High Speed 2:
the next government project disaster?

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by

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Contents

Executive Summary

- There is a significant risk that High Speed 2 (HS2) will become the latest in a long series of government big-project disasters with higher-than-forecast costs and lower-than-forecast benefits. HS2 is not commercially viable and will require substantial and increasing levels of subsidy. Taxpayers will therefore bear a very high proportion of the financial risks, which are wholly under-represented in the *Economic Case* presented by the Department for Transport.

- The level of financial risk of HS2 is huge, far more than for the earlier HS1 (Channel Tunnel Rail Link). The estimated cost of £34 billion to construct HS2 is equivalent to £1000 per UK income-tax payer. Most taxpayers will derive no benefit from the scheme.

- The wasteful allocation of resources is demonstrated by the 'gold-plating' of the HS2 route. The first five miles from Euston to Old Oak Common, for example, will add almost 25% (about £4 billion) to the cost of the first phase but deliver negligible time savings.

- The government's economic case for HS2 depends on estimates of demand growth that are very high compared with a range of previous forecasts for long-distance rail travel. The long timescale adds to the uncertainty surrounding future passenger numbers. A similar approach was taken in forecasting passenger numbers for HS1 and the lessons, clearly reported by the Public Accounts Committee, have not been learned.

- The economic case for HS2 assumes that time on board a train is wasted for business travellers. In fact many business people are able to undertake productive work during part of their journeys. The economic benefits of HS2 are therefore substantially exaggerated.

- The construction of the line will involve the appropriation of large numbers of properties on the route. Several areas are likely to be affected by 'planning blight'. Significant environmental and social costs are not included in the assessment of the economic case. Again, painful lessons from HS1, about using existing transport corridors, have not been learned.

- HS2 is likely to create demand for additional high-cost, taxpayer-funded transport capacity. Terminating the line at Euston may require a new Underground line or Crossrail 2 link to cope with extra passenger numbers.

- Claims that HS2 will bridge the north-south divide and bring regeneration should be treated with scepticism as the evidence is largely speculative. Alleged benefits must be set against the wider economic losses from the additional taxation required to fund HS2.

1. Introduction

The Department for Transport (DfT) has produced plans to construct a high-speed rail link (High Speed 2) from London to the West Midlands and then to the north of England. The government claims that the line will produce significant economic benefits: travellers will benefit from faster journey times; capacity will be freed up on existing routes; and the economies of the Midlands and the north of England will be boosted.

The total cost of the scheme has been estimated at around £34 billion. But the project will not be commercially viable. It will require substantial taxpayer subsidies in a period when government debt has hit alarming levels[1] and will be an example of government central planning. Taxpayers will bear a high proportion of the financial risk.

High Speed 2 (HS2) is therefore an example of a big government project – a political scheme rather than a commercial one. The history of such initiatives, such as Concorde, the civil nuclear power programme, the Millennium Dome and, indeed, High Speed 1 (the Channel Tunnel Rail Link) provides prima facie grounds for concern. These projects – and many others of their kind – suffered from cost overruns, delays, lower-than-expected revenues or outputs, or some combination of these problems.

This does not, of course, mean that the HS2 project will necessarily follow a similar trajectory. Yet there are also clear economic grounds for questioning a 'grand project' such as HS2. Politicians and government officials face both knowledge and incentive problems when planning and delivering such schemes. In particular, transport planners cannot obtain accurate information about the preferences of travellers and the demand for services in the absence of genuine market prices.[2]

The rail industry and the transport market as a whole are heavily socialised with a high level of state intervention. Taxpayer subsidies to rail totalled approximately £7 billion in 2009/10[3], a figure comparable to the £6 billion collected in passenger revenues (ORR, 2010, p. 15). Moreover, a high proportion of rail fares have been subject to price controls since privatisation, with increases to regulated fares kept well below rises in average incomes.[4] The tax system has also favoured rail vis-à-vis competing modes of transport – fares are exempt from VAT, for example, whereas tax is charged on road fuel at a rate of approximately 150% (HMRC, 2011). In addition, planning policies have been designed to favour rail by preventing the spatial dispersal of economic activity[5] and prohibiting the expansion of airports.[6] It should also be acknowledged, however, that state intervention has loaded extra costs on to the rail sector, for example by imposing an artificial structure with very high transaction costs on the industry (Hibbs et al., 2006).

In practice, an accurate assessment of the economic case for HS2 could only be made once these distortions (and many others) were removed. In the context of massive subsidies, regulated fares,

1 See, for example, Silver (2010).
2 On the knowledge problem, see Hayek (1945); on incentives see Olson (1965); Tullock (2006).
3 See: http://www.publications.parliament.uk/pa/cm201011/cmselect/cmtran/473/47306.htm; Rail funding has become so complex and opaque that only an approximate estimate can be given. On the recently upgraded West Coast Main Line, subsidies mean that passengers are not paying the full infrastructure costs. For a summary of the subsidies to Virgin Trains, see: http://www.stagecoachgroup.com/scg/media/press/pr2006/2006-12-13/
4 Unregulated fares have tracked incomes more closely (see ORR, 2010, p. 55).
5 See, for example: http://www.communities.gov.uk/publications/planningandbuilding/ppg13
6 There are numerous other interventions, discussed in detail elsewhere (see Wellings, 2006).

unfair competition, discriminatory tax treatment and artificial industry structures there is a significant danger that arguments for expenditure on new rail infrastructure are based on levels of passenger demand that have been severely distorted by state intervention. Indeed, it may be the case that existing subsidies are breeding future subsidies.

In the remainder of this paper, the details of the scheme and the economic case for its approval are subjected to critical economic analysis drawing on empirical evidence and insights from economic theory. Chapter 2 summarises the government's case for HS2 in the context of the experience with High Speed 1; Chapter 3 discusses the economic issues associated with the route; and Chapter 4 examines the 'business case' for the project, including the estimates of passenger growth and time savings; the impact of competition; and the claims of wider economic benefits. In the final chapter it is concluded that there are serious deficiencies in the economic case for HS2. These reflect the political nature of the project and the non-commercial approach to cost and risk.

2. High-speed rail in Britain

High Speed 1

The history of high-speed rail in the UK is well documented. The Channel Tunnel Rail Link (HS1), connecting London St Pancras to Europe is the UK's 1st high speed railway and therefore potentially a major source of learning for HS2.

Myddelton (2007) describes the development of HS1 up to 2007. In estimating demand for HS1, the DfT failed to give consideration to the potential for competition from low cost airlines and the ferry companies, which had spare capacity. The Public Accounts Committee, in its 38th Report of Session subsequently reported in May 2006:

> 'In bidding for the project in 1996, LCR forecast that passenger numbers using Eurostar would reach 21.4 million in 2004 but actual passenger numbers were only 7.3 million. Where future income from passengers is expected to provide a major element of the revenue needed to repay the cost of constructing transport infrastructure, it is crucial that realistic forecasts are prepared from the start. Downside risks need to be given due weight, drawing on both UK and international experience, in considering future projects.' (House of Commons, 2006)

The experience with HS1 appears to have been largely ignored by the government in its eagerness to support HS2. Not only has HS1 failed to make an economic return on the capital investment (about £10 billion in 2011 prices); for most of its history the train services have made losses (see Wolmar, 2009).

High Speed 2

The DfT has used a complex econometric transport model developed by HS2 Ltd to argue that there is a huge, future demand for long-distance rail travel in the UK. In the *Command Paper* (DfT, 2010a), the DfT estimated that by 2033 (i.e. in 22 years' time) the level of demand will be 267% higher than it is today. In the more recent *Economic Case* (DfT, 2011a), the prediction has been adjusted, the DfT arguing that this level of demand will be reached by 2043 - i.e. 10 years later.

To meet that demand the DfT argues that it is not sufficient to increase capacity of the existing rail network. A new network must be created to enable these additional journeys. The DfT also argues in Recommendation 19 of its *Command Paper* that it is a transformation of such scale and over such a long period that only government is able to fund this, with 'further contribution from third parties'.

In combining these estimates of future demand with an assessment of the 'value of time' to rail passengers, HS2 Ltd, in its *Report to Government* (March 2010), developed a business case. Using the DfT-approved 'webtag' methodology[7], they assessed that there is an economic benefit of '£2 for every £1 spent' by the government, seemingly a demonstration of good value for money, a conclusion reiterated in the more recent *Consultation Document*.

7 See www.dft.gov.uk/webtag

The Secretary of State for Transport, Philip Hammond, has declared further benefits of High Speed Rail:

- [it will become] 'the preferred mode of travel for the overwhelming majority of passengers between London and its hub airport and Britain's great provincial cities' and 'deliver reduced carbon footprint'.[8]
- 'High speed rail will be an unbeatable option for inter-urban travel' and it will 'achieve a step change transformation of our economic geography' and 'lead to huge regeneration opportunities…in Birmingham, in London and in due course in Manchester, Leeds and South Yorkshire' and 'deliver a transformational change to the way Britain works' and reduce 'carbon emissions' as well as 'cutting congestion' whilst 'tackling the North-South divide in economic growth rates more effectively than half a century of regional policy'. Moreover, 'High speed rail will merge our great population centres into a single economic hinterland'.[9]

The *Consultation Document* develops this further, suggesting that of itself a high-speed rail network offers a 'fast track to prosperity' and the transformation of Britain:

> 'A new high speed rail network would transform the country's economic geography. It would bring our key cities closer together, enable businesses to operate more productively, support employment growth and regeneration, provide a genuine alternative to domestic aviation, and create a platform for delivering long-term and sustainable economic growth and prosperity.' (DfT, 2011b, executive summary, p. 8)

The remaining chapters of this paper examine these claims, analysing the economics of the proposed route and applying economic principles to the business case for HS2.

8 'Sustainable Transport', IBM Start Conference, 10 September 2010, http://www2.dft.gov.uk/press/speechesstatements/speeches/hammond20100910.html

9 'High Speed Rail Business Debate', NEC Birmingham, 29 November 2010, http://www2.dft.gov.uk/press/speechesstatements/speeches/hammond20101130.html

3. The route

As discussed above, HS2 is not a commercial project. The route reflects this. It is a result of the flawed cost benefit analysis methodology, discussed in Chapter 4, which places a premium on the notional value of 'time saved'. Rather than seeking to minimise costs by making use of existing transport corridors and infrastructure, the project involves the construction of a very expensive brand new route. Indeed the details of the London–Birmingham section suggest that the scheme has been 'gold plated' with little regard for the immense costs imposed on both taxpayers and property-owners.

Summary of the route[10]

The planned route begins at Euston station – the current terminus of the West Coast Main Line (WCML). The line heads westward underneath North-West London in a 4-mile-long tunnel, reaching Old Oak Common where an interchange will be built to link HS2 with Crossrail and Great Western services. From Old Oak Common it heads West-North-West, roughly parallel to the A40, before turning North-West as it leaves London and passes through Buckinghamshire. HS2 then enters the Chiltern Hills, an area of outstanding natural beauty (AONB). The terrain and environmental considerations require further significant tunnelling. The route continues through rural Oxfordshire, Northamptonshire and Warwickshire in a path east of the M40 and west of the WCML. In the West Midlands, HS2 bypasses Coventry to the south, reaching a new interchange at Birmingham International, adjacent to Birmingham Airport. The link then divides in two with one branch heading west into central Birmingham and the other north to join the WCML in Staffordshire. A new station will be built at Curzon Street in Birmingham, adjacent to the existing Moor Street Station and on the east side of the city centre. In the second phase the route will split in two with one line heading west of the Pennines to Manchester and the other east of the Pennines to Leeds.

Cost implications of the Euston terminus

Starting our analysis at the southern end of the route, the decision to terminate HS2 at Euston has very negative cost implications. The last five miles of the link (just 4% of the total length) will incur a hugely disproportionate share of the scheme's overall cost, while the time savings for most travellers will be negligible.[11] The combined cost of expanding and rebuilding Euston station and tunnelling to Old Oak Common will constitute an estimated 22.5% of the base construction costs (DfT, 2010b).[12] The share of additional costs, such as compensation to property owners, is likely to be at least as large, suggesting an overall cost for the last five miles of around £4 billion.[13]

A further major concern in terms of cost is that the existing local transport infrastructure will not be able to cope with the additional traffic generated by HS2. It should be noted that the Euston area

10 For detailed maps of the route see: http://www2.dft.gov.uk/pgr/rail/pi/highspeedrail/proposedroute/maps/

11 As the *Mawhinney Review* points out, 'if the final destination of these passengers is not within a few hundred yards of Euston station, they would also need to access the transport system within London. This is time consuming. While high speed rail reduces long distance train times, it is important to remember that this is only one component of most people's overall journey times. Connecting at Old Oak Common on to Crossrail would give a quicker and more convenient overall journey to many destinations in and around London than would travelling via Euston' (Mawhinney, 2010, pp. 8-9).

12 The expansion of the station could be avoided if Crossrail were linked to the WCML slow lines, with a share of commuter services diverted to the Crossrail route and running straight into the West End, City and Canary Wharf (see Network Rail, 2010).

13 Including 'optimism bias' – the assumption of higher than expected costs included in the economic case.

itself is not a major business district in London and the vast majority of travellers will travel onwards to hubs such as the West End and the City. Most will travel to and from Euston by Tube or bus. The existing Underground station is already congested at peak times and the Victoria Line and the Northern Line (Bank branch) from Euston are among the most severely overcrowded sections of the entire network (see London Assembly, 2009, p. 12).

Terminating HS2 at Euston is likely to require major new investment in local and London-wide transport infrastructure – including a major upgrade of the tube station and the construction of new links. If the Euston terminus provides a rationale for major additional taxpayer-funded infrastructure, there are very serious cost implications for this decision.

According to the Deputy Chairman of Transport for London[14], 'there will be serious congestion problems at Euston when the line goes beyond Birmingham which need to be dealt with in a practical sense.' One suggested solution is to divert the proposed Crossrail 2 link to Euston. Instead of taking the original direct route, it would head west from King's Cross to an additional stop at Euston before heading south to Tottenham Court Road. The rerouting would slow down journey times, be very expensive – requiring additional tunnelling and station construction – and would also impose significant costs on affected property owners who saw their properties 'safeguarded' (see below). The cost of Crossrail 2 is likely to be similar to the first Crossrail, an estimated £16 billion in today's prices[15], largely funded by taxpayers. Clearly there is a major danger that the need for additional dispersal capacity at Euston will tip the balance in favour of this economically questionable project. Another option to cope with extra passenger traffic is the construction of a new tube line: 'Even with an expanded Euston station that reaches out and integrates Euston Square station below ground, we believe a new tube line will be needed …the figure we would be looking at in current prices would be in the order of between £6 billion and £9 billion for the tube line we are talking about.'[16]

The need for extra transport capacity for journeys to and from Euston was subsequently confirmed by the Mayor of London, who apparently complained that the Underground will not be able to cope with 'a doubling of the current number of passengers at Euston station every morning'. It was reported that the Mayor wanted 'a commitment from the government that their proposals for HS2 would include new underground rail capacity between Euston and Victoria.'[17]

This evidence chimes with the conclusions of the *Mawhinney Review*, which questioned 'the immediate need for the expensive and time-consuming tasks of tunnelling between Old Oak Common and Euston and of rebuilding Euston station' (Mawhinney, 2010, p. 9). Indeed, the Review stated 'that adhering to the proposal that Euston should be the terminus from the outset could make the cost prohibitive' (ibid.).

Clearly, the Treasury is likely to face significant additional costs as a result of the HS2 route, yet this is not currently factored into the cost-benefit analysis.

A further issue is the impact of construction at Euston on users of the existing WCML. It has been estimated that £68 million will be paid to the train operating companies (TOCs) as a result of disruption (DfT, 2010b), and it is standard practice to compensate season ticket holders in these cases

14 Uncorrected transcript of oral evidence, to be published as HC 1185-ii, oral evidence taken before the Transport Committee, High Speed Rail, 28 June 2011.
15 http://www.crossrail.co.uk/railway/funding
16 See note 14.
17 See 'Boris derails Cameron's 'perverse' £34billion high-speed link', *Daily Telegraph*, 2 July 2011

(via the TOCs). Nevertheless it is not clear that the costs of the disruption to other travellers, including time losses, have been fully incorporated into the economic case. For example, based on the experience of the WCML upgrade, it may be necessary to terminate the service outside London for significant periods or divert trains via slower routes. Some of these implications appear to have been confirmed by HS2 Ltd, though with few details: 'there would be some instances of disruption to services where, for example, the station would be closed for a few days over public holidays.'[18] It has also been suggested that for some of the redevelopment period, peak-time services may have to be cut to off-peak frequencies.[19] Given that a major part of the case for HS2 relies on the assumption that faster journey times between London and Birmingham would boost economic output, it seems curious that little or no allowance has been made for the economic damage which would be caused by months or possibly years of disruption during construction of the HS2 terminus.

Finally, connectivity to High Speed 1 (the Channel Tunnel Rail Link) must be considered. This terminates at St Pancras station, about a 10-minute walk from Euston. To avoid the inconvenience, a small stretch of railway may be constructed to link HS1 via the existing North London Line (NLL) to the HS2 tunnel north of Euston. However, only a very small minority of services are likely to use the link. There are, nevertheless concerns about the impact on the capacity of the NLL, which is heavily used for both passenger services and freight.[20] There may also be a risk that delays on the NLL will affect the reliability and effective capacity of HS2.

Cost implications of the route through the Chilterns

The decision to run the route through the Chilterns, an area of outstanding natural beauty, also has major cost ramifications. This section requires further major tunnelling work and accounts for approximately 17% of the construction costs (DfT, 2010b).[21] In addition, it should be noted that many of the environmental costs of HS2 are not included in the cost-benefit analysis. Apart from those property owners in close proximity to the route, people who enjoy the amenities of such areas will not be compensated by for the damage caused by HS2. This includes significant noise pollution from high-speed trains that could be as frequent as every two minutes or so. Quantifying such costs is highly problematic, since valuations are highly subjective, but, nevertheless the impact is likely to be significant.

Planning blight

Major infrastructure projects such as HS2 may have an adverse effect on private property on or near the planned route. Owners may be unable to realise the market value that would have been obtained had their land not been affected by the proposals because prospective purchasers either will not proceed with the purchase or, having learned of the planning proposals, they will only offer a lower price (see VOA, n.d., §15.26).

In addition, major schemes may have the wider effect of precipitating the general decay of a local area since uncertainty can deter investment and divert it elsewhere. Moreover, 'social capital' can be destroyed when communities are broken up and dispersed as a result of compulsory purchase and/

18 Written evidence to the Transport Select Committee from HS2 Ltd (HSR 169), http://www.publications.parliament.uk/pa/cm201012/cmselect/cmtran/writev/rail

19 For a summary, see 'High-speed rail work "would hit Euston for up to 8 years"', *Evening Standard,* 12 July 2011; also evidence to the Transport Select Committee, 12 July 2011.

20 See for example: http://www.publications.parliament.uk/pa/cm201012/cmselect/cmtran/writev/rail/m134.htm

21 Costing refers to 'Amersham, Missenden, Wendover and Aylesbury' section.

or general planning blight, resulting in further degeneration. The presence of derelict and/or uninhabited buildings clearly detracts from an area's appearance and may attract anti-social behaviour, while the departure of long-term residents can lead to further social disintegration. Compensation payments are generally limited to those directly affected by new transport schemes. Victims of the resulting wider decay of areas are not entitled to compensation and the associated economic costs are generally not included in a scheme's cost-benefit analysis. An illustrative case study of the possible impact of HS2 is provided in the Box.

HS2 and planning blight – a case study[22]

The Regent's Park ward in the borough of Camden, west of Euston station, is likely to be one of the areas most affected by HS2. The potential impact illustrates many of the problems of planning blight that will be experienced along many sections of the route.

The expansion of Euston station will involve the compulsory purchase of several acres of land and the destruction of an estimated 340 dwellings.[23] Around 200 homes on the Regent's Park Estate will be demolished (although the final figure could be even higher, depending on the impact on blocks adjoining the boundary of the works). Several hundred people will have to be re-housed at substantial cost.

It has been suggested that eventually replacement accommodation will be provided through the redevelopment of Euston. However, the timetable is unclear and tenants may face a prolonged spell in expensive and unsuitable temporary accommodation in a borough already under severe pressure for housing. Some may choose to leave the area rather than deal with such uncertainty.

The situation is perhaps even more uncertain for the leaseholders on the estate, many of whom bought their homes under the right-to-buy scheme extended during the 1980s. Roughly a quarter of the residents are believed to come under this category. They will receive statutory compensation but this is unlikely to enable them to remain in the area, since ex-local authority flats tend to be at the bottom end of the market. Moreover, such residents (together with small business owners) may in some cases receive only a proportion of the full value of their property at the time it is acquired and may have to wait for months or even years for the full value to be agreed or determined by arbitration and for the balance to be paid, leaving them in limbo and unable to purchase a replacement.[24]

The dispersal of residents is likely to destroy much of the 'social capital' that has evolved in the area over the years, i.e. the informal networks of trust and reciprocity that exist among residents and local businesses.[25] Such linkages are difficult to quantify in cash terms, but their destruction is nonetheless a significant cost.

An important point is that the impact will go beyond the area that is compulsorily purchased for HS2. For example, the project will involve the demolition of two large hotels whose

22 This section is partly based on interviews and personal communications with key 'stakeholders' in the affected area.

23 Written evidence to the Transport Select Committee from HS2 Ltd (HSR 169), http://www.publications.parliament.uk/pa/cm201012/cmselect/cmtran/writev/rail/m169.htm

24 The associated problems may be exacerbated if the procedure is implemented during a period of rapidly rising property prices.

25 For an introduction to the issues surrounding social capital, see Meadowcroft and Pennington (2007).

guests are a major source of business for nearby restaurants and shops. Local businesses and residents will also be affected by disruption during the construction phase, such as road closures, noise, dust, and so on. In the case of road closures, compensation is generally not paid for costs such as longer journey times or reduced passing trade. This is just one example of the economic case for HS2 not incorporating the full costs of the scheme.

The effects of planning blight are exacerbated by the stop-start nature of many government projects. Some areas of north London, for example, have been blighted since the early 1970s as a result of plans to widen the A406 (North Circular).[26] A large number of properties were compulsorily purchased, but the scheme was delayed again and again. Condemned properties had their windows bricked up and fell into disrepair. Their gardens became magnets for fly-tipping, further damaging the local environment. Some houses were later inhabited by squatters, or even used as brothels or 'drug dens', while others were used as temporary accommodation for problem families by the local authority.[27] It is conceivable that the uncertainties associated with HS2 could bring similar impacts to Euston and other affected areas. The risks of 'urban decay', which is often triggered by government-funded transport or social housing projects[28], are not incorporated in the economic case for HS2. Local residents and businesses do not receive compensation for such effects.

At the same time, private-sector investment that promises to regenerate areas by bringing new employment, new residents from higher socio-economic groups and extra trade for local businesses, may be disrupted by the risks associated with schemes such as HS2. This problem is illustrated near Euston where a planned redevelopment on Hampstead Road will be destroyed if the plans to expand the station go ahead. The development would provide 300,000 square feet of office space and 38 residential units and would bring significant economic benefits as well as replacing comparatively low-value buildings of poor architectural quality. Long-term plans to redevelop the former National Temperance Hospital on Hampstead Road, which is currently derelict and borders the area designated for appropriation, could also be jeopardised by the uncertainties surrounding HS2. Thus the scheme threatens to undermine the ongoing, largely privately-funded economic regeneration of the neighbourhood.

It may be argued that in the long term HS2 will bring economic benefits to the area since redevelopment will bring new retail and office space. Pre-existing redevelopment plans suggest, however, that HS2 is not essential to such outcomes.[29] It may therefore be disingenuous to claim regeneration benefits at Euston for HS2. Moreover, the gains flowing from HS2-related redevelopment arguably represent a further implicit state subsidy, since they depend on the granting of special government privileges that are not generally available – i.e. the right to appropriate several acres in central London from their rightful owners. Clearly such rights are not typically granted across central London and if they were a high proportion of the projected returns of the redevelopment of Euston would not be forthcoming.

For properties which will not be acquired for HS2 but which may suffer from noise, vibration etc. from

26 See, for example, Enfield Council (2008).
27 See 'Derelict North Circular Homes May Be Saved', Enfield Independent, 8 October 2008, http://www.enfieldindependent.co.uk/news/localnews/3739250.derelict_north_circular_homes_may_be_saved/
28 See, for example: Jacobs (1961); Coleman (1985).
29 See, for example, Sydney and London (2009).

the use of the new railway, statutory compensation claims can only be made 12 months after HS2 is operational, so on current plans not until 2027 at the earliest. So for the next 15 years those suffering from 'blight' due to proximity to the proposed route have few if any legal remedies. For those whose property requires compulsory purchase or is extremely close to the proposed route the government has indicated that it may decide to address this situation. On an interim basis, it has put in place a voluntary purchase scheme for those who can demonstrate 'exceptional hardship' resulting from the HS2 proposal due to personal circumstances (for example, a serious medical condition), necessitating immediate sale of a property before it is required for HS2 (likely to be 2016 – 2017 at the earliest). If the property can't be sold after 3 months for more than 85% of its market value then the government will step in and buy it based on independent valuations. But whilst the government has acknowledged that property prices in the vicinity of the route may be seriously affected, the purchase scheme is likely to apply only in a very few, exceptional, cases.

A further cost that is neglected is the loss of development rights when property is safeguarded along the route. Owners who plan to increase the value of their estate or property by development or redevelopment are generally prohibited from doing so as part of the safeguarding process. Although the compensation, if and when the property is eventually acquired, should reflect the value of planning permission which would have been granted in the absence of HS2, redevelopment will not be able to proceed and sites or run-down properties ripe for redevelopment may well be left in their existing state. There are probable examples of such cases along the HS2 route, in both London (see Box) and Birmingham. The costs associated with this particular aspect of planning blight are not generally included in the cost-benefit analysis.

It is a major feature of the proposal that the extended Y route, from Birmingham to Manchester and Leeds, which apparently provides considerable additional value over the London-Birmingham phase of the route has not yet been published even as a feasibility study. The implications for the quality of the economic analysis are discussed later. However, many property owners near the Y route are already living in 'blighted' property during the consultation phase, yet are unaware of this. Arguably if the route is already known, it should be published; if it is not known, the robustness of the cost-benefit analysis has to be called into question.

Time savings undermined

The construction of a new station at Curzon / Fazeley Street on the eastern fringes of Birmingham city centre[30] will not only prove expensive and potentially involve opportunity costs and planning blight; it may also eliminate a significant part of the time savings claimed for HS2. The site is some distance from New Street Station, the major transport hub of the West Midlands, which is also right in the middle of the city centre. Passengers using local trains to reach Birmingham (or travelling to/from the main commercial area) face a walk of up to half a mile (about 10 minutes) to transfer to HS2, or alternatively an inconvenient and time-consuming transfer by bus or taxi. The DfT suggests that a dedicated tram or people mover could be installed to reduce transfer times; thereby explicitly acknowledging the time losses engendered by current plans.

Similarly, the HS2 station at Birmingham Interchange will be far further from Birmingham Airport and the National Exhibition Centre than the existing Birmingham International station.[31] The airport terminals are about a mile and a half from the HS2 station and travellers will have to use an airport-

30 For details of the location, see: http://highspeedrail.dft.gov.uk/library/maps/curzon-street-station-detailed-map
31 See: http://highspeedrail.dft.gov.uk/library/factsheets/birmingham-interchange-station

style shuttle service to transfer. If passengers from the local train network wish to transfer from the existing station to the HS2 station they also face an inconvenient transfer by shuttle (equivalent to changing trains twice). It should be noted that some passengers will trade off more convenient transfers for time savings (see Chapter 4).

Parking for 7,000 cars will be provided at the station. The DfT suggest that with modifications the local road network will be able to cope with the additional demand. Yet the nearby M42 motorway is among the most congested in the UK (DfT, 2008) – and indeed became the first motorway to benefit from Active Traffic Management to increase its peak-time capacity. A significant proportion of vehicles are likely to arrive and depart at morning and evening rush-hour peaks. The marginal congestion costs of the extra traffic are likely to be significant if they push local roads beyond their free-flowing capacity. It is not clear that additional road congestion costs have been included in the cost-benefit analysis. Additional congestion caused by Birmingham Interchange could slow down the journeys of thousands of travellers on the M42 and other nearby routes. There is also a danger that congestion induced by HS2 will be used as a rationale for additional government expenditure on new road capacity – another example of subsidy-stimulated demand feeding further subsidies.

Alternative route options

Much of the case for HS2 is based on projections that the WCML will be close to full capacity in 20 years' time. As discussed briefly in Chapter 1, this argument is questionable given the artificial nature of demand on the WCML in the context of substantial taxpayer subsidies and other distortions.

Moreover, it is clear that it would be possible to increase capacity incrementally on the existing WCML at a fraction of the cost of HS2 (see Stokes, 2011). Indeed, it would also be feasible to improve travel times to close to those of HS2, particularly when the time losses associated with the location of the new HS2 stations is factored in.[32] A further advantage of the incremental option would be to keep major centres such as Milton Keynes and Coventry on the core inter-city network.

Comparatively low-cost solutions to congestion on the WCML include introducing longer trains and reducing the proportion of first-class carriages (which seat fewer passengers). And one solution to any capacity constraints at Euston would be to link Crossrail to the WCML slow lines, with a share of commuter services diverted to the Crossrail route and running straight into the West End and the City.[33] This option could also reduce pressure on crowded Underground lines. More generally, the economically rational approach would be remove fare regulations and allow train operators to charge fares that reflected demand. In this way, congestion on the WCML could be managed through the price mechanism and government subsidies reduced.

Population centres bypassed

Whereas the current WCML London-Birmingham route passes through major population centres such as Watford, Milton Keynes, Northampton (on a loop line) and Coventry, HS2 will bypass these and travel through predominantly rural areas. Avoiding large sources of custom seems contrary to the approach a commercial operator would take. As a consequence, several major population centres will no longer be on the main inter-city rail network. It is conceivable that some locations will

32 For an example of proposals based on the existing WCML route, see 'Branson calls for longer franchises and control of stations', *Rail News*, 19 May 2009.

33 See, for example, Option K1 of the Network Rail Route Utilisation Strategy.

suffer longer travel times and it is a core planning assumption that around 2/3 of exisiting WCML services will 'transfer', with their passengers, to HS2, although this will depend on the extent to which spare capacity on the WCML is used for additional services (which would probably require extra taxpayer subsidies under current financial arrangements).

The impact on air travel

The proposed high-speed network has been promoted as an alternative to short-haul aviation and the expansion of London's airports. According to the Secretary of State, 'the development of a high speed network has been a key factor in our decision on additional runways at London's airports'.[34]

The government decided to prohibit the construction of a third runway at Heathrow Airport, which is heavily congested, raising fears that the UK will gradually lose the economic benefits associated with a major international hub airport (see Buchanan and Siraut, 2009). Other European hubs, such as Schiphol (Amsterdam), Frankfurt and Charles de Gaulle (Paris) now have far greater capacity than Heathrow and Heathrow has gradually been losing market share (ibid., pp. 13-15). A possible side effect of the government's policy is that an increasing proportion of long-haul passengers from the north of England and Scotland will fly to hub airports on the Continent rather than taking the train to Heathrow. It should also be pointed out that the expansion of Heathrow was to be privately funded by the airport operator, in stark contrast to taxpayer-funded HS2.

The London-Birmingham phase of HS2 is unlikely to have a significant impact on air travel. The distance is too short to make flying worthwhile (except to change on to other flights at the airport). Indeed, there were no commercial flights from Birmingham to any of the London airports during 2010 (CAA, 2011). Slightly faster travel times may mean Phase 1 has a marginal impact on air travel from destinations further north-west, but it should also be remembered that a significant proportion of air passengers within the UK will be transferring to international flights or travelling to suburban or rural destinations in the South East. Rail services stoppin in inner or central London may be unattractive to these groups.

Under current plans, Heathrow will not be connected to the high-speed network during Phase 1 of HS2. There will, however, be a relatively quick connection via the Heathrow Express and Crossrail, which will connect to HS2 at the new station at Old Oak Common. A spur to Heathrow will be added if or when Phase 2 links Leeds and Manchester to the high-speed line (DfT, 2011c).

In terms of passenger traffic, HS2 is largely irrelevant to the Heathrow expansion debate. The Leeds and Manchester routes will not be completed until 2032 at the earliest, meaning no discernible impact on Heathrow for more than twenty years. In any case, domestic passengers comprise only 7% of passengers at Heathrow (BAA, 2011), a percentage likely to decline as congestion pushes up access charges.

And more than three-quarters of domestic passengers to London airports are on routes from Scotland, Northern Ireland and various offshore islands (CAA, 2011). The train journey from London to Edinburgh and Glasgow will still take around 3 hrs 40 min after the completion of the Y-network. Air travel will therefore remain attractive, particularly since the completion of Crossrail will significantly reduce travel times from London airports to the major business districts (DfT, 2011d, p. 6). But gov-

34 Statement delivered to Parliament on 20 December 2010, http://www2.dft.gov.uk/press/speechesstatements/statements/hammond20101220.html

ernment-imposed capacity constraints and security delays at airports may well mean travellers are pushed from air to HS2 – another example of markets being distorted and competition suppressed to favour high-speed rail.

4. The business case

The level of public subsidy required

The first part of this analysis simply looks at the level of investment required to support the development of high-speed rail through the implementation of HS2.

The figures are summarised below in Table1, taken from the DfT Command Paper, updated by the Economic Case report.

Table 1	Net Present Value - £ Billion	
HS2 Cost Summary	**HS2 Phase 1**	**HS2 Full Y network**
Capital cost	17.8	30.4
Operating cost [net]	7.6	13.9
Total cost	25.5	44.3
Additional revenue	-15.0	-27.2
Indirect tax	1.5	included
Net cost to government	**11.9**	**17.1**

The government describes HS2 as a 'strategic' government project which reflects its grand design and cost. To develop HS2 + y network, it requires taxpayers to find the equivalent of £30.4 billion in capital cost at current prices.

To put this into an everyday context, the Office for National Statistics estimates that in 2010 there were 30.2 million individual income-tax payers[35]; each would be required to contribute the equivalent of an additional one-off tax premium of about £1000, now, to enable the project to go ahead, with the first trains scheduled between London and Birmingham from 2026.

It is clear from the outset that there is no business case for HS2 in commercial terms. The sum of capital and revenue costs, discounted over time, is nearly twice as high (£44.3 billion) as the projected stream of revenues from ticket sales (£27.2 billion). Therefore, in commercial terms, if the project went ahead as planned, and people behaved as predicted over the 75-year time horizon, the project would achieve a financial loss of £17.1 billion, or about £565 per UK taxpayer.

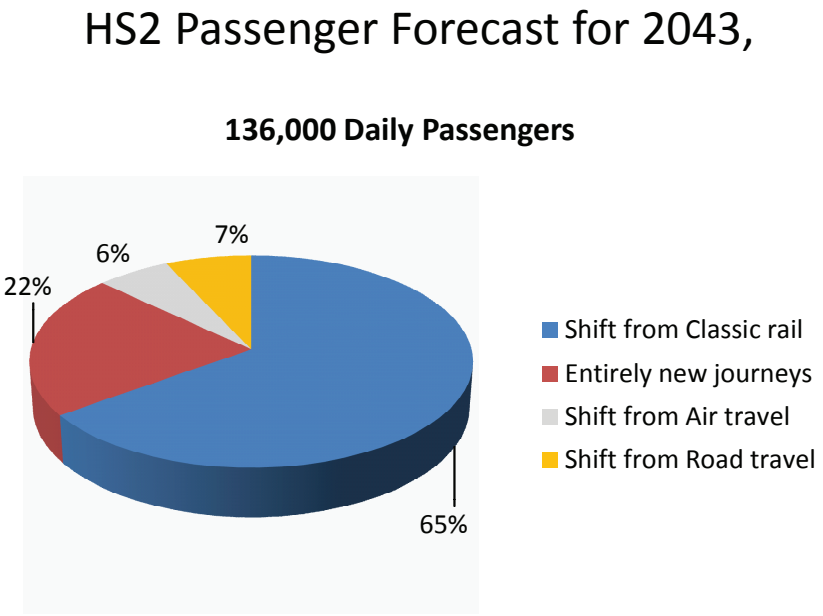
Demand forecast – who will use HS2?

The DfT methodology for estimating future long-distance transport demand is critical to the case for HS2. The method identifies a positive correlation between historic growth in GDP and long-distance travel and projects this estimate forward into the future. This approach, set out in the 2010 *Command Paper*, concluded that the demand for rail journeys between Birmingham and London would increase by 267% by 2033. This forecast was subsequently put back to 2043 in the 2011 *Economic Case*, as is discussed in more depth below.

In summary, the DfT forecasts an average of 136,000 people per day using HS2, most of whom are

35 See www.HMRC.gov.uk/stats/tax_receipts/table1-4.pdf

forecast to transfer from the WCML services, which can be expected to be reduced.



The DfT's revised *Economic Case* reflects a fall in GDP forecasts since the *Command Paper* was published. However, the DfT implies that the detail does not matter, as it is simply a matter of when people will require the extra fast-train capacity, rather than if:

> 'With the lower current GDP forecasts, this cap would now be hit later, in 2043. This level of demand is consistent with households becoming wealthier as GDP per head grows and adopting lifestyles with more frequent long distance travel as demonstrated by those in higher income bands today' (para 3.2.9).

The methodology

As the future is inherently unpredictable, long-term predictions are as much an art as a science. In the commercial world, McKinsey strategy consultants (Dye et al., 2009) argue for the use of scenarios, developing more detailed investment plans based on alternative 'big picture' models of different possible futures. The DfT has chosen to disregard this approach and takes information from the past and predicts it 75 years hence, to make a 'best case' estimate.[36]

From a statistician's perspective, the parameters of uncertainty around this best guess are enormous and get wider with every year. Similarly, from a commercial perspective, the risks around financial projections become increasingly unreliable as the parameters of uncertainty widen. With regard to HS2, there are only two certainties: firstly, that the precise econometric forecast will not be accurate and secondly that HS2 will achieve nil revenue for the next 15 years, as the service will not

36 The DfT's approach arguably reflects the non-commercial nature of the project and the fact that the main financial risks are borne by taxpayers (see Chapter 1).

operate before 2026 at the earliest.

In its White Paper, *Delivering a sustainable railway* (2007), the DfT identified a more progressive approach:

'While the Government must plan 30 years ahead, it recognises that it is impossible accurately to forecast demand that far into the future. Some cities and regions will grow faster than others. People and firms are likely to respond to the challenge of cutting carbon emissions by changing travel patterns and re-engineering supply chains. The pace of technological change is equally unpredictable.

> 'Forecasts have been wrong before, and any strategy that tried to build a rigid investment programme based on fixed long-term forecasts would inevitably be wrong again. Such an approach could well deliver additional capacity in the wrong place.
>
> 'To overcome this challenge, the guiding principles in this strategy are:
> • To invest where there are challenges now, in ways which offer the flexibility to cope with an uncertain future; and
> • To put in hand the right preparatory work so that, as the future becomes clearer, the necessary investments can be made at the right time'

Even more recently, the Transport Select Committee's Review (Oxera, 2011, p. 5) refers to the government's own rail value for money study, *Realising the potential of GB rail* (McNulty et al., 2011), and states that 'In common with other transport sectors, there should be an end to "predict and provide" in the rail sector' and there should be much greater emphasis on making better use of existing capacity.

These principles appear to have been dropped in favour of a vision for High Speed Rail founded on a single, long-term econometric forecast.

Other estimates of demand

It is worth considering what other experts in the field predict for future transport trends; even if the apparent precision of HS2 Ltd's forecasts should be treated with great caution, we might take some confidence if other attempts to predict the future, using different modelling approaches, suggest a similar result. Table 2 below, together with references, is taken from *Review of the business case for HS2* (HS2 Action Alliance, 2010).

Table 2 - Forecasts of long distance rail travel demand

Source	Date	Period	Increase	Annual rate
(DfT[i] - all DfT[ii] - all	2007 (July) 2007 (July)	2006-2027 2006-2030	65% 73%	2.4% (1.8% from 2017)) 2.3%
Network Rail[iii] - WCML MML ECML	2009 (June)	2007-2036	45 - 89% 36 - 77% 34 - 78%	1.3 - 2.2% 1.1 - 2.0% 1.0 - 2.0%
Network Rail[iv] - all	2010 (August)	2008-2034	70%	2.1%
Prof J Dargay[v] for ITC - all	2010 (January)	2005-2030	35%	1.2%
HS2 Ltd (Atkins) - WCML	2010 (February)	2008-2033	133%[vi]	3.4%
HS2 Ltd (Atkins) - all	2010 (February)	2008-2033	62%	1.9%
HS2 Ltd (Atkins) WCML (south MK) WCML (north MK) MML (south of Corby) ECML (south of Peterb'h)	2011 (February)	2008-2043	 102% 127% 96% 114%	 2.0% 2.4% 1.9% 2.2%

ITC is the Independent Transport Commission

HS2 Action Alliance (HS2AA) include in their report a detailed analysis of the model used by HS2 Ltd to forecast demand; inter alia, they argue that this relationship has broken down over recent years (ibid., p. 10).

HS2AA also provide a detailed analysis of the 'demand elasticities', i.e. the propensity for individuals to seek long-distance travel, as their income grows, arguing that these are over-stated by HS2 Ltd (ibid., pp.15-16).

Whilst the future level of demand is unclear, what we can say is that:

- the business case is based on only the one scenario;
- the demand forecast drives the entire business case;
- the DfT's 'best estimate', of demand growth with HS2, remains high against the range of other industry forecasts;
- evidence from Flyvbjerg, Holm and Buhl (2006) shows that 9 out of 10 rail transport projects over-estimate future levels of demand;
- In the 2010 *Business Case*, a 20% reduction in demand was modelled in a sensitivity test and shown to reduce the Benefit Cost Ratio (BCR) from 2.4 to 1.5, i.e. offering potential for 'medium' rather than 'high' value for money;
- between 2010 and the latest *Economic Case* modelling for the full Y network, HS2 Ltd reduced its forecast annual rates of growth from 3.4% to 2.0% per annum, in response to the economic downturn. This had the impact of reducing the BCR for Phase 1 (London to Birmingham) from 2.4 to just 1.6.

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i 'Delivering a Sustainable Railway: Summary of key research and analysis', July 2007, slide 27.
ii 'Delivering a Sustainable Railway', Cm 7176, Dft, July 2007, paragraph 6.6, p. 60
iii Network Route Utilisation Strategy, Scenarios and Long Distance Forecasts, Network Rail, June 2009, p. 66.
iv 'Planning ahead: The long distance planning framework', August 2010, section 2.10, p. 6
v 'The prospects for longer distance domestic coach, rail and car travel in Britain,' Prof J Dargay, January 2010, Table 37.
vi 'Command Paper 7827', March 2010, section 5.38, p. 91, growth without HS2 uplift

Effective demand and the cost of buying a ticket

Economists draw a distinction between the underlying levels of demand – different levels of demand at different levels of pricing, conventionally drawn as a 'demand curve' – and effective demand - e.g. ticket sales at a given price point.

There is little consideration given in the *Command Paper* or by HS2 Ltd to pricing policy, other than

- an assumption that pricing policy would be internalised between the new HS2 route and the existing West Coast Main Line route and that
- passenger fares will increase in real terms, year on year above the rate of general inflation.

Supporters of high-speed rail have argued in *High-Speed Rail: Fair and Affordable* (Greengauge, 2010a), that fare levels on HS2 will be set at levels that will enable high use of the new network. However, rail services are already heavily subsidised by the taxpayer (see Chapter 1), a balance that the coalition government has recently pledged to change. In his speech of 14 September 2010, 'Sustainable transport', the Secretary of State for Transport declared, 'We have one of the most expensive railways in the world….That is not acceptable. The taxpayer is contributing almost as much as the farepayer.'[37]

The government has since announced plans to reduce the level of fare subsidy it offers to the rail industry: fares for Year 1 of HS2 Ltd's 30-year revenue projection will rise by 5.8% and from 2012 fare increases will be based on 'inflation + 3%' for three years.

Applying these pricing assumptions to the forecasts of future passenger numbers generates the passenger revenues included in the HS2 Ltd / DfT business case. However, what it means is that the cost of rail fare in 2043, the point at which demand is supposed to have increased by 267% above current levels[38], will be 43% higher in real terms than today. And travelling during peak times into London is already expensive.

To put this into a specific context, the cost of a standard-class, off-peak 'saver' return between Birmingham and London would be the equivalent in today's money of £63, with a standard class, peak-time day return fare at £213, as summarised in the table below. Does this make sense, a 267% increase in demand at the same time as a 43% real terms increase in rail prices? This also assumes that the cost of travelling HS2 – a premium service – is kept at the same level as the cost of travelling on the slower, classic WCML. Surely, if HS2 is to be a premium experience, 'saving time and money', its fares will be even higher, reflecting this premium? This has certainly been the experience of HS1 in Kent, where its Javelin trains provide a premium service and passengers who use the service pay higher fares - in which case the 2043 HS2 Ltd pricing illustration below represents an underestimate of the cost of travelling HS2.

37 Available at: http://www2.dft.gov.uk/press/speechesstatements/speeches/hammond20100910.html
38 In the current 'consultation' case this estimate has been reduced to around 200% - still a very substantial increase.

Table 3 - Ticket pricing assumptions[39]

Birmingham New Street to London Euston	2010	2043 HS2 Ltd pricing	% Fare increase
Peak, return fare	£149	£213	43%
Off peak, return fare	£43	£63	43%

The modelling assumptions made by HS2 Ltd / DfT do not assume that HS2 will be charged as a 'premium service'. This has an important consequence as, if HS2 follows the same path as HS1, real increases in fare costs that reflect this premium will have a disproportionate impact on reducing passenger numbers for those who choose to travel HS2, as opposed to classic services.

To be specific, HS2 Ltd estimates an average income demand elasticity of about 2.5 for Birmingham to London and 2.8 for longer journeys (e.g. from Manchester); the model also assumes that about 2 out of 3 journeys originates 'north', travelling into, rather than away from London. This is used by HS2 Ltd in the business case to justify the unusually high demand forecast discussed earlier. By the same token, if government decided to reduce public subsidy on rail ticket prices, this would be expected to have a disproportionately large impact on forecasts of future revenues from HS2; demand is assumed to be price elastic with increases in price producing a net loss of incremental fares.

Oxera's review for the Transport Select Committee (Oxera, 2011) draws attention to a sensitivity test conducted by HS2 Ltd whereby rail prices are increased by RPI + 2% in the long-term and this confirms that the Benefit Cost Ratio for HS2 falls to less than 1.0 (i.e. net cost exceeds benefit), highlighting that the policy of fares subsidy and/or regulation is a key assumption.[40]

Herein lies the basis for the accusation that HS2 is a 'white elephant', i.e. it is so expensive that government will be required to sustain high levels of public subsidy in order to keep ticket prices low enough to generate viable levels of effective demand. Rather than a strategy to promote growth, its unintended consequence is more likely to be a continued drain on taxpayer resources.

Spare capacity and competition policy

The *Economic Case* for HS2 + Y network predicts that more than 1 in 5 passengers who will use HS2 will be new passengers, people attracted by the prospect of shorter journey times who would not have travelled by train before. However, when HS2 enters service this is likely to create substantial spare capacity, at least in the short-term - also a feature when HS1 came into service. We might recall the Public Accounts Committee review of HS1 and note that the lessons to be learned focused on issues of price competition and alternatives not considered by econometric modelling. This failure resulted in fare-paying revenue targets being substantially missed and further loss to the taxpayer, as discussed in Chapter 2. The costs of HS2 + Y network dwarf those of HS1, so this is a key risk for the 'strategic' decision to invest in HS2.

It is not clear, in any detail, what the impact of competition at a time of spare rail capacity might be;

39 Prices at 2010 levels; based on current, published West Coast Main Line (WCML) fares Birmingham to London, see www.nationalrail.co.uk; HS2 Ltd pricing assumption based on inflation + 3% (3 years) followed by inflation + 1%, remainder; HS2 Ltd assumes no differential / premium pricing between HS2 service and residual WCML classic service.

40 According to the *Economic Case* (DfT, 2011a, p. 50): 'If rail fares increase by RPI + 2% (instead of 1%) through to 2043, then demand on the railway would be 24% lower ... [T]he result is that the number of passengers on HS2 would fall, leading to lower benefits and revenues overall (despite the higher fares). This would mean the BCR excluding WEIs falls to 0.9.'

the modelling by HS2 Ltd of passenger demand treats HS2 and WCML demand 'as one', therefore assumes no price competition. Although conjecture, potentially government might seek to franchise the WCML and HS2 together, to create a single, monopolistic rail provider on the route. Alternatively, the government may prefer to see competition between HS2 Ltd and WCML operatives, which with spare capacity would be expected to drive down rail prices, as illustrated below.

The business case for HS2 is actually quite remarkable in that it is based on a huge increase in the demand curve, to which Diagram 1 (below) refers, already tempered by an assumption of an increasing cost to use the service, which still generates a forecast in the HS2 Ltd model for a threefold increase in demand for rail services, to which Diagram 2 (below) refers.

This is largely the result of combining projections for steady long-term economic growth in the UK with an average income elasticity of about 1.9 which together more than offset the impact of the rise in ticket prices.

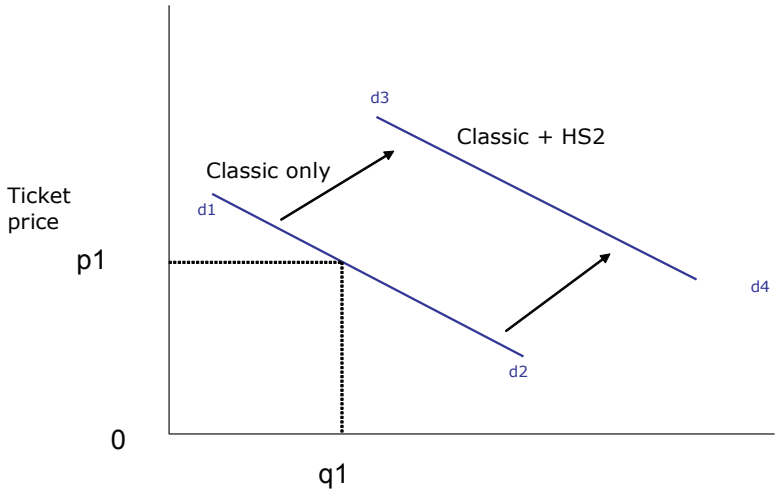
However, two factors do not appear to have been considered:

- Firstly, the impact of spare capacity, at least in the short-term, is to create more choice for passengers (the experience of HS1) which can be depicted in terms of greater price sensitivity. This may take the form of price discounting from rival train or bus operators (the HS2 equivalent of the ferry companies offering cheap Dover-Calais tickets as an alternative to using the Channel Tunnel). This can be expected to impact upon the demand for HS2, at least for a time as the marketplace adjusts. On the supply side, HS2 is an 'all or nothing' project, the service not easily tailored to levels of demand evolving over time; when HS2 comes 'on-line' it will create a significant level of spare capacity in the network.

- Secondly, no consideration appears to have been given to the impact of price differentiation in the pricing model, e.g. charging premium fares for riding on HS2 as a premium service. In theory, price differentiation will reduce 'consumer surplus' and will therefore enable a reduced government subsidy. However, because the demand curve is price sensitive, raising prices to travel on HS2 will disproportionately impact upon the number of passengers choosing to travel on the new line, as opposed to choosing to travel on the (less crowded than they were, slightly slower, cheaper) classic rail services.

Both omissions have a similar effect of making the future demand curve for HS2 more price-elastic / sensitive. Whist business users may not be overly price sensitive to using a premium service, the evidence from quite extensive market differentiation policy on the WCML by operator Virgin, is that the majority of passengers (i.e. 'leisure users') are disproportionately price sensitive - for example responding positively to price discounts for off-peak tickets. The converse is also likely to be true, especially when alternatives exist to HS2 and competition prevails and in a situation of spare capacity, where increasing ticket prices for leisure users – unless subsidised further by taxpayers – will reduce the volume forecasts below those used in the model.

Diagram 1 – HS2 and the demand for transport



Explanatory note:

Now

Current demand for trains into London on classic rail routes = d1,d2

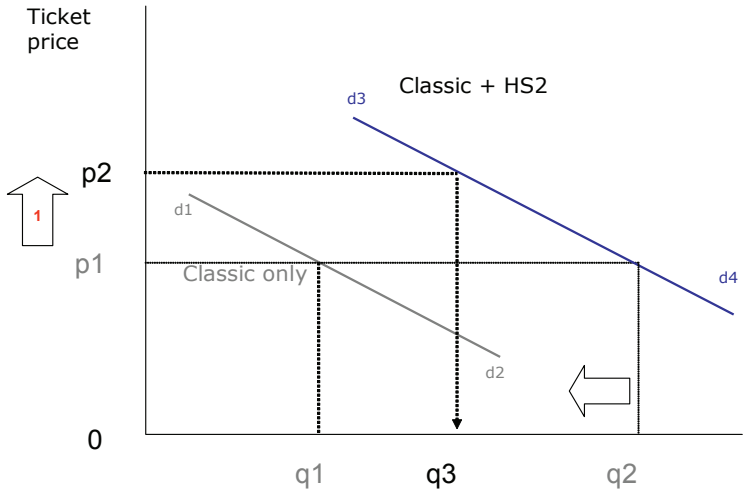
At prices p1, this achieves ticket sales of q1

Future – 2043 +

HS2 Ltd assume rising demand for long distance travel that is more than proportionally sensitive to growth in national GDP. HS2 Ltd assume an average demand elasticity of around 1.9 times the growth in GDP / national income over the period. This is denoted in the diagram by a new demand curve, based on the new HS2 service + classic rail = d3,d4

Diagram 2 illustrates how an increase in the real cost of fares (p1 to p2) sits alongside the threefold increase forecast in passenger demand, i.e. p2q3. By inference, HS2 Ltd's model suggests that passenger demand would be even higher if the real cost of rail fares were maintained at current levels, i.e. p1q2.

Diagram 2 – HS2 and the demand for transport



Explanatory note:

Pricing effect

The new demand curve brought about by HS2 is d3d4, reflecting increases in consumer incomes and a disproportionate propensity amongst wealthier people to buy long-distance travel.

However the model assumes ticket prices will rise about 50% in real terms, hence the shift p1 to p2.

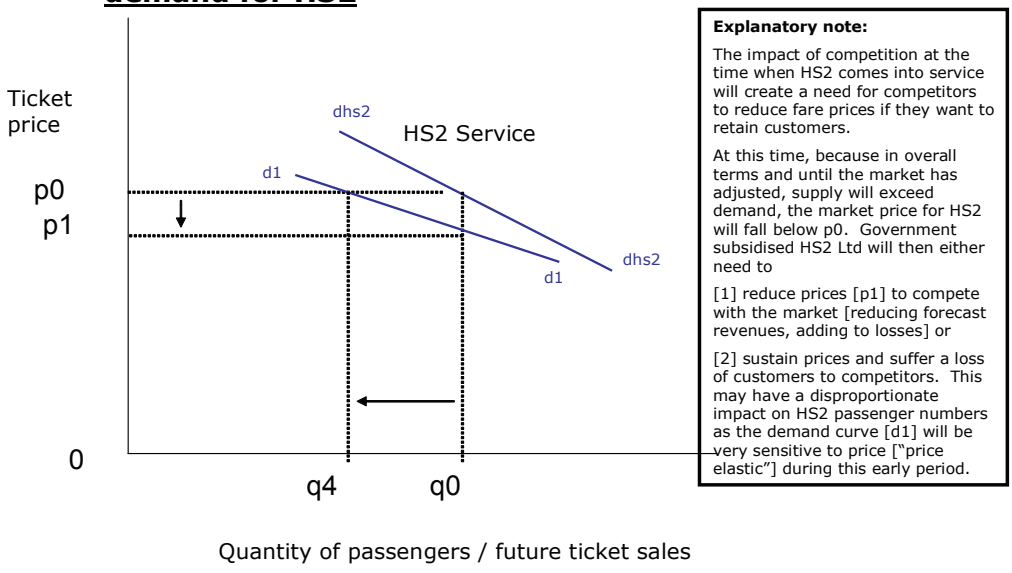
So there will be both an income and substitution effect, a movement back along the demand curve to q3.

Diagram 3 below highlights the impact of competition on the predicted numbers of HS2 rail users (as opposed to those using the network as a whole).

Essentially, when HS2 first comes into service it will mark a huge increase in network capacity/supply. Whilst demand is also forecast to take a step up, simply because of people wanting to travel on HS2, for a period at least the system is likely to shift quite suddenly from an under-supply of trains to an over-supply, as passenger demand adjusts to the new rail networks.

In this scenario, where supply exceeds demand and where competition exists, demand can be expected to be highly sensitive to pricing policy. For these reasons and with reference to the analysis below, either HS2 will require further public subsidy to cover short-term losses or substantially fewer rail travellers may be expected to travel on HS2 that in predicted through the 'monopolistic provider' modelling used by HS2 Ltd, as depicted in the prediction of q0 to q4.

Diagram 3 – The impact of competition on the demand for HS2



It is worth noting that whilst switches between HS2 and classic services may be considered tax neutral, it would be highly embarrassing politically if passengers actually preferred a mix of marginally longer journey times, from more local stations and with lower fares, i.e. classic rail, to the HS2 cocktail of rapid transit from a few new rail hubs and premium fares.

And before 2026?

There is a question of how the DfT meets service demand in the decade preceding HS2's completion in 2026. If the demand forecasting is accurate, WCML services are likely to suffer significant over-crowding and higher fares in the 15 year run-up to HS2 becoming operational. If the demand forecasts are over-estimates, as other commentators suggest, the issue of spare capacity and price

competition from 2026 will be even more apparent.

The cost benefit analysis

Cost benefit analysis (CBA) is a mainstay of economic analysis and HS2 Ltd has rigorously applied the DfT's webtag methodology in making its business case for HS2. However, stepping back from the detail, does the methodology make sense in the context of high-speed rail?

The analysis starts with the presumption that 'time is money', i.e. if you save time by getting from A to B quicker, you will save money. This represents value added ('benefit'), so if HS2 significantly reduces journey times, this adds a lot of benefit. HS2 will reduce journey times from Birmingham to London, cutting the typical station-to-station travel time from 84 minutes to 49 minutes, a saving of 35 minutes (41%).

Table 4 below, taken from the DfT *Command Paper* and *Economic Case*, February 2011, summarises the DfT's calculation and the headline view that the HS2 + Y network will deliver £43.7 billion passenger benefit. Including an estimated £6.3 billion of wider economic impacts (WEI), this provides the ammunition for the government's claim that HS2 will deliver '£2 benefit for every £1 spent'.

Table 4 – Summary of the cost benefit analysis used in the 2010 *Command Paper* and then updated by the 2011 *Economic Case*

		London - Birmingham		Full Y Network
Line	**HS2 Benefits Summary**	**March 2010**	**Economic Case February 2011**	
1	Business traveller benefits	17.6	11.1	25.2
2	Leisure and commuter benefits	11.1	6.4	13.1
3	Adjustments	0	- 0.9	- 1.0
4	**All transport user benefits**	**28.7**	**16.5**	**37.3**
5	Wider Economic Impacts	3.6	4.0	6.3
6	**Total benefits**	**32.3**	**20.6**	**43.7**
7	Total costs	25.5	24.0	44.3
8	Net revenue	-13.5	-13.7	- 27.2
9	**Net cost to government**	**11.9**	**10.3**	**17.1**
10	**Net benefits ratio Line 4 / Line 9**	**2.4**	**1.6**	**2.2**
11	NBR including WEI Line 6 / Line 9	2.7	2.0	2.6

The DfT analysis

Even before looking at the methodology itself, it is worth noting problems with the DfT's own assessment.

Firstly, the DfT uses a methodology called New Approach to Appraisal (NATA) which does not include WEI, so the correct net benefit ratio (NBR) is that shown at Line 10 in Table 4 above, i.e. an

NBR of 1.6 for the London to Birmingham (Phase 1) HS2 route, increasing to an NBR of 2.2 after completion of the full Y network.

Secondly, the route for the full Y network has not yet reached the stage of feasibility study and has certainly not yet been officially published. What this means, as confirmed by Oxera's review (Oxera, 2011), is that the DfT's analysis of benefits for the full Y Network are mostly 'extrapolated' from earlier work on the London-Birmingham phase of HS2 and have no further substance to them. A similar concern exists around the costing of the full Y-network route, where huge assumptions have had to be made without any firm plans having been agreed.

Thirdly, the sensitivity of the whole HS2 programme to fluctuations in demand is shown starkly by comparing the published *Economic Case* to the view published in the *Command Paper* less than a year earlier. In less than 12 months, the forecast transport benefits, which are based on the HS2 demand projections, fell 42%, i.e. from £28.7 billion to £16.5 billion, reducing the NBR from 2.4 to just 1.6. This demonstrates more clearly than any theoretical sensitivity testing how vulnerable the HS2 programme is to the demand forecast.

Fourthly, DfT's assessment of HS2, using its own NATA methodology is that it only offers the prospect of 'medium' value for money if it includes the full Y network, the route for which is not even known. In other words, the case for high-speed rail now appears to rely upon the benefits generated for the full Y Network, rather than London-Birmingham alone. As the Oxera Review makes clear (Oxera, 2011, Table 1), this means that HS2 is little better - yet with much higher opportunity costs and a lot more risky - than 'strategic alternatives' previously dismissed.

It leaves us with a conclusion that the proposal is:

- to proceed with Phase 1, which offers modest returns, at substantial cost, in the anticipation that
- Phase 2 (completing the Y-network) will 'recover' the programme to an acceptable level, even though very little new or detailed work has actually been done to substantiate the claims for Phase 2.

Time savings

The methodology that generates the transport user benefits warrants further attention, specifically the question; how much is your time really worth?

HS2 Ltd's model puts a premium on business travel, based on a generous assumption that the average business traveller has a salary of £70,000 per year.

The methodology then argues that time on board a train is entirely wasted for business travellers so that a minute saved in journey time is an additional productive minute. Similarly for leisure travellers and commuters, the assumption is that people would pay to have a shorter journey.

Now, many business passengers read papers or a book on the train; others work on a laptop, listen to i-pod players, make phone calls, send texts and so on, all of which, if they were not on a train, would be termed either business or leisure activities. But because passengers choose to do these things on a train, they are deemed to have no value. This is the logic that drives the need to have a

very fast train service; the basis on which DfT calculates huge 'benefits' arising from shorter journey times; when people stop travelling their activities gain value!

This explains why the main benefit of HS2 is for business passengers, since it is assumed that (a) their time is more valuable and (b) all their time spent on a train is wasted time. Now, clearly there is some wasted time in making a train journey, mostly near the start and end of a journey - the transfer points, for example: getting to the station, buying tickets, waiting on the platform, finding a seat etc. Yet in reducing a journey from 84 minutes to 49 minutes, there is good reason to think that passengers are losing the most productive 35 minutes of that journey!

It is absolutely clear to anyone who frequently travels by train that the methodology is at best substantially out of date. The impact of mobile technology means that people increasingly utilise their travelling time, engaging for much of the journey in some activity, business or leisure, which they would otherwise do if not on a train. Therefore, the benefits included in the CBA are grossly overstated, for two reasons:

- business travellers are able and do work – with technology helping them to become ever more productive – so time saved does not equal extra productive time
- new technology makes train travel more pleasant so people will pay less to shorten their journey

Even if one makes the equally random, but probably more accurate assumption, based on observing behaviour on a train, that only 50% of business travel time is unproductive, without any other change it immediate has the effect of reducing the BCR for the HS2 full Y route to less than 1.5.

Similarly, Oxera's Review for the TSC states in paragraph 3.7 how it tested a sensitivity for the value of time for business users, reducing it by one third, which had the impact of lowering the BCR to 1.3 for phase 1 (London - Birmingham) and for the full Y network to 1.8.

The counter-argument has been made that there will be benefits to business travellers from 'reduced congestion' on a train i.e. as a result of the additional capacity created by HS2 (*Economic Case*, DfT, 2011a). However most business travellers will pre-book seats, common practice on the WCML Virgin Pendolino service, so it is not clear how reduced congestion adds more than additional elbow-room for business travellers. Indeed, the DfT's argument acknowledges that the methodology is fundamentally wrong, as business travellers do work on a train!

The only conclusion that can be drawn from the above is that the DfT's view that taxpayers will get '£2 benefit for every £1 spent on HS2' is based on an inappropriate methodology and is entirely without foundation.

Distributional analysis – who benefits, who pays?

When the Treasury assesses public sector business cases for new investment they consider, as part of their assessment, who benefits from the investment and who contributes to the costs.

Some public sector projects gain public support because people can see the 'public good' or they can recognise some indirect benefit arising from the investment. The most obvious example is spending on defence and policing.

A good transport infrastructure could also be argued to offer 'public benefits', for example because increasing workforce mobility enables the freer operation of labour markets.

However, the cost benefit analysis prepared by HS2 Ltd argues that 90% of the benefits of HS2 will be for passengers who use the service, so it will only be of real value to a narrow subset of the UK population. By contrast with spending on areas such as health or defence, most UK taxpayers do not use the rail network. And the majority of those that do, according to the *National Rail Travel Survey* live in London and the South East (ORR, 2009).

Also, for those who do travel by rail and who do use the WCML, a significant proportion will choose not to travel HS2 because:

- it will be inconvenient for many people having to connect via one of the new stations;
- for anyone living south of Coventry it will be quicker to travel directly to London, rather than head back up the line to Birmingham's HS2 terminal;
- travelling on HS2 is likely to be relatively expensive (see the earlier discussion about premium pricing and the experience of HS1).

Even if one accepts the argument of a small shift from each of Road (7%) and Air (6%) to HS2, and bearing in mind there are currently no scheduled flights between Birmingham and London, it is clear that HS2 will be a premium service for a relatively small number of frequent-use passengers. For most people it will be quicker and probably much cheaper to use the existing transport system rather than the new super-system of high-speed rail, as most people will not live within easy access of the few new stations.

The *Economic Case* argues that HS2 will free capacity on other parts of the network, allowing non-HS2 users to gain benefit. However the train operators run a business and they will need to close down 'spare capacity' if passengers switch to HS2, as speculated: 'spare capacity' means empty seats and zero revenue.

The conclusion to this distributional analysis is that the main beneficiaries of HS2 will be:

- Business users / businesses centred in the larger cities of Birmingham, Manchester, Leeds, Sheffield, which will develop as satellites to the London hub.
- Daily commuters, mostly from Birmingham or the East Midlands for whom working in London may become a practical possibility ('increased mobility of labour' argument applies)
- Leisure passengers – living near to the hub stations, with improved access to London
- Those owning property within easy access of the new stations
- Businesses stimulated by the greater proximity of London to its satellites (74% of such benefits are estimated to arise from new jobs created in London).

Those who will pay / contribute to the costs of HS2 are principally:

- Taxpayers, who are asked to provide a net subsidy of £17 billion, as set out above and potentially a lot more that £17 billion if demand assumptions do not materialise into

revenue streams;
- Passengers living in towns and cities by-passed by HS2, such as Coventry, Wolverhampton and Stafford, where some direct / intercity services are likely to be withdrawn (see Stokes, 2010);
- Those owning property 'blighted' by the proposed route of HS2;
- Regional businesses not connected to the London / satellite cities HS2 network; a sizeable proportion of 'new jobs created' in London or Birmingham are likely to reflect a re-distribution in the economy from other locations in the UK, reflecting the experience of high-speed rail in mainland Europe.

So, the proposal for HS2 is to provide an upgraded service, heavily subsidised by the general taxpayer, for which only a small percentage of the general population will gain a significant benefit; most people living in the UK and paying the taxes to fund HS2 will never make use of the service.

The impact of HS2 has other distributional effects, too, stemming from the fact that the *Economic Case* requires a very substantial public subsidy.

Firstly, the effect of a price subsidy is to stimulate demand above the market level, in effect by enabling the train operators to charge fares at substantially less than the full cost. Although rail prices are expected to be 43% higher in real terms, than today, this still reflects a substantial price subsidy (HS2 is hugely expensive).

So, because rail fares are to be subsidised, this encourages more travel, particularly by business travellers. The DfT estimates that the first stage of HS2 will induce 10.5 million extra journeys per annum, journeys that would not otherwise be made. This sits unhappily with government's initiative to encourage alternatives to business travel and those favouring green economic solutions; remote conferencing via high speed broadband is far less CO2 inducing.

The second distributional impact is to provide a subsidy to the affluent. HS2 has the regressive property that it supports the mainly affluent users of long distance rail. The evidence suggests that it is the top 20% income earners, arguably those most able to meet the premium fares of a high speed service, who do nearly half of long distance train travel currently, who will gain most from HS2. Governments usually adopt a taxation policy more in keeping with Robin Hood's alleged maxim of 'taking from the rich, giving to the poor' – however, quite the reverse with HS2!

Risk and uncertainty

A business case involves assessing risks to a project and developing an assurance strategy to manage those risks: the overall objective of assurance is to help identify and reduce risks to the successful delivery of project outcomes. The National Audit Office recently published a report, *Assurance for High Risk Projects* (NAO, 2010), which identified a set of principles that should be applied to major investment programmes, such as high-speed rail. It begins with identifying key elements of the project – time, cost, quality, scope, risk, benefits – and recommends putting in place a governance process that highlights whether they are exceeded or in danger of being exceeded.

For example:

> 'Assurance should take place at the earliest opportunity to help establish clear criteria for identifying and measuring elements in a project which are uncertain and turning them into understood areas of

> risk which have a value placed on them. It should ensure that there is a justifiable reason to start a project and that the justification put forward in the business case is correctly documented and approved.
>
> 'Assurance should inform the initial approval of projects and decisions on ongoing funding.
>
> 'Assurance should act as a primary method for transferring learning between projects.'

(Section 6, Part 2, Section 6, p. 14)

It is astonishing that given the scale of investment proposed, the high public profile of HS2, the reliance on a single demand scenario and the experience of HS1, neither HS2 Ltd nor the DfT have published any serious, quantified analysis of the risks or an assurance strategy to address these, as part of the *Economic Case*.

Where sensitivity testing has been done, the results have not formed part of DfT's presentation of high-speed rail. One of the benefits of a scenario-based approach would have been to consider the high-speed rail strategy against combinations of assumptions, thereby developing a more intelligent risk profile. With such a long-term programme it is inconceivable that variables will only change one at a time.

A number of the points identified below have been referred to earlier in the analysis and so are only briefly mentioned again.

The forecast of future demand for HS2

From the DfT analysis shown in Table 4, it is clear that most of the benefits expected from HS2 rely on accurate forecasts of passenger demand. It is also clear from the analysis above that:

- because of the very long time period involved, there is considerable uncertainty over the estimate of future demand and
- the forecasts for HS2 shifted 42% even over a recent 12 month period; the case for the full Y Network is an extrapolation of the case for the first phase;
- the level of effective demand is related to the fares that passengers will be asked to pay, which is scarcely considered.

HS2 Ltd published a sensitivity analysis in papers supporting the DfT *Command Paper* that concluded that if demand is 20% below its predicted level, the net benefit ratio of HS2 Phase 1 falls from 2.4 to 1.5, which is interpreted by the DfT as a marginal investment. Subsequently, as a result of revised growth forecasts and their impact on demand, the NBR was in fact reduced from 2.4 to 1.6.

For these reasons it is extraordinary that the *Economic Case* does not even repeat the simple sensitivity analysis made in the earlier *Command Paper,* as a starting point for assessing downside risk. On this basis alone the *Economic Case* could be deemed inadequate as a basis for investing £30.4 billion of taxpayers' money.

The extract below from 3.2.5 of the *Economic Case* summarises the government's uncompromising stance, assuming the need for high-speed rail as a given:

> 'One of the key uncertainties for forecasting is the future level of demand. There are different views of

> the future – how the economy will grow, and how that will drive growth in demand. However, the rate of growth in demand actually defines when, rather than whether, a scheme such as HS2 would be justified. Slower growth would not necessarily mean that HS2 would not be a worthwhile investment, though it might suggest that the opening year of HS2 should be later and/or that a lower level of service should be provided in the early years of operation. A higher growth rate, by contrast, would argue for the project to be accelerated if that were possible.'

The parameters of uncertainty over the reliability of future income forecasts are very large indeed, given that HS2 is planned to start commercial operation in 2026 and the assessment period runs to 2085. Conventionally, in the private sector, this would be reflected in the level of interest rate used, higher rates reflecting higher levels of perceived risk. Perversely the DfT uses a 3.5% 'discount factor' reducing this after 30 years to just 3%. Whilst this is standard practice for public-sector transport projects, the impact of this is to substantially inflate the discounted value of future revenues against the projections that the private sector would make for the same project. From a commercial perspective this seems an entirely inadequate approach to assessing risk.

The £17.1 billion cost to taxpayers is a figure net of revenues, and highly sensitive to assumptions about future revenues from ticket sales, as discussed above. So the downward revision of demand / NBR discussed earlier also impacts on revenue projections and therefore the net cost to the taxpayer.

How robust are the cost estimates?

It is almost impossible to assess how robust the the DfT's cost estimates are for this massive infrastructure programme since the larger proportion of the route, the phases beyond Birmingham, has not yet been published; even the London – Birmingham plans are at the level of 'feasibility study' rather than detailed design.

For example, the Oxera review (2011, para. 3.30) draws attention to the fact that no work has yet been undertaken on train diagrams, which are required to assess HS2 Ltd's rolling stock and operating costs. They also point to details about cost savings, for example the inclusion of savings of £78m per year from reducing Pendolino services, questioning the rationale for this.

This absence of detail could of course mean that costs are more easily managed within potentially generous 'contingencies', although there is plenty of evidence – a sustained track record by government – of understating the cost of big infrastructure projects. Several examples are researched by Myddelton (2007), including Concorde, the Millennium Dome and the Channel Tunnel Rail Link (HS1).

Research by Flyvbjerg et al. (2006) examined 25 major projects and found that on average rail schemes experienced a 45% cost overrun, often because of unusual technical and engineering challenges.

Looking specifically at high-speed rail projects, several have identified major financial problems, whether as a result of cost overruns, over-optimistic revenue forecasts or some combination of both, for example:

- The new Dutch high speed line between Amsterdam and Brussels has been reported to have substantially lower operating profits than forecast due to there being fewer

domestic passengers than originally projected using the line;

- The proposed Tampa – Orlando high-speed line in the United States has recently been cancelled. Despite government funding its construction, the State of Florida is now unwilling to commit to the indefinite operating subsidies likely to be required.

The cost assessment of £17.1 billion includes 'optimism bias' to mitigate the potential for cost over-runs on capital spend. However, the overall assessment of cost is incomplete and no consideration is given to alternative scenarios (which may impact directly on cost as well as revenue impacting net costs). Sensitivity testing of the financial model would help to quantify these risks. Neither does the £17.1 billion include consideration of environmental costs (see below) nor financing costs (e.g. should future governments seek to engage the private sector to finance all or part of the project at a later stage). Moreover, the taxation required to fund the project will produce additional economic losses.

Also missing from the *Economic Case* is a robust appraisal comparing the relative risks of one project, HS2, against an alternative such as incremental improvement of the railway network. HS2 is 'transformational' to its supporters and will only deliver benefits on completion. Indeed, if it incurs 95% of its costs and is never fully commissioned, it will deliver almost no benefits, nil return on investment.

Almost every other alternative investment strategy offers greater flexibility and therefore a much closer matching of capacity to future demand, delivering benefits sooner than HS2. Other commentators, such as the HS2 Action Alliance have noted that 'Rail Package 2' – a collection of measures designed to achieve an increase in capacity on the WCML, meets the DfT's predicted growth in demand through a staged approach to investment and does so at considerably lower cost. This option was dismissed by the DfT for not providing the spare capacity that HS2 might offer. It is unclear what benefit the DfT attaches to taxpayer investment to produce spare capacity, particularly when spare capacity will impact upon prices, revenue forecasts and future levels of taxpayer subsidy.

As HS2 will deliver no improvement for at least the next 15 years, there is almost certainly an 'opportunity cost' in its development, diverting resources that would otherwise feed incremental growth in network capacity to meet growing demand. Over this development period, the gap between demand and supply is likely to grow significantly, as HS2 consumes most available resources, building up to the step change in capacity planned for 2026. It is not clear that the opportunity cost of this investment strategy is properly reflected in either the cost benefit analysis or the assessment of risk - i.e. of increasingly failing to match capacity to demand over the 15 year intervening period.

Somewhat perversely, Oxera's review (Oxera, 2011, Appendix A1.1) includes a sensitivity test showing that delays to the HS2 programme actually increase the BCR; a delay of 4 years increases the BCR to 2.0, further evidence of the mismatch between DfT's own demand forecast and the 'solution' offered by HS2.

'Green' economics - what impact on our environment?

High-speed rail is part of a government strategy to promote economic growth and it will have a number of major environmental impacts, which are not factored into the *Economic Case*. The section below is not intended as a complete review of the environmental impacts; however, a review of the economic case requires consideration of the environmental and other consequences of investment

in high-speed rail, and there are considerable policy implications.

Firstly, HS2 will impact directly on the environment through its construction, cutting a wide corridor along its length between London and Lichfield (Phase 1), with four new stations – in Birmingham and London - a number of tunnels and deep cuttings, construction-related CO2 production and disruption to businesses, families and wildlife habitats.

Secondly, HS2 will draw power from the National Grid and the extent to which this is 'green' of course depends on the mix of energy sources contributing to the Grid at that stage, for example renewable sources, fossil fuels or nuclear. However, largely resulting from the flawed methodology used in the CBA, described earlier, HS2 is to be designed to travel faster than European high speed trains, reaching 225 mph. Higher speed uses disproportionately more energy than a new generation of 'classic' trains and speed is not 'green' (see Kemp, 2004).

Thirdly, HS2 will also be far from silent, however good the design and whatever noise mitigation is provided. With 1100 seat capacity, 3 times bigger than the Javelin HS1 trains, and travelling at 225 mph, HS2 will generate considerable levels of wind noise and vibration.

Even more fundamentally, one might question how a strategy that is based on stimulating 22% additional journeys between Birmingham and London, journeys that only arise because of the new, ultra-fast HS2 service, is part of a 'green' approach to transport planning. All of those additional HS2 journeys require that people connect to one of the new stations – in Birmingham city centre, near Birmingham International, at Old Oak Common and at Euston – all with additional CO2 producing journeys to stations, by train, bus or car.

Other government departments and even the government's rail advisors, Arup, advocate policies of flexible working to reduce unnecessary travel. And advances in internet-based technology make this increasingly possible and likely over the next 40 years. The Transport Minister, in supporting the development of telework, recently issued a press release stating:

> 'Reducing demand for travel will reduce congestion, pollution and stress in our daily lives. Working just 1 day in 10 from home would have a huge impact, and working from home could do wonders for that work life balance we all strive for…
>
> 'The results will be tangible - reduced congestion, reduced carbon emissions, improved quality of life and if we're all working from home we might even start talking to our neighbours again, which can't be a bad thing for our communities.'[41]

However, none of the above is reflected in Ministerial rhetoric about HS2, which is designed to do the opposite - through on-going public subsidy it will artificially stimulate the demand for additional journeys. Nevertheless Philip Hammond describes HS2 as offering a 'sustainable' transport solution, 'environmentally friendly', 'delivering on our climate change targets' and creating 'new habitats for local flora and fauna along the line.'

The business case presented by HS2 Ltd prior to the 2010 Command Paper, in contrast to the rhetoric, assesses HS2 as broadly 'environmentally neutral' in its operation, a view that explicitly excludes consideration of the environmental and CO2 impacts of its construction.

41 See: http://www.normanbaker.org.uk/pr/2010/100712_travel.htm

HS2 Ltd calculates a 6% modal shift from air to rail, as illustrated in the earlier pie chart. Ministers point out that this will create capacity at regional airports for more profitable long-distance flights, which consume far more CO2 than short-haul. Mr Hammond has been keen to point out that Birmingham International airport will become closer in travel time from central London than either London Stansted or London Luton.[42]

Wider economic benefits

The business case prepared by HS2 Ltd included an estimate of £3.6 billion 'wider economic benefits' arising through the project. This assessment looked at three areas:

- Agglomeration benefits, i.e. benefits of improved linkages between businesses;
- Labour market impacts, i.e. benefits to commuters;
- Imperfect competition, i.e. the benefits to consumers of higher output, caused through investment in high-speed rail.

These benefits are on top of the conventional economic benefits, in the form of business time and reliability savings, already counted in the DfT's transport assessment.

HS2 Ltd's initial analysis, published in 2010 using DfT guidelines, indicated potential agglomeration benefits of £2 billion and £1.6 billion arising from imperfect competition, with hardly any benefit on labour markets. HS2 Ltd also commissioned further work from the Centre for Transport Studies, Imperial College, to ascertain any further benefits and the DfT concluded that 'this suggests there may be some additional benefits that are not included in our estimates of wider economic impacts, it is unlikely that they will change the conclusions presented in this report' (DfT, 2010c).

Subsequently, in the 2011 *Economic Case*, the DfT has increased this projected benefit to £6.3 billion, reflecting the impact of the Y network. Whilst there has been much talk in the media of 'new jobs created', this DfT estimate for wider economic benefits only represents 14% of the total benefit claimed in the *Economic Case* and it is a modest return on the £30.4 billion capital investment required to create the infrastructure. It should also be noted that jobs will be lost in the wider economy as a result of the additional taxation required to fund HS2 and its negative effects on work incentives, the division of labour, investment and so on. Moreover, even if one were to accept the case for major investment in high-speed rail, doing so on routes into London will be as likely to result in people, jobs and economic activity moving/commuting into the capital city as out of it; and the government does not seem to have considered the case for improving infrastructure on west-east rather than north-south routes (for example, between Manchester and Sheffield).

Ministers have turned increasingly to work done for the high-speed rail advocacy group Greengauge 21 for evidence of the 'transformational' benefits of investing in new railway infrastructure. Taking a different approach to the methodology used by the DfT, KPMG (in a report for Greengauge 21), argue that by 2040, a new high-speed rail network could leave the economy with GDP output about 2.1% higher than it would otherwise have been (Greengauge 21, 2010b). This is based on an approach of assessing how changes in transport supply can affect the scale and pattern of economic activity.

KPMG's work shows a strong correlation between higher levels of rail connectivity and higher

42 For example, 'Philip Hammond: high-speed rail will be a "pleasant surprise" for many', *Daily Telegraph*, 11 December 2010

wages. Taking higher wages as a proxy measure for higher productivity, KPMG admit that a causal relationship, i.e. better rail connectivity causes higher productivity, is an assumption. KPMG project this forward over 30 years using an econometric model.

The main features modelled in this approach are:

- Changes within the business sector enable greater specialisation and so stimulate greater productivity (similar to the agglomeration effects modelled by DfT).
- Changes of location affect wages, which are higher within cities, suggesting that high-speed rail would enable a shift of economic activity towards big centres (e.g. Birmingham and London). This may then attract inward investment and economic migration.
- Potential changes in the different mix of industry relating to high-speed rail are noted but not modelled.

This is an imaginative approach, based as much on intuition as evidence and suffers from similar problems to HS2 Ltd's long-term modelling approach. However, it develops potential scenarios, such as the long-term reaction of business to changes in infrastructure investment, ignored by the DfT and arguably more appropriate than the simple econometric modelling used in the HS2 business case.

A few words of caution are required:

- The large benefits projected are instead of, rather than additional to the DfT's cost-benefit analysis.
- The modelling assumes a full HSR network, not just the HS2 link between Birmingham and London or even the extended Y route to Manchester and Leeds. The analysis extends to Wales and Scotland, and so is highly speculative and not balanced by any assessment of the comparative costs required to deliver the return.
- Are higher wages a reasonable proxy for productivity? In the public sector, the growth of wages in the NHS has been associated with a marked reduction in productivity. In developing Asian economies, lower wage rates compared to western economies are associated with high productivity growth, high returns on investment and rapid GDP growth over the last decade.
- Most major cities are connected by a mixture of different transport infrastructures, so how effectively can the impact of rail connectivity be distinguished and identified independently from the impact of other transport connectivity, e.g. airports and motorways?
- The Northern Way commissioned work on the methodology used by KPMG by Mackie and Laird at Leeds ITS. They concluded that there were serious methodological issues, and the results were high.

Further work can be expected from KPMG as they refine their approach.

5. Conclusion

The above analysis suggests that the economic case for HS2 is fundamentally flawed. The government appears not to have drawn on the earlier experience of HS1 and the scheme appears to share many characteristics with previous government project failures. Indeed, projected net-present-value income from HS2 is substantially less than cost, showing that there is no commercial case for HS2 - it is planned as a loss-making service from the start.

The lack of a commercial attitude to cost is reflected in many aspects of the proposal. The route, for example, appears to have been 'gold-plated' with apparently little concern for the cost-implications. As with HS1, a disproportionate share of the total costs will be incurred in the first few miles of the route from central London (i.e. terminating HS2 at Euston). There is also strong evidence that the knock-on effects on other transport infrastructure (such as the Underground lines from Euston) and the possibility of very expensive upgrades have not been fully considered. The full costs of planning blight and other disruption related to the scheme are also neglected in the economic case.

The non-commercial attitude to risk is reflected in the excessive demand forecast, which mirrors the failed approach used to project demand for HS1. The forecast is subject to huge uncertainties, mostly downsides, insufficiently tested by assessing alternative assumptions. The DfT argument that at some point in the future demand will eventually reach the levels predicted provides no basis to justify such large scale public investment. The impact on passenger demand of the government's current policy of increasing the real cost of rail fares is simply ignored.

The whole case for HS2 is predicated on a single scenario projection of future demand, a mistake accepted by the DfT in its 2007 White Paper but now to be repeated for HS2. It does not do what some of its own supporters have called for and consider a range of alternative scenarios that may involve major structural change over time.

Indeed, the scheme is highly dependent on achieving a very high estimate of future demand. These demand forecasts have now been reduced, in line with more cautious estimates of future economic growth. However, no new sensitivity tests on the full HS2 + Y network have been published, even though the risk profile is even higher. The decision to push on with the full Y network disguises the fact that even accepting weaknesses in the DfT's methodology, the net benefits ratio (NBR) for HS2 Phase 1 – London to Birmingham – is only 1.6 and therefore marginal.

But the DfT cost-benefit methodology also contains incorrect assumptions about the value of time, and fails to compare HS2 with a realistic alternative. Even if one accepts that 50% of business time on a train is entirely wasted, and no other changes are made, the NBR on the full Y network falls to less than 1.5.

A further flaw is the under-developed framework for considering risk. No attention has been paid to the impact of pricing policy on levels of uptake in demand for HS2. At the most fundamental level, the business case for HS2 has a prediction for a trebling in customer demand over 35 years sitting alongside a plan to increase ticket prices by nearly 50% in real terms.

The potential impact of competition has also been completely ignored, as it was for HS1 and with serious consequences for profitability and the need for on-going public subsidy. Instead the business

case assumes regulation or a new rail monopoly 'optimising' prices between WCML and HS2.

Moreover, the strategy of HSR fails to achieve a close match between its own forecasts of supply and demand; HS2 delivers nothing to match the predicted year-on-year growth over the next 15 years. However, alternative strategies that enable a much closer matching of supply and demand have been rejected.

The eventual costs to the taxpayer are heavily dependent in this scheme on the magnitude of the revenue stream starting in 2026 (i.e. taxpayers will provide a subsidy to cover losses and the level of subsidy will be higher if revenue forecasts / passenger demand is less than that forecast). Projections of future revenues do not deliver anything even close to a positive return on investment payback. Furthermore, the use of a non-commercial discount rate (3.5 / 3%) which clearly does not adequately reflect future risk over such a long-term planning horizon, serves to substantially inflate the value of the stream of future revenues in the business case.

And although capital-cost estimates include a notional sum for 'optimism bias', there is a long history of substantial cost overruns on large public-sector projects. It is also clear that there are significant omissions from the calculation of cost included in the *Economic Case* such as the knock-on impacts for rail services in London and that the Y network cost assessment is not even based on a feasibility analysis; no route has yet been published, making the programme extremely high–risk.

The financial risks associated with HS2 are not mitigated significantly by the wider economic benefits associated with the scheme. The estimates of wider economic benefits presented by HS2 Ltd and Greengauge are highly speculative. Moreover, in the case of HS2 they must be set against the wider economic costs resulting from the additional taxation required to fund the scheme. Clearly, there are also significant environmental and social costs associated with HS2.

In conclusion, the *Economic Case* presented in February 2011 served to restate the belief that HS2 will be good for Britain, almost irrespective of the evidence that shows it to be a very costly and high-risk 'investment'. Using a flawed methodology and failing to assess the financial risks, the Economic Case for HS2 stretches belief beyond breaking point.

The case made by the DfT for HS2 now rests on the proposition that whilst the London-Birmingham phase may represent only modest value for money, there is a better case to be made for extending the route to Manchester and Leeds. This better case rests on a dubious cost-benefit analysis, an extrapolation of unreliable demand forecasts, and costings for a route that is not yet known.

The government is on the cusp of committing very large amounts of taxpayer money to support a very expensive 'grand design' – a potential white elephant that will drain resources from the existing network and the wider economy, and which is likely to require continuing subsidies from future generations.

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