Chapter 2

Economic and Business Case

Prepared by Wharf Weston

2 ECONOMIC AND BUSINESS CASE

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2.1 This chapter relates to the following questions listed by the Committee:

- 2.1 – implications for domestic aviation
- 3.1 – how robust are the assumptions and methodology and the impact of lost revenue on the "classic network"
- 3.2 – Alternatives – upgrading the WCML
- 5.4 – Major beneficiaries of HSR make an appropriate financial contribution

2.2 The case DfT make for HS2 is not a commercial one, but a social cost benefit assessment made in line with the NATA approach. The £17bn required subsidy is justified by £44bn of economic and social benefits. However there are serious issues with the HS2 assessment:

- *Subsidy*: long distance rail travel is an odd priority for government subsidy, given the recipients are generally affluent and it encourages more travel.
- *Forecasts*: evidence suggests demand is substantially overestimated – the doubling by 2043 should be less than half that increase, and the trebling with HS2 less than doubling.
- *Benefits*: the principle benefits depend on an outdated view of how people use their time on trains, causing both productivity and benefits to be significantly overstated.
- *Comparator*: HS2 is assessed against an unrealistic comparator (and not the best alternative, or even alternatives developed by DfT) which makes HS2 appear to have benefits much greater than it should e.g. crowding benefits.

2.3 Revising DfT's demand and benefits assessment reduces the £44bn for the 'Y' to about £14bn, and the benefit cost ratio (BCR) from 2.6 (including Wider Economic Impacts) to about 0.5. If our key concerns have a lesser impact, the BCR would still only reach about 1.0.

Justification for Subsidy

2.4 While HS2 is justified in terms of its social benefits, even on DfT's assessment, the BCR is not sufficiently high in itself (2.2 to 2.6), and less for Phase 1 (1.6 to 2.0), that it justifies priority over many other transport projects. There are two concerns with the subsidy:

- *Encouraging more travel:* The subsidy, in providing a new railway at less than its cost, encourages additional travel – particularly business travellers[1]. 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[2].
- *Subsidising the affluent:* The subsidy also has the regressive property that it supports the mainly affluent users of long distance rail. As Figure 2.1 shows, the top quintile of households by income do 47% of the long distance train travel currently. It is unexpected to seek to subsidise those who can best afford to pay the full cost.

DEMAND FORECASTS ARE OVERESTIMATED

DfT Forecasts[3]

2.5 The forecasts of demand for HS2 are crucial to its economic case, as passenger numbers directly relate to the level of additional fares income and the scale of economic and welfare benefits. DfT's 2011 forecasts for the London–West Midlands (phase 1) are in Table 2.1, with the breakdown of HS2 journeys in Table 2.2, together with a revised indicative forecast.

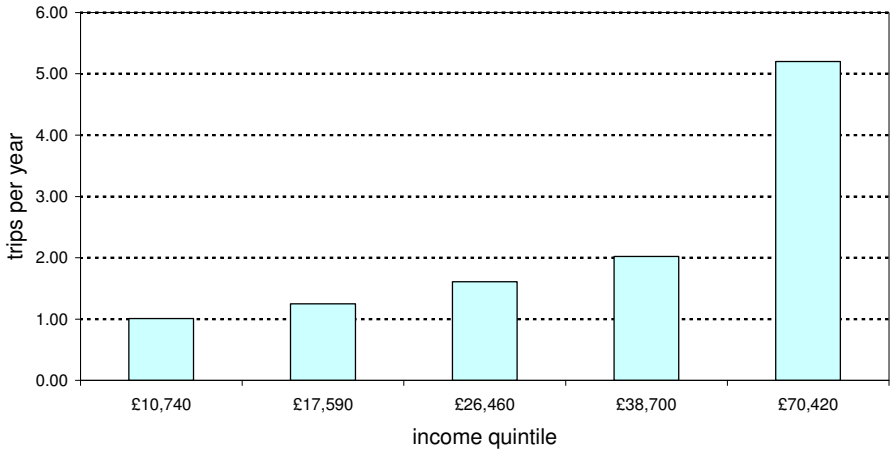
2.6 DfT have not provided sufficient information to do a similar analysis for the full "Y" network.

[1] HS2 Ltd estimate 37% of the new journeys on HS2 would be business travellers ('Demand for Long Distance Travel' April 2011,section 6.18 page 15, compared to an all HS2 traveller average of 30%

[2] Norman Baker (Parliamentary Under-Secretary of State for Transport) holds this portfolio responsibility

[3] HS2 Ltd actually do the forecasts, but they are done to Department for Transport (DfT) rules

FIGURE 2.1 LONG DISTANCE RAIL TRIPS BY HOUSEHOLD INCOME



Source: 'Modelling Long-Distance Travel in the UK', Charlene Rohr, James Fox, Andrew Daly, Bhanu Patruni, Sunil Patil, Flavia Tsang. RAND Europe, NTS 2002/5, income data 2005/6 ONS

TABLE 2.1 TOTAL LONG DISTANCE DOMESTIC TRIPS

	Increase 2008 to 2043	Average Annual Rate
Total Long Distance Rail (Over 100 Miles)	60%	1.4%
WCML (South Of Milton Keynes) without HS2	102%	2.0%
WCML (North Of Milton Keynes) without HS2	127%	2.4%
HS2/WCML with HS2 Phase 1	209%	
Domestic Air	128%	2.4%
Car	54%	1.2%
Total Long Distance Without HS2 (All Modes)	66%	1.5%

TABLE 2.2 COMPONENTS OF DEMAND

Phase 1	DfT Feb 2011 forecasts for 2043				WW revised forecast
	%[4]	Journeys per Day	Journeys per Year (m)	Increase over 2008 Base (50,085[5])	Increase over 2008 Base (50,085)
WCML (without HS2)		100,961	35.3	102%	38%
Switch from Rail	65	88,467	31.0		
New Trips	22	29,943	10.5		
From Air	6	8,166	2.9		
From Car	7	9,527	3.3		
Total on HS2	100	136,103[6]	47.6		
HS2 to HS1		5,926[7]			
Remain on WCML		12,494[8]			
Total WCML + HS2		154,523		209%	81%[9]

2.7 DfT's forecasts show a doubling in WCML rail demand (102%) without HS2 (i.e. 'background growth'), and a trebling (209%) with HS2 (phase 1). Using more justifiable assumptions, discussed below, Wharf Weston (WW) estimate an indicative revised forecast of 38% (i.e. less than half the doubling), and 81% respectively i.e. to not quite double, with HS2.

2.8 The DfT describe their forecasts as 'conservative', but put in context this is difficult to justify.

Context

2.9 *Domestic travel and income:* DfT's forecast depends on long distance domestic travel growing with increases in real income[10]. However evidence demonstrates that this link is breaking down:

[4] 'Economic case for HS2', Feb 2011, Table 3

[5] The historical 2008 base was changed (from about 45k to 50k between 2010 and 2011 forecasts)

[6] 'Economic Case for HS2' Feb 2011, Figure 3, page 20

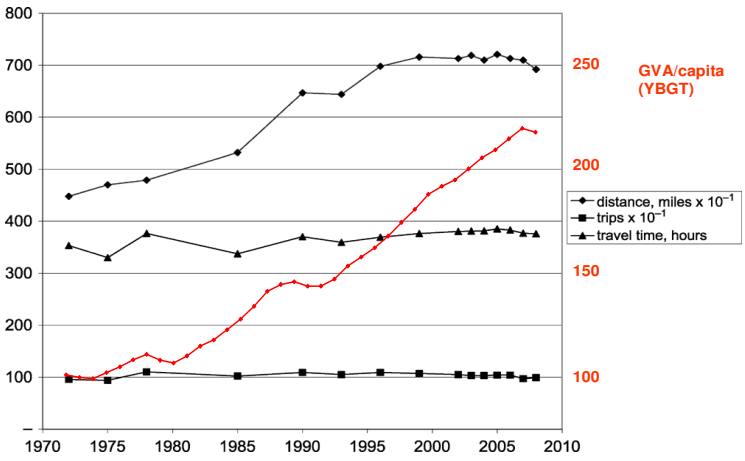
[7] Economic Case for HS2' Feb 2011, section 3.3.22 page 24, gives 4,850 using HS2 to go onto HS1 in 2033, escalating this at the rate of background growth (2%/annum) to give a 2043 figure

[8] Assuming all transfers from classic rail are from WCML. This is inconsistent with the 14,000 given at 'Demand for Long Distance Travel' April 2011, Section 6.3. The number remaining on WCML will be higher, and some transfers are from Chiltern Railway, but there is no basis to estimate this accurately. The information has been requested from DfT.

[9] Excludes HS1 passengers

- Since the mid 1990s domestic travel per person has not been growing despite real incomes (GVA/capita) increasing by about a third (34%). Prior to this, journey length did seem to be increasing with income. See Figure 2.2.
- This decoupling of domestic transport from economic growth is not specific to the UK, but applies to the European developed economies.[11] And Crozet in an OECD discussion paper observes: *"…In Germany, the UK, Italy and France, domestic passenger traffic has been more or less flat since the early 2000s."* [12] Economic growth however continued.
- Long distance trips per person have been constant since 1995. See Figure 2.3. People are not making more trips as average real incomes increase (although higher income groups make more trips than lower income groups). DfT however forecast the over 100 mile trips (all modes) will increase by 36% from 7 to 9.5 per person by 2043.

FIGURE 2.2 TRAVELLING TIME, TRIPS AND DISTANCES PER PERSON (COMPARED WITH REAL GVA/CAPITA[13]



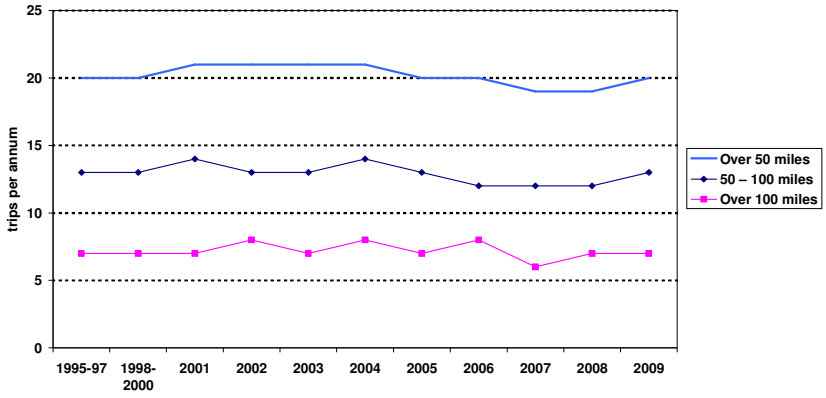
[10] DfT state in 'HSR Consultation: Future Demand for Long Distance Travel' 'as people become more prosperous they make more long distance journeys'

[11] see Transport at the Crossroads' EEA Report 3/2009, for decoupling in Europe using Eurostat data

[12] 'The Prospects for Inter-Urban Travel Demand', Y. Crozet — *Discussion Paper 2009-14* — OECD/ITF, 2009, section 2.2

[13] Based on analysis by Dr Metz based on NTS 2008 Table 2.1 with GVA/capita trend added

FIGURE 2.3 LONG DISTANCE TRAVEL PER PERSON (NTS037)[14]



2.10 *Population growth*: DfT say population growth boosts demand for travel, but population grows slowly. Over the last 15 years demand grew with population but only by about 5%. Population is forecast to grow by 22% to 2043, explaining about a fifth of DfT's 102% rail forecast.

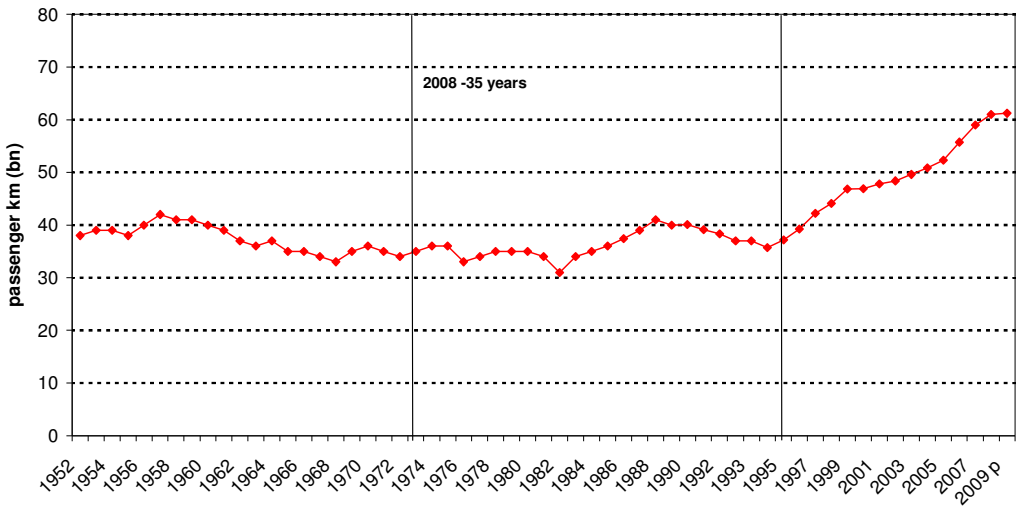
2.11 *Past rail growth*: within an overall lack of growth in domestic travel/person, rail has grown strongly (3.9%/a) over the last 15 years, mainly by modal shift (from coach and car). But it did not grow at all over the previous 40 years (see Figure 2.4), not even with population. If the past 15 years are relevant to future rail growth, the drivers of that growth need to be understood:

- Privatisation and the accompanying increased investment and improved services.
- Airline-style pricing, and price increases limited with the extra cost met by extra subsidy).
- Mobile technologies (phones, laptops, wifi, broadband) making trains a more productive and enjoyable environment in a way that has not favoured other transport modes.

2.12 Some of these have run their course, others have more potential (e.g. improved services and mobile technology), but rail's modal share cannot be expected to expand indefinitely.

[14] Based on analysis by Dr Metz based on NTS 2008 Table 2.1 with GVA/capita trend added

FIGURE 2.4 LONG TERM RAIL GROWTH



Source: Transport Statistics of GB, 2010 release, Table TSGB0101

2.13 The context is one of a saturating market for travel within which rail has increased its share.

Use of Rail Model (PDFH) for a 35 Year Forecast is Unsound

2.14 The forecasting model that DfT uses relies on relationships extracted from the past for factors such as population, economic growth, fares, journey times, etc, to derive a rail demand forecast. This type of model is inherently best suited to short to medium term forecasts, where shifts in these key relationships are less likely to happen.

2.15 It is generally accepted that to take account of market saturation it is necessary to stop, or cap, the projections at some point. This is particularly important given it is a fixed elasticity model i.e. it assumes people spend ever increasing proportions of income on travel. Different views are taken as to when growth should be capped:

- DfT recommend a normal horizon for projecting increases to 2026[15] i.e. 18 yrs (2008-2026).
- Sir Rod Eddington thought that a 10 year period was long enough[16].

[15] Webtag unit 3.13.1 Section 3.3. DfT August 2007. It says central case should cap growth at 2026

[16] 'Inter Urban Rail Forecasts' section 3.17. Whilst the trends may be a consistent basis for forecasting forward through time, they do not account for saturation of demand in the rail market, and as such, confidence in such an uncapped forecasting procedure must reduce considerably for forecasts beyond 2016.' Eddington, 2006

- Network Rail see a cap as essential[17], but express concerns about using PDFH for long term forecasts at all. They observe that PDFH was calibrated during a period of rapid rail growth, and has already been amended three[18] times to reflect behavioural changes.
- DfT used a 25 year period (to 2033) for their March 2010 forecast, justified on the HS2 completion date, rather than the capabilities of the model[19]. Given the cap concerns the 'background growth' (not induced demand for HS2 itself) this is difficult to understand.
- DfT in their new February 2011 forecast extend this to 35 years (to 2043) i.e. to twice their own 18 year norm. This looks unsound in the context of the past 35 years (i.e. from 1974, see Figure 2.4), as only for the last 15 years has there been any growth in rail travel at all.

2.16 DfT, on their own admission[20], say they are not forecasting demand, but are estimating how long a doubling takes, which they have independently decided (without evidence) will happen.

2.17 *Indicative revised forecast*: capping demand after 25 years (as in DfT's 2010 forecast), but at 2011 growth rates[21], reduces the rail 'background growth' increase from 102% to 65%.

Version of Rail Model Used Assumes too much Growth for Longer Journeys

2.18 DfT continue to use an outdated version of the rail model (PDFHv4.1) in which the 'income elasticity' factors forecast longer journeys to grow more quickly than shorter ones. For 1% more income, people in Birmingham are expected to spend 2.5% more on travel to London, whereas in Glasgow it is 2.8% more. This feature is recognised to be a problem:

- DfT issued Draft Guidance (which has yet to be adopted) which imposes a cap (at 2.5%).

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[17] 'Network Route Utilisation Strategy: Scenarios and Long Distance Forecasts' Network Rail, June 2009, Section 5.2 page 34

[18] Now five times, with the issue of PDFH4.1 and PDFH5.0

[19] 'HS2 Demand Model Analysis', HS2 Ltd, February 2010, section 3.2.6 page 31

[20] ' *For our earlier work we capped growth of rail demand in 2033, at a level of demand in the WCML corridor that is slightly more than double current levels. With the lower current GDP forecasts, this cap would now be hit later, in 2043.*'
'Economic Case for HS2', DfT, February 2011, section 3.2.9 page 15

[21] average 2%/a (not 3.3%/a in 2010 forecast) includes the economic downturn and price increases

- The current model (v5.0) removes the problem e.g. 1.9% would apply to both journeys, but despite research (for DfT and others) confirming the feature incorrect[22] v4.1 is still used.

2.19 *Indicative revised forecast*: if the demand forecast for HS2 were redone with v5.0 'income elasticities', it would reduce the increase in 'background growth' from 102% to about 68%.

Rail Model Assumptions Overestimate Uplift in Demand due to HS2

2.20 DfT also expect HS2 itself to induce demand because of its shorter journey times – taking demand from doubling due to 'background growth', to more than tripling with HS2. The uplift for HS2 (Phase 1) represents a further 47,000 passengers/day (i.e. a 54% increase over those transferring from classic rail). There are concerns that the uplift is overestimated:

- PDFHv4.1 is based on journey time relationships that pre-date the development and market penetration of the technologies that have made time on trains more productive.
- Evidence from the last WCML upgrade (that DfT cite) shows a 36% increase in demand for an average 34 minute reduction in journey time[23]. In fact WCML improvements were larger with major increases in service frequency too, and the HS2 journey time saving will be on average smaller for the first phase of HS2. WCML could only partly reflect the reducing value of journey time savings. The 36% is therefore a high estimate of uplift.

2.21 *Indicative revised forecast*: assume HS2 demand uplift uses last WCML upgrade figures.

Summary of Adjustments to Rail Forecast

2.22 Combining the above three factors would result in a 'background growth' of only 38% to 2033 and staying at this level (compared to DfT's 102% to 2043), and increasing to 81% with phase 1 HS2 uplift to 2033 and remaining at this level (compared with DfT's 209% to 2043).

[22] The findings of research by Oxera and Arup were publicly presented at Transport Economists Group in February 2011 (by Oxera, Arup and DfT)

[23] 'Demand for Long Distance Travel' April 2011,section 6.19 page 16 (the 36% relates to 2006 to 2009)

2.23 The adjustments we have made are intended as indicative of the overestimate. They do not attempt to remodel demand, but have been based on specific identifiable factors.

2.24 We also apply a 50% sensitivity to the adjustments. Demand with HS2 uplift then increases from 81% to 139% to 2033 and stays at this level (compared to DfT's 209% to 2043).

2.25 The demand forecast has a major impact on the schemes value for money (the BCR):

- If the WW indicative forecast is used the BCR for the full "Y" network reduces to 0.8 (without WEI) and 1.1 (with WEI). This compares with 2.2 and 2.6 for HS2.
- Applying the 50% sensitivity to our adjustment, the 'Y' BCR still reduces to 1.3 and 1.6.

2.26 *Premium fares:* DfT presume no premium fares for HS2, and they assume classic services will not compete on fares (despite the freed up capacity). If premium fares were to apply (as many believe will happen) then the demand uplift for HS2 would reduce, as would those transferring to classic services (eroding the £5.4bn saving that the business case currently assumes). No adjustments are made for these affects

2.27 These outcomes suggest that the case for HS2 is not robust to plausible adjustments to demand forecasts, even putting aside other issues.

Sensitivities not Done on Key Income Related Assumptions

2.28 It is common ground that there is uncertainty with long term demand forecasts. We would expect DfT to show that HS2 is robust to plausible different views of key parameters:

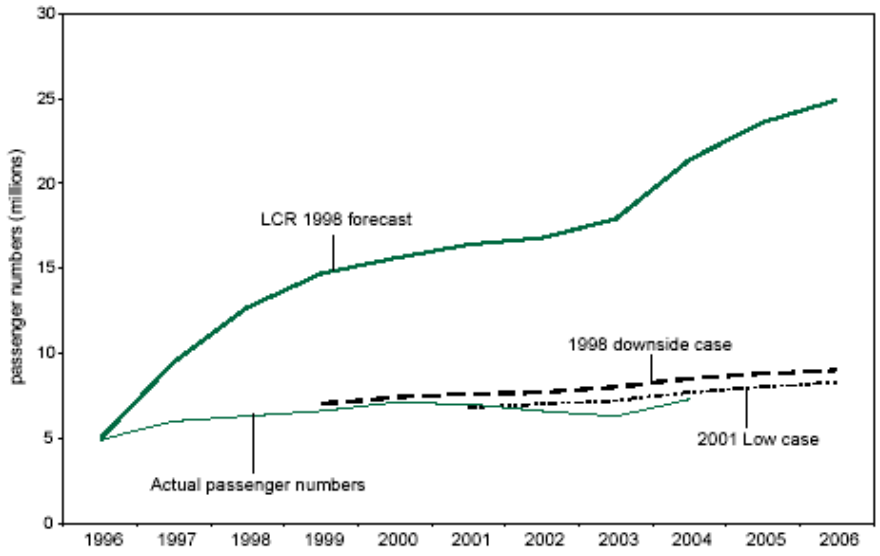
- DfT's own guidance[24] requires sensitivity analyses; but the stated tests in webtag were not done, nor PDFHv5.0 factors used (as discussed with Analytical Challenge Group).
- Developing different scenarios e.g. downside case (as Challenge Group discussed).
- Applying lessons from previous experiences e.g. HS1, given DfT's track record.

[24] Webtag unit 3.15.4 (section 6.1.1 page 7), states the alternative elasticities to be used for sensitivities

2.29 In the 2010 case HS2 Ltd showed that a 20% shortfall in their forecast reduced their BCR from 2.4 to below 1.5. Even this simple sensitivity has not been repeated.

2.30 The Public Accounts Select Committee[25], criticised the HS1 forecasts for being optimistic and DfT undertook "to factor more severe downside assumptions" in future assessments. As Figure 2.5 shows demand fell short of even the low scenario. By 2009 demand was still only just 37% of the original LCR forecast.

FIGURE 2.5 HS1 PASSENGER NUMBERS



2.31 The explanation that caused the forecast to be optimistic, that competition was not foreseen, is a concern given that competition has been sidelined for HS2.

2.32 Excessive demand forecasts are frequently produced in support of rail projects. More than 9 out of 10 rail projects have demand overestimated, on average by a factor of two[26].

2.33 Given the history of demand overestimation in similar projects, it is surprising to find that DfT are not heeding there own advice, as stated in 'Delivering a Sustainable Railway' in 2007 :

[25] Select Committee on Public Accounts, Thirty-Eighth Report, and C&AG's Reports, HC 77 of Session 2005/6, Fig. 8

[26] 'Inaccuracies in Traffic Forecasting' B Flyvbjerg, M Skamris Holm and S Buhl. Transport reviews, Jan 2006

"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."

Air Forecast

2.34 A detailed review of aviation impacts are given in Chapters 11 & 12 and below is an overview of the DfT assumptions for air transfers to HS2.

2.35 DfT estimate 6% of HS2 passengers (about 8,000 journeys/day or 2.9m/a) switch from air. This figure increases to 6m/a for the Y (but with no supporting detail). Both look optimistic:

- To generate even 6%, DfT must assume that the domestic air market grows – they forecast by 128% to 2043 (last year they said 178% by 2033) – and their forecast is no longer constrained by supply[27], i.e. it is not all real air journeys that switch to HS2. That much real growth could not occur without extra runway capacity for London (and hence some of the 6% is new journeys rather than modal transfer).
- The forecast 2.9m/a is about 95% of current passenger levels on the relevant air market (London - NW/Scottish lowlands) and half if all London airports included (yellow bar).
- The actual trend in domestic air demand, particularly in the relevant routes, is declining, and scope for modal shift looks limited.

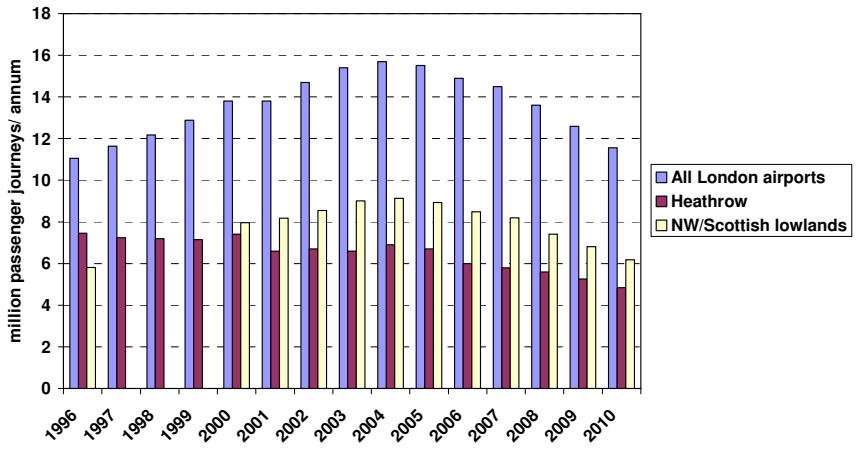
2.36 Figure 2.6 shows what has been happening to London domestic air demand (CAA figures[28]). Domestic air services for London have actually been declining since the mid 2000's (from before the recession). This will reflect the time penalties imposed by tight security, and the improved intercity train services winning on key routes.

[27] 'Economic Case for HS2'. section1.1.8 page 7

[28] CAA UK airport statistics, Table 10 2 Domestic terminal passenger traffic, Table 12 2 Domestic air PAX route analysis

FIGURE 2.6 LONDON DOMESTIC AIR PASSENGER NUMBERS

Figure 6: London domestic air passenger numbers



2.37 It is generally agreed that rail may replace air where rail journeys are under about 3 hours[29]), with rails percentage falling off sharply above 2.5hrs[30]. These times may have lengthened due to security issues, but if this is still relevant in 2026, it may apply to HS2. Given that the HS2 journey times to Glasgow and Edinburgh with the "Y" are 3 hr 30 -40 minutes, and the fastest Edinburgh-London train is already only 4 hours, the modal transfer looks optimistic.

Benefits are Overstated

2.38 The key benefit of HS2 in its economic case is the value of the shorter journey times. It accounts for £18bn of the £44bn benefits, £14bn of which depends on the assumption that time savings translate into greater productivity for business travellers.

2.39 Business time is valued at the cost to employers of the time; leisure (and commuter) time at willingness to pay values. The former are around 8.5 times that of the latter. These values relate to research conducted on data over a decade old. The business time values are increased in line with real per capita incomes, and those for leisure passengers at 80% of this increase, so unlike costs that erode during the 60 year assessment period (lasting to

[29] 'High Speed Rail Investment: An overview of the literature', Network Rail, 2009, Chris Nash

[30] Michael Mann op cit

2092 for the second phase of HS2), these benefits are very influential on the assessment.

2.40 There are two serious problems that both concern use of outdated assumptions:

- *Productivity*: no account has been taken of the impact of modern technology in making on-board time useful and enjoyable – it is assumed at zero (wholly wasted), and so every minute of journey time saving is assumed to translate into a minute extra productivity.
- *Unit costs*: the cost of business time DfT use relates to when there were relatively few business travellers and they were typically the high earners (£70k/pa in 2009 money).

Productivity

2.41 DfT now accept that at least some time on board trains is already productive[31] i.e. businessmen do work on trains. This is unsurprising as it is common knowledge. The surprise is that it has not been reflected in DfT's assessment framework. The issues are:

- *Technical feasibility:* There are some limitations at present e.g. patchy mobile phone and broadband coverage, but these are unlikely to be issues by 2026 when HS2 commences.
- *Time at seat:* Not all time on board a long distance train can be productive e.g. finding a seat, getting out papers, computer, packing up is not productive. However this happens irrespective of the journey length. Any reductions in journey time e.g. 30 minutes, directly correspond to less time available in the seat i.e. 30 minutes. What matters is how time is used in the seat compared to where else one would have worked e.g. home, office. If working on the train is as productive as elsewhere, then productivity benefits should not flow from having a shorter journey.
- *Period of working:* Business travellers are unlikely to spend all their time working, but this is similar to the normal workplace or when they work from home. Travellers may have a cup of coffee or a meal, but shortening the journey and preventing this does not generate more productive time – unless the coffee or meal would be foregone.

[31] Economic Case for HS2: The Y Network and London – West Midlands', February 2011 para 7.3.2 and 7.3.3 page 51

- *Impediments:* There are impediments for some people and occupations - if you get travel sick it precludes work, if you need privacy or cannot do your specific work on a train (because you are a service engineer), but for 'briefcase travellers' (main business group) this will not generally be a problem. Crowding is an impediment and discussed below.

2.42 Similar issues apply to the value of on board leisure time.

2.43 DfT observe in the consultation that such a change to the assessment framework cannot be made in isolation[32]. However, they are wrong to conclude as they do that HS2 can recover the lost benefits through a reduction in crowding being more valuable. As discussed below, compared to realistic alternatives HS2 actually has greater crowding (58%) compared with even the DfT alternative RP2 (51%). Neither are they recovered by productive gains from modal shift from air or car. Air will shortly support the same technologies that make trains productive, and any benefit to the 7% of travellers from car would be swamped by the 87% of HS2 travellers with much reduced benefits.

2.44 The implications are, notwithstanding, substantial:

- *Overcrowding:* this is not just an issue of minor inconvenience but a productivity issue. It bears on HS2, as the alternative of uprating the existing rail network can be done more quickly and so prevent crowding developing.
- *Full 'costs'*. The 'full costs' of train journeys for business and (to a lesser extent) leisure travellers has therefore been reducing, which will have been a material factor in the recent increases in long distance rail demand, but will not continue indefinitely.
- *Very high speed:* the basis for determining how fast high speed rail should go has been undermined, as this inherently involves trade-offs between journey time savings against capital, operating, climatic and environmental costs. With a materially reduced value of time savings, the previous view of the best balance needs to be reconsidered. The same problem affects the route selection process, as it has presumed the straighter faster route has substantial benefits due to its journey time savings. This may not in fact be the case.

[32] op cit

2.45 DfT's failure to take account of changes in the usefulness of time on-board trains not only invalidates their assessment, but calls into question the choices made about speed and route.

Unit Costs (for Valuing Time Savings)

2.46 The unit costs are an issue because, with increasing rail business travel, the higher numbers of trips require a broader base of travellers to make them. A further near quadrupling in business travel forecast for HS2 between 2008 and 2043 (against a population increase of just 22%) must be expected to have an effect. It becomes unreasonable to assume that such travellers could be composed predominantly from the earnings elite, as DfT's figure does (their figures translate into £70k/a salary in 2009 money).

2.47 A reduction of earnings to the average for 'Managers and Senior Officials'[33] (at £47k) would still put earnings into the top decile, but reduce the level by a third. This overstatement would by itself remove about £7bn from the £44bn benefits, as it affects time savings and reliability.

Unrealistic Comparator

2.48 For most small and medium sized projects that are appraised using Green Book and webtag a 'do minimum' provides a suitable base for assessment purposes. However for major schemes such as HS2 it is no more realistic than a 'do nothing', especially over time scales as long as HS2.

'Do Minimum'

2.49 The assessment of HS2 is done against a 'do minimum' case. This means no improvement to capacity or services beyond those already committed[34]. This is unrealistic as:

- The infrastructure clearly requires renewing over the next 30 years: use of a 'do minimum' implies ignoring all the opportunities for improvements that renewals offer.
- It is questionable whether this approach is consistent with DfT's guidance[35] that envisages addressing anticipatable problems within the 'do minimum' case.

[33] ASHE 2009 (ONS survey) mean gross annual average earnings for occupation code 1 ((£47k)

[34] On WCML this involves extending part of fleet to 11 car, 4 new sets and IEP. It however excludes Evergreen 3, that reduces the Birmingham London journey time on Chiltern Railways, that will win business from WCML, delaying the requirement for any additional WCML capacity.

- Demand/capacity is not managed to prevent for example overcrowding[36]. It is inconceivable that if Government were faced with further substantial increases in demand that it would fail to enable further capacity and permit very high levels of overcrowding.
- High benefits from crowding relief and service frequency improvements are artificially created by the improbable assumption that the crowding would be left unaddressed.
- The appropriate test should be whether HS2 is better than the 'best' alternative.

Best Alternatives

2.50 Development of the *best alternatives* is entirely in line with NATA, and is in fact a requirement[37]. We assume a best alternative to be one that satisfies forecast demand either commercially or with the highest BCR (with evidence for other objectives being poor). However, no 'best alternatives' were developed, as discussed below.

Other Developed Alternatives

2.51 DfT did however have alternatives developed, e.g. Rail Package 2 for WCML, but even then they were not compared with HS2 in the business case. If they had been it would have been clear that there were cheaper, more cost effective alternatives that could be implemented earlier and in stages against developing demand.

2.52 However, DfT go to considerable lengths to present HS2 as having no viable alternatives, by developing transparently sub-optimal options, conducting assessments on dissimilar bases and misrepresenting results. Examples are:

- *Sub-optimal options*: In the analysis of rail alternatives for the consultation[38] there is no attempt to cost effectively provide for the forecast demand, with many of the Y options producing very high levels of capacity that would be seriously underutilised.

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[35] Webtag unit 2.5

[36] '…….Do Minimum matrices for rail (and road) are estimated by uplifting constrained (i.e. ex-post / observed) 2007/8 demand for exogenous influences only, with no attempt to estimate levels of underlying unconstrained demand, or the effects of changes in supply/congestion occurring after 2007.'

[37] WebTag Unit 3.13.1 Guidance on Rail Appraisal, section 3.2.2

[38] 'High Speed Rail Strategic Alternatives to the Y Network', DfT (Atkins), February 2011

An important benefit of improving the existing network is that this can be done quickly and incrementally, preventing economically costly crowding from developing and avoiding the risk inherent in relying on long term forecasts. Incremental implementation is ignored for the assessment. All elements of the options are implemented when HS2 is e.g. 2026.

- *Capacity they produce*: The Secretary of State and Theresa Villiers[39] repeatedly claim that the alternatives e.g. Rail Package 2 (the most favourable alternative DfT had developed to HS2's Phase 1) are not credible[40] or practical[41] It is claimed they cannot provide sufficient capacity to meet demand. But RP2 in fact delivers 151% more capacity (not 50%) when assessed on the same basis as DfT forecast demand (at 102%)[42].

- *Disruption they produce*: Government have repeatedly said that uprating existing lines would cause unacceptable levels of disruption – similar to the previous WCML upgrade despite the completely different scale of change[43]; that the Euston rebuild work on three new platforms for RP2 would be greater than the 8 year rebuild for HS2 (described as 'like open heart surgery on a conscious patient[44]'); there would be greater demolition of houses involved with alternatives (a subsequent FOI[45] confirmed DfT had no such evidence). Work has been done (see Chapter 1 on Optimised Alternative) that shows that forecast demand can be met through rolling stock changes, with little or no interference with railway operations (and the three new Euston platforms are not required). Even with RP2, the disruption would be minor compared to that from HS2

- *Costs*: DfT had RP2 reviewed in 2010/11 to bring it in line with 2011 HS2 assessment. A 41% increase to operating costs for optimism bias was introduced[46], despite not being included in 2010 and extensive practical experience of such costs for WCML (by contrast to HS2 that has

[39] 31 March 2011,(Westminster Hall debate on HS2);

[40] Philip Hammond at 'High Speed Rail Transport Times Conference, 4 November 2010

[41] Response by Philip Hammond to oral question raised by Tony Baldry, MP (28 October 2010)

[42] see 'Briefing note on Demand, Capacity and RP2', April 2011, HS2AA.

[43] 'More capacity on WCML: an Alternative to HS2' Section 5, March 2011,HS2AA

[44] HSR Summit by New Civil Engineer and Infrastructure Journal (reported April 2011 Modern Railways)

[45] Response to FOI request ref: P0007057, 10 December 2010 to B Weston

[46] High Speed 2 Strategic Alternatives Study, London to West Midlands rail alternatives – update of economic appraisal, Atkins, Feb 2011 (9 March, released to DfT website not library late March 2011

consistently attracted the same 41% bias). Rolling stock costs for WCML are also inflated by optimism bias and re-assessment, despite costs being clearly understood from the current Pendolino procurement.

- *'Do minimum' comparator'*: The 2010/11 re-assessment of RP2 changed the basis of the do-minimum comparator (extending all trains to 11 car) from that used for the 'do minimum' comparator for HS2, and hence removing some of the benefit attributed to RP2.
- *Value for money:* In the March 2010 business case, although RP2 had a significantly better BCR (3.63)[47] than HS2 (at 2.4). The 2010 White Paper concealed this by showing figures for 'medium scale rail upgrade package'[48] with rolling stock costs assessed on a different and more expensive basis than HS2. In the 2011 business case the same happened again with RP2 that relates to Phase 1 bundled with the Y alternatives that appear poor value for money reflecting the inappropriateness of options developed.
- DfT take no account of the effect of risk on the expected outcomes, which would favour the short lead time and incremental character of enhancements to the existing network.

2.53 The result of the failure to develop proper alternatives, and to compare HS2 against them, invalidates the economic assessment DfT presents.

Adjusting the Assessment

2.54 It is not practicable to put the assessment of HS2 onto a sound footing, it is only possible to make a number of simple adjustments to illustrate the extent to which the economic case for HS2 may change were more appropriate assumptions made.

2.55 There are also serious doubts about its technical deliverability of the service pattern proposed for the "Y" network is that. This involves 18 trains/hr in the peak, with no services specified to Heathrow or onto HS1. Existing technology cannot deliver 18 trains/hr on HS2, with 15 trains/hr a likely maximum[49]. This is not even discussed in the business case materials. A review of the technical deliverability is given in Chapter 4. However we are not able to adjust the assessment to reflect this.

[47] 'High Speed 2 Strategic Alternatives Study – Strategic Outline Business Case'

[48] Table 2.4 page 51, 'Mid-scale rail upgrade package'

[49] Greengauge21 July 2010 HS2 Interfaces Report

2.56 We assume that the best alternative against which HS2 is assessed is made up of a set of low cost capacity improvements on the existing network, and these improvements will either be commercially viable or have a high BCR. Such an optimised alternative has been developed (see Chapter 1). It is better than the highly sub-optimal alternatives developed by Atkins for DfT e.g. RP2 and others.

2.57 On this basis, the assessment of HS2 should be of the *incremental* benefits that it would be delivered for the *incremental* costs. The incremental costs would be the full costs, and the incremental benefits would be those over the benefits of the alternative.

2.58 The table illustrates what this might look like for the Y (and the BCR effect only for phase 1 at foot of the table), with the basis of the benefits adjustments in Table 2.5. It shows:

- Adjusting the benefits only, the BCR falls from 2.2/2.6 to 0.9/1.1, and together with the indicative demand forecast, it becomes just 0.3/0.5 i.e. a 'poor' value for money project.

TABLE 2.3 FEBRUARY 2011 DFT FIGURES ADJUSTED FOR REVISIONS TO BENEFITS AND DEMAND

All £Bn NPV at 2009 Prices	DfT Feb 2011 Figures (Full Y)			Revisions to Benefits (Full Y)			Including Revisions to Demand
	Business	Leisure/ Commuting	Total	Business	Leisure/ Commuting	Total	+81% (not 209%)
Rail: Journey Time Saving	14.1	4.3	18.4	0.9	2.2	3.1	1.9
Improved Reliability	4.4	1.3	5.7	3.0#	1.3#	4.2	2.6
Reduced Crowding	1.5	3.6	5.1	0	0	0	0
Waiting Time*	2.0	2.0	4.0	1.3	2.0	3.3	2.0
Other Impacts e.g. Access	0.5	0.6	1.2	0.4	0.6	1.0	0.6
Released Capacity Benefits			1.3			1.3	1.3
Road Decongestion	2.7	1.3	4.0	2.7	1.3	4.0	2.4
HS1 Link			0.4			0.4	0.2
Total Transport User	**25.2**	**13.1**	**39.9**	**8.3**	**7.3**	**17.2**	**11.0**
Reduced Tax			-2.7			-2.7	-1.6
Net Transport Benefits			**37.3**			**14.6**	**9.4**
WEI - Agglomeration			4.1			4.1	4.1
WEI – Imperfect Competition			2.4			0.8	0.5
Total WEI			6.5			4.9	4.6
Total Net Benefits incl WEI			**43.8**			**19.5**	**14.0**
Additional Revenue			**27.2**			**27.2**	**16.6**
Capital and Operating Cost			**44.3**			**44.3**	**44.3**
Net Subsidy			**17.1**			**17.1**	**27.7**
Benefit Cost Ratio (excl WEI)			**2.2**			**0.9**	**0.3**
Benefit Cost Ratio (incl WEI)			**2.6**			**1.1**	**0.5**
	DfT Feb 2011 Figures Phase1			**Revisions to Benefits (Phase1)**			**Including Demand**
Benefit Cost Ratio (excl WEI)			**1.6**			**0.7**	**0.3**
Benefit Cost Ratio (incl WEI)			**2.0**			**1.0**	**0.5**

 # Issues about achievability of 18 trains/hr are likely to eliminate reliability benefits, although no reduction made to reflect this. Adjustment made in sensitivity

** Waiting time has not been reduced to reflect that the realistic comparator may have a higher train frequency than the 'do minimum', as Rail Package 2 does. Purely rolling stock based improvements would not reduce waiting time benefits*

2.59 Table 2.4 considers a 50% sensitivity test on both benefits and demand (by adjusting journey time savings and crowding benefits by a half, assuming a worse reliability, and adjusting the indicative demand forecast). The basis is shown in Table 2.5.

TABLE 2.4 FULL "Y" NETWORK FIGURES ADJUSTED FOR REVISIONS TO BENEFITS AND DEMAND - SENSITIVITIES

All £Bn NPV at 2009 Prices	**Revisions to Benefits (Full Y) (50% Sensitivity)**			**Including Demand (50% Sensitivity)**
	Business	**Leisure/ Commuting**	**Total**	**+139% (Not 209%)**
Rail: Journey Time Saving	4.7	3.2	7.9	6.4
Improved Reliability	1.5	0.6	2.1	1.7
Reduced Crowding	0.7	1.8	2.5	2.0
Waiting Time*	1.3	2.0	3.3	2.7
Other Impacts E.G. Access	0.4	0.6	0.9	0.8
Released Capacity Benefits			1.3	1.3
Road Decongestion	2.7	1.3	4.0	2.4
HS1 Link			0.4	0.3
Total Transport User	11.3	9.6	22.5	20.4
Reduced Tax			-2.7	-2.1
Net Transport Benefits			**19.8**	**18.3**
WEI - Agglomeration			4.1	4.1
WEI – Imperfect Competition			1.0	0.8
Total WEI			5.2	5.0
Total Net Benefits incl WEI			**25.0**	**23.2**
Additional Revenue			**27.2**	**21.9**
Capital and Operating Cost			**44.3**	**44.3**
Net Subsidy			**17.1**	**22.4**
Benefit Cost Ratio (excl WEI)			**1.2**	**0.8**
Benefit Cost Ratio (incl WEI)			**1.5**	**1.0**
	Revisions To Benefits (Phase1 Only)			**Including Demand**
Benefit Cost Ratio (excl WEI)			**0.9**	**0.6**
Benefit Cost Ratio (incl WEI)			**1.2**	**0.8**

2.60 The table shows that for the full "Y" even with the 50% sensitivity, the BCR on benefit changes is 1.2/1.5 and together with demand, only just reaches 1.0 (compared to DfT's Feb 2011 result of 2.6 including WEI).

TABLE 2.5 SUMMARY OF BENEFITS ADJUSTMENTS

	WW Benefits Adjustments	**50% Sensitivity**	**Demand Effect**
1. Business On-Board Journey Time Saving	Zero Productivity Value – Reduced To Half DfT's Leisure Value	Half DfT Productivity Value	Pro Rata to Demand
2. Other On-Board Journey Time Saving	Half DfT Value	¾ DfT Value	Pro Rata to Demand
3. Reliability	DfT Percentage	Half DfT Value	Pro Rata to Demand
4. Crowding	Zero	Half DfT Value	Pro Rata to Demand
5. Waiting Time	DfT Value	DfT Value	Pro Rata to Demand
6. Other Rail User Impacts	DfT Value	DfT Value	Pro Rata to Demand
7. Released Capacity Benefits	DfT Value	DfT Value	Unaffected
8. HS1 Benefit	DfT Value	DfT Value	Pro Rata to Demand
9. WEI Agglomeration	DfT Value	DfT Value	Unaffected
10. WEI Imperfect Competition	DfT Percentage value	DfT Percentage value	Pro Rata to Demand
11. Revenue	DfT Value	DfT Value	Pro Rata to Demand
12. Costs	DfT Value	DfT Value	Unaffected
13. Business Time Unit Value (Affects Items 1,3, 5, 6, 10)	2/3 of DfT Value	2/3 of DfT Value	Unaffected