Deciding What Transport is for: Connectivity and the Economy

Bridget Rosewell

Abstract The evaluation of transport projects rests on comparing the costs of investment with their benefits. How we describe these benefits therefore has a strong impact on whether investments are made. One approach is to use time savings, but this abstracts from trip generation and economic impacts, and leaves it hard to incorporate environmental constraints. This however is still a dominant methodology amongst transport analysts. This chapter will critically evaluate these methodologies and the impact they have had on the ability to consider transport projects, with particular reference to the UK.

1 Does Transport Matter?

It is really rather odd how hard it is to answer this question. At one level it is clearly obvious that without transport there is no trade and without trade there is no economy. The discovery of wheeled transport, the training of animals to pull this transport created networks of towns and markets which were the backbone of mediaeval Europe. Moreover, transport is even more the backbone of military might. Roman roads are to this day referred to and even used—they were built to move troops, military material and all important provisions. Napoleon Bonaparte is credited with saying that an army marches on its stomach. Romans knew this just as clearly.

Harnessing steam power made railroads possible and it is hard to imagine the Industrial Revolution taking place at the pace and extent that it did without the

B. Rosewell (✉)
Volterra Consulting and Greater London Authority, 56-58 Putney High St, London SW15 1SF, UK
e-mail: brosewell@volterra.co.uk

O. Inderwildi and Sir David King (eds.), *Energy, Transport, & the Environment*,
DOI: 10.1007/978-1-4471-2717-8_35,

power of railways to move goods, people and food across continents. It is perhaps not surprising that it is the railways which feature in such descriptions of American capitalism as Kipling's Captains Courageous, and Ayn Rand's Atlas Shrugged.[1]

Containerisation is the further transportation improvement which dramatically reduced the cost of moving goods and has helped make possible the current wave of globalisation that we are experiencing.[2] The effort and investment which this required and the fortunes made and lost in the process are just as compelling as the stories of the railway barons of the early nineteenth century, though not nearly as well known. If moving goods is one axis of transportation, then moving people is the other. People movements are equally essential to trade as merchants, but the twentieth century has seen most extensively the rise of personal mobility, not only in cars, but also by air. Such movements have created entirely different labour markets as well as a whole new leisure industry. The OECD [2] has concluded that the outcome is that infrastructure needs are increasing across the globe and more funding is required.

But if transport is important, it seems remarkably hard to prove it, and economists have struggled with various methodologies. These have been well summarised by Crafts and Leunig [3] in a background paper for the Eddington Report into Transport and the Economy for the UK government. It is apparent from this study that creating a general framework is fraught with difficulty. A growth accounting framework is likely to lead a reliance on unmeasured spillover assumptions, while the analysis of gains from trade has no allowance for the benefits of variety and new products becoming available. Crafts and Leunig rely on case studies to illustrate the benefits of transport systems for the economy and the way in which the returns to transport systems have been measured. It is clear from their account how different forms of communication systems, from canals to roads, have had strong positive impacts which have then faded away, to be replaced by new structures. It is this phenomenon which needs to be at the heart of any understanding of transport and the economy.

For example, an investigation of the relationship between the growth of road traffic and that of output in the UK from 1950 to 2009 shows a strong short-term relationship but distinct phases over the medium term (Fig. 1). Up to the first oil crisis in 1973 there was strong growth in road traffic moving cyclically with output. In the period from then to the early 1990s both output growth and road traffic growth slows down while thereafter the cyclical pattern is much less obvious. At the same time, the relationship between traffic growth and output growth is distinctly different, with higher output growth compared to traffic growth than in the 1950s and 1960s.

This illustrates how the relationships can evolve over time for any given technology, and that an understanding of such relationships and the impact of investment will not be straightforward.

---

[1] In both stories, the efficiency and speed of communication are used as metaphors for power and commitment.

[2] The story of containerisation is dramatically described in The Box, by Marc Levinson [1].

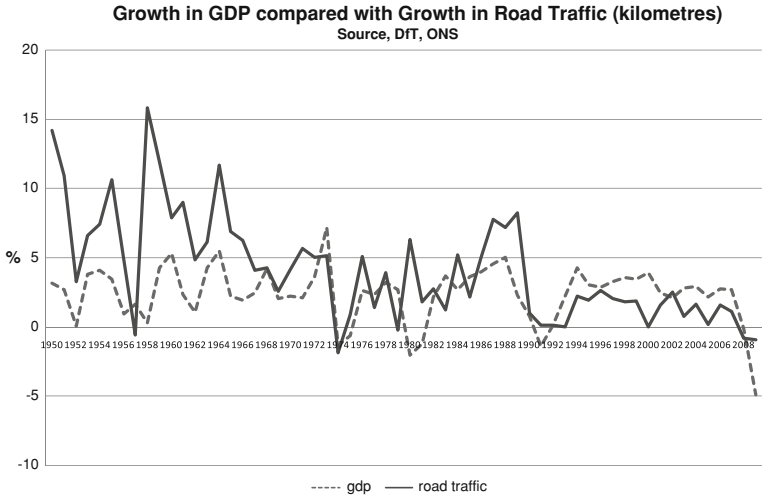

Fig. 1 Growth in GDP and Road Traffic

Moreover, it is noteworthy that, as far as people are concerned, the amount of time spent in travel remains fairly static over a lengthy time period. Table 1 illustrates this. While the survey shows an increase of about 50% in average trip length, the average trip time has barely changed. This suggests that persons engage in some form of time budgeting which will only allow for a certain proportion of time spent travelling.

Improvements in transport availability allow longer trips rather than saving time as Metz [4] has shown and it is this which creates greater market access for both people and goods. So the basic relationship between output and transport continues to be powerful as Fig. 2, taken from an analysis by the UK Department of Transport, shows. This data indexes all forms of mobility including both passengers and freight. Although road traffic growth has slowed down, the relationship with output as a whole has remained strong—suggesting that we are a long way from ending the role of transport in growing our economy.

However, the uncertainties surrounding these trends and of measuring the impact of transport have been compounded by the proposition that new technologies will make physical transport systems redundant as we move into the digital age.

2 The Digital Economy and Transport

It is not yet entirely clear what we mean by this term. It could be argued that the digital economy is anything that happens using a computer (based in other words on bits). However, most commentators concentrate on aspects of the economy which are mediated in some way through the internet.

Table 1 Passenger trips, distance travelled and time taken: Great Britain 972/1973 to 2009, National Travel Survey

Year	Per person per year						
	All trips[a]	Trips of 1 mile or more	Distance travelled (miles)	Time taken (h)	Average trip length (miles)	Average trip time (minutes)	Unweighted sample size (individuals)
1972/1973	956	594	4,476	353	4.7	22.2	15,879
1975/1976	935	659	4,740	330	5.1	21.2	24,692
1978/1979	1,097	736	4,791	377	4.4	20.6	18,433
1985/1986	1,024	689	5,317	337	5.2	19.8	25,785
1989/1991	1,091	771	6,475	370	5.9	20.4	26,285
1992/1994	1,053	742	6,439	359	6.1	20.5	24,671
1995/1997[b]	1,086	794	6,981	369	6.4	20.4	22,861
1998/2000	1,071	810	7,164	376	6.7	21.1	21,868
2002	1,047	819	7,135	380	6.8	21.8	16,886
2003	1,034	812	7,192	381	7.0	22.1	19,467
2004	1,026	806	7,103	382	6.9	22.3	19,199
2005	1,044	818	7,208	385	6.9	22.1	19,904
2006	1,037	812	7,133	383	6.9	22.2	19,490
2007	972	786	7,103	377	7.3	23.3	19,735
2008	992	800	6,923	376	7.0	22.7	18,983
2009	973	774	6,775	372	7.0	22.9	19,914

Great Britain comprises England, Wales and Scotland

[a] There is an apparent under-recording of short walks in 2002 and 2003 and short trips in 2007 and 2008 compared to other years

[b] Data from 1995 onwards has been weighted, causing a one-off uplift in trip numbers, distance travelled and time taken between 1992/1994 and 1995/1997

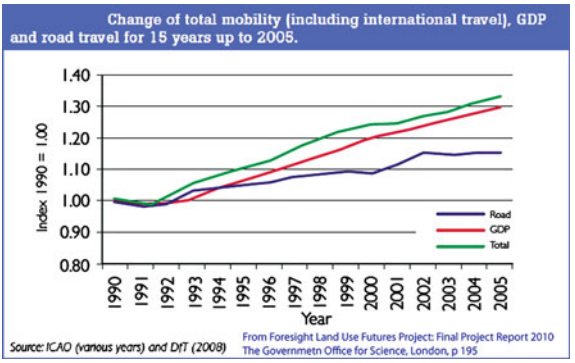

Fig. 2 Taken from: Foresight Land Use Futures Project: Final Project Report (2010), The Government Office for Science, London (page195)

However, this is not necessarily the most useful way of thinking about the digital economy. Conceptually, we are most interested in those aspects of activity which are facilitated by Internet activity or which take place entirely online. If I buy my music online, I may never have a physical object. However, the

production of the music in the first place is not (yet) an entirely digital event. My grocery shopping equally relies on a cyberspace catalogue but certainly requires physical activity at many other levels.

In principle, therefore, we are most interested in the added value that such activity represents and whether the margins on internet sales are higher than those on bricks and mortar shopping. Since many retailers now effectively offer both, this is not a straightforward question. It is noteworthy that HMV has recently announced the closure of many of their stores to cut costs, precisely because customers are now buying entertainment products entirely online.

Businesses also purchase over the internet; the UK Office for National Statistics estimated that the value of this totalled £360bn—in GDP terms this counts as intermediate purchases and does not add to output. However, if these purchases are better value for money then the cost reduction can be passed on in lower prices or better profits for shareholders.

There are also products which are produced entirely online. An example is internet advertising, on which companies are estimated to have spent £4bn in 2010, now representing 30% of the total advertising spends.[3] In the US, spend reached a record $26bn.[4]

Software is not necessarily a digital product. A piece of software delivered to me on a physical medium and used on a standalone system is a more traditional product. Software downloaded and with internet capability in its operation is more clearly digital. At present, we do not have statistics which distinguish these categories. Counting the firms engaged in this type of business might be the best that can be done.

Various EU studies have looked at the impact of digital trading and broadband access. The biggest impact has been procurement savings by manufacturers. Broadband access also adds to service sector productivity.

The measurement of GDP was originally intended to serve as a measure of how well off a set of consumers was—this was the value of their total product. As economies have developed, it has become harder to make such measurements. Service sector products are harder to value, and there is more focus on consumer surplus and welfare—a source of the new interest in 'happiness' measures.

Consumer surplus is conceptually the difference between what I am willing to pay for something and what I actually paid for it. An innovative economy and information constraints mean that this is an uncertain concept. What I would have paid for a product that did not exist is a moot point. Estimates of price elasticity have been used to get a handle on this, and research for BT showed the value of broadband access in this way.

---

[3] Internet Advertising Bureau, http://www.bancmedia.com/news-online-advertising-value-passes-4billion/

[4] http://www.iab.net/about_the_iab/recent_press_releases/press_release_archive/press_release/pr-041311

One of the most significant aspects of internet economy products is their impact on information availability. Standard analysis suggests we consume information up to the point where the cost of acquiring additional knowledge is less than its benefit. However, this implies that we have knowledge of the benefit of this additional information. But to know this is the same thing as saying that we actually have the information in the first place. Under these circumstances, traditional measures of value become meaningless.

More useful therefore are the measures of internet use, connections and sales and measures of intensity. UK estimates[5] show that:

- 19 million households have an internet connection.
- 25 million UK residents are members of Facebook.
- 31 million adults made online purchases during 2010, spending c£50bn in 2009.
- More than a quarter of mobile phones were smartphones by the second quarter of 2010.

BCG [5] has calculated that the value of the internet economy in GDP terms was around £100bn in 2009, of which the largest share is consumer transactions. This is using an expenditure-based estimate, valuing all products and services purchased and it represents 7.2% of GDP.

This description of the digital economy shows how much physical activity takes place in it as well. Goods need to be delivered and indeed manufactured. Even a completely digital product will be hard to create without human interaction.

Of course there are those who think that such interaction can take place in the digital domain itself. However, all the evidence suggests that this is likely to be a minority taste. Edward Glaeser's recent book 'The Triumph of the City [6] describes how cities provide the essential underpinnings to civilisation and the face-to-face interaction that economies and in particular innovation require.

He points out that in countries which are more urban, people report being happier. As the share of the country's population that is urban rises by 10%, the country's per capita output increases by 30%.[6]

It is noteworthy that the more we are able to communicate the more we congregate rather than spread out. From road to rail to the internet, cities have become more important rather than less, and we have now reached the point where it is estimated by the UN that more than half the world's population live in cities.

This all leads to the conclusion that the digital economy will not be one where transport does not matter and where physical proximity somehow becomes irrelevant. However, it certainly implies that the growth of digital products will change the production methodologies and spatial organisation of activity. As a result, it is more than ever important to think about how transport infrastructure investments are decided upon and how their contribution to a sustainable economy should be evaluated.

---

[5] BCG [5].

[6] Glaeser p. 7.

3 The Current Methodology

The preferred methodology for an evaluation is to compare costs and benefits. Indeed, one might say this is pretty obvious at first sight and bears useful comparison with the methods used by business to decide on investments.

The challenge is to decide however, what the relevant costs and benefits actually are. In practice, they can become so complicated that the relationship with simpler business concepts becomes misleading. The evaluation of transport projects in the UK in particular is an arcane art conducted with large and complicated models by a priesthood of experts skilled in their use. Outsiders can find it hard to judge the results and unable to penetrate the conclusions.

Let me try and set out the parameters. In order to judge a transport project it is of course necessary to assess how many will use it. Over the last 30 years London has developed a suite of models to produce these results. The model takes as inputs pre-existing forecasts of employment and population changes which have been allocated to a large number of transport zones (1,700 at the latest count). These zones are very small in the centre and tend to get larger as you move outwards and indeed include commuter zones outside London. These forecasts are used to predict the use of the network of roads, rail, bus and underground, given the costs of this use. Costs include the time taken as well as money spent and include adjustments for difficulties such as having to make a change of train. The model is solved on the assumption that people will minimise the cost of making the trips they need given the distribution of where they work and where they live.

In order then to understand the effects of a new transport investment, we create a new solution of the model having made the changes to the cost of the network that new linkages imply. We still have the same number of trips, but now they are being made more easily as a result of the new investment, which means crowding can go down and trips take less time. This is the key measured benefit of any transport scheme.

Of course time savings are made in minutes, while the cost of the scheme is in money. So time savings need to be turned into money in order to establish the value of the scheme. The establishment of a value for time is a non-trivial question, as some introspection should quickly show. It will vary by person, by income, by kind of trip and so on. The most recent review of this question was undertaken in 2003 [7] and its conclusions are the basis for the current levels which have been set by the Department for Transport.

An hour of leisure time is currently valued at £4.46 per hour and an hour of work at an average of £26.73[8]. The studies on which these values are based are not uncontroversial. Much of it used experimental studies which give people options of various trips. Answers can be inconsistent but these will often be ignored because rational economics suggests that they ‘ought’ to be. These values are part of the whole edifice of rational, expert, cost benefit analysis which rests on an intellectual construct which is increasingly under challenge. The value of working time is perhaps less controversial as it essentially rests on wage

rates—these are at least directly observable whatever actually drives them. However, for most studies they provide a relatively small proportion of benefits. Even in the Crossrail[7] case, where a value of work time of £55 per hour was applied for trips to Heathrow, the contribution was only 30% of the total time savings.

These basic calculations are those used to compare all UK road and rail projects where there is public investment. The approach is based on wanting to capture all the benefits of improving people's welfare when considering the costs.

Saving time can be considered the welfare benefit of an investment. Since time can also be thought of as money, then it implies somewhere a willingness to pay for a commodity (travel) which is not being charged for, or where the charges do not actually cover the costs. The approach is described in the official guidance (WEBTAG) as follows:

> The basic strategy of the willingness-to-pay (WTP) calculus is to arrive at a money measure of the net welfare change for each individual that is brought about by the project under consideration, and then to sum these. The welfare change for any individual is measured by the *compensating variation*, i.e. the individual's WTP for benefits or the negative of his/her willingness to accept compensation for disbenefits. The principle behind this calculus is the Kaldor-Hicks *compensation test*: a move from one state of affairs to another passes this test if, in principle, those who benefit from the move could fully compensate those who lose (without themselves becoming losers). When the cost-benefit accounts are presented in this way, there often are items which appear as benefits for one person and equally valued costs for someone else: such items are *transfer payments or pecuniary externalities*. Items which do not cancel out in this way are *social* costs or benefits (sometimes called *resource or real resource* costs or benefits). The word 'social' is used to signify that these are costs or benefits which fall on 'society as a whole', understood as the aggregate of all individuals.
>
> The calculus of social costs and benefits seeks to measure the value of the 'resources' used by, and the benefits created by, a project.[8]

These dense jargon ridden paragraphs can essentially be translated into English in a single sentence. Namely, the benefit of an investment can be defined as the willingness to pay of an individual—in this case for an extra minute of time. This willingness to pay is clearly an individual matter based on the enjoyment of individual benefits. It takes no account of broader economic benefits or indeed the impact of one individual's enjoyment on another.

This approach to transport projects was reinforced by a major study of the analysis of road schemes which reported in 1999. The report showed that economic theory suggested that time savings and economic benefits were two sides of the same coin. In principle, and in a competitive economy, time savings could be converted into economic activity as trips increased and time savings were competed away. As SACTRA concluded, "If these conditions hold, we concur that the value of the estimated costs and benefits to transport users (notably time savings, operating costs

---

[7] This railway, involving a new tunnel under Central London, is now under construction. It is a large project costing in the region of £16bn and will add around 80–90,000 to London's commuter capacity.

[8] WEBTAG, Unit 3.5.4, Box 2 [8].

and accident reduction), and to nonusers (notably environmental impacts—provided that they have all been identified and a money value attributed to them) would give a full and unbiased estimate of the value of the overall economic impact. This is equivalent to the statement that no 'additional' economic value exists."[9]

This means that there are circumstances in which an analysis of costs and benefits based on time savings will give us the transport investments which are needed to drive economic growth, since these can be considered to be one and the same thing. It is therefore crucial to take a look at the likelihood this will actually be the case.

In fact, there are many reasons why these conditions will not hold. First, there is the question of whether all costs and benefits have been correctly valued. Second, there is the question of whether the assumptions of perfect competition hold. And third there is a challenge to the time period over which any such changes will take place.

4 Valuing Costs and Benefits

It is easy to gloss over estimating costs. All projects are however bedevilled with this question. In large projects there is great scope to get things wrong and since they also take a long time to come to fruition, many costs can change in this period too. The UK government insists on 'optimism bias' in costing which adds 50% to costs on the basis of past over-runs. Giving firm deadlines can concentrate minds on delivery but also escalates costs as it approaches. It is well known that the Millennium Bug generated eye-watering fees for computer consultants as the end of 1999 approached—and it is still not obvious whether the bug was anything more than a minor irritant, rather than a deadly sting.

Even so, getting the costs right is a minor problem compared to getting the benefits right.

The process of time evaluation described above has a lot of embedded assumptions which go far beyond whether we can measure the value of time correctly for any set of individuals. At the heart of this is how we view the process of trip generation.

The benefits of time saving accrue, fairly obviously, to those who make the trips. For any investment, these are future trips and therefore there is a forecasting process involved.

Forecasts are notoriously wrong. They are nonetheless central to any investment evaluation—indeed this applies to costs as well as benefits. The trouble with the benefits is that they have to take place over a longer horizon than the costs and thus become still more uncertain.

The truth of forecasts. A forecast is likely to be right when the variable in question is not too random and where its causation is likely to be stable and direct. Merely stating this shows how unlikely this outcome is. Where there is any circularity of causation—your forecast leads me to take a different decision—there is already a

[9] SACTRA Final Report, para 24, [9].

problem as with any structural changes which are going on. In the short run, output of the economy has a large random element and the noise overwhelms the signal.

There is far too little active consideration of what we might call 'forecastability' and far too much reliance on the need to simply have a set of numbers. Figure 3 shows the percentage change in UK GDP from 1956 with each quarter as the percentage growth on the same quarter the previous year. Two things jump out—the volatility in growth, and perhaps the unusual stability of the period between 1994 and 2008. If we want to examine 'the business cycle' it is not really obvious where we should look for it.

Looking at a chart like this, it is hardly surprising that forecasters struggle to get the following year right and often disagree. Precisely why each turning point occurs can be established in hindsight but their timing looks pretty random. Signal is dominated by noise.

On the other hand there is some underlying stability exhibited by the same data when we look at levels of GDP, as Fig. 4 shows. This certainly illustrates how unusual the last couple of years have been in historical terms compared to previous slow downs, but also how the general path of growth has continued to march upward. Thus it becomes an important judgement to consider whether recent and unprecedentedly sharp falls herald a completely different path for the economy—a break with the whole of post war history—or rather that growth will eventually return. In planning it is important to rise above the short term and the mood of the moment to consider the whole sweep of relevant history.

It is equally important to consider the level of aggregation. Employment or output may be fairly stable over the long term at a regional or national level. They may be quite variable and unpredictable further down. There is often a demand for consistent forecasts, where views taken at one level are the same as those taken at another. But the actuality may not be consistent at all. Individual areas may buck a trend. For example, funding in Hull for housing renewal was being put at risk by forecasts which showed employment and output plummeting. Yet this was inconsistent with what was actually being observed in the city where the trajectory seemed more stable. The forecast was based on a national and regional prediction of falls in manufacturing, which indeed was the case more generally. But Hull had been hanging on to its manufacturing despite the trend elsewhere. Should the forecast therefore capture Hull's own history or should it show a break with the past and capture the patterns of the rest of the country. Either position is equally viable.

Another example is Hounslow, which lost 40,000 jobs between the late 1980s and the mid 1990s and then gained 30,000 back again by the turn of the century. Should this strong variability be part of a future projection, or should it try and abstract from this over the longer term? There is no right answer—planning for variability is extremely hard to do in spatial terms, but on the other hand its existence would lead you to foreground a need for flexibility.

The forecastability question obscures a more important issue. This is the extent to which the outturn is independent of the investment. This is one of the ways in which confusion is generated by the evaluation process.

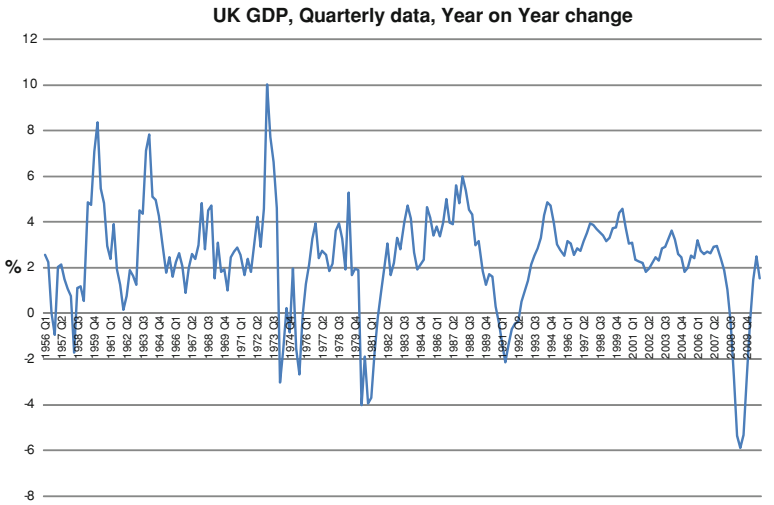

Fig. 3 Quarterly growth, year on year, UK GDP, Source ONS

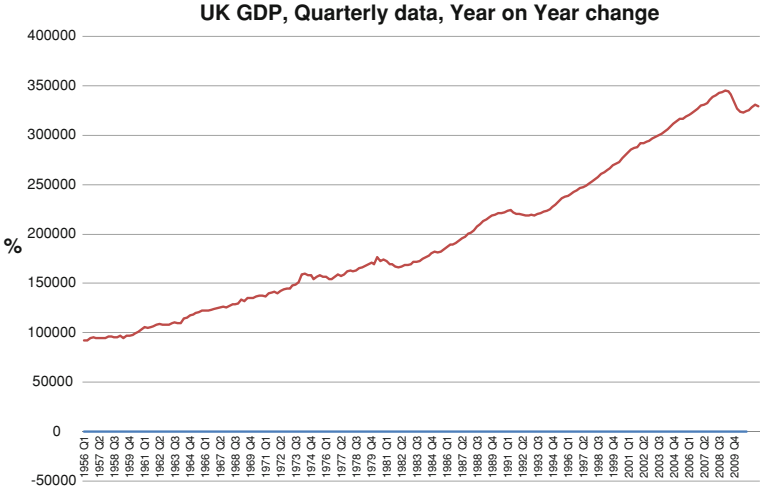

Fig. 4 UK GDP quarterly data- year on year change

It is like considering an investment in extending your house. You get a quotation for the building work, and imagine the benefits of living in the new kitchen, dining room and conservatory. But you fail to imagine the process which is essential to getting from the original state of the house to the final state and the other spending (from kitchen equipment to curtains) and the time involved in the process. You also (generally) fail to realise how the project will need to change as you go along, as it turns out you really want the windows somewhere else, or the building regulations change.

A similar process is going on with any transport infrastructure investment. The benefits are thought of as time savings for people who make trips using it. But how they use it and why they will change as a result of the new opportunities—and their choices will involve their own investments (the kitchen equipment). All of this will happen in real time as the feedbacks emerge between the ideas and the reality. The trips that will use the new infrastructure do not emerge independently of the investment, much as the new kitchen and curtains do not emerge independently of the new extension. They are complementary and one only exists because of the other.

Thus it is the trips and their associated output that comes first—the welfare benefits are a by-product. It is putting the cart before the horse to start with welfare and to consider the economy as an afterthought.

Moreover, this is a process that happens in time. It may take many years to generate the full consequences of a major investment. Even in the case of the house extension, construction takes time, fitting out takes time, and deciding on furniture may take still more time. Each stage involves decisions and changing decisions.

This kind of world, in which we must consider the result of an investment as something that happens in time and should be assessed that way is quite against the assumptions of perfect competition. Indeed it is the assumptions of perfect competition which lead to a comparison of one outcome with another and no consideration of the path involved. It also leads to the ability to equate welfare with economy.

In perfect competition there is perfect information. No need to change your mind about the colour of the curtains—you will have got it right the first time. Moreover, you only need information about yourself, your tastes and preferences. Fashion plays no role—since fashion implies that you are affected by what others do. There is never any need to look round and think that the colour scheme looks dated.

In other words, perfect competition is a theoretical construct established to enable economists to generate neat and tidy results. It should be used with the utmost care, as it has a tendency to behave like a weed and swamp more careful analysis.

Once it has been dug out, we can clear the way for thinking more clearly about the links and feedbacks between transport and its effects without assumptions that mean no one cares about another's choices, or that the future is completely known to us.

5 What Next?

Whether evaluating transport investment with welfare-based tools, or assessing an 'approved' cost of capital with a regulated asset base, we have allowed economic models to get in the way of reality.

This means that costs and benefits are assessed by different standards and with insufficient attention paid to payback, as distinct from benefit cost ratios. Private investment needs to get a payback which can cover interest and principal and over which the investor has some control. Where the returns are under the control of the

public sector (fares, charges, prices) a lender must have faith that the monies will be sufficient and robust to that regulation. This is a difficult judgement and made more difficult every time the rules are changed.

In the case of Tax Increment Funding, there is a further judgement that tax revenues will flow through to a project to make this payback. Creating this ring fence at a sufficient scale and size to cover the costs is still untested outside the US.

The Treasury will only be prepared to hypothecate taxes which they view as additional to those they might otherwise collect without the investment. This is quite a stringent view of how the economy works and depends on strong economic modelling assumptions of the kind that are extremely hard to test—another example of how economists have imposed a particular view of reality.

Another implication of the 'modelled' approach that we take to infrastructure is that the real economic benefits are seen as the add-on and the less real are taken to be the basic benefit. In the case of a transport investment, for example, it is time savings, valued by some limited techniques, which is the core method of thinking about rail and road infrastructure.

The weakness of this approach is self-evident:

- It relies on forecasts of economic activity and population and assumes this growth will happen anyway.
- It relies on assumptions of the value of time which are in turn dependent on survey evidence.

The larger and longer term an investment the less likely it is that growth will be independent of the investment. The value of time (even if measured correctly) will only be a good measure of welfare and economic benefits if the stringent and highly unrealistic assumptions of perfect competition apply.

Nonetheless this approach is used in generating the cost benefit ratios which are a key public sector decision rule.

More recently, some variations on this theme have been permitted—a bit like the addition of further epicycles to Ptolemaic astronomy rather than accepting that the earth goes round the sun. These variations permit additions to benefits if it can be shown that:

- Investment increases activity in highly productive centres, increasing the output of the UK as a whole.
- Investment improves land use and regenerates locations which are the subject of policy.

Both of these add further degrees of arcane analysis and are difficult, if not impossible, to prove. It is undoubtedly true that increasing activity in productive centres by relieving constraints on transport systems, such as Crossrail does, increases the output of the UK economy as a whole. Indeed it is possible to show that the taxes on such activity are sufficient to pay back the investment, while the fares are capable of covering the interest charges. In this context, it would seem that the whole paraphernalia of traditional cost benefit analysis is unnecessary—the investment will pay for itself.

In the case of the second effect, this has been defined in the guidance in such a way as to provide an almost impossible test, especially for any investment on a large scale. Requirements include the need to provide a model of how transport interacts with land use known as LUTI models. Such models are even larger black boxes than the transport models, but like them the scale of investment that is made in them by both researchers and clients mean that there is a tendency for faith to replace judgement. These models are opaque and almost impossible to calibrate to real data. Relying on them for any policy decision is entirely irresponsible.

The case for the Thames Gateway Bridge in London had to rest on proving the potential for the bridge to create economic activity. Models in social science do not meet the standards of proof of engineering models and this proved a serious difficulty.

If we are to be able to invest in transport infrastructure it is essential to find a better way to rank investments and especially to create a more transparent method which can both be better understood and challenged. Public sector priority setting is a key element in the investment process, whether there is public sector funding or not. Even where there is a private sector funding, planning processes will still require analysis to meet the standards set by transport policy makers.

The tests that assessments need to meet are:

- Transparent in process and assumptions.
- Clear about the split between financial and non-financial benefits.
- Clear about the purpose of investment and what form of benefits are expected.
- Clear about who controls the benefits.

One way it has been proposed to do this is to create a future asset base valuation (RAB) on which an agreed rate of return can be made. Unfortunately this will fail the transparency test. The way in which a future asset base is estimated has a lot of similarities with the existing process of modelling. Again, it relies on forecasts and an assessment of benefits in the same framework as before.

The easiest way to create transparency is to start with an analysis as if a project is a private sector investment. Benefits would clearly be financial and it would be clear to what extent these could actually be captured by the investors. This would also create a framework for analysing the extent to which private investors would have an interest in investing—if returns can only be captured by institutions under the control of the public sector, this will clearly limit private sector funding.

Subsequent to this initial analysis, which can be provided in a form in which it will be possible for third parties to understand and challenge the analysis, it is then perfectly possible to consider external effects which might make the investment either more or less attractive, such as:
Negatives:

- It reduces the value of other activity (cannibalisation).
- There are environmental negatives.
- There are distributional negatives.

Positives:

- There are growth impacts.
- There are environmental benefits.
- There are distributional benefits.

It would need to be obvious that these were not captured in a monetary analysis before they could be accepted—but if they were, this would be a clear signal for government investment.

It must be accepted that such an approach to investment appraisal for transport would go against the development of large-scale models and associated guidance which has been built up over 30 years or more. There is much vested interest associated with the current system and intellectual capital that has been built up around understanding and presenting this complex analysis.

However, it is clear that this system militates against principles of good governance, even if the analysis could be done perfectly. It lacks transparency of both process and analysis. Moreover, the embedded assumptions in the analysis are risky and lack calibration to the real world. The current decision making process has therefore failed at a very basic level.

A simpler system must have a better chance of getting a sensible set of decisions which can generate the infrastructure we need.

6 Institutions and Finance

In infrastructure, institutions come in three flavours—planning, delivery and finance. While the skills required in each are different, they need also to be related to each other and creating new institutions is rarely an answer to a problem. A willingness to create a long-term vision and act on it in a flexible way is much more important. It requires a willingness to create proper financial vehicles which can control costs and manage revenues, whether from charges or from taxes.

At a recent conference on High Speed 2, the speaker from France stressed finance, profitability and return on investment. The UK speakers did not mention any of these concepts. Instead they talked about systems, general economic benefits and management. This was noteworthy from a French system which is nonetheless heavily subsidised by the public sector.

The attack on investment in High Speed 2 in the UK has focused on the damage to properties in a rich part of England in return for '20 min off the trip to Birmingham'. If this were indeed the only return on such an investment, it is hard to see why it would be work spending up to £40bn on it. This is the consequence of an evaluation framework based on time savings. In fact such new connectivity is focused on economic regeneration, and exploiting opportunities for growth in cities in the North of the country. This case is not well made at present.

The stress on model-based benefits and evaluation tends to lead to larger projects and a focus on cost benefit ratios, rather than a focus on deliverability and

revenues. The best becomes the enemy of the good. Large projects obscure the identification of benefits and who could pay.

I have recently worked with a small group looking at finance for High Speed 2. We concluded that the public sector should pay only for the basic infrastructure of tracks and signalling. Trains, stations and associated development should be the subject of separate appraisal and separate finance. Indeed the spurs from the main track to city centres are not necessarily a general taxpayer benefit, although the organisation of local government finance means that it is hard to see how a city could raise the necessary funds.

References

1. Levinson M (2006) The box: how the shipping container made the world smaller and the world economy bigger. Princeton University Press, Princeton
2. OECD (2006) Infrastructure needs to 2030, OECD futures project
3. Crafts N, Leunig T (2005) The historical significance of transport for economic growth and productivity. Background paper for the Eddington report
4. Metz D (2008) The myth of travel time savings. Transp Rev 28(30):321–336
5. Boston Consulting Group (2010) The connected kingdom: how the internet is transforming the UK economy, Google
6. Glaeser E (2011) The triumph of the city
7. Institute for Transport Studies (2003) Values of travel time saving in the UK, Leeds University
8. WEBTAG Unit 3.5.6 (2011) http://www.dft.gov.uk/webtag/documents/expert/pdf/unit3.5.6.pdf
9. Standing Advisory Committee on Trunk Road Assessment (1991) Final Report, Department for Transport