STEP CHANGE TRANSPORT IMPROVEMENTS: AN ASSESSMENT OF THE POTENTIAL FOR 'STEP CHANGE' TRANSPORT IMPROVEMENTS TO GENERATE WIDER ECONOMIC BENEFITS

MICHAEL MANN[1]

[1] The paper has benefited from input by the Eddington Academic Friends Group and from Professor Roger Vickerman. However, the findings of this paper are those of the author and do not necessarily represent the views of those who provided input, or of DFT.

EXECUTIVE SUMMARY

Introduction

1. This paper examines the scale of wider economic benefits offered by 'step change' transport measures; that is, transport policies or schemes which reduce the speed or cost of connectivity and in so doing create changes to economic geography that could deliver benefits in addition to those direct economic benefits captured in standard scheme appraisal . It considers the potential for such improvements to generate changes in the economic geography of the UK, resulting in positive economic impacts at the national and regional level*s*. In particular, it considers the potential for new high speed rail links to generate wider economic benefits.

2. The approach adopted is as follows:

   - **Review of literature**. In addition to studies appraising and evaluating major transport improvements in the UK and overseas, relevant literature on the role of transport infrastructure and improved accessibility in contributing to economic benefits has been reviewed.

   - **Identification of potential step changes appropriate to the UK.** This draws on the findings of the literature, analysis already done for the Eddington Study and examples of recent step change transport improvements. It goes on to consider the case for such improvements at the strategic level, distinguishing between type of service (e.g. commuter, inter-urban, international) and including some location specific findings

   - **A strategic assessment of the potential economic and environmental benefits offered by a high speed rail line in the UK.** This considers the case for high speed rail links between UK cities, drawing on evidence overseas, in particular the experience of the TGV in France and several UK studies considering the potential for such links.

Conclusions from the literature review

3. The key messages emerging from the study are summarised below.

   a. In most cases the uplift to the results of conventional appraisal from including wider economic benefits and transport improvements will be relatively modest, but there are some exceptions, particularly for schemes targeted at relieving congestion in agglomerated areas.

   b. In economies such as the UK with well developed transport infrastructure*, s*chemes designed to tackle congestion problems and transport bottlenecks are likely to offer larger economic benefits than schemes targeted at creating new opportunities where demand doesn't currently exist.

   c. There is little appraisal or ex-post evaluation evidence on the extent to which transport policies and schemes have delivered national economic benefits. The vast majority of studies concentrate on the local or regional distributional effects, without distinguishing how far these are additional at the national level. There is a difference between local and national benefits: if local benefits arise from displacing economic activity from elsewhere in the economy then net national benefits could be quite

limited. Only where new or increased agglomeration impacts or trade linkages are opened up will there be national benefits. If a scheme reduces the size of an agglomeration by dispersing activity then there is scope for negative benefits.

d. There is conflicting evidence on the two-way road argument on the impact of improving links between core areas and other regions, with some studies pointing to benefits to what the literature calls peripheral areas from improved accessibility, but others pointing to the risks of this being offset by economic activity being sucked into core areas. This concern underpins the conclusion by the Ultraspeed promoters that the cities of the North should be linked together through a high speed rail link before they are connected to Birmingham and London.

e. Most studies focus on regional and distributional impacts of transport improvements, with limited evidence on whether they result in net benefits at the national level. If economic activity is displaced from elsewhere in the economy, net national benefits could be quite limited.

f. There is evidence that for business travel between cities rail become competitive with air once journey times are reduced to around 2 ½ hours , but the experience of the TGV identifies limited overall stimulation of business travel market and little evidence of wider economic benefits not captured through standard appraisal techniques.

g. Although there may be wider benefits from major projects aimed at relieving congestion problems, e.g. from attracting FDI, these are hard to attribute and measure. With the possible exception of schemes in highly agglomerated areas, the wider economic impact uplift is unlikely to make the difference between a scheme with a mediocre benefit cost ratio and one with a very good one.

Conclusions in the potential for step change measures to deliver wider economic benefits in the UK

4. These are as follows:

a. Improvements to commuter services offer the prospect of wider benefits from 'speeding up' the development of agglomerations to provide external benefits, extending labour catchment areas and agglomeration externalities. Though there is little hard evidence on the circumstances which need to be in place to provide the benefits of an extending labour market catchment.

b. These benefits are likely to apply most strongly to transport links into and within London, given its strong comparative advantage globally as a finance and business services cluster and strong agglomeration benefits. Good transport links are important not only in reducing congestion and speeding up journeys to work, but also in facilitating business travel within London, trips to airports and the efficient distribution of goods.

c. Given London's strong comparative advantage as a business and financial services cluster and the fact that it is competing primarily with overseas cities such as New York and Tokyo, it is unlikely that transport improvements that have the effect of broadening its labour catchment area and strengthening agglomeration benefits will be at the expense of other parts of the UK. However to the extent that London is competing for skilled labour with other UK cities, some displacement of economic activity is possible.

d. Agglomeration benefits may also arise from improved transport links into and between other agglomerated cities, particularly where they are within close commuting distance to each other. This applies most strongly to where road links are congested and rail journey times slow.

e. Any solutions providing fixed infrastructure are inherently less flexible in response to external and policy driven risks than other measures such as liberalisation of markets and pricing policies to better reflect external costs

Conclusions from a strategic assessment of the potential economic benefits offered by high speed rail in the UK

5. These are as follows:

a. Additional benefits from high speed rail schemes intended to provide a step change in connectivity between UK cities are likely to be modest for three reasons

- Firstly, the UK's compact economic geography means that most of our cities are already closer together relative to many other European countries.

- Secondly, for those economically important connections that are more distant (eg London to Glasgow and Edinburgh), air services already provide fast, frequent, relatively low cost services serving business markets. The introduction of some form of pricing to reflect the climate change costs of aviation would be expected to have a relatively small impact on price, and would not significantly affect aviation's competitive position relative to rail.

- Thirdly, demand for inter-city business travel in the UK is surprisingly low, and too small to form the bedrock of an economic case for a high speed line.

b. A high speed line may offer additional benefits from releasing capacity constraints on existing routes with heavy commuter and freight demand in agglomerations, but this proposal for relieving capacity constraints would need to be compared with the value for money (vfm) of alternative rail and other modal options for relieving congestion on particular economically important routes.

c. Uncertainty about future demand forecasts and costs is likely to present a significant risk to the economic returns and commercial viability of a high speed line.

d. The extent to which a high speed rail line could offer a cost-effective way of reducing carbon emissions has not been examined by this paper. This would be heavily dependent upon i) demand for services along the entire route and throughout the day and ii) the speed of the train and iii) load factors achieved.

e. Given the very large costs involved in constructing and operating a high speed line (with, for example, capital costs of a comprehensive network estimated at £33bn by the Atkins study) and the risks involved, Government will find it difficult to ensure that it offered better value for

money in meeting economic, environmental and other policy objectives than alternative ways of spending that money.

Conclusions

6. Transformational economic benefits are unlikely to arise from a north-south high speed line because:

    a. UK cities are already well connected: it is hard to identify any promising examples of routes not served by air where day return trips are not already feasible using existing rail services.

    b. Agglomeration effects typically extend over 45 –60 min door to door travel time – even the fastest of HSLs to the North of England and Scotland are unlikely to provide such benefits.

7. Starting with an analysis of the problems facing the UK economy, and the potential for wider economic impacts, to the extent that there is a case for HSL it would be most likely to reside in:

    - freeing up existing/forthcoming capacity constraints on commuter links, particularly into and within London;

OR

    - by extending the labour market of London and the South East. The latter effect would, given the state of existing knowledge, be fairly speculative and highly dependent on the particular options under consideration. The literature argues convincingly that higher returns will typically come from tackling existing and known congestion bottlenecks.

8. High speed rail options or other new build infrastructure (eg new commuter or freight lines) could help tackling such problems by freeing up capacity for commuter services, but this would require very large sums of money. Its value for money would need to be compared with the full range of alternative options, including incremental improvements to existing transport infrastructure and services.

AN ASSESSMENT OF THE POTENTIAL FOR 'STEP CHANGE' TRANSPORT IMPROVEMENTS TO GENERATE WIDER ECONOMIC BENEFITS

I. Objectives of the paper

1. The Eddington team has been asked to consider the long term links between transport improvements and the UK's productivity and growth performance. The particular focus of this paper is on 'step change' policies; that is, transport improvements which offer a step change in the speed or cost of connectivity, and through doing so, have the potential to lead to changes to economic geography that have impacts on the UK economy beyond those direct economic impacts captured in conventional appraisal techniques. The intention is to inform thinking in prioritising which transport links, or policies more generally, might be expected to be of greatest benefit to the economy.

2. Of particular interest is the potential for new high speed rail links to deliver wider economic benefits beyond conventional time saving benefits.

II. Approach

3. The approach adopted has been to draw on the following inputs to identify transport outcomes and potential step change improvements capable of delivering these outcomes in the UK:

- The findings of the literature review of appraisal and evaluation evidence;
- Examples of past step changes since the 1960's that have opened up new opportunities;
- The economic geography analysis already done for the Eddington study;
- Evidence on key thresholds for travelling times

4. The literature review focuses on studies of major transport improvements which, unlike smaller projects resulting in marginal changes in travel time, cost and capacity, have the potential to change economic geography by, for example, changing the location of activity, increasing labour market catchment areas or by increasing agglomeration effects in a particular area.

5. As well as including case studies of appraisal and ex-post evaluation evidence on the wider economic impacts of specific links or policies, more general relevant literature on the role of transport infrastructure and accessibility in contributing to development benefits has been reviewed. Key findings, messages and inferences that can be drawn from these studies are presented, setting out areas of broad consensus and noting where there is conflicting evidence and gaps in the evidence base. In particular the applicability of findings of overseas schemes to the circumstances of the UK is considered. It goes on to consider the implications from the literature on the scale and source of economic impacts not included in standard transport appraisal for the appraisal of major step change schemes.

6. The case for potential step change policies or schemes is set out at the strategic level, together with an indication of the source and likely scale of any wider economic development impacts at the regional and national levels. The focus is on step changes that open up new opportunities and create new demand, as opposed to schemes whose principle objectives are

to provide additional capacity in response to increased demand, thereby alleviating transport bottlenecks. Key risks that might compromise the success of step change improvements and the flexibility of these measures in response to external and policy driven risks are also identified.

III Potential Sources of Wider Economic Benefits

7. Wider benefits contributing to the impact of transport on productivity and GDP have been considered by the Standing Advisory Committee on Trunk Road Assessment (SACTRA), various academic studies and, more recently, in a paper by DfT (2005), "Transport, Wider Economic Benefits and Impacts on GDP," where a fuller discussion can be found. The potential economic benefits missing from conventional appraisal are identified as agglomeration externalities from interactions between co-located firms, competition and trade benefits, foreign direct investment (FDI) and additional tax revenues from higher employment and productivity. The other major element of benefit arising from reduced transport costs is time and reliability savings to businesses, which is already included in standard appraisals (although reliability is not always fully captured). An important additional element of wider benefit, which contributes to GDP but not welfare, arises from labour market effects from increased labour supply from more people entering the labour market or working longer hours or from people moving to more productive jobs.

IV Literature review

8. The key findings emerging from the literature review are summarised in bullet point format in annexes 1 and 2. These cut the cake in two ways; by issue and by status of the evidence. Annex 3 provides a summary of the findings of the modelling evidence and ex ante studies while annex 4 summarises the findings of ex post evaluation studies.

SACTRA

9. The starting point for much of the underlying thinking on the way in which transport contributes the growth and efficiency of the economy is provided by SACTRA (1999). Using simulation modelling of transport effects in the context of imperfect competition, this report considers the scale and source of additional benefits not captured by standard cost benefit analysis (CBA) techniques. The Committee recognised that imperfections in competition in transport and transport using sectors may give rise to additional benefits not captured in conventional cost benefit analysis, but came to the view that these were likely to be quite small relative to those involved in estimating conventional transport benefits. For the typical transport scheme, a possible uplift of 6% was suggested but a range of between 3 and 30% was reported in the evidence submitted to SACTRA, reflecting the variance and lack of predictability in the ratio.

10. The main sources of additional benefit identified by SACTRA arose from reducing imperfections in labour and product markets through and from facilitating scale economies in the process of urbanisation (agglomeration).

Linkages Between Transport and Economic Growth

11. Both SACTRA and other literature, e.g. Graham (2005), Venables (2004) and Vickerman (1992) stress the importance of linkages between transport and other markets. In particular:

- Potential for improvements to commuter networks to facilitate agglomeration benefits in urban areas.

- Links between transport and labour markets can occur where transport improvements lead to better functioning of labour markets. These arise through better transport accessibility widening the area of job search, thus adding to the pool of labour available to companies.

- Links between labour and housing markets. Inward migration to an area benefiting from transport improvements will exert upward pressure on local house prices where there are constraints on the supply of housing. In these circumstances, benefits from a reduction in the generalised cost of commuting will be captured in the housing market. Housing market flexibility is important in allowing transport improvements to support the growth of agglomerations.

- Links between transport and land use, particularly step change policies which give rise to changes in economic geography. Transport can facilitate development of clusters e.g. along the M4 corridor. Good commuter networks are essential for service based clusters while access to good surface port and airport transport is critical for industrial clusters.

- Links between transport and the attraction of capital through foreign direct investment (FDI), which can lead to supply side benefits. Transport infrastructure can be an important driver in influencing business location, but it is notoriously difficult to identify tipping points.

12. One important theme emerging from the literature is that new or improved transport links can be enablers of growth but can not, by themselves, generate wider development impacts. The mechanisms and linkages between the transport link in question and other markets are critical to the delivery of wider development impacts. For example, a new transport link on its own is unlikely to improve local productivity and growth if local people do not have the skills and qualifications needed by prospective employers. This means that local economic conditions and links with the local transport network will influence the extent to which a major transport project or policy results in local and national economic benefits. This finding emerges from case study of the TGV in France (Bruyelle and Thomas, 1994, Greengauge 21 cities report, 2006) and from the work by Vickerman (1992), Vickerman, Spiekermann and Wegener (1997) on links between transport accessibility and regional development.

Capacity Constraints

13. There is general agreement amongst commentators that the scope for wider transport economic development impacts is relatively modest in economies with well developed transport infrastructure e.g. SACTRA (1999), Roger Tym & Partners (2002). However, there is also consensus in the literature e.g. Atkins (2003), Oosterhaven and Knaap (2000), Steer Davies and Gleave (2004), Vickerman (1992), Vickerman, Spiekermann and Wegener (1997) that significant benefits can arise from schemes that relieve major transport bottlenecks. This means that schemes not targeted at relieving capacity constraints will tend to offer smaller

benefits by comparison. This has significant implications for Government spending priorities in a world of limited public resources. In practice, some schemes such as proposed new high speed rail infrastructure offer both improvements and additional capacity. In these cases it will be necessary to unbundle these elements to identify the incremental benefits arising from higher speeds.

The Two-Way Road Argument

14. There is conflicting evidence on the impact of improved transport links between core and peripheral areas. The two-way road argument suggests that there are a number of ways in which reductions in transport costs could encourage improved economic performance, and that improved accessibility between two regions or two cities may benefit one of them to the disbenefits of the other (Roger Tym, 2002). With the UK economy dominated by London, some commentators eg CURDS in their report for Ultraspeed (2004) point to the risk that improved transport connectivity between cities could be disproportionately appropriated by London, given its dominant starting position. Some modelling work for the Netherlands, Japan and Korea point to benefits accruing to peripheral areas from improved accessibility to the core. However other work, notably by SACTRA (1999) and Vickerman, Spiekermann and Wegener (1997), and in the UK studies on new high speed rail infrastructure by Roger Tym & Partners (2002) and Ultraspeed (2004), point to the risks of core regions benefiting from improved accessibility more than peripheral regions, thus widening regional disparities. SACTRA commented that this disparity could occur between cities, regions or countries. One aspect of this issue is at the local level where within regions benefiting from new transport links there are frequently winners and losers, with cities plugged into new links such as Lille benefiting at the expense of more remote areas.

National or Regional Benefits

15. There is a distinction between transport improvements that give rise to social and distributional benefits at the local and regional levels and those which can potentially contribute at the national level to GDP and productivity. In general, national economic benefits will only arise where agglomeration impacts or trade linkages are opened up. Displacement of economic activity will occur when benefits to a city or region from transport improvements occur at the expense of outlying areas or other parts of the country. One exception to this, where benefits can arise at the national level, is where FDI is attracted which would otherwise have gone abroad. Most studies are limited to assessing impacts at the regional and local levels and tend to be silent on whether benefits can arise at the national level. This often means that it is necessary to attempt to make inferences on whether economic benefits simply arise at the level of an individual region or city within a zero sum gain, or whether net benefits can arise at the national level.

16. There are potential exceptions to this, and a small number of studies have considered national benefits from improved transport infrastructure. Most notable is the work by Oosterhaven and Elhorst (2003) on modelling wider benefits of high speed rail infrastructure in the Netherlands. This concluded that peripheral areas would benefit from improved access to the core of the country but that improved access between core cities would give rise to disbenefits at the national level through exacerbating already overheated labour markets. However, differences in appraisal methods, some questionable assumptions, particularly regarding the workings of the labour market, and economic geography make it difficult to transfer these findings to the UK.

17. One area where it is possible to make inferences is with transport improvements likely to benefit the London economy. Evidence from the DfT paper, published in 2005, “Transport appraisal, wider economic benefits and impacts on GDP” and GLA Economics (2005) suggests that London's growth benefits the rest of the UK rather than happening at its

expense. The GLA study notes that London has not achieved rapid growth in recent years by sucking in increasing amounts of labour from the rest of the UK and that the structure of the London economy is very different from that of other regions.

18. London has a disproportionate concentration of financial and business services in which it is a pre-eminent global player and a correspondingly smaller (and shrinking) manufacturing centre. This means that both London and the rest of the economy are able to benefit mutually from inter-regional trade. The concentration of financial and business services has strengthened agglomeration benefits, resulting in superior productivity performance relative to other parts of the UK. The existence of high land and property values, although in part reflecting planning constraints, is a signal of large foregone agglomeration benefits. These will need to be compared against any of offsetting congestion and environmental costs, likely to be higher than in other locations outside London and the South East. However in these circumstances it seems likely that measures to improve transport accessibility into and within London will give rise to benefits at the national level, and not be at the expense of the rest of the UK.

High Speed Rail Development

19. The bulk of the case studies in the literature consider the impact of high speed rail schemes. The experience of the TGV in France and the Shinkansen in Japan have demonstrated that a high speed rail service can influence the development of urban centres. A number of studies have reported evidence of new development clustering around major rail terminals, resulting in significant local increases in commercial and business activity.

20. The Shinkansen appears to have resulted in benefits from accessibility to smaller cities rather than larger metropolitan areas. Modelling work of the proposed high speed rail link in South Korea shows similar findings, with it expected to result in some dispersion of employment and economic activity from Seoul towards other cities made more accessible through the high speed link.

21. Similarly the TGV has provided greater opportunities for the development of regional cities, previously disadvantaged by distance from core areas. New high speed rail stations at Lyon and Lille have provided a boost to local service economies, encouraging a range of new development in commercial, business, and tourism activities. However, within regions there is some evidence of displacement of economic activity leading to distributional impacts, with nodal points such as Lille, connected to the new high speed rail links benefiting at the expense of more remote areas and resulting in a widening of economic disparities within Nord Pas-de-Calais. High speed rail links can be a factor behind the regeneration of rundown areas within cities, but transport is not a sufficient factor by itself.

22. There is evidence, eg from the Greengauge 21 Cities report (2006), that such regeneration is most likely to occur in successful cities heavily orientated towards the service sector or moving strongly in that direction. This suggests that high speed rail can be an important contributory factor in strengthening successful cities by attracting economic activity into a small part of a city near a major transport hub. This is illustrated by land use patterns around the transport network (eg airports, freight distribution centres) as well as in London with the development of Docklands coupled with the Jubilee line extension helping to release a constraint on the city of London.

23. Evidence of the impact of the TGV finds that they have led to some growth in business and substantial growth in leisure rail travel but surveys of local businesses have indicated that there was little or no impact on the overall level of business activity. This suggests that any additional economic benefits from facilitating inter-urban rail travel for

business passengers may not be that significant. The main impact has been to shift passengers from air to rail, though the liberalisation of the EU airline industry and the emergence of budget airlines has subsequently shifted the balance back somewhat, particularly for business travellers.

24. A feature of all these studies, e.g. Bruyelle and Thomas (1994), Greengauge 21 (2006), Hay, Meredith and Vickerman (2004), Kwang (2000), OECD (2002), SDG (2004), Roger Tym & Partners (2002), van den Berg and Pol (1998) is that they are limited to considering development impacts at the regional, and in some cases, local levels, and as such make it difficult to draw conclusions about the potential for a net benefit to the national economy. Some of the general inferences and messages that can be drawn from these studies on the potential impact of high speed rail for the UK economy are considered later in this report.

V Implications for Appraisal of Major Changes

25. The implications of wider economic benefits for transport investments for scheme appraisal are addressed in the DfT paper "Transport Appraisal, Wider Economic Impacts and Impacts on GDP" published on the DfT Website (2005). Some of the high-level messages emerging are worth reiterating as they are relevant here:

- The standard transport appraisal framework captures most of the economic benefits and costs including transport impacts on GDP;
- Although wider economic benefits are unlikely to be nearly as large as conventional time saving benefits, they are not always trivially small, and failing to incorporate them risks distorting decisions;
- The main sources of welfare gains not captured by standard transport appraisals arise from agglomeration externalities, imperfect competition and exchequer benefits from higher employment and productivity.
- An additional benefit contributing to GDP, but not welfare, arises from labour market supply side effects arising from transport improvements.

26. The implications are that in many cases the uplift to conventional transport benefits and benefit cost ratios (BCRs) will be relatively modest, but there are a limited number of densely populated and congested areas, notably the central London financial and business services cluster where agglomeration benefits are likely to be significant and where these add-ons are likely to be greater. Using the example of the Crossrail appraisal, the DfT paper shows quite high benefits arising from agglomeration and increased competition, though this is recognised that this is an atypical project where agglomeration benefits are likely to feature highly. The uplift to benefits increases further when exchequer benefits from increased tax receipts are included. These additional benefits arise principally from productivity benefits arising from agglomeration.

VI Potential Step Change Policies Appropriate to the UK

28. This section addresses the following issues:

- What are the transport outcomes capable of producing beneficial GDP effects?

- Is there any evidence of critical thresholds that would help identify the sort of step change improvements that are likely to have the greatest impact on the UK economy?

- Identify potential future step change improvements

- Identify key risks that might compromise the success of these step change improvements

Transport Outcomes

29. Table 1 attached sets out some transport outcomes that might be expected to lead to wider economic benefits. It describes the type of result in economic benefits, together with supporting evidence, and provides examples of linkages with other policy measures. In interpreting this table there are some important interactions between transport and other markets that should be recognised, including in particular the point that transport infrastructure is an enabler which by itself can do little to unlock wider development benefits.

30. With the widespread recognition in the literature cited earlier that transport bottlenecks and resulting degradation of service quality and reliability pose a major threat to economic performance, policies that reduce congestion can play a major role in improving accessibility and avoiding substantial economic costs. But the main focus of this paper is on transport policies and schemes which have the potential to delivery a step change in the cost or speed of connectivity, and in doing so open up new opportunities and create new demand. It should be recognised that some of the policy measures are cross cutting, with for example, road user charging bringing benefits from reduced journey times and improved reliability to inter-urban, commuter and freight traffic. Similarly new high speed rail infrastructure is seen by some promoters as offering the potential for changing the economic geography of the UK by opening up new markets and by improving accessibility for business travel. At the same time second order benefits to commuters and freight users could also arise from freeing up rail infrastructure.

Thresholds

31. There is evidence that, generally speaking, people are reluctant to commute for more than 45 minutes each way, eg UK Ultraspeed Project (2004), although higher-income workers, particularly those employed in London, are more likely to commute longer distances. For commuter travel there are potential benefits from reducing journey times, by increasing the size of the labour market catchment areas accessible to central business districts (CBDs), or by cutting journey times to existing commuters. Statistics show that London has high average commuting times compared with other cities in the UK and elsewhere, with an average 40 minutes commuting time each way, as compared with around 25 minutes for other UK cities[2]. 50% of journeys to central London are in excess of 1 hour, compared with only 5-10% of journeys outside London. An empirical study by Rice and Venables (2004) finds that any beneficial effects from reducing driving times to work declined sharply with time ceasing to be important after 80 minutes and with the effects falling off quite rapidly beyond 30 to 40 minutes. However these critical values are higher for London where travel to work times are longer.

32. These statistics do not point to any single critical threshold but suggest that improvements in commuter infrastructure or services that bring more people into London within the 45, or even 60 minute threshold, could give rise to benefits from widening the labour market. Threshold times are likely to be lower for commuter journeys into and between other cities.

33. For inter urban business travel, one possible threshold might be the critical travelling times that make day return trips more feasible. There is evidence from Greengauge 21 in their Heathrow report (2006) that a rail journey time threshold of 2 ½ hours is necessary to make it competitive with air, by facilitating day return trips. This might be a little on the high side, for some day return journeys because it is overall journey times rather than just the train or aircraft element that are relevant. The improved rail journey times between London and Manchester, now down to 2 hours 10 minutes, together with improvements in service reliability, have increased the rail modal share (excluding car) from 40% to 58% at the expense of air. However, it is not clear whether a transport improvement resulting in a modal switch will bring about economic benefits not captured in standard transport appraisal. Benefits through generating additional day trips by business passengers are more likely to occur on routes not served by air. But many of these routes for example, London to Leeds and Cardiff already fall inside the feasible day return trip critical time. Charts 1 and 2 show that distances and travel times between UK cities are lower than in many other European countries. It is hard to identify any promising examples of routes not served by air where day return trips are not already feasible using existing rail services.

The Strategic Case for High Speed Rail

34. We now consider what general inferences can be drawn from these studies on the possible impact of high speed rail in the UK. The message that emerges is that additional benefits from high speed rail intended to provide a step change in connectivity between UK cities may be relatively modest, with few potential benefits not captured in a conventional business case.

Nature of benefits

- Trade benefits within countries can arise where new infrastructure opens up so called peripheral areas. Where these occur, net benefits are likely to arise at the national

[2] Analysis from Labour Force Survey, published quarterly by the Office of National Statistics: www.statistics.gov.uk

level. However it seems unlikely given the mature state of transport infrastructure in the UK, that new high speed rail infrastructure would contribute much to opening up trade with cities that are already significant centres of activity and which enjoy good road and/or air links;

- Despite evidence from France and elsewhere on the impacts brought by high speed trains on times up to 2 ½ hours (Greengauge 21 cities report, 2006), there are few quantitative estimates of benefits in the literature.

- The evidence from France and elsewhere of the impact of high speed rail suggested limited wider economic benefits from any stimulation of inter urban business travel in total, particularly where air services already serve the route (Roger Tym, 2002). However there is evidence that they have contributed towards the development of some areas within cities (Greengauge cities report, 2006, Ultraspeed, 2004).

Economic Geography

- Where cities are already well served by other transport modes, notably air, a new high speed rail link is unlikely to result in significant generation of the business market (SDG, 2004). There will be benefits for business passengers switching to rail and from stimulation of the leisure market, but these are largely captured by standard transport appraisal.

- The classic SACTRA-type benefits arise from factors such as agglomeration and widening labour market catchment areas. These apply more to commuter journeys than inter urban journeys. For cities close to each other high speed rail can result in changes to commuting patterns (Greengauge 21 cities report, 2006).

- The geography of the UK is different from that of countries such as France, with distances between London and regional cities shorter (with the exception of London to Edinburgh and Glasgow), and those between several regional cities very much shorter. Some comparisons of distances and travelling times between capital cities and secondary cities for the UK and other European countries are shown in Charts 1 and 2 below.

- For those routes where air services provide less effective competition, for example shorter inter-urban routes of less than 300-400km, generation of trips could be more significant, particularly for commuter journeys and in those instances where business trips are brought within the day return trip threshold. However it is hard to identify any promising examples of routes not served by air and where day return trips are not already feasible using existing rail services.

Sources of demand

- High speed rail links stand the best chance of supporting cities with successful or developing service based economies. Transport can act as a magnet, encouraging businesses within an area or city to relocate near major transport hubs, and contributing to the regeneration of rundown areas within a successful city. However even where these conditions exist, displacement may arise with major cities benefiting at the expense of peripheral areas (Roger Tym, 2002, Ultraspeed, 2004, Vickerman, 1992).

- A high speed rail network connected to Heathrow would lead to the transfer of some domestic and short-haul passengers from air to rail (Greengauge 21 Heathrow report,

2006), but the scope for inter-modal switch would be limited to those routes which are within the critical time threshold.

- The volume of inter-city business trips is quite small, and there are unlikely to be sufficiently large flows of business travel to justify the very large cost of such investment (estimated by Atkins at just under £33 billion for a comprehensive high speed rail network).

Chart 1 Distance by rail between selected European capital cities and the next 5 most economically important cities

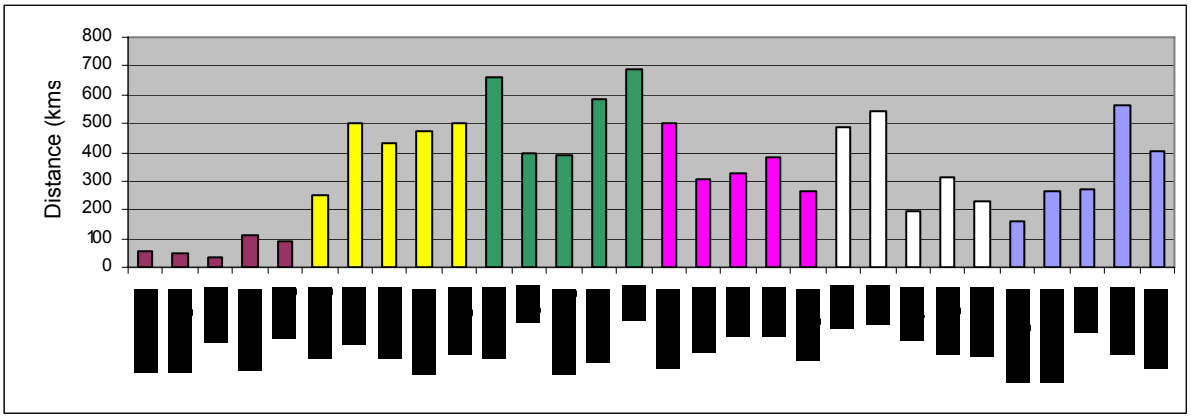
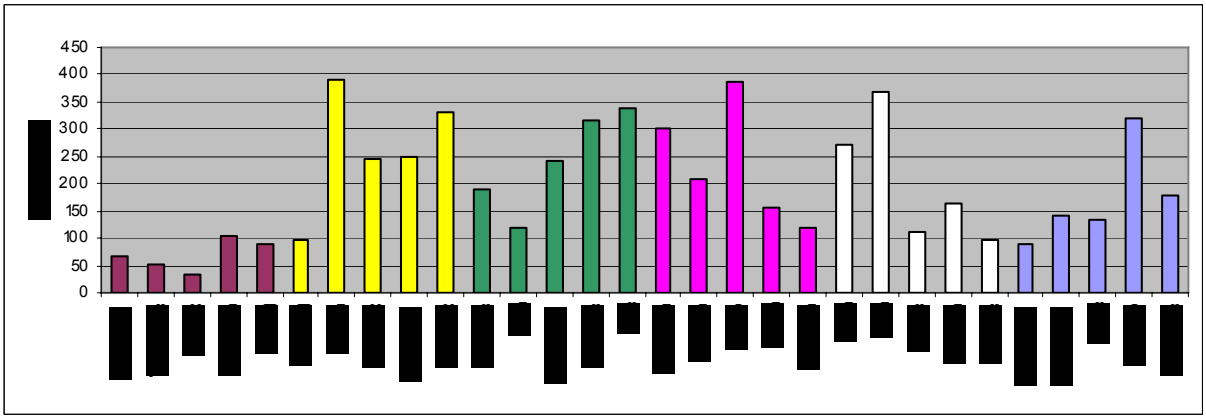


Chart 2. Average time by rail between selected European capital cities and the next 5 most economically important cities



Relationship with alternative modes

36. High speed rail is potentially highly competitive for journeys of medium distance, but offers relatively little advantage for either very short or very long journeys. For journeys of 150 to 400 kilometres rail is already faster than air travel using conventional rail; high speed rail would reinforce this advantage. SDG (2004) argue that benefits from high speed rail are greatest for journeys in the 300 to 550 kilometre range where there is potential to achieve significant modal switches from air. In France, Spain and Japan the distances are ideal for high speed rail with the majority of cities more than 400 kilometres from their respective capital cities.

37. In Britain with conventional rail operating at speeds of 160 kilometres per hour on the East Coast Main Line, and more recently on West Coast Main Line services, the time advantages offered by TGV-style high speed rail might be of the order of 35 minutes for

journeys of 450 kilometres such as London to Newcastle, and 20 minutes for 300 kilometre journeys such as London to Manchester. With existing speeds already relatively high and distances generally shorter than 400 kilometres, UK cities are already well connected, making the advantages in Britain are rather less strong than in France and Spain.

38. High speed rail offers potential benefits from freeing up capacity for commuter and freight services on conventional routes. For example the opening of CTRL has enabled some expansion of commuter services from south and east Kent into London. While there would be transport and potential additional wider economic benefits from increasing rail capacity in Britain, it needs to be established that high speed rail infrastructure provides the best solution in comparison with other available, lower cost, incremental improvements to relieve capacity bottlenecks.

39. Where there are existing capacity constraints on rail lines that are important corridors for commuters, business and/or freight, a new high speed line could offer economic benefits from relieving these capacity constraints, but a full business case would be needed to compare its value for money with the full range of other feasible options for relieving capacity and congestion on these corridors. The existing evidence based on the experience of the TGV in France, the availability of modal alternatives, and the UK's economic geography suggest that the net benefit to the national economy of such a line in stimulating inter-urban business travel in total would be relatively modest.

40. Modelling work commissioned for the Air Transport White Paper suggest that impact on modal shift and demand for air travel from pricing policies to reflect capacity constraints and environmental costs is likely to be modest. Analysis undertaken for the Air Transport White Paper, reported in DfT's South East consultation document (2002), showed that the impact of an environmental charge that had the effect of increasing air fares by 10% would be limited, with a reduction in air travel of 10% or less; equivalent to around two year's traffic growth.

Conclusions on the strategic economic case for High Speed Rail

41. Transformational economic benefits are unlikely to arise from a north-south high speed line because:

- UK cities are already well connected: it is hard to identify any promising examples of routes not served by air where day return trips are not already feasible using existing rail services.

- Agglomeration effects typically extend over 45 –60 min door to door travel time – even the fastest of HSLs to the North of England and Scotland are unlikely to provide such benefits.

42. Starting with an analysis of the problems facing the UK economy, and the potential for wider economic impacts, to the extent that there is a case for HSL it would be most likely to reside in:

- freeing up existing/forthcoming capacity constraints on commuter links, particularly into and within London;

OR

- by extending the labour market of London and the South East. The latter effect would, given the state of existing knowledge, be fairly speculative and highly

dependent on the particular options under consideration. The literature argues convincingly that higher returns will typically come from tackling existing and known congestion bottlenecks.

43. High speed rail options or other new build infrastructure (eg new commuter or freight lines) could help tackling such problems by freeing up capacity for commuter services, but this would require very large sums of money. Its value for money would need to be compared with the full range of alternative options, including incremental improvements to existing transport infrastructure and services.

Better transport links into and within major cities

44. The greatest benefits from agglomeration and widening labour market catchment areas are likely to be realised from measures aimed at improving speeds, reliability and connectivity within growing cities and their catchment areas. However, there is little hard evidence of the circumstances which need to be in place to provide the benefits of an extended labour market catchment. The wider benefits from improving links to reduce the generalised cost of commuting into London and other cities, and both into and between cities such as Birmingham, Leeds and Manchester are potentially significant. But even here there will be second round impacts, as shorter commuter journeys will create incentives for residents and jobs to relocate further out of city centres. This could have the effect of offsetting some of agglomeration economies.

Other potential step change improvements

45. For the purposes of this study, we are primarily interested in identifying future step changes that have the potential to open up new opportunities and give rise to economic benefits not included in standard transport appraisal. Table 3 provides examples of past improvements that might be regarded as step changes. Although some such as the development of the motorway system and the introduction of containers were undoubtedly major changes that had far reaching implications extending beyond transport, other changes were either more incremental or had less significant implications. Some were the result of Government policies or investments, whilst others were driven by market developments. Table 4 identifies some possible future step changes, arising from both infrastructure improvements and other policies such as pricing and market liberalisation measures.

Geographical focus of step-change policies

46. What can we say about the location of possible step change improvements? Analysis of the magnitude of agglomeration effects by DfT (2005) indicates that they are substantially higher both in absolute terms and as a proportion of direct user benefits for the central London financial and business service cluster than other large UK cities. This is supported by analysis undertaken by GLA Economics (2005) demonstrating London's strong global comparative advantage in the provision of financial and business services together with evidence of superior productivity performance compared with the rest of the UK arising from agglomeration economics and access to a highly skilled labour force.

47. This, together with the labour supply benefits from widening the labour catchment area, suggests that measures targeted at reducing congestion and increasing capacity on radial commuter links into London could deliver substantial wider economic benefits. There may also be other transport links within London given its huge size, that are important in maintaining its position as a cluster for financial and business services, for example improved peripheral links and links across the city. These may be important not only in reducing congestion on journeys to work, but also in facilitating business travel within London, trips to airports, and the distribution of goods and services within London.

48. In cities outside London, the potential add-ons to the benefits from conventional appraisals are expected to be smaller (but the cost of schemes might generally be expected to be lower). It is dangerous to generalise in making recommendations for transport interventions, but the most promising areas to focus on may be links within and between growing cities, where there are problems of road congestion and where rail services are congested and slow, for example, between and into Manchester and Leeds. With a number of growing urban areas in the UK located close together, better links between them could give rise to labour market and agglomeration benefits e.g. Leeds - Manchester, Edinburgh – Glasgow.

49. These are policy options which have the potential to offer wider economic benefits. More detailed cost benefit analysis of specific scheme proposals would be needed to compare their economic benefits and value for money with those of other options.

VII Risks

50. This final section examines the risks that might jeopardise successful outcomes from the step change improvements identified, and asks how flexible step change measure might be in response to these risks.

51. Key external risks assessed in standard transport appraisals will also have implications for the scale of wider economic benefits. Generally speaking, any risks to the magnitude of conventional benefits would be expected to have a proportional impact on the scale of the wider economic benefits. These include traffic growth (both in total and its composition), input costs including oil prices and their impact on fares. Policy driven risks to the scale of costs and benefits realised may arise from measures to tackle congestion, for example road pricing, or from measures intended to achieve environmental objectives, which may result in measures to reduce dependency on car and air travel. In addition changes to the patterns of land use and economic activity occurring independently or in response to improved transport links will have implications for the scale of these wider benefits.

52. With electric rail infrastructure, higher oil prices and added environmental pressures could be regarded as up-side risks. In addition, where links are already congested, demand side risks will be less relevant. For measures that open up new opportunities, key risks will include projected trends in traffic demand and its geographical pattern, and the demand impact of service improvements, which will depend on behavioural and competitive responses, for example from the airlines to new high speed rail services. There may be induced relocations of both residents and jobs in response to shorter commuter times with people moving further out from city centres as a result of improved transport links. Other risks arise from changes in land use patterns that may occur independently, for example trends towards decentralisation with relocation of economic activity from CBDs. Employment and residential decentralisation could make fixed radial links into city centres less viable. Planning risks can also be important, particularly where conditions imposed add to costs or reduce the scope of the scheme. With airport and port infrastructure, demand side risks will have implications for financial viability of schemes and may delay introduction in service dates.

50. The implications of this risk analysis are that step changes that involve the building of new infrastructure tend to be less flexible in response to key risks than policies that open up markets and provide opportunities for new services.

TABLE 1 TRANSPORT IMPROVEMENTS WITH POTENTIAL TO PRODUCE WIDER ECONOMIC BENEFITS

OUTCOME	ECONOMIC BENEFIT	EXAMPLE OF LINK/ POLICY	EVIDENCE
Enable day return business trips from wider catchment areas	Business travel, freight logistics, competition, trade.	• Road user charging • high-speed rail linking city centres • motorway improvements • faster airport to city centre links • new services from regional airports.	Survey evidence that 2 ½ hour threshold is critical to enable return day trips for business and freight .
Maintain or improve speed and reliability on routes within growing cities and their travel to work areas, bringing more potential commuters with the city's labour market catchment area.	Business/commuter travel and freight, agglomeration and labour market benefits.	• Increased capacity on local road and rail networks • New/improved urban rail/metro/tram/bus • new high-speed rail links could free up capacity on existing infrastructure • road user charging.	Evidence that relieving transport bottlenecks produces significant economic benefits. Evidence of behavioural impacts from new transport links into and within large urban areas with labour market and agglomeration benefits from speeding up commuter journeys.
Increased capacity at international gateways to meet demand, improve reliability and improve international connectivity.	Competitiveness, trade, supply side benefits arising from FDI.	• Increased airport and container port capacity • new services from airports or ports	Airports White Paper showed large costs from failings to provide runway capacity to ease capacity constraints. Cost penalties from failure to provide additional container port infrastructure, with increased transhipment from continental ports
Open up new markets.	Competitiveness, trade, FDI and labour market benefits; also potential supply side benefits from attracting FDI	• Further airline liberalisation resulting in lower fares and new routes • New services in Europe by budget airlines to take advantage of liberalisation in the EU market.	UK's strong position in aviation means that UK aviation industry stands to benefit from liberalisation. Beneficial productivity impacts from inward migration arising from some services by budget airlines to eastern Europe
Use existing transport infrastructure more effectively.	Across the piece.	• Road user charging • Airport slot auctions • Operator pricing policies • Rail/air substitution (e.g. from high-speed rail links).	Substantial benefits from policies that encourage use by those who value transport most highly. High-speed rail can have a limited impact in freeing up airport slots, but not a complete substitute for air.

TABLE 2 - PAST STEP CHANGE MEASURES

IMPROVEMENT	DRIVER/IMPLEMENTATION	DATE	COMMENTS
Development of UK motorway network	Government in response to business and consumer demand	1960s-1980s (mainly)	Major implications for freight distribution, car travel and location of economic activity.
Introduction of the container box	Market driven implemented by maritime and logistics industries	1960s-70s	Major implications for ports and freight distribution, facilitated by motorway network.
Liberalisation of EU aviation	EU policy decision driven by aviation industry and liberally minded member states	1990s	Removed capacity and fare restrictions – trigger for development of budget airlines. Main impact in stimulating new leisure markets but has also reduced the cost of business travel
High speed train services	Government/rail industry	1970s	Impacts on business travel from enabling day return trips and on commuting patterns (e.g. to London).
Rail privatisation	Policy decision – implemented by Government and rail industry	1990s	Changed structure of industry but substantial remaining Government involvement. High traffic growth.
BAA privatisation	Policy decision, CAA involvement as airports regulator	1980s	Exposure to commercial pressures and price cap regime has kept airport charges low, promoted efficiency and relaxed constraints on investment.
Channel Tunnel / CTRL	Commercial drivers, but policy decision	1990s	Response by airlines and ferries greater than expected, but has captured significant market share and generated new markets.
Local transport schemes e.g. JLE, DLR, train systems	Local / central Government	1990s	Local impacts on commuting patterns and urban development.
Developments in logistics and distribution industries	Market driven-implemented by logistics and road haulage industries in response to developments such as just in time delivery	1980s-now	Incremental in nature – emergence of major distribution centres on parts of motorway network.
Ports privatisation, abolition of Dock Labour Scheme	Government policy but also market driven. Implemented by port operators	1990s	DLS abolition a step change that improved port efficiency. Privatisation more gradual.
Development of Heathrow as a hub airport	Market driven by aviation industry, given UK's favourable geographical position, but dependent on Government policy and planning decisions	1980s	More incremental in nature. BA and BAA privatisation provided a boost. Capacity constraints mean that other European hubs are catching up with Heathrow.

TABLE 3: PROSPECTIVE STEP CHANGE MEASURES - Page 1

Improvement	Driver/Implementation	Comments
Urban/Commuting		
Commuter links in the Greater London area	Government (central and regional/local)	Potential large benefits nationally from wider labour catchment area and enhanced agglomeration economics. Includes, both improved links into London and within London.
Commuter links in other urban areas	Government (central and regional/local)	Potentially significant benefits from improvements to commuter journeys and business trips between neighbouring cities.
High speed rail infrastructure	Commercial promoter/Government	Additional benefits through development of commuter markets by reducing journey to work times and releasing infrastructure capacity constraints on congested routes.
Inter-Urban		
High speed rail infrastructure	Commercial promoters/Government	Additional benefits from high speed rail links between UK cities likely to be modest. Large capital costs and the scale of economic benefits from improvements to inter-urban travel likely to be limited relative to cost. Commercial viability, environmental and planning hurdles.
Major new roads programme	Government	Most major UK cities already linked to motorway system so benefits would be more about faster journeys and improved reliability from relieving capacity constraints on to existing links than improvements to accessibility from new links.
International Passenger Links		
Pricing policies	Government/EU/ICAO	Slot trading and auctions would encourage better use of scarce airport capacity and environmental changes would internalise external costs
Additional airport capacity	Aviation industry requires Government decision	Large economic benefits from relieving capacity constraints notably in S E England, using standard appraisal techniques. High level of commitment by airlines to third Heathrow runway which would maintain its position as an international hub, but major planning and environmental hurdles.
Liberalisation of long-haul air services	Aviation industry/liberally minded Governments/EU	Added spur to globalisation would reduce cost of business travel and stimulate leisure market. Likely to be incremental with EU-US agreement first.

TABLE 3: PROSPECTIVE STEP CHANGE MEASURES Page 2		
Improvement	**Driver/Implementation**	**Comments**
International Freight Links		
Expansion of container port hubs to allow economies of scale and scope at UK hub ports	Ports and shipping industries, but subject to planning approval	Benefits from relieving capacity constraints, but likely to be incremental.
Cross-cutting		
Road user charging	Government	Large benefits to road haulage and business users, flowing into the national economy from reduced journey times and improved reliability. Increased catchment areas for labour markets, and for other markets.

ANNEX 1: LITERATURE SEARCH: FINDINGS BY STATUS OF EVIDENCE

Areas of broad agreement

- traditional transport appraisal techniques are inappropriate for capturing all impacts of major step change improvements. Broader economic development impacts need to be quantified and included in the appraisal process on a case by case basis (ITS, 2005, SDG, 2004, Ultraspeed, 2006, Venables, 2004).

- wider economic benefits (or disbenefits) arise where prices differ from marginal social costs e.g. from labour and product market imperfections and environmental externalities (SACTRA, 1999, SDG, 2004).

- linkages between transport and other markets (labour, housing and product) are critical to understanding nature of economic benefits (DfT, 2005, SACTRA, 1999,).

- an important source of benefit is from improved accessibility from giving firms access to a wider pool of labour by reducing the generalised cost of commuting, thus bringing people closer to jobs (Graham, 2005, SACTRA, 1999, Venables, 2004).

- benefits at the national level can arise from transport schemes that increase the density of economic activity (agglomeration) and result in higher economic activity. Benefits reported in the evidence by SACTRA, 1999 and others (see below) arise principally from agglomeration and labour market impacts, though these tend to be lumped together.

- Investment in transport infrastructure can influence the location of new investment and development, but other necessary conditions need to be present to enable these benefits to be realised. New transport links by themselves can do very little to unlock wider development impacts; to be effective accompanying measures including adequate links with the local transport network, an adequately skilled local labour force and local economic development measures are critical. This finding emerges from the Greengauge 21 cities report (2006), Roger Tym, 2002 and Vickerman (1992).

- the scope for non-transport benefits in enhancing productivity levels is relatively modest in mature economies with well developed transport infrastructure, but relieving major transport bottlenecks can give rise to significant benefits to economic performance (Roger Tym, 2002, Vickerman, 1992). This means that benefits from schemes not targeted at relieving bottlenecks will tend to be smaller by comparison. In assessing the case for high speed rail infrastructure, a key outstanding question is whether they will give rise to incremental net benefits over and above those benefits from arising from relieving capacity constraints.

- where new transport links benefit regions, there are frequently winners and losers, with cities plugged into new links e.g. Lille benefiting at the expense of more remote areas in the same region (Roger Tym, 2002, Ultraspeed, 2004, Vickerman 1992.

- high speed rail is competitive with air for journey times up to 2 ½ hours by rail, but falls off rapidly beyond that (Greengauge cities report, 2006, SDG, 2004).

- budget airlines, particularly in the UK, but increasingly in the rest of Europe, presents a serious challenge to high speed rail both domestically and internationally (SDG 2004).

Areas of conflicting evidence

- the scale of additional benefits. SACTRA (1999) found that for typical transport schemes, an uplift of 6% to transport benefits would be appropriate. Other evidence from the Netherlands suggests much larger potential impacts on top of conventional benefits, with modelling analysis suggesting additional benefits of 65-80% from a high speed link between the core and periphery of the Netherlands. This finding is based on the generation of employment and economic activity arising from improved accessibility to peripheral areas and assumes labour market imperfections (Oosterhaven and Elhorst, 2003, Ultraspeed, 2006).

- the sources of additional economic benefits. In most studies benefits arise from reduced labour and product market imperfections, but a minority focus on increased economic activity in areas of high unemployment brought about by transport schemes, akin to the use of a shadow price for labour costs, although it is important to note that the latter are modelled benefits rather than benefits demonstrated through evaluations of actual schemes (Oosterhaven and Elhorst, 2003).

- two way road argument on the impact of transport links between peripheral and core areas. Some modelling work for the Netherlands, Japan and Korea points to benefits accruing to peripheral areas from improved accessibility (Kwang, 2000, Oosterhaven and Elhorst, 2003). Other work, notably by Vickerman (1992) but also recognised in the UK studies on potential new high speed rail infrastructure point to the risks of this being offset by economic activity being sucked from the so called periphery into core areas (Ultraspeed, 2004 and 2006).

Gaps in the evidence base

- whether benefits are largely redistributional in producing economic benefits at the level of the individual region or city within a zero sum game, or whether benefits can arise at the national level. Most studies are limited to assessing impacts at the regional and local levels, with very little evidence on benefits at the national level. If local benefits arise from displacing economic activity from elsewhere in the economy, then net benefits at the national level could be quite limited.

- limited assessment of wider economic impacts in project appraisals to date but there are several studies that have attempted modelling of proposed high speed rail links to assess indirect economic benefits.

- there are fewer examples of ex post evaluations of transport projects, and those that exist focus on transport outcomes rather than wider economic impacts.

- most studies available consider the impact of high speed rail projects, with limited literature on the impact of improvements in other modes.

ANNEX 2: LITERATURE REVIEW: FINDINGS BY ISSUE

Appraisal Methods

- there is broad consensus that in appraising and evaluating the impact of transport infrastructure projects, wider economic development impacts need to be taken into account, but differences on view on both the scale and sources of underestimation of benefits using traditional transport CBA and of additional indirect economic benefits (SACTRA, 1999, SDG, 2004).

- limited assessment of wider economic impacts has been attempted in project appraisals to date. Most consider regional and distributional (including regeneration) impacts, but very little assessment of impacts at the national level has been conducted (SDG, 2004).

- most of the studies reviewed to date consider the impact of high speed rail based on appraisal evidence, but there are a few that look at road infrastructure investment

- there are few examples of ex post evaluations of transport projects, and those which do exist focus on transport outcomes with limited quantification, rather than wider economic impacts. Taken together there is insufficient information derived from such studies to provide a firm quantitative basis for impacts on regional economies and regeneration, let alone impacts at the national level

Evidence of Wider Economic Benefits

- wider effects arise when prices differ from marginal social costs e.g. from imperfections in product and labour markets and environmental externalities. But there is conflicting evidence on the scale of these additional benefits. SACTRA (1999) found that for the typical transport scheme, an uplift of 6% over transport benefits to reflect total economic benefit benefits might be appropriate. However other evidence from the Netherlands (Oosterhaven and Elhorst, 2003) points to much larger potential impacts.

- the scope for non-transport benefits from efficiency improvements, greater competition etc is limited in mature economies with well developed transport infrastructure. Transport investment is not the top ranking mechanism for securing higher productivity in a mature economy but has a potential role in enhancing economic performance provided other necessary factors are present (Greengauge 21 cities report, 2006), .

- there is widespread recognition that transport bottlenecks and resulting degradation of service quality and reliability pose a major threat to growth. Even in economies with developed transport infrastructure, policies or projects that reduce congestion can have significant effects in improving accessibility, resulting in additional wider economic benefits (Roger Tym, 2002, SDG, 2004, Vickerman ,1992, Vickerman, Spiekermann and Wegener, 1997).

- Only where new agglomeration impacts or domestic trade opportunities are opened up will there be national economic benefits (DfT, 2005, SACTRA, 1999)

Features of Transport Markets

- high speed rail can compete effectively for business trips with air for journey times up to 2½ hours by rail; beyond that the share that can be captured by rail drops off sharply (Greengauge 21 cities report, 2006, SDG, 2004). But there are some variation - rail's competitive position depends on the attractiveness and availability of competing air services. In addition rail is at a disadvantage compared with air for journeys that do not start or finish in city centres and for connecting air passengers.

- the market for high speed rail is strongest where there is a large market for travel over distances between 300-600kms and where population densities within cities are high. This explains in part why France and Japan were the first countries to introduce high speed rail (SDG, 2004).

- budget airlines, particularly in the UK but increasingly elsewhere in Europe, present a serious challenge to high speed rail. Although much of the activity of budget operations within Europe has been to stimulate traffic, principally in markets, some traffic has been diverted and this has contributed to the problems experienced by Eurostar. A high speed rail line in Britain may face more intense airline competition than elsewhere in Europe, though airport capacity constraints may blunt its intensity over time (SDG 2004).

- A high speed line linked directly to the CTRL and Heathrow could have a significant impact in transferring passengers from air to rail on domestic and a limited range of short haul European flights (Greengauge 21 Heathrow report, 2006).

- Modelling for the Air Transport White Paper suggests measures to internalise the external carbon cost of aviation could increase the cost of aviation by around 10%, and reduce demand by a similar amount. Whilst not insignificant, this increase in cost from a low baseline would not be expected to significantly change the competitive price advantage of air over rail.

Linking Mechanisms

- the spatial pattern of impacts from improved transport links depend critically on the workings of regional economies, and in particular the states of labour, housing and product markets in the areas affected (SACTRA, 1999).

- broad agreement that linkages working through the labour and housing markets are a critical precondition in determining total economic impacts and that benefits can arise through giving firms access to a wider pool of labour by reducing the generalised cost of commuting (Graham, 2005, SACTRA, 1999, Vickerman, 1992). Conversely, disbenefits can theoretically arise from projects which add to the overheating of labour markets (Oosterhaven and Elhorst, 2003).

- there is evidence from a number of studies of positive linkages between effective density of economic activity (agglomeration) and productivity, though it varies as between sectors (Graham, 2005).

- transport infrastructure by itself can do very little to unlock wider economic impacts; accompanying measures and conditions, such as linking in with the local transport network, availability of skilled labour, and local economic development measures (which require a high degree of political commitment) are critical (Greengauge 21 cities report, 2006, Roger Tym, 2002, Vickerman, 1992).

- 2 way road argument - conflicting evidence on the impact of improved transport links between core and peripheral areas, with some modelling analysis, largely from the

Netherlands and Japan, indicating potential benefits to peripheral areas and others arguing that economic activity will be sucked into the core (Kwang, 2000, Oosterhaven and Elhorst, 2003, Ultraspeed, 2004 and 2006, Vickerman, 1992).

- even where regions benefit from new transport links there are frequently winners and losers, with cities plugged into new links benefitting at the expense of remoter areas (Roger Tym, 2002, Ultraspeed, 2004, Vickerman, 1992).

- distinction between projects that give rise to social and distributional benefits and those that can also potentially contribute to gdp and productivity (SACTRA, 1999, DfT, 2005). For example would a major agglomeration in the north facilitated by improved transport links produce economic benefits at the national level in addition to regional economic development benefits?

- transport policy measures such as road user charging should be taken into account in assessing the long-term benefits from major transport schemes i.e. get the prices right before considering the case for investment (ITS, Leeds, 2005).

ANNEX 3: SUMMARY OF EX ANTE APPRAISAL AND MODELLING EVIDENCE

1. SACTRA (1999)

The issues covered in this report include whether transport improvements have led to increased economic activity and whether the economic impacts are fully captured in the standard transport appraisal methodology. SACTRA commissioned some theoretical modelling analysis by Venables and Gasoriek (1998) to assess the likelihood and scale of biases in conventional CBA. This results suggested additional benefits of up to 30%, largely from reducing mark-ups on cost. This work was reviewed by Newbery (1998) who found

much smaller benefits of around 3%, suggesting that biases in CBA were too small to worry about. SACTRA appears to share the view that, despite imperfections to competition outside the transport sectors, errors compared with conventional CBA may be quite small, with additional benefits in the region of 6-12% plausible, though it recognises that there will be some projects with large network implications where benefits could be higher.

2. Evaluating urban transport improvements: cost-benefit analysis in the presence of agglomeration

Venables (2004) developed a theoretical model to derive the impacts on productivity of including agglomeration benefits for transport improvements that reduce commuting times by 20%. The results suggest that there are significant gains from urban transport improvements, over and above those shown in standard CBA. The increase in productivity stem from thicker labour markets and agglomeration economies.

3. Indirect economic benefits of transport infrastructure developments

This study by Oosterhaven and Elhorst (2003) considers the economic benefits of two rail proposals in the Netherlands: a high speed rail ring linking the cities in the central core of the country and a link between the core and the the so called periphery (to Groningen in the north). Unlike many other studies, this model assumes imperfections in the labour market, with a national minimum wage rate and low labour mobility. As a result the major source of benefits arising from increased labour demand in regions of high unemployment. This gives rise to economic benefits additional to direct transport benefits of +59% to +85% from a high speed link between the core and the so called periphery. Conversely linking together the core cities would give rise to net disbenefits of 15% because of the increased pressure on an already tight labour market.

This study contains rather different findings from many others, showing the scale of potential benefits from improved links between core and peripheral areas to be large and the source arising from attracting economic activity and employment to areas of high employment as opposed to improvements in the efficiency of the labour market in core areas from reduced commuting costs found in other studies. It illustrates the conflict of evidence as to whether such improved transport links benefit or harm core areas. However the results should be treated with caution,notably because of the assumption adopted that labour markets operate imperfectly.

4. High Speed Line Study

This report by Atkins (2003) considers the business case for a new high speed line to provide additional rail capacity and faster journeys for north-south travel. It argues that with the forecast growth of demand, there will be substantial overcrowding on the existing rail network unless action is taken. Eight options for a potential HSL network were assessed with capital costs ranging from £9.9 billion for a line between London and the West Midlands to £32.7 billion for a comprehensive high speed network. The business case was assessed through the use of standard benefit cost analysis. These showed benefit cost ratios ranging from 1.4 to 1.0. The study concluded that there was a good transport and business case for HSL, but recognised that there were environmental weaknesses, that would require mitigation to minimise the adverse impacts. Alternative options to solve the transport problems identified were not appraised.

5. UK Ultraspeed Project

The economic case for linking up the major cities of the UK with a rapid Maglev rail link is considered in the evidence submitted by UK Ultraspeed to the Eddington review (2005) and in a supporting study by CURDS (2005), University of Newcastle.

The evidence seeks to explain the role that a Maglev scheme as a strategic transport project might play in delivering a step change in connectivity and access to and from the major cities of the UK. It is argued that traditional CBA is too narrow in assessing the broader economic impacts of strategic transport investments of this nature. The study examines how this might change the economic geography of the UK, creating a major urban agglomeration to rival London in terms of economic dynamism.

The issues examined include:

- The extent to which time savings could alter commuting patterns, improve market access and generate new agglomeration economies;

- The extent to which increases in the level of economic specialisation might result;

- The extent to which economic benefits would be shared between the cities of the North as opposed to being appropriate by a few larger cities;

A model of "economic potential" was used to assess potential benefits in cities' relative accessibility. This is recognised as a very simple approach capable of giving only rough-and-ready approximations of the impacts of reduced journey times.

The key findings summarised below should be regarded as preliminary and tentative given the small scale of the study and the use of a simple simulation model that does not appear to have been validated and calibrated.

- Commuting patterns within the higher paid and skilled would be most affected, resulting in accelerated integration of Edinburgh-Glasgow and Manchester - Leeds labour markets;

- A Northern Ring Main would lead to a significant improvement for Glasgow, Edinburgh and Tyneside and dramatically improve the economic potential of Manchester (whose economic potential would jump from one third to four fifths that of London);

- Extending high speed links to Birmingham and London results in the enhanced market potential of the more northerly cities being retained, but Manchester would no longer close the gap with London;

- This presents a dichotomy; while linking up the northern cities would have the most dramatic implications for the economic geography of the UK, extending it to London would give rise to bigger potential benefits to the UK economy;

- The analysis confirms that there would be winners and losers with agglomeration economics and business service clusters strengthening the position of Manchester and Leeds at the expense of smaller cities such as Liverpool, Sheffield and Newcastle (an effect SACTRA had previously referred to as a two-way road). There are opportunities for these cities to become more specialised in order to play an enhanced role in the region's economy but these need to be grasped.

- It is recommended that in order to maximise the economic development benefits to the cities of the North, these cities need to be linked by high-speed rail links before they were interconnected with London. Otherwise it is likely that the economic development benefits of improved connectivity will be disproportionately appropriated by London.

An interesting dilemma is posed by the recommendation that the cities of the north be connected by a high speed rail link before these cities are connected to Birmingham and London. It is argued that this would maximise the prospects of changing the economic geography and creating a conglomeration to rival London. Importantly, the model does not enable an assessment of whether the impact of this would lead to benefits at the national level, as opposed to distributional changes within a largely zero sum game

6. High Speed Rail: International Comparisons

The objectives of this report by Steer Davies Gleave prepared for CfIT (2004) were:

- to investigate whether Britain's failure to invest in high speed rail resulted from differences in appraisal criteria or differences in transport markets which make it less beneficial.

- to make recommendations on how, if at all, appraisal criteria should be changed to better capture the costs and benefits of high speed rail.

The approach used relied on case studies of high speed rail development, transport markets and appraisal processes in Britain and six other countries.

Its key findings were as follows:

- most European countries require detailed economic appraisal, using cost benefit analysis, of major transport projects, but included limited assessment of wider economic impacts. Japan is the only exception, but few details are publicly available.

- although many countries consider impacts on the regional economy of transport projects, there is no evidence on the scale of any national benefits.

- ex post evaluations of transport projects, covering transport impacts, let alone wider impacts, are rarely undertaken. A rare exception was of the TGV

Atlantique. This showed costs coming in on target but an initial shortfall in traffic.

- additional economic impacts more likely where projects are targeted at relieving transport bottlenecks.

- case for high speed rail strongest in countries where there is a large market for travel over distances of 300-600km. Distances between cities and distribution of population (located densely around key modes) in France, Spain and Japan mean these countries have an economic geography which strengthens the case for high speed rail.

- the case for high speed rail on transport market grounds is less strong in Britain, but stronger if capacity, as well as faster journey times, is included as a part of the investment case. Capacity constraints make the case for high speed rail construction stronger now than it was in the 1980s.

- although the report finds that the transport appraisal framework used in the UK represents best practice, it makes several recommendations. These include the proposal that analysis of wider national economic impacts should be undertaken for major projects (which DfT has responded to in its TIF guidance).

- a number of adjustments are made to the BCR of a high speed link calculated by Atkins. These have the effect of increasing the BCR of Option 1 from 1.42 to almost 2. It is argued that including wider economic impacts would further strengthen the robustness of the case. This is based on academic debate reported in SACTRA, indicating incremental economic benefits ranging from 3% to 30%.

7. Economic Performance and the High Speed Link

The report, dated December 2002, was prepared by Roger Tym and Partners, sub-consultants to Atkins and commissioned by the SRA. It provides a review of the evidence on the links between transport investment and economic performance and puts forward an appraisal of the likely regional and distributional effects of a high speed line.

The report recognises the role of transport services and infrastructure in widening labour catchment areas and influencing the amount and location of development land. However, it recognises that in a mature economy transport investment is not the critical driver for securing productivity gains and that the creation, retention and attraction of skills the key determinant of regional economic performance.

It recognises the two-way road argument that improved accessibility may benefit one region at the expense of another, accepting that causal links between transport improvements and economic growth are not strong.

It distinguishes between wider economic benefits at the national level and distributional benefits arising from transport schemes. The study focuses on regional and distributional impacts identifying two principal mechanisms; the improvements in accessibility and their effect on perceptions of investor confidence. It concludes that transport infrastructure investment can influence the location of new development but that complementary policy and action is essential to capture this revitalisation potential. It finds that a high-speed link would be consistent with the Government's urban renaissance and regional policy agendas. Greater London and the lagging regions with low GDP per capita would gain, while some of the heat

would be taken out of the stronger regions, such as the South East. However no assessment of how a high-speed line would benefit the economy at large is included.

8. High-speed rail developments and spatial restructuring

This study by Kwang Sik Kim (2000) uses a case study approach to consider how a high speed link between Seoul and Pusan might affect the demography and economy of the capital region.

Studies considering the land-use effects of high speed rail developments are briefly reviewed, in particular the experience of the Shinkansen in Japan, which one study found that the most significant impacts arising from changes in accessibility occurred in smaller cities. This was supported by the experience of the TGV in France and by modelling work considering the expected impact of the Channel Tunnel.

The results show that with the rail link, the concentration of population towards the Seoul region would continue, albeit at a slower price, but that the employment distribution would become more dispersed, with more job opportunities created on the new development corridor.

9. Greengauge 21 Cities Report

This study by Greengauge (2006) considers the role of high speed trains in the development and regeneration of cities and concludes that they can be a major factor, supporting regeneration of rundown areas within successful cities. It finds that by bringing cities closer together, high speed lines can change travel patterns, including commuting between cities located close together. The gains are most likely to be made by cities heavily orientated towards service sector activities or moving in that direction, where bringing cities closer together in terms of travelling time can underpin expansion of these activities. The study cites Lyon and Lille as success stories where service economies have prospered since the arrival of high speed rail, but notes that this is not sufficient in facilitating the development and regeneration of city economies. This requires an integrated city strategy with committed political leadership. Another essential precondition identified is the need for effective transport links within and beyond the conurbation. Where these prerequisites are not in place, or where there is insufficient demand to justify high frequency services, these benefits will not be realised.

In common with most other studies, Greengauge 21 does not address the extent to which benefits occur at the national level. These are only likely to arise where there are agglomeration or trade benefits. However, the report recognises that trade-offs may occur within regions, with the major cities benefiting at the expense of smaller regional towns.

10. Greengauge 21 Heathrow Report

This study by Greengauge (2006) considers the impact of high speed rail on Heathrow airport. It considers surface access to an expanded Heathrow, recommending that progress on rail access schemes, including their funding, should be made in order for a third runway to proceed. The report goes on to consider the potential for transfer of demand from air to rail resulting from a high speed rail network connected to the CTRL and Heathrow. It concludes that 19% of Heathrow throughput (short-haul domestic and European flights) is susceptible to transfer, noting also that high speed rail could be attractive to interlining air passengers. However it recognises that not all this demand would switch to high speed rail if connections were built to Heathrow. Some of the routes identified are either outside or on the boundary of the 2½ hour threshold where high speed rail has a strong competitive advantage and the report recognises that some of this demand would not switch. The study suggests that options

for the development of Heathrow should take into account the impact of high speed rail, as this could affect the timing and prioritisation of investments at Heathrow.

11. Accessibility and economic development in Europe

This study by Vickerman (1997) assesses the impact that improving transport for competitiveness reasons through the development of TENs is likely to have on accessibility and economic opportunities of regions. It recognises that there is conflicting evidence on whether transport infrastructure contributes to regional polarisation or decentralisation, and reaches the view that attempts to explain economic performance by changes in accessibility brought about by transport improvements have not been very successful. The conclusion is that in countries with well developed infrastructure, improved transport links will bring about only marginal improvements, though schemes that relieve transport bottlenecks are identified as an exception to this.

The results show that improved links between central and peripheral regions may make it easier for firms in the latter to market their products in the core, but that this is more than offset by the ability of producers in central regions being better able to expand into peripheral markets. This does not mean that peripheral regions would not benefitted, but that where they do, these benefits have been overshadowed by larger gains in core regions, conflicting with the objectives of TENs to narrow such differences.

12. The impact of the Channel Tunnel on Nord Pas-de Calais

This study by Bruyelle and Thomas (1994) examines the possible impact of the Channel Tunnel and related transport developments on the local economy of Nord Pas-de-Calais. It finds that these transport links will be of the greatest benefit to a limited number of nodal points, principally Lille at the expense of more remote areas, with further widening of economic disparities within the region. The favourable position of Lille relative to the rest of the region arises from its position as a crossroads on the TGV network and from supporting investment stemming from a high level of political commitment. The focus of the study is very much on the regional impacts within a depressed part of France and it does not attempt to estimate the economic impacts on the national economy.

13. The European high speed train and urban development

This book by van den Berg and Pol (1998) considers the influence of high speed trains in Europe on regional economic development. No unequivocal causal relationship between transport infrastructure and regional economic development is identified, but transport improvements are seen as a catalyst. The case studies in the book seek to ask how best HST systems can be fitted into an urban region to contribute effectively to balanced sustainable urban growth. Effective integration of HST connections with the local transport systems is viewed as essential. By improving access and raising the status of cities, HST connections can be a significant catalyst to local spatial developments in and around HST stations.

ANNEX 4: SUMMARY OF EX POST EVALUATION EVIDENCE

1. TGV Atlantique

This analysis, reported in the Steer Davies Gleave report for CfIT (2004), showed that most of the appraisal assumptions were correct. Construction costs came in very close to target, and while there was a shortfall in initial traffic volume in 1992, this was attributed to economic slowdown and an increase in rail fares.

2. High Speed trains in Spain

A study by de Rus and Inglada (1997) found that the high speed link between Madrid and Seville was not economically justified. Time savings obtained from users shifting from slower transport modes and gains from newly generated traffic were found to be insufficient to cover infrastructure costs, even including shadow pricing of labour. The internal rate of return was close to zero.

3. The impact of the Channel Tunnel on Kent

This study by Hay, Meredith and Vickerman (2004) is a rare example of an evaluation covering the wider impacts of new transport infrastructure. While the Channel Tunnel resulted in significant changes to traffic flows, with consequences for employment, it did not have the expected impact on economic development locally or more widely within Kent. However the growth of no frills airline and the abolition of intra-EU duty free resulted in decreased traffic and tunnel market share since 1998. It was found that the Channel Tunnel has resulted in limited integration of cross-channel housing and labour markets, with commuting at very low levels as compared with across other intra-EU borders. With the completion of the CTRL, Ebbsfleet and Thames Gateway were seen as the main areas expected to experience economic change, with limited growth arising at Ashford or Dover.

4. Measuring the benefits gained by industry from road network improvements

This study by Mackie and Tweddle (1993) considers savings to industry accruing from the improvement in the road network from higher speeds attained by commercial vehicles over and above those in the then COBA assessment method. Based on a limited number of case studies the relationship between direct transport savings and distribution costs savings from road improvements was assessed. The results showed that in a minority of cases distribution system cost savings exceeded transport cost savings. It was concluded that the role of road network improvements should not be exaggerated, but recognised that they can be important. Transport cost savings may in certain circumstances underestimate total benefits of road improvements, particularly for logistics/distribution systems where transport accounts for a high proportion of costs.

5. Valuing Road Access Using Transport Innovation

This study by Gibbons and Machin (2004) evaluates the benefits of rail access to consumers, based on the construction of new stations in London in the late 1990s associated with the Jubilee Line extension and the DLR. The paper recognises that traditional CBA, using fixed values of time, underestimate the benefits of transport innovations, where there are behavioural responses. It considers the economic benefits of improved rail access to consumers by using house price impacts to value access improvements. The results showing that the implied values of time are not out of line those by DfT, suggests that benefits using traditional CBA have not been underestimated. However the study focuses on benefits to consumers and does not address potential producer benefits that might arise from reduced labour frictions and agglomeration effects.

6. Impact of Transport Infrastructure Investment on Regional Development

This study by an OECD working group investigated evaluation studies of major transport infrastructure projects with the objective of identifying impacts on regional development. It found that few ex post evaluation studies analysing the broader impacts from transport investment had been undertaken and that they did not provide a sufficiently firm quantitative basis to draw conclusions about the impact of transport infrastructure on regional economies and regeneration.

REFERENCES

Atkins. “High speed line study: Summary report”, 2003.

Bruyelle P, Thomas P. "The impact of the Channel Tunnel on Nord Pas-de-Calais", Applied Geography 1994.

DETR. "Transport and the economy". SACTRA 1999.

DfT. " Transport, wider economic benefits and impacts on GDP", 2005.

Gibbons S, Machin S. "Valuing rail access using transport innovations", Journal of urban economics, 2004.

GLA Economics. "Growing together: London and the UK economy", Jan 2005.

Graham D. " Wider economic benefits of transport improvements: links between agglomeration and productivity, Stage 1 Report," UK Department for Transport, July 2005.

Greengauge 21. “The role of high speed trains in the development and regeneration of cities”, 2006.

Greengauge 21. “The impact of high speed rail on Heathrow airport”, 2006.

Hay A, Meredith K, Vickerman R. "The impact of the Channel Tunnel on Kent." University of Kent, Sept 2004.

ITS. "Eddington Transport Study," University of Leeds, 2005.

Kwang S.K. "High speed rail developments and spatial restructuring: a case study of the capital region in South Korea" Cities 17(4), 2000.

Laird J, Nellthorp J, Mackie P. "Network effects and total economic impact in transport appraisal", Transport Policy, 2005.

Mackie P, Tweddle G. “Measuring the benefits gained by industry from road network improvements”, University of Leeds ITS Working Paper 391, February 2003.

Organisation for Economic Co-operation and Development (OECD), IM2 Working Group. "Impact of transport infrastructure investment on regional development", 2002

Oosterhaven J, Elhorst J. "Indirect economic benefits of transport infrastructure development," 2003.

Oosterhaven J and Knaap T. "Spatial economic impacts of transport infrastructure investments". Prepared for TRANS-TALK Thematic Network Brussels, Nov 2000.

Roger Tym and Partners. "Economic performance and the high speed line: An ex ante appraisal of the distributional effects". SRA, Dec 2002.

de Rus G, Inglada V. "Cost benefit analysis of the high-speed train in Spain," The annals of regional science, 1997.

The Standing Advisory Committee on Trunk Road Assessment (SACTRA), “Transport and the economy”, August 1999.

Steer Davies Gleave. " High speed rail: international comparisons", prepared for CfIT, Feb 2004.

UK Ultraspeed. "Evidence to the Eddington Review, Jan 2006.

UK Ultraspeed project. "The economic geography implications of major improvements in travel times between the cities of the North, CURDs, University of Newcastle upon Tyne, Sept 2004.

van den Berg L, Pol P. " The European high speed train and urban development." 1998.

Venables A. "Evaluating urban transport improvements: cost-benefit analysis in the presence of agglomeration," 2004.

Vickerman R. Spiekermann K, Wegener M. "Accessibility and economic development in Europe. Regional Studies, 1997.

Vickerman R. "Transport infrastructure in the European Community: new developments, regional implications and evaluations," 1992.