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Valuing Transport Investments based on Travel Time Savings – A Response to David Metz

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ABSTRACT

David Metz's recent case study published in this journal argues that the conventional approach to the economic appraisal of transport projects is inadequately evidenced and likely to lead to inconsistency with policy goals. In his view, these shortcomings have been further demonstrated by the recent UK study of the value of travel time savings (VTTS), and radical reform of appraisal is required. Metz makes some good points, but many of his key arguments are unsound. This paper responds to Metz's arguments, including his critique of the VTTS concept and the recent UK study on this subject. The paper argues that the preferred approach to appraisal should be an evolutionary one, bringing together the transport sector impacts and the planning and economic development impacts in the overall transport business case.

1. Introduction

David Metz's recent case study on transport policy (Metz, 2017) merits comment in a number of respects. At the broadest level, interpreted as a call for transport appraisal to inform social and economic priorities, it is difficult to disagree. Indeed, a more thorough assessment of the likely impacts of a scheme on local and national economic priorities is what the Transport Investment and Economic Performance (TIEP) report (Venables, Laird & Overman, 2014) and the Department's revised guidance is seeking to achieve (DfT, 2017). But below that top level, in many respects, Metz's challenges to what he terms *'the conventional approach'* (p716) are misguided. Metz concludes his paper by issuing a clarion call for *'an appraisal framework that is evidence based rather than theory based….'* (p720). This is a false choice. Well-formed analysis with the purpose of informing decision-makers on priorities and providing for public accountability requires a combination of:

- A coherent theoretical framework.
- Predictive modelling populated by data and validated against evidence.
- A set of social values or weights.

This is a completely general statement and does not presuppose or imply any particular form of theory, model or valuation system. But all are required, working together. The appraisal framework needs to be capable of bringing together the full range of economic, social, environmental and financial impacts and presenting them to decision-makers in a comprehensible and balanced way.

Metz's thesis can be broken down into the following linked propositions:

1) Travel time savings are a short run phenomenon as evidenced by the constancy of travel time budgets.
2) The long term benefits of transport investment are to be found in changes in land use and value.

3) The recent changes to the UK's official values of travel time savings and reliability based on the 2014/15 study (Arup, ITS Leeds & Accent, 2015; Batley et al., 2017) are open to criticism in various respects.
4) The conventional approach to appraisal is weak on the spatial distribution of the benefits of investment – which is important to decision-makers.
5) The conventional approach should be complemented by a methodology more explicitly rooted in spatial economics.

This response is organised as a comment on propositions 1), 2), 3) and 5) above. Metz's point 4) about the spatial and social incidence of the final benefits of transport projects is justified, and the present paper will explain why this is a very demanding question to answer fully.

2. Do travel time savings exist?

Metz's starting point is the approximate constancy of travel time in personal time budgets: *'There are no travel time savings in the long run, which is the perspective of the 40-year NTS time series'* (p717).

This proposition can be debated at a number of levels. At the empirical level, the recent Commission on Travel Demand (Marsden et al., 2018) found that actual expenditure of time on travel has fallen over the last decade. Then there are points about whether long term behaviour changes such as preference for foreign holidays and substitution of internet purchases by white van for shopping by car may have disturbed the series. Plausibly, the outcome in terms of time spent travelling is the result of very many economic and social forces, some endogenous to transport, others largely exogenous. So theory, modelling and empirics working together are required to give a good understanding of an observed phenomenon.

The constant travel time budget hypothesis is consistent with unitary elasticity of demand for travel with respect to travel time. Of course that is an average not just across people but also across the network. It could easily be that the elasticity is well below unitary on the inter-urban highway network, and above unitary in the urban network where more choices are in play such as mode and destination, trip purposes are chained together, and demand/supply feedback.

But more fundamentally, it does not matter for the integrity of transport appraisal whether the constant travel time budget hypothesis holds or does not hold. The real world consists of a myriad of choice behaviours which are difficult to enumerate comprehensively, never mind evaluate. A reduced form is required which aggregates all those choices into a relationship between accessibility and trip making. At an aggregate level, the value of improving a transport system can usefully be viewed as the sum of the fall in generalised cost for a given volume of trips plus the enhanced value of the amalgam of induced behaviours. Time is a major component of generalised cost, so understanding the set of exchange rates between time and money remains important irrespective of whether the constant travel time budget hypothesis holds good.

Metz seems to have fundamental objections to the concept of travel time savings. Of course, on a strict constructionist view, it is not possible to save time, only to transfer it between higher valued and lower valued activities. But similar considerations apply to many other consumer decisions. People buy electric hedge trimmers in order to reduce the time and physical effort of trimming their

garden hedge. If they then invest part of the time saving in trimming their next door neighbour's hedge, this does not deny the value of investing in the hedge trimmer. Similarly, whether or not people choose to take out part or all of a travel time saving in travelling to/from a preferred location is very relevant to modelling but does not undermine the concept of travel time values as a proxy for the value of enhanced accessibility.

3. Representing Transport and Economic Change

What happens to the spatial economy if government intervenes via investment or pricing or regulatory policy to change the transport system in some way? Here, there is little reason to disagree with Metz. The consequences can be represented as a linked chain of economic processes, not all having the same time profile (Figure 1).

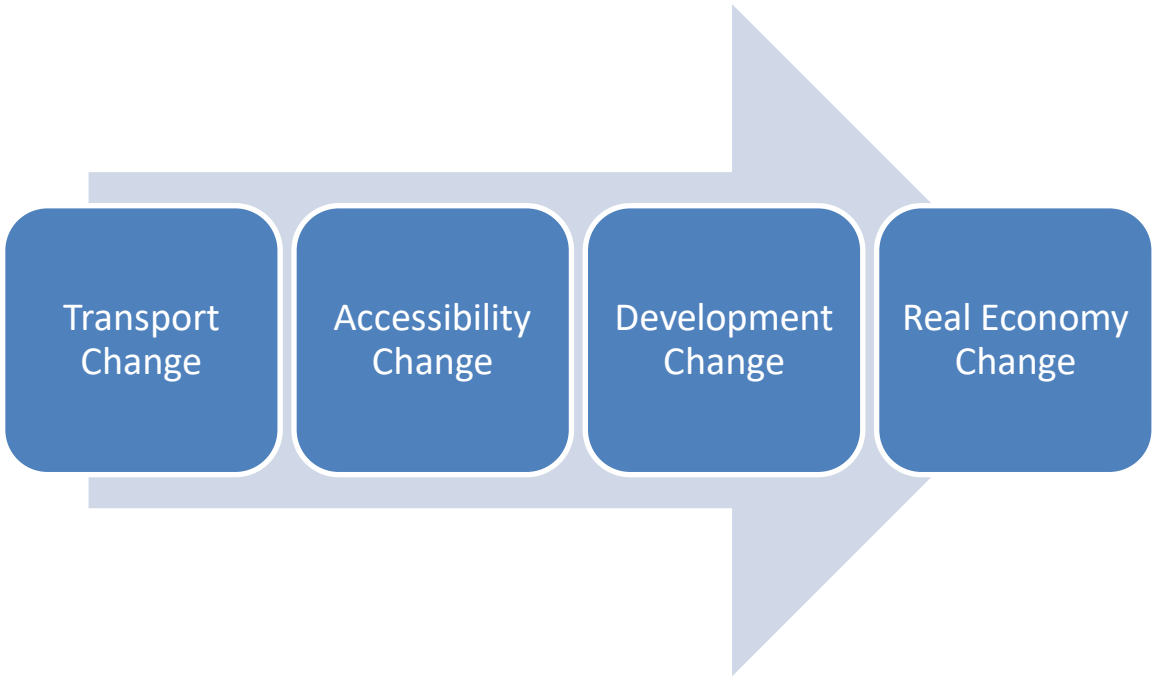

Figure 1: Process of change in the spatial economy stimulated by a transport change

Change implies that an intervention creates a difference between a 'Do-Something' state of the world and a Baseline or Reference Case. Practical appraisal typically requires many Do-Something alternatives to be considered and compared, not just in some base year, but over the life of the project. In order to bring discipline and coherence to this task, some form of modelling is essential.

How does this linked chain of processes percolate through the economic system? A representation of this can be found in Figure 2.

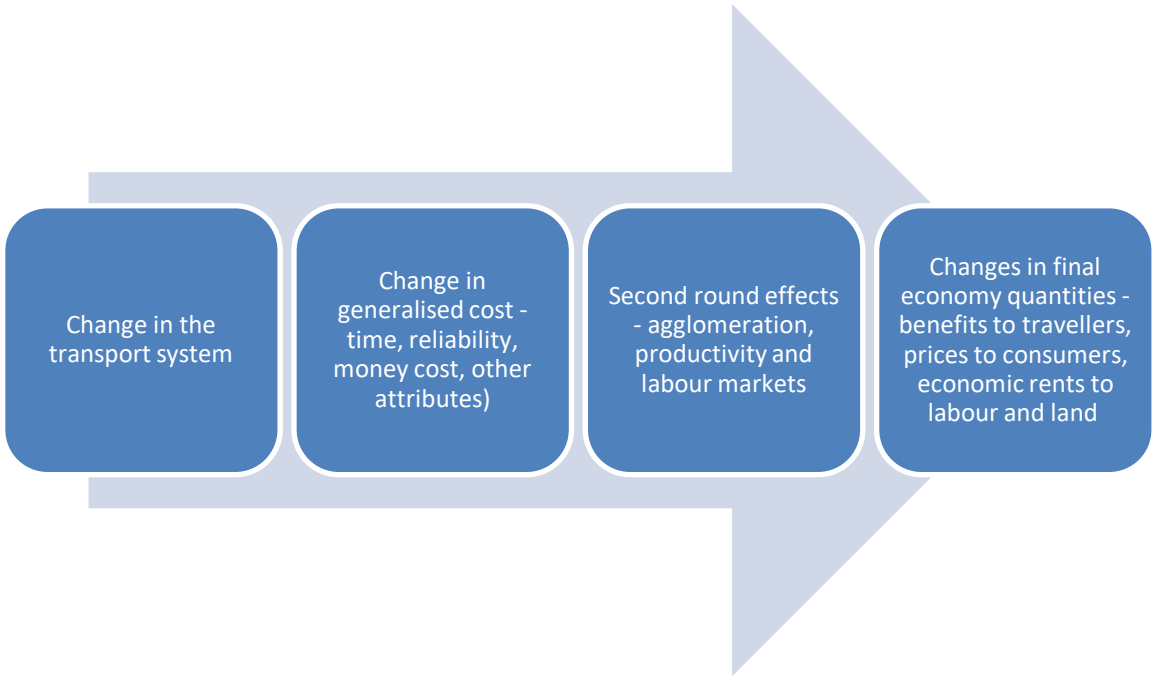

Figure 2: Process of change in the economic system stimulated by a transport change

A consistent approach to the appraisal of transport projects requires that the economy cake be sliced in a way which avoids double counting. Conceptually it would be possible to count either the primary and second round impacts (i.e. the second and third boxes in Figure 2) or the changes in the final economy (box four). The UK Department for Transport's practice, built up over many years, is to do the former.

Metz says: *'Consequential changes in the economy, such as in how land is used and how its value increases as a result of improved access, are largely disregarded* [in economic appraisal]*'* (p720). An interpretation of this which would have logical attractions would be that the Department's practice should really be abandoned in favour of a new approach measuring the changes in value to the actors in the final economy – travellers, consumers, workers, rentiers and taxpayers. The attractions of this are obvious – the final beneficiaries and the pattern of gains and losses would be laid out for public scrutiny. But a number of points are in order.

First, the information requirements would be great. The pattern of economic impacts between travellers, workers, property owners etc. would depend on the relative elasticities and response properties at work in the economy which will certainly be context specific. Many of Metz's more convincing examples are from urban, and specifically London, contexts where land is in inelastic supply and it is credible that a significant proportion of the initial benefit will percolate via the land market. A fair conjecture is that most projects in the Department's budget or planning overview are not like that and the benefits will accrue widely across the economic actors. There are many channels at work, not just the land market.

Secondly, experience of project appraisals such as HS2 and the third runway at London Heathrow suggests that achieving the desired level of robustness and validation of the spatial economic impacts of schemes remains a big challenge. Further development of Spatial General Computable Equilibrium (SGCE) models offers one possible route here, but there would need to be increased

transparency to aid understanding and validation of what is happening inside the box. For projects of such complexity, estimates of land value change on their own as benefit indicators would be fraught with danger, although they would certainly offer something to the financial appraisal as indicators of taxable capacity.

Thirdly, even if the shift to final economy modelling could be achieved, the drivers of change would still be the same. What drives economic and land development? Changes in accessibility. What are the major components of changes in accessibility? Changes in time, reliability, comfort and money cost. Their relative values would still be required in order to drive the model.

4. The Value of Travel Time Savings

Turning now to Metz's comments on the 2014/15 VTTS study for the UK Department for Transport, some background context is useful. The study is one of several recent such studies internationally and UK experience is not atypical of those countries which use cost-benefit analysis as a key input to decision-taking.

Prior to the 2014/15 study (Arup, ITS Leeds & Accent, 2015; Batley et al., 2017), official WebTAG recommendations on VTTS were based on behavioural data collected by Accent and HCG some 20 years previously (AHCG, 1999). Many changes had occurred in the intervening period, both technical such as Satnav, laptops and mobiles, and socio-economic such as the nature of employment and moves towards more flexible working practices. Real incomes, travel costs and population characteristics such as age profiles had also changed. So there was a strong objective case for a new national study. In advance of the 2014/15 study, DfT commissioned a number of scoping studies covering both business and non-work. Guided by these scoping studies, which acknowledged the radical changes which had occurred over the subsequent 20 years – relating not only to travel behaviour but also to the methodology of estimating VTTS – the 2014/15 study entailed an expansive scope, covering all major surface modes, business and non-work purposes, and various aspects of travel quality in combination with travel time. More specifically, the objectives of the study were to:

- To provide recommended, up-to-date national average values of in-vehicle travel time savings, covering business and non-work travel, and based on primary research using modern, innovative methods.
- To investigate the factors which cause variation in the values (e.g. by mode, purpose, income, trip distance or duration, productive use of travel time etc.) and use this to inform recommended segmentation of the values.
- To improve understanding of the uncertainties around the values, including estimating confidence intervals around the recommended values.
- To consistently estimate values for other trip characteristics for which values are derived from the values of in-vehicle time savings.

Against this background, Metz's comment – '*the research study attempted to fit a diversity of observations into a theoretical framework, dealing with uncertainties and inconsistencies through the exercise of judgement on the part of a group of investigators committed to the overall approach and to advancing the state of the art'* (p718) – perhaps does not do full justice to the scale, comprehensiveness and rigour of the study.

Turning to some of the specific criticisms of the 2014/15 study highlighted by Metz, the following responses are in order:

- Metz comments that: *'Quite substantial changes in the monetary values of time between current standard values and those from the new research confirm the problematic nature of SP studies. For instance, the research suggests that time spent commuting is worth £10.01 per hour in 2010 prices, in contrast to the current value of £6.81'* (p718). Following from the earlier discussion, the 'current value' referred to by Metz was based on data collected in 1994. It should therefore come as little surprise that substantial update is needed to account for 20 years of changes in travel behaviour and travelling conditions. In the past it has sometimes been alleged that studies are somehow constrained to come up with the same values, so perhaps we are between the devil and the deep blue sea. But the 2014/15 approach was to report the results of the best fit models, without regard to whether the resulting cell values were higher, lower or the same as the 1994 study results.
- Metz comments that: *'It is important to distinguish between time savings and reliability improvement as potential outcomes of investment in the transport system, since these benefits can be achieved in different ways. Reliability can be improved by providing predictive journey time information in advance of the trip, taking advantage of digital technologies'* (p719). This assertion is puzzling; the provision of passenger information can only mitigate for unreliability, not eliminate it. However, if the point is that the values should be applied both to hardware and software changes which reduce unreliability then that is agreed.
- Metz further comments that: *'…it is hard to justify such a major change to the value to be ascribed to reliability on the basis of a single set of SP experiments involving variations in both in time and reliability. Reliability and time savings are conceptually distinct and the former could be valued in SP experiments dedicated to that purpose, which would increase confidence in the findings…'* (p719). This assertion is confused; as is common in many VTTS studies, a requirement of the 2014/15 study was to deliver valuations of reliability in the form of time multipliers (i.e. using time rather than money as the numeraire). This is only possible if the relevant Stated Preference (SP) experiments feature both time and reliability. More generally, the state of nature is that people are frequently trading between time, reliability and money in their travel choices and the task is to elicit those trade-offs.
- Metz goes on to say: *'The same argument applies to crowding on the railway, the relief of which through longer or more frequent trains is unrelated to journey time'* (p719). Again, this criticism can be rejected, for the same reason as above. In passing, it is worth noting that the disutility of crowding is intuitively related to the amount of time spent in crowded conditions, which makes time (rather than money) the obvious numeraire.

Whilst the points above focus on criticisms which necessitate rebuttal, section 2 of Metz's paper details further criticisms of the 2014/15 study which are generally legitimate and are openly acknowledged in the Arup, ITS Leeds & Accent (2015) report. Bearing in the mind the ambitious scope of the 2014/15 study and the inherent complexities of delivering on such a scope, a lot went right, and relatively little went wrong. Where unanswered questions remain, the DfT's ongoing research agenda is seeking the plug the gaps.

5. Transport, Development and the Wider Economy

Metz calls for a complementary approach to appraisal based on *'the sub-discipline of spatial economics, which would allow the real long term consequences of investments to be analysed'* (p720). The question is what blend is needed in order to achieve that. The 1998 SACTRA Report considered the possibility of replacing transport analysis by Computable General Equilibrium (CGE) modelling so as to predict impacts on the final economy – but rejected switching over to that approach as too risky. This was partly because of the relative weakness of regional economic data in the UK. So the solution for the last twenty years has been to develop in the direction of measuring direct transport benefits plus *additional* wider economic impacts (the 'CBA-plus' approach). But there have been various attempts to estimate the effects of the improved accessibility created by megaprojects such as Crossrail, HS2 and additional runway capacity in the London airport system on GDP and employment. The results are controversial at the technical level, and an order of magnitude more uncertain than the CBA-plus approach.

Perhaps there is another way forward. In 2010, the UK Government established the five business case model as a way of structuring the Transport Business Case (DfT, 2013). What has been discussed in this response relates to the content of the Economic Case, which is best viewed as the economic-engineering case for the scheme. But there is also the Strategic Case. Some of Metz's points, though levelled at the Economic Case, are really critiques of the system for failing to articulate what projects are trying to achieve, how improved accessibility will drive this and what economic outcomes are expected. So far, rather limited progress has been made in terms of what analytical content and evidence should support the rather vague aspirational content of the Strategic Case. For major schemes and strategies, perhaps some high level analysis to substantiate the vision for a scheme and complement the nuts and bolts of the CBA-plus approach would be useful. But other countries have not found this any easier to implement than the UK (Mackie, Worsley and Eliasson, 2014).

6. Conclusion

Metz's high level thesis is that the appraisal system and particularly its use of travel time savings as a proxy for accessibility benefits is flawed and inconsistent with UK policy objectives. As a response to Metz, the present paper has argued that the link between a transport scheme and the economy cannot be made without reference to the changes in accessibility afforded by the scheme. In any case, this paper has questioned whether changes in accessibility can be defined in terms of anything other than some amalgam of changes in time, reliability, comfort and money cost which make up an index of real service quality. A core objective of current UK transport investment policy is to maintain real service quality over the networks with an acceptable environmental outcome within a growth agenda. Against this background, a holistic approach to appraisal is required and chasing the Benefit:Cost Ratio as if it were the only indicator of project worth is to be avoided. But the value of the change in accessibility remains a cornerstone in developing the economic case and contributing to the overall business case for a transport scheme. To move away from estimating these direct impacts would be a fundamental error.

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