducing construction costs if the road was restricted for use by light vehicles only.[71] In responding to a House of Commons enquiry into Road Pricing in 2005 the department reported that they had asked the Highways Agency to work on a detailed feasibility study of the proposal and to compare the pro and cons of widening the existing M6 in parallel and for the HA to provide advice on which option to take to public inquiry. The following year the expressway proposal was dropped in favour of widening the existing M6.[72] As a result, I believe a great opportunity to test a different approach to the provision of strategic highways was missed.

There is, however, another approach to providing the road user with more choice which is to include toll lanes within existing motorways when they are widened. For example, it might be feasible when widening motorways to divide *each* of the two carriageways into a 2+2 lane configuration, with the outside pair of lanes tolled and, to differentiate the product, to restrict their use for light vehicles only. Each pair of lanes could be divided by some form of barrier but suitable markings or rumble strips on the carriageway surface could suffice.[73] The light vehicle lanes would be subject to electronic tolling (with information relayed to motorists with the aid of the overhead gantries which, as Figure 7 shows, are part and parcel of active traffic management schemes) and a higher maximum speed limit for these lanes could be appraised.

71 http://www.official-documents.gov.uk/document/cm65/6560/6560.pdf

72 This is an outcome to be expected. The Highways Agency 'owned' the motorway widening concept. In contrast an expressway is likely to have introduced another entrant into the management of the strategic network.

73 Referring to Figure 7 one can envisage this separation of the four lanes into two pairs. In effect, the un-tolled lanes, together with the hard shoulder, would be constructed out of the current motorway hard shoulder and adjacent land. By restricting the tolled lanes to light vehicles only, the opportunity might be taken to reduce the width of these lanes which would help to create the space required for rumble strips or chevrons marking the separation of the two pairs of lanes.

In the vicinity of junctions, to simplify entry and exit, the two pairs of lanes could merge to form a single four-lane carriageway, although in some cases, the tolled pair might by-pass less important junctions. By using tolls to ration the number of light vehicles using the two lanes, thus maintaining speed levels, and by eliminating heavy vehicles from these lanes, the light vehicle user would have the opportunity of exercising choice by purchasing a higher quality product.

Importantly, there might also be, as was the case with the commuter rail proposals, supply-cost advantages by adopting this approach.[74] In circumstances where the incremental costs of adding capacity is high and probably increasing at the margin, (and in my 2002 Beesley lecture I presented some evidence of this (Starkie, 2004: Table 2.3)), segmentation of the market provides an opportunity to add smaller tranches of capacity while maintaining, by use of a varying toll rate, a high quality of service on these additions. The current approach to road design implicitly assumes that the average value for time saved applies to all forecasted traffic. The result of this assumption is that too much incremental capacity is being added, probably at high, if not very high, marginal costs, to accommodate all anticipated users of the road including those who would be unwilling to pay the (long run) marginal costs of the improvements if required to do so; the result is a poor economic return on the incremental expenditure and thus an inefficient use of resources.[75]

74 In the case of a parallel motorway or expressway, this would have the advantage of adding resilience to the network in the event that one route is blocked.

75 This issue arises, of course, because of the absence of direct road pricing. With such pricing, the tail of marginal users would be priced off the roads (at least in the peak) and expansion would take place when pricing signals indicated that it was warranted.

Conclusions

There is a distinct division in the role of the public and private sectors in the provision of UK transport infrastructure. The private sector provides vital infrastructure through which flows the nation's trade in goods; it is responsible for most major airports, seaports and their associated distribution networks and, in response to the demands of the market, it has invested on a substantial scale in this infrastructure over the last decade or so. From time to time, the government has been inclined to intervene in the ports sector, seeking to influence the location of additional runways or container berths, although without proposing state investment. But, the state has to be circumspect about such intervention; it could damage the UK's international competitiveness, and the onus is on the state to prove that it has a strong case for doing so. Thus far, it has failed to develop such a case and the evident willingness of the ports to meet market demands, suggests little evidence of the private sector failing to supply the required capacity.

Infrastructure investment by the public sector is focused on internal road and rail networks and is channelled largely through monopoly providers. This investment is influenced by public interest issues, is open to lobbying by interest groups, and its economic assessment is based on meeting 'demand' (without specifying an explicit price) using the neo-classical welfare approach of cost-benefit analysis for assessing particular projects. This approach has been honed over the years, but circumstances have changed and important issues have been raised concerning the values of travel time saved and the extent of the wider economic impacts of transport investments.

Thus far, how investments impact on competition in intermediate and final product markets has been ignored in the formal analysis, but I suggest that this is mistaken and that the competition effects of transport investment, particularly in the roads sector, could be significant.

Across both rail and road networks, degraded quality of service in the form of congestion (queuing and standing) is endemic. It is the design of solutions to ease congested networks that has been my focus. Theory suggests that the unregulated monopolist (in this instance a public sector monopolist) when attempting to judge the average value of quality will tend to either under- or over-provide quality. My suggested solution is that the public sector should learn from the continual experimentation of the private sector generally and address the quality issue by exploring the different preferences that travellers have for different attributes of the transport service. Consequently, when adding capacity, it should offer travellers a choice of different price-quality bundles, in the manner of the de-regulated aviation sector. I have illustrated such an approach, first in relation to commuter railways with the suggestion of a further, price-discounted class of travel alongside standard and first, and then, in relation to motorways, with the suggestion of parallel-running, quality options, differentiated by tolls.

Segmentation of the transport market and the introduction of priced options provide an opportunity to add smaller and less expensive tranches of capacity while achieving equal if not higher levels of overall benefit. To aid this segmentation more analysis should be done to reveal the dispersion of values of travel time saved around the mean value. More generally, there is a question mark over the presumed utility function of travellers. I am inclined to think that travel behaviour is more complex than is assumed in current appraisal methodology and requires further investigation using the tools of experimental economics or trials, but a useful start might be made by examining the *revealed* preferences of road users in the M6/M6Toll corridor.

References

Albert, W. (1983), 'The Turnpike Trusts' in D. Aldcroft and M. Freeman (eds), *Transport in the Industrial Revolution*, Manchester: Manchester University Press.

Andrew, D. (2002), Regulated Industries the 'Governance Contract', *Proceedings*, 30, Bath: CRI.

Asteris, M. and A. Collins (2007), 'Developing Britain's port infrastructure: markets, policy and location', *Environment and Planning A*, 39(9): 2271 – 2286.

Atkins (2004), *Traffic Impact Study Report*, Birmingham: M6 Toll Traffic Monitoring Study.

Botham, R. (1982), 'The Road Programme and Regional Development: The Problem of the Counterfactual', in K. Button and D. Gillingwater (eds), *Transport Location and Spatial Policy*, Aldershot: Gower Books.

Butler, E. (2012), *Public Choice – A Primer*, London: Institute of Economic Affairs.

Casson, M. (2009), *The World's First Railway System: Enterprise, Competition, and Regulation of the Railway Network in Victorian Britain*, Oxford: OUP.

Charlesworth, G. (1984), *A History of British Motorways*, London: Thomas Telford.

Davis, E. (2012), *Made in Britain*, London: Abacus.

Department for Transport (2004), 'M6: Giving Motorists a Choice: A Consultation Proposal', London: DfT.

Department for Transport (2005), *Transport, Wider Economic Benefits and Impacts on GDP*, London: DfT.

Dimock, M. (1933), *British Public Utilities and National Development*, London: George Allen & Unwin.

Dodgson, J. (1974), 'Motorway investment, industrial transport costs and sub-regional growth: A case study of the M62', *Regional Studies*, 8: 75-91.

Dodgson, J. (2009), Rates of Return on Public Spending on Transport, Report 09/103, London: RAC Foundation.

Duckham, B. (1983), 'Canals and River Navigations' in D. Aldcroft and M. Freeman (eds), *Transport in the Industrial Revolution*, Manchester: Manchester University Press.

H. Dyos and D. Aldcroft (1974), *British Transport: An Economic Survey from the Seventeenth Century to the Twentieth*, Harmondsworth: Penguin Books.

Eddington, R. (2006), The Eddington Transport Study, The case for action: Sir Rod Eddington's advice to Government, London: DfT.

Foster, C. (1992), *Privatization, Public Ownership and the Regulation of Natural Monopoly*, Oxford: Blackwell.

Foster, C. (2001), 'Michael Beesley and cost benefit analysis', *Journal of Transport Economics and Policy,* 35(1): 3-30.

Goodwin, P. (2010), 'Improving value for money in the context of transport expenditure cuts: feasibility study', manuscript, University of West of England

Graham, D. (2007), Agglomeration, productivity and transport investment, *Journal of Transport Economics and Policy*, 41(3): 317-343.

Hennessy, P. (2012), *Distilling the Frenzy. Writing the History of One's Own Times,* **London: Biteback**.

House of Commons (2005), Select Committee on Transport, Seventh Report Session 2004-5.

Highways Agency (2011), *Post Opening Project Evaluation: Meta-analysis of Major Projects*, Dorking: Highways Agency.

Hughes, T. (1980), 'Roads policy at national, regional and local levels and the role of motorways', proceedings of the conference on 20 years of British motorways, London: Institution of Civil Engineers.

Jiwattanakulpaisarn P., R. Noland and D. Graham (2012), 'Marginal productivity of expanding highway capacity', *Journal of Transport Economics and Policy*, 46(3): 333-347.

Kain, P. (2002), 'Attracting private finance for infrastructure projects: lessons from the Channel Tunnel Rail Link', *International Journal of Transport Economics*, 19(1): 43-62.

Kain, P. and D. Starkie (1998), 'Overcrowding on Commuter Trains: an Economic Solution', Economic-Plus *Perspectives*, June.

Kay, J. (2003), *The Truth about Markets: their Genius, their Limits, their Follies*, London: Allen Lane.

Krugman, P. (1993), *Geography and Trade*, Cambridge, Mass: MIT Press.

Leitch, G. (Chairman) (1979) *Report of the Advisory Committee on Trunk Road Assessment*, London: HMSO.

Mackie, P. (2010), 'Cost-benefit analysis in transport: A UK perspective', International Transport Forum Discussion Papers, http://internationaltransportforum.org/jtrc/DiscussionPapers/DP201016.pdf

Marcial Echenique and Partners (1987), *A Study of the Feasibility of Light Vehicle Roads: Final Report*, Cambridge, UK: Marcial Echenique and Partners.

Marshall, A. (1920), *Principles of Economics* (8th Edition), London: Macmillan & Co.

Metz, D. (2004), 'Travel Time: Variable or Constant?', *Journal of Transport Economics and Policy*, September, 38(3): 333-344

Paxton, A. (1969), 'Traffic engineering and control before the motor vehicle', *Traffic Engineering and Control*, August.

Pawson, E. (1977), *Transport and Economy: the Turnpike Roads of 18th Century Britain*, London: Academic Press.

Powell, M. and A. Davis (1996), 'Small Time Savings and Cost/benefit Analysis in the UK Roads Programme', Discussion Paper E96/02, School of Business and Economic Studies, University of Leeds.

Spence, A. (1975), 'Monopoly, Quality and Regulation', *Bell Journal of Economics*¸ 6: 417-429

Starkie, D. (2004), 'Road networks: efficiency, externalities and consumer choice', in C. Robinson (ed.), *Success and Failures in Regulating and De-regulating Utilities*, Cheltenham: Edward Elgar.

Starkie, D. (2008), *Aviation Markets: Studies in Competition and Regulatory Reform*, Aldershot: Ashgate.

Stigler, G. (1971), 'The theory of economic regulation', *The Bell Journal Economics and Management Science*, 2(1): 3-21.

Venables, A. (2007), 'Evaluating urban transport improvements: cost-benefit analysis in the presence of agglomeration and income taxation', *Journal of Transport Economics and Policy,* 41(2): 173-188.

Walters, A. A. (1968), *The Economics of Road User Charges*, Washington: World Bank.

Wolmar, C. (2012), 'The Myths Around HS1', *Rail*, 15 April, available at: http://www.christianwolmar.co.uk/2012/04/rail-694-the-myths-around-hs1/

Worsley, T. (2011), 'The evolution of London's Crossrail scheme and the development of the Department for Transport's Economic Appraisal Methods', ITF/OECD Roundtable 152, available at: http://www.its.leeds.ac.uk/fileadmin/user_upload/News/OECD_ITF_Worsley_Dec_2011.pdf

The Institute of Economics Affairs
2 Lord North Street
London SW1P 3LB
Tel 020 7799 8900
email iea@iea.org.uk