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Agenda

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Not in my kitchen: the economics of HS2

HS2, a high-speed rail link between London and Birmingham, has been given approval by the UK Secretary of State for Transport, despite ongoing debate about the value for money (VfM) of the project. Why might one go ahead with a project that appears to have lower VfM than that of strategic alternatives? What further evidence would make the case more compelling?

In January 2012 the Secretary of State (SoS) for Transport gave approval for HS2—a high-speed rail link between London and the West Midlands, and the first phase of the UK government's high-speed rail programme. The announcement was greeted by mixed but strong reactions, with proponents claiming that the scheme is needed to bring Great Britain's transport network into the 21st century, and opponents claiming that it is poor value for money (VfM) and will do irreparable damage to the countryside (and some unfortunate people's kitchens).

The proponents' claims are focused predominately on the strategic case for HS2 (whether or not it is needed, either now or in the future), as was the SoS's approval decision, whereas opponents have tended to focus more narrowly on the economic case (an assessment of the impacts and the resulting VfM). Although there are genuine debates about the components of the economic case, much of the overall debate can also be attributed to the gap between the strategic and economic cases. This article investigates the debate around the VfM of the scheme, and extends it to consider the strategic elements of the case for HS2 that are not captured by the conventional economic appraisal.

The economic case

Underlying the decision is an economic case constructed by the UK Department for Transport (DfT) and High Speed 2 Ltd (HS2 Ltd, the company set up by the government to consider the case for a new high-speed rail network in the UK).[1] The case provides an assessment of the costs and, where possible, the monetised benefits of the scheme. Table 1 below shows this quantification.

The costs of the scheme include those relating to the construction phase (network and rolling stock) and the ongoing operation of the network and its services, and amount to £27.4 billion in net present value (NPV) terms. Some of these costs will be covered by rail users, who are expected to provide £13.9 billion through additional fares revenue stimulated by the project. On this basis, clearly the scheme cannot

Table 1 Economic case for HS2 (£ billion net present value, NPV)

		HS2 (London–West Midlands)	Y network (London–West Midlands, with extensions to Manchester and Leeds)
a	Capital cost	18.8	36.4
b	Operating cost	8.6	21.7
c	Increase in rail revenue	13.9	31.8–34.0
d = (a + b – c)	Total cost to government	13.5	24.1–26.3
e	Economic benefits	19.0	41.4–46.9
f	Wider economic impacts (WEIs)	4.1	5.7–12.3
g = e + f	Total economic benefits	23.1	47.1–59.2
h = g/d	Benefit–cost ratio (BCR) (including WEIs)	1.7	1.8–2.5

Source: Based on DfT and HS2 Ltd (2012), 'Economic Case for HS2', January, Table 1.

be funded as a purely commercial exercise and the outstanding balance of £13.5 billion will be provided by government funds.

Quantifying the benefits is less straightforward, since these do not arise in direct cash terms, so benefits such as time savings for passengers have to be monetised as closely as possible. The sources of the benefits are direct transport user impacts (such as time savings from faster journeys), wider economic impacts (WEIs, such as agglomeration), and greenhouse gas reductions. The WEIs are fairly intangible and monetisation is difficult, so, given this uncertainty, DfT/HS2 Ltd have reported values both excluding and including WEIs.

Some opponents of HS2 have disputed how some of these benefits have been monetised. The largest contributor to these benefits is the value of time savings, which opponents have claimed is overstated. The premise of valuing time savings is that reducing the duration of a given journey frees up more time for an individual to spend elsewhere—ie, the notion being that passengers do not choose to travel for the sake of it, and that their journey time is essentially a cost to them.

The value of these time savings depends on the assumption on the use of travel time. The conventional DfT appraisal assumes that time spent travelling is not productive, and thus that all time saved is valuable. On the face of it this seems like an unrealistic assumption, given that casual observation on any train journey would find some evidence of passengers working. Indeed, the DfT's response to a 2011 Transport Select Committee Inquiry acknowledged that some travel time may be used productively.[2]

Given the importance of time savings in the economic case for HS2, it would initially seem that changing this assumption would have a significant effect on the case for HS2. However, the DfT/HS2 have argued that, in assessing the overall impact, there are a number of effects that at least partially offset each other. Assuming that travel time is productive affects the value not only of travel time savings, but also of reductions in crowding and any shift between different modes of transport brought about by HS2.

However, putting methodological issues to one side and taking HS2's case as a given, the benefit–cost ratio (BCR) for the first phase of HS2 is estimated to be 1.7: 'medium VfM' according to the DfT's own categorisation. In addition to this single estimate, DfT/HS2 have conducted some sensitivity modelling to analyse how the BCR might differ under various assumptions. The outcome of this suggests that 14% of the scenarios are high VfM, 43% are medium VfM, 32% are low VfM, and 12% are poor VfM. This raises the question of why the government might approve a scheme with a relatively modest BCR and a reasonable possibility that it might turn out to be poor VfM.

Why might one opt for a scheme with relatively modest VfM?

Many opponents of HS2 suggest that there are strategic alternatives that involve upgrades to the existing lines, which would provide better VfM and still deliver extra capacity.

Table 2 puts the modest BCR of HS2 into context when compared with these strategic alternatives—ie, packages of enhancements to the conventional network. It shows that the alternatives could indeed

Table 2 Scale, costs and benefits

		Extra capacity	Costs	Benefits (excl. WEIs)	BCR (excl. WEIs)	Benefits (incl. WEIs)	BCR (incl. WEIs)
		%	£ billion NPV	£ billion NPV		£ billion NPV	
London–West Midlands							
HS2		>100	14	19	1.4	23.1	1.7
Strategic alternatives	'RP2'	56	2	8	4.0	9	4.7
	'RP2A'	56	3	7	2.7	8	3.1
	'51M'	56	1	6	5.2	7	6.1
Y network							
HS2		>100	25	41–47	1.6–1.9	47–59	1.8–2.5
Strategic alternatives	'Scenario B'	56/133/114	10	14	1.4	16	1.6

Note: 'RP2', 'RP2A', '51M' and 'Scenario B' are names given to conventional alternatives to high-speed rail. These strategic alternatives are packages of enhancements to the conventional network rather than new conventional lines. The alternatives to HS2 are primarily upgrades to the West Coast Main Line, while the alternative to the Y network also includes upgrades to the East Coast Main Line.
Source: Atkins (2012), 'High Speed Rail Strategic Alternatives Study Update Following Consultation', January.

generally deliver much better VfM. For the London–West Midlands phase they have BCRs of three to six, which are closer to the values of other schemes that are thought to be good VfM.

However, both the costs and the benefits of the strategic alternatives are much smaller than for HS2. The absolute value of the net benefits they provide is comparable to HS2 for London–West Midlands, which explains why the BCRs are higher.

It is also important to examine a similar situation in the Y network, which is a proposed extension of HS2 to Manchester and Leeds. However, the BCRs for the strategic alternatives to the Y network are estimated to be much smaller than the high-speed option. Although the analysis of the Y network extension is much less advanced, the proposition that the case for the first phase is predicated on later extensions is likely to be well-founded, given that high-speed rail is more competitive over longer distances.

The current capacity constraints on the West Coast Main Line are not really disputed. HS2 will create more long-distance capacity, but it is unclear how the capacity enhancements delivered by the classic rail options (56% extra), combined with the recent upgrade and current proposals for 25% extra seats in the new West Coast Main Line franchise, relate to the projected increase in demand (around 100% by 2043).

In considering the case for HS2, it is necessary to take into account comparisons of VfM across transport as a whole, and more widely across government. The latter is not straightforward, partly due to the difficulty of calculating VfM for some expenditures—for example, it is difficult to quantify the benefit of defence spending. However, there is a great deal of evidence on VfM for other transport schemes, and it is clear that, in the absence of currently unidentified wider benefits, HS2 does not score strongly. Although there is an expectation that transport funds would be available for HS2 after the completion of Crossrail (a new East–West rail project across London), it should not be taken as a given that funds are available for transport, given that a spending review could determine that those funds would be better used if allocated to other government departments.

In summary, on the basis of the economic case it does not seem irrefutable that HS2 is the best use of public funds. However, this needs to be set in the context of a broader strategic case. The government's 2011 consultation document stated that the 'BCR is important but it is not, by any means, the whole story'.[3] The key question is how to evaluate the contribution of a high-speed rail network in 'supporting economic growth' which, to the extent that it is significant (which many opponents dispute), is not readily captured by current appraisal methods.

What is it about the extra capacity and performance generated by HS2 that appraisal cannot capture?

The strategic case takes account of non-monetisable benefits and other wider considerations that are not adequately captured in the economic case. The standard approach to appraisal is to monetise as many impacts as possible and, following this, to take into account other non-monetised factors such as the impact on sustainability. In the case of HS2:

> The Government believes that high speed rail would deliver significant non-monetised benefits, such as its contribution to job creation and regeneration and its potential to promote sustainable and balanced economic growth. It is these non-monetised benefits which underpin the strategic case for high speed rail.[4]

Supporting the economy

Much appraisal is designed for schemes that do not have fundamental effects on connectivity and may not capture other features where the project may transform the functioning of the wider economy. A key part of the original case was the expectation that HS2 would generate WEIs that were inherently intangible and difficult to capture.

> The Government believes that high speed rail can play an important role in promoting valuable strategic change in the economic geography of Britain, supporting sustainable long-term growth and reducing regional disparities.[5]

Perhaps the most direct of these strategic factors is the ability of the first phase to unlock the potential from later phases. Simply constructing the Y network extensions substantially improves the BCR of the overall HS2 project. Extending this to a potentially longer or wider network, should this be warranted by the growth of demand, could increase the BCR further. These extensions could be to Edinburgh and Glasgow, or to other new lines such as a western line to South Wales. These schemes might benefit from the knowledge and skills gained from constructing the first lines or from connecting to existing high-speed hubs.

Option values

How should this potential for an economically beneficial wider high-speed network be accounted for, and to what extent is it dependent on the future growth in demand? These sorts of options for future schemes

have a value. It may even be possible to estimate this value by using techniques borrowed from financial options theory. We know that demand forecasts are uncertain, and so the more flexibility that is built into the proposals to allow subsequent stages of the project to be tailored more precisely to future growth out-turns, the greater the option values will be. Extending the analysis in this way could change the estimated benefits of HS2.

Real options enable firms and institutions to be flexible in making their financing, operational and investment decisions, depending on how outcomes for key contextual variables differ from a firm's expectations. It is useful to make allowance for options to delay, expand or abandon a project, since they allow a government or firm greater flexibility in operations and investment. In the case of HS2, building the first phase gives the government the option to implement the second phase. It would choose to do so if the likely flows of net social benefits associated with implementing the second phase exceed the cost.

Asset life

One other factor not taken into account in the current economic case for HS2 is the mismatch between the asset life (which is uncertain, but could be 100 years or more) and the appraisal horizon (which is 60 years as per standard guidance). This mismatch could be accounted for in two possible ways: by extending the appraisal horizon or by allowing for a residual value at the end of 60 years. These approaches are conceptually identical and, if included, would be likely to increase the benefits of the project. They are not currently included, in line with the DfT's current guidance, which states that residual values are not taken into account for projects with indefinite lives.[6] However, regardless of the approach taken, discounting will make the impact of any changes to the appraisal beyond 60 years relatively small.

Conclusion

Although there are some challenges and debate surrounding specific issues in the appraisal of HS2, the types of analysis that have been conducted (detailed cost–benefit analysis and sensitivity testing on key variables) have certainly improved the information available to inform the decision-making process.

The BCRs, as currently calculated, suggest that the high-speed rail programme has a net benefit. Hence, in a world of unconstrained public funds, HS2 would be an economically sensible project to undertake—and would be so at any level where the BCR was greater than unity. However, given that the government must choose carefully how to spend its limited funds, and given that the high-speed rail projects do not appear to be exceptionally good VfM, is it clear that HS2 should be a priority project on the basis of this economic case? The case for HS2 relies both on extensions beyond the London–West Midlands section, and on the wider strategic case suggesting (but not demonstrating) enhanced benefits.

There are also other relevant strategic factors that are not captured in the pure economic appraisal. Conventional appraisal does not capture the potential effects of high-speed rail on the spatial distribution of economic activity, such as regeneration of regions and locations currently with weaker economic performance, potentially addressing the 'north/south divide'.

Taking all these other factors into account, it cannot be ruled out that the overall value of the scheme may exceed that put forward in the economic case. However, the strategic case relies a good deal on aspiration and assertion, suggesting substantial wider impacts. This would benefit from further evidence.

[1] Department for Transport and High Speed 2 Ltd (2012), 'Economic Case for HS2', January.
[2] Department for Transport (2011), 'Response to Transport Select Committee Questions', further written evidence from the Department for Transport (HSR 167A).
[3] Department for Transport (2011), 'High Speed Rail: Investing in Britain's Future: Consultation', February, p. 14.
[4] Ibid., p. 14.
[5] Ibid., p. 12.
[6] Department for Transport (2011), 'TAG Unit 3.5.4: Cost Benefit Analysis', April, section 5.3.

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