

The transport problem: The need for consistent policies on pricing and investment

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This paper reviews the basic issues involved in identifying and providing solutions to transport problems. The paper argues that solutions focusing solely on investment in capacity or second-best solutions to pricing such as road pricing and free public transport ignore the essential economic relationships involved in transport. The paper provides a critique of investment and pricing and argues for a more integrated approach in which optimal pricing is a core consideration in any investment decisions. This is seen as particularly important in a post Covid-19 world where many of the fundamental drivers of transport demand have changed, and public authorities face significant constraints on budgets whilst new pressures such as commitments to net zero in the face of global warming threats add additional pressures. The paper offers some thoughts on the principles involved in establishing a more suitable structure for dealing with the transport problem.

1. Introduction

Everybody knows what the transport problem is, and they've all got the solutions to it. The most usual solution for policy makers is investment in infrastructure. Adding capacity to the system is often an attractive solution in terms of its impact on congestion and its visibility. There is also evidence that infrastructure has a positive impact on productivity. This paper argues that what is needed is a step back to think about the fundamentals that are involved here and not to forget the critical role of pricing alongside optimal investment in providing solutions to the transport problem. Sixty years ago in 1963 Christopher Foster¹ (Foster, 1963) argued this in a book, which was really an introduction to transport economics, and identified three core issues.

- how to define the economic objectives of road and rail and evaluate the efficiency of the two modes;
- what are the appropriate pricing and investment criteria;
- what can be said about competition and the coordination of transport policy?

Those three issues remain important, but we could add some 21st

century problems.

- the way that public funding of transport is affected by changing demand patterns and budgetary constraints;
- how do we finance investments against a background of slowing economic growth;
- what are the environmental imperatives as we move towards net zero;
- increasing problems of equity and equality of access to good transport, particularly for people who face various constraints on the use of transport;
- the new challenges that exist post-COVID.

This paper reviews the key issues that lie behind identifying what is the transport problem and provides a guide to assessing the most relevant solutions. In doing this it argues for a move away from what may have been an excessive emphasis on refining investment appraisal towards a more balanced view of how to improve the transport system to support the economy.

Section 2 of the paper looks at the historical development of the pricing problem in transport, showing that this is a long-standing

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¹ Christopher Foster (1930–2022) became Director General of Economic Planning at the Ministry of Transport in London in 1966. With Michael Beesley he undertook the first application of cost benefit analysis in the UK that led to a major transport project being carried out: the Victoria Line of the London Underground, the first underground line that had been built for many years (Foster and Beesley, 1963). Foster was instrumental in developing the use of economic analysis in transport policy in the UK.

concern of economics, and the problem of implementing prices in more detail, Section 3 reviews the fundamental relationship between transport and the economy, Section 4 discusses the development of more refined approaches to appraisal, and Section 5 discusses the particular issue of how to identify and capture wider economic impacts, before Section 6 examines whether there is an inherent bias towards infrastructure investment. Section 7 returns to the question of optimal transport policy and its organisation. Section 9 draws some conclusions and recommendations.

2. The pricing problem in transport

2.1. The basis of transport pricing

The key question is why is transport different from other goods and services? The distinction is that transport is both time and place specific; it cannot be stored and although it can be bought in advance it has to be consumed at a particular time and in a particular location. This in turn leads to problems of congestion (scarcity of supply at a particular time). Secondly, transport requires both infrastructure and the provision of service using that infrastructure. These can either be integrated or unbundled, and there will be differences between different modes. Both infrastructure and service may be subject to economies of scale and scope and network effects may be a key element in these. Such a structure can lead to the emergence of monopoly (often railways are considered to be a case of “natural monopolies”), but at the other extreme low barriers to entry in some modes can lead to destructive competition in which profits on profitable routes are creamed off and prices forced down leading ultimately to mass exodus from the market. Such instability invites regulation and regulators face problems in applying pricing rules such as whether to use short- or long-run marginal costs and how to define benefits and costs in order to implement a relevant surplus criterion.

These are not new problems and have dominated discussion and analysis for the best part of two centuries (see Vickerman, 2023, for a fuller discussion). Much of that discussion has been about reconciling theoretical first-best solutions with the practicality of defining prices that are both efficient and acceptable. The early contributions from Dupuit (1844, 1849) and Marshall (1899, 1920) also set in place an ongoing issue about whether the analysis of transport should be in a partial or general equilibrium framework. Dupuit was clear that transport could not be considered in isolation from the markets for which transport was used and this defined the “public utility” whereas Marshall focused on the individual utility of the user and the willingness to pay for the service. Pigou (1920, 1952) developed the Marshallian tradition focusing on the deviations between private and social costs, particularly in the case of decreasing returns, in order to demonstrate the potential need for intervention (the “Pigouvian tax”) to ensure correct behaviour. Although Knight (1924) criticised Pigou’s analysis, and Pigou dropped his model of allocating traffic between two roads with different costs in subsequent editions, this has become the bedrock of the analysis of congestion and road pricing as well as the pricing of public transport (Ramsey, 1927; Boiteux, 1956; Beckmann et al., 1956; Walters, 1961; Mohring, 1972) and much subsequent analysis. Notably the practical implementation lagged behind the subsequent theoretical developments.

Pigou (1920) also made an important distinction between “cost or service” and “value of service” in his analysis of the “special problem of railway rates”. This leads to the important issue of price discrimination that arises because of the time and place specificity of transport.

2.2. Pricing in practice

The first rule of investment is always that until the price is right an investment cannot be justified. It has to be clear that there is efficient use of existing capacity, and for whom is that capacity being used efficiently,

and that requires the price to be right and to be the right prices for the right people. So how are optimal prices to be set, is there a welfare maximising solution that doesn’t depend on initial assumptions about ownership and control? (Hörcher et al., 2020; Hörcher and Tirachini, 2021).

Efficient allocation suggests that prices should reflect marginal costs. One of the points made by Foster (1963) was about getting the relative prices right between different modes in order to ensure the right allocation of traffic between them, a point made 40 years earlier by Pigou (1920). If deregulation and the attempt to promote competition between transport operators is about ensuring efficiency, does this lead to the right level of investment or do the constraints posed by the nature of the contracts that they operate under, which are probably being set up with a different set of parameters in mind, work against this? The difficulties of getting this exactly right are often the reason for a retreat to second best solutions. At one extreme is the argument for making public transport free, and at the other the use of road pricing on its own. Neither of these second-best solutions addresses the fundamental issue of getting the prices right to ensure an efficient distribution of traffic between modes. The most appropriate method of charging for the use of roads has had a long history. Pigou’s observations were principally about how to ensure that the costs of maintenance of public roads could be covered. As congestion became a more serious problem from the 1960s onwards there was renewed interest first in understanding the marginal social costs of road usage (e.g. Walters, 1961) and again in the overall charging regime (e.g. Walters, 1954; Newbery, 1988), but these were usually seen as a mode specific intervention rather than as part of an overall efficient transport system (see Vickerman, 2023, for a fuller discussion).

The road pricing debate has moved its focus from that on congestion pricing in cities back to the more general question of how to finance the construction and maintenance of roads when the proceeds of fuel taxation, that has been the mainstay of road funding for many years, is reducing with the switch towards electrical or other more sustainably powered vehicles. That switch has also been encouraged by tax incentives, including, perhaps irrationally, exemption from congestion charges. Whilst road pricing has been too often criticised as an additional tax, there is an opportunity to use the transition away from petrol and diesel power to a more rational system of charging for roads, but in the context of an overhaul of all transport pricing.

The public transport pricing argument is usually one about the appropriate balance between the user and the taxpayer, how far should public transport be subsidised to keep fares low? Increasingly perception of the fare has become distorted by a range of discounts based on the individual, (e.g. student, older persons), frequency of travel (e.g. season tickets, multi-journey tickets) or time of day (peak or off-peak, weekday or weekend). The bundling of transport services in an area into a single ticket (or the increasing use of contactless payment using bank cards) makes life simpler for the user but often obscures the direct cost of a particular service. Since, in the absence of a direct road-user charging system, the direct cost of the individual car journey is also unclear, users are faced with no direct comparison in the costs of alternatives for a particular journey. Much of this confusion arises from the way transport and particularly public transport, is organised, an issue to which we return in Section 7.

3. Transport and the economy

Transport is essentially an enabler to support an efficient economy. Without good transport there will not be an efficient economy, but efficient transport in itself is not enough to produce an efficient economy. The demand for transport is essentially a derived demand; we need to understand what people are travelling for (or why goods are being moved) as that will drive changes in the demand for transport. Transport demand is usually based on the concept of generalised costs so that such factors as speed (i.e. the time taken for a journey and the value of that

time to the traveller), comfort etc can be incorporated along with the monetary cost of a journey. Whilst it is analytically convenient to reduce these various factors to monetary terms it is not always clear that is how users see it. Does a full consideration of generalised cost determine the decision to travel and how to travel. Understanding how the user perceives the “price” and therefore how they will themselves evaluate the benefits from a transport change needs much deeper consideration as evidenced by the failure to predict accurately the impact, particularly of large changes in supply.

Both price and supply will be affected by the way transport is organised. We identified above the debate about the role of competition in transport and the nature of its conditions of supply leading either to destructive competition or to natural monopoly. Should policy aim to effect a degree of planning and control to prevent either of these extremes dominating, or should policy be directed towards allowing for competition to flourish to achieve greater efficiency. In both cases there is a further consideration of the degree of regulation needed. What is needed is a detailed look at how to define the welfare maximising solution rather than focusing either on a narrow debate about the effects of different contractual arrangements or a wider philosophical discussion about planning versus freedom. A welfare maximising solution has to determine the objective function; what is the objective of good transport, how do we measure it and for whom, who is the final user (e.g. Hörcher et al., 2020; Hörcher and Tirachini, 2021).

At the same time, we know that transport can be used as a means of driving economic growth, it has a supply side role. Infrastructure can be seen as a factor of production. A big debate started in the 1980s as a reaction to the prevailing economic policy ideas at the time in the US and the UK that the public sector was inherently wasteful of resources. The problem with public infrastructure was seen to be that it might crowd out private investment and crowd out private initiatives in industries that really produce value added. Transport was seen as just a cost, not a productive activity that generates increased productivity. A series of studies showed empirically that improved transport can be a hidden factor of production that enhances the productivity of firms though such an impact is not universal and can be exaggerated if care is not taken with the estimation (see Gramlich, 1994; SACTRA, 1999). As well as consideration of the global effect of transport in the national economy such effects may be important at the regional level in driving inequalities and hence the need to consider ways in which improved transport, and especially transport infrastructure, is an important tool in redressing such inequalities. Infrastructure can have an important impact on the competitiveness of cities (Graham et al., 2022). This has become part of the so-called levelling up debate in the UK (HM Treasury, 2020). Harris and Moffat (2022) provide some evidence for the UK suggesting that differences in infrastructure is one of the factors driving differences on total factor productivity between regions (see also McCann, 2016).

Too often analysis of transport focuses on just one of supply and demand; what is needed is to consider the interaction of supply and demand as both together affect welfare and output.

4. Appraisal

One of the problems of translating this into appraisal is that an essentially Marshallian perfect competition paradigm has been used as the basis of the traditional cost-benefit model. It is much simpler to assume that there is perfect competition in all transport using sectors so that prices are equal to marginal cost, as a result of which a change in the cost of transport passes directly through into product prices and real wages. This standard approach is represented in Fig. 1 in which the cost transport at the existing level of demand at Q is reduced from C to C' . Demand increases from Q to Q' . The resulting benefit is the area of the rectangle for the existing users at Q plus the lighter shaded triangle which is the benefit achieved by those who begin to travel following the reduction in cost – this is sometimes called the “rule of half” as the area

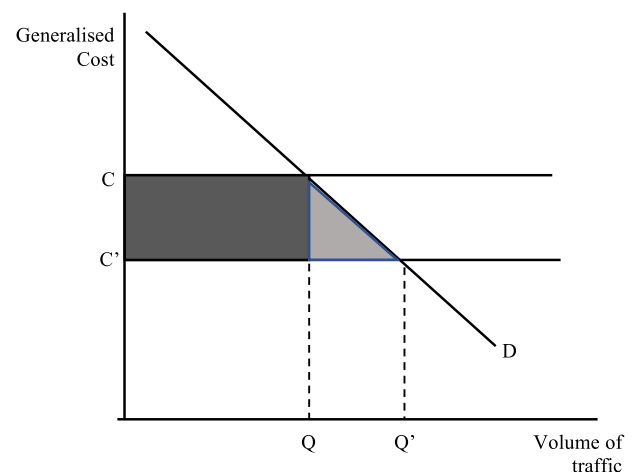


Fig. 1. The standard model for CBA.

of the triangle is the half the reduction in cost multiplied by the increase in use from Q to Q' . This assumes that there is a linear demand curve and a linear, horizontal, marginal cost curve. It also tends to assume that there is something approaching perfect competition in the transport industry itself but many transport industries have quite substantial barriers to entry and there are both economies of scale and economies of scope which change the nature of that cost curve. When we start changing the shape of those curves and moving them around, we no longer have a very simple solution.

The danger is that our appraisal approaches have been based on these very simple assumptions and of course the traditional model has essentially been based on urban areas and how to solve the peak hour congestion problem particularly in larger cities. The so-called “predict and provide” approach was based on the idea that predicting demand on key links will enable the provision of capacity to meet that peak demand and this will solve congestion and cater for all needs. This approach also assumes that locations of both firms and people are fixed and hence that the total amount of traffic, as a derived demand, is fixed. However, improved transport can lead to a change in the both the amount and the pattern of traffic as people seek out new alternatives and so that’s a real problem. We have seen as a consequence of the Covid-19 pandemic that the growth of working from home has led to a reduction in peak hour travel and a move towards residential relocation to benefit from more space in more rural areas (see Section 7 below for further analysis of this point). At the same time the growth in discretionary leisure travel has changed the pressure points on many transport systems to different times and at different locations. Activity-based models thus become much more important in our understanding of travel demand. The big drivers of change in urban transport are not people but things, the growth of on-line shopping and home delivery has meant that vans have become just as important in moving around and creating demand in the city (see for example, Giuliano, 2019; Browne et al., 2019).

The underlying argument in the standard model of appraisal is that investment in transport improves accessibility and the major economic benefits are savings in time and reductions in accident costs. But once we relax the strict assumptions around the standard model it may change the way we view new investment. For example, if labour market areas become larger so that more people have access to jobs and firms have better access to a wider range of skills, that can lead to an increase in productivity. This can help pay for the investment through higher real wages and increased tax revenues for the government, because people are earning more, and rising land values create the possibility of land value capture. That is the origin of what are now known as wider economic impacts. Identifying these as impacts rather than benefits is important because it is not necessarily clear that the impacts are always positive (see SACTRA, 1999, for an early discussion of this). The other

problem is that the value of time savings, as usually measured, is directly related to the level of wages and therefore there is a problem that if we move more rich people around then we might get more value, and this leads to the danger that we concentrate investment into areas inhabited by richer people. Thus, there will be likely to be a better return out of a suburban rail service into the CBD used by high value workers than from a neighbourhood scheme where people don't work in the CBD but in peripheral factories.

Interestingly, pricing is typically not a major consideration in investment appraisal. The perfect competition assumption seems to assume that prices are fixed, or at least independently regulated. Therefore, options to change prices are often not calibrated as part of the appraisal process. This can affect the benefits ascribed to investment options that might be the subject of premium prices such as often used in high-speed rail relative to conventional rail services. Here the user pays for (at least some of) the time saving benefit directly.

Appraisal is also affected by optimism bias (HM Treasury, 2020). This says that project promoters are likely to systematically underestimate the cost of projects and overestimate demand and likely benefits.

Whilst there is some simple statistical evidence for this (see Flyvbjerg et al., 2003), these studies are not based on any systematic analysis of the possible reasons for under- or over-estimation, but are based on simple, ex-post comparisons of outturn cost and numbers of passengers. Ex post analyses are notoriously difficult methodologically (see Nicolaisen, 2021) and the danger is that there is an easy assumption that there is deliberate, even dishonest, behaviour on the part of promoters leading to an arbitrary adjustment to raise costs and reduce benefits to compensate rather than seeking ways of reducing risk and uncertainty in forecasting (see Love et al., 2022; Ika and Feeny, 2022). Graham (2019) has summarised the problems in establishing casual inference for ex-post evaluation (and for an application see Carbo et al., 2019).

5. Wider economic impacts

When people or firms move, the dynamic effects are more difficult to predict. This underpins the wider economic impacts argument. Wider economic impacts arise essentially when there are market failures in markets are affected by transport and where transport improvement will

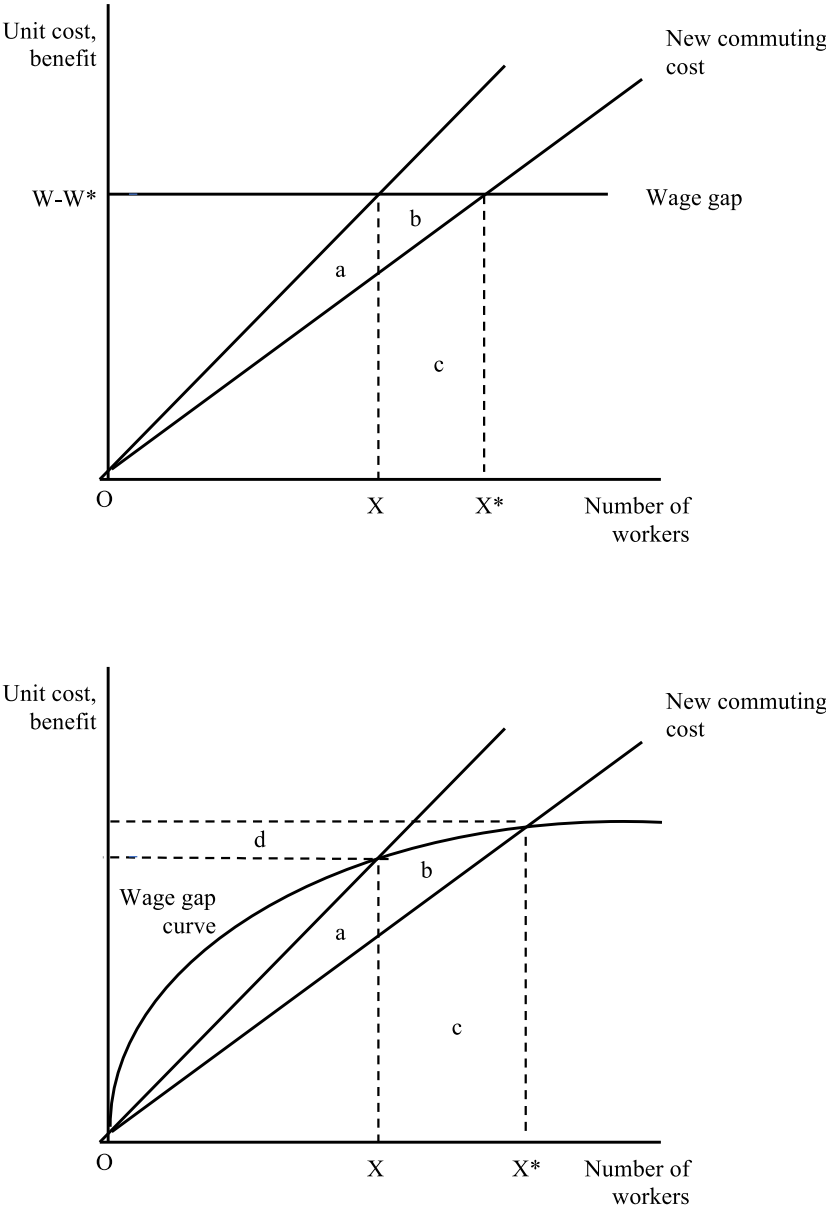


Fig. 2. The basis of wider economic effects (Venables, 2007).

impact on welfare and the value for money. Venables (2007) showed rather neatly the effect of this in a simple diagram (reproduced in Fig. 2). If we assume that there is no response to what is called here the wage gap - wages in the city are higher than those outside - then the shift in the commuting costs from the transport change in the upper diagram will shift commuting from X to X^* with benefits of an additional a for existing commuters and $b + c$ from the additional commuters.

If the wage gap curve is as in the bottom diagram rising as the city size increases, albeit at a decreasing rate, then the effect of the lower commuting cost is to increase commuting from X to X^* by a larger amount. The benefits from this are again a for existing commuters and a larger $b + c$ for the additional commuters but there is in addition an extra amount d that derives from the increase in the wage gap at the new labour market size. This is the agglomeration impact of rising productivity that determines the wage gap.

Wider economic impacts derive from three basic processes. First is induced investment which comes from new investment dependent on the reduced transport costs and from output change in imperfectly competitive markets, ones in which price is not equal to marginal cost. Secondly there are employment effects through changes in labour market participation and the move to more productive jobs, better sorting. Thirdly there are productivity effects which can be measured through the relationship to agglomeration; bigger cities are more productive than smaller cities due to both locational and urbanisation externalities.

Of course, it must be remembered that wider economic impacts cannot always be assumed to exist, and if they do, they may not always be positive. It has to be decided when and how to determine that there may be market failures leading to the potential of such impacts. There are five main sources of market failure that may have an impact. First, imperfect competition can be identified where price is not equal to marginal cost, where there is only a small number of firms, or where there are significant barriers to entry. Secondly, externalities lead to a divergence of private and social costs. Thirdly, tax distortions can impact on investment and on labour supply decisions. Fourthly, by widening market areas there can be an increase in product variety that increases consumer welfare. Fifthly, widening labour markets improve search and matching of jobs which reduces frictional unemployment and also reduces wage rigidities which reduces structural unemployment.

In all of these cases the key to measuring wider economic impacts is agglomeration. This is usually measured by reference to a measure of access to economic mass (ATEM), also called effective density. As transport costs are reduced the density and access to economic mass at each location within the city is increased leading to improvements in productivity. The static effects of this are that reduced travel costs bring firms and employees closer together, enlarging labour market areas and it increases clustering and raises productivity. But there are also dynamic effects, changes in economic activity lead to changes in density. Increasing productivity in one area may of course simply be a redistribution but it is not likely to be a zero-sum game. Firms are moving towards better locations which have got better accessibility to other locations.

Modelling the wider economic effects is quite complex because it depends on identifying first the geographical scale of the impact. An early example of this in the UK, which was influential in justifying going ahead with the Crossrail project, a mainline railway underneath central London, found that there were substantial wider economic impacts from increasing agglomeration in the metropolitan area (Graham, 2007; Graham and Gibbons S, 2019). But can the same analysis be applied to, for example, the building of a high-speed railway line between two major cities. How does agglomeration work here, does it lead to concentration in the larger area, or does it redistribute activity between those areas. The evidence from high-speed rail systems, for example in France, is that concentration into the larger city has not generally happened (Chen and Vickerman, 2017; Vickerman, 2018). What does seem to happen is change within firms as to where they locate their

activities, so there is specialisation by skills rather than specialisation by sectors, but that still gives the productivity effects (Venables, 2017).

Understanding the basis of this process of agglomeration depends on the view taken of the market scale involved. Is it about the macroeconomics of the impact on output (gross domestic or regional product) or is what is much more important the microeconomic and behavioural responses. More work needs to be done on how both firms and individuals respond behaviourally to changes in transport. A considerable number of studies have been carried out estimating agglomeration elasticities Graham and Gibbons (2019) looked at a set of 47 international studies where the elasticities ranged from -0.8 to $+0.658$ with a mean of about 0.05 and a very high clustering between 0.0 and $+0.1$. Nevertheless, it suggests a positive response of productivity to agglomeration, but these are mainly studies of single urban areas and there is no clear guidance about ATEM in a multi city context. Studies must also be conscious of the difficulty one in demonstrating the causality in any relationship.

6. An investment bias?

If we can refine appraisal taking these various issues into account, does it always justify investment? The danger is that investment in new infrastructure always seems attractive to policymakers and politicians. There is a tendency always to believe that the solution to any perceived transport problem is to add capacity to the system. In part this derives from the bias towards time savings in the appraisal process and highlights again the problems with the business value of time savings. The argument for using the value of time savings is that such savings can be converted into productive activity. This works well for urban improvements where business and commuting trips dominate but may pose problems when applied for example to high-speed rail where a mix of business and discretionary leisure travel is more likely. Trains with Wi-Fi enable passengers to work on the journey, but there is some evidence to suggest that this does not usually mean working at the same level of productivity as in the office and adjustments to values of business travel time savings are more modest than sometimes suggested (Wardman and Lyons, 2016; Wardman et al., 2020). Börjesson and Eliasson (2019), in a review of this issue, identify that variations across travel times, trip lengths, travel modes and trip purposes may be more important in defining different marginal utilities of time savings. This remains an area that needs further examination.

Increasingly environmental costs have become included in appraisal, either by quantifying such costs as elements in a CBA or through qualitative evaluation in a parallel analysis such as the UK's Appraisal Summary Table (Department for Transport, 2022). Multi-criteria analysis is often suggested as appropriate here, but MCA is too dependent on what are often subjective weights to be part of an objective appraisal exercise (see Dobes and Bennett, 2009; HM Treasury, 2020). Perhaps of increasing importance is how to deal with equity. The use of distributional weights in CBA has been discussed for some time but these perhaps fail to identify the range of factors in what is sometimes referred to as transport justice. Shiftan et al. (2021) explored a range of socio-economic based accessibility indicators to assess the impact of a new metro (see ITF, 2022). This introduces a focus on getting people who are excluded from transport services gaining access and there is an argument that this should involve access to general transport not necessarily just to a special transport service that reinforces the exclusion (Stanley and Stanley, 2021).

Returning to the core question of when infrastructure investment is likely to be the solution requires that first the problem needs to be defined. Very often what is proposed is a project looking for problems to solve; a planning or engineering led approach that ultimately leads to a lack of accountability and raises the optimism bias problem that is inherent in what are sometimes seen as vanity projects. The bias towards infrastructure is its visibility, something that can be seen to be a solution to a problem rather than attempts to manage traffic more efficiently which are often less visible. Setting out the business case for a project

with a clear rationale for its need is essential if subsequent analysis is to be done transparently and effectively.

The example of HS2 in the UK is a case in point. Here the primary objective has changed from speed and connectivity, to increasing capacity of the rail network, to a rebalancing of economic activity between UK regions (Vickerman, 2018). The core CBA analysis has remained essentially the same however, heavily dominated by business time savings on the benefits side and increasing estimates of cost on the other side leading to sharp falls in the overall BCR, as the recent *Oakervee Review* (2020) has shown (see Table 1). Subsequently the UK Government cancelled all the extensions to the scheme beyond Stage 1 between London and Birmingham, not on the basis of a formal appraisal but on the overall budgetary cost. All the appraisal evidence suggested that the gains from these northern extensions produced a larger overall BCR than Stage 1. Although the budget saved was to be devoted to a range of smaller projects, there was no formal comparison of the overall returns to these projects that could be compared with HS2.

The costs of major projects often rise as solutions are found to ameliorate opposition during the development of specific planning applications. These may involve expensive modifications to original plans by, for example, using tunnelling or expensive earthworks to deal with objections about noise or visual intrusion. Objectors are in some sense bought off but at the expense of the viability of the project. This raises the question of how to engage with all stakeholders, users and non-users, in the planning process of major projects. Increasingly there has been discussion of the way in which transport policy and the planning of investment in transport is governed. This recognises the extent to which the policy and planning cycle is typically much longer than the political or budgetary cycle. Projects may become political footballs kicked around and losing the principal focus of their rationale. The search for ever greater precision in their appraisal also contributes to delays that are likely to inflate costs.

The inclusion of wider economic impacts is shown to increase the expected BCR, but the focus in public discussion is usually on the direct user benefits and hence the concern raised above over the value of time savings, particularly business time savings. The argument over wider economic impacts can be distorted by unsubstantiated claims over the transformational aspects of such projects (see Vickerman, 2018). The wider use of general equilibrium approaches that allow for the transmission of improved transport throughout the economy would solve these concerns, but these remain difficult and expensive to implement. As suggested in the previous section of this paper it is less clear how to implement measures of changes in agglomeration in the multicity context of a high-speed rail project.

Table 1
The evolving economic case for HS2 in the UK.

	2013 Economic case (2011 £bn pv)	2017 Economic case (2015 £bn pv)	Oakervee Revised estimates (Low costs) (2015 £bn pv)	Oakervee Revised estimates (High costs) (2015 £bn pv)
Net transport benefits	5707	74.6	74.2	74.2
Net benefits with WEI	71.0	92.2	92.6	92.6
Total costs	62.6	83.4	107.6	114.5
Revenue	31.1	43.6	45.4	45.4
Net cost	31.5	39.8	62.2	69.1
BCR (no WEI)	1.8	1.9	1.2	1.1
BCR (with WEI)	2.3	2.3	1.5	1.3

Source: *Oakervee Review* (2020)

7. The organization of transport policy and provision

7.1. Background – the alternatives

Rational decisions over both pricing and investment depend on the way transport is organized and managed. The objectives of any organization will depend on whether it is focused on profit maximisation or some form of public service obligation (See Hörcher and Tirachini, 2021; for a fuller analysis). An optimum based on marginal cost pricing under conditions of scale economies and declining marginal costs will not satisfy a profit maximising organization and this is likely to result in a less than optimal level of supply. Similarly, an organization focused on profit maximising is going to be less interested in any wider economic impacts of an investment in the absence of any mechanism to recoup some of the financial value of these benefits. The nature of much public transport with the potential for economies of both scale and scope, including network economies, renders the likelihood of the emergence of monopoly operators and this “natural monopoly” argument is the historic case for public control and supply of public transport (De Palma and Monardo, 2021). Increasingly, however, the question has become focused on the most appropriate governance model for public transport in the face of competition from private and informal modes and the pressure on public budgets. This recognises that there are important equity issues in dealing with the transport disadvantaged.

Notwithstanding these traditional arguments for public control, there has been a move over the past thirty to forty years to a deregulated competitive model in which private companies compete to provide commercial services alongside a residual public commitment to support marginal services (see Hensher, 2021, for a recent review). There are many variations of the model, whether it is about competition for the market via franchising or competitive contracts or competition in the market. The latter approach typically involves some form of light regulation to avoid the worst excesses of destructive competition or the creation of excessive monopoly power. Increasingly with pressure on public budgets making it difficult to support marginal services and the loss of market share in for example urban public transport, this approach has been shown to be difficult to support efficient and effective public transport, especially in rural areas and for those without access to a car. This has been compounded by the problems resulting from the Covid-19 pandemic, changes in working practices and the resultant failure of public transport ridership to bounce back rapidly to pre-pandemic levels. Despite attempts by governments to prop up public transport operators in the short-term, the uncertainty surrounding future levels of demand cast uncertainty over whether there can be a return to the previously prevailing model of support which was already under stress in many countries (see Vickerman, 2021, for a further discussion).

This requires a rethink in the role of public transport where public means that there is a public involvement in it. The idea of social norms and trust that govern the attitude to public services raises the key question of an appropriate governance model for transport (see Marsden and Reardon, 2017). The extent to which people no longer trust policymakers, policymakers no longer trust operators, the operators don't trust the policymakers and the users of transport don't trust anybody means that unless there can be a rebuilding of trust in public transport it will not be possible to achieve a working transport system (see Poon and Vickerman, 2020). If that can only be assured by ever larger contributions from the public sector and/or higher fare levels, what will that do to investment?

7.2. Responding to external shocks

The existing model was already showing signs of strain, but external shocks such as those presented by the Covid-19 pandemic or a rapid rise in fuel prices, as well as the pressure to ensure that public transport played its part in the move away from fossil fuel as part of the commitment towards net-zero, has precipitated an urgent need for

action.

The challenges faced by public transport from the Covid-19 pandemic are illustrated well by the changes in travel patterns using data from benchmarking for a group of 45 metro operators worldwide by the Transport Strategy Centre (TSC, 2023). Fig. 3 shows data on metro ridership compared to pre-Covid levels in four main regions. These data suggest that, with some differences in the extent of convergence between regions, ridership is generally converging on levels below 100% of pre-Covid levels. This confirms the view that it is unlikely that there will be a return to previous levels in the short-to mid-term, if at all. Where there has been a return to 100% or above of pre-Covid levels, principally in Asian metros, this is often associated with an expansion of metro networks that were planned before the pandemic so that the density of demand is not always at the same level. Most European metros were somewhere between 90 and 100% of pre-Covid levels by Summer (2023) but North and Latin American networks showed no real growth in ridership from early 2022 and remained at between 60% and 75% of pre pandemic levels by mid 2023.

The challenge for operators is consider whether and how to amend long-term investment plans. The focus is more likely to be on cost-saving measures, especially ones which save labour and energy costs, than new capital investment. This includes postponing maintenance though this can lead to higher costs in the long run. Given the evidence that fixed costs can amount up to 80 per cent of costs for metro systems, adjusting service levels is not usually a viable option if it also reduces revenue.

What is also noteworthy is the changing pattern of travel within the total, comparing metro ridership recovery on different days of the week (Fig. 4). In Europe and the Americas Saturday and Sunday ridership recovered more quickly than weekday ridership. This reflects that leisure travel came back much more than weekday traffic that is affected by changing working practices including working from home and avoiding peak-hour travel.

Whilst metros are focused on major urban centres with large flows of passengers, buses often serve less densely populated areas including rural areas, and are easier to cut to save money on uneconomic routes. In the UK the number of registered bus routes has fallen by almost a half since 2010, but with the biggest fall of 17.5% between 2022 and 2023 (Traffic Commissioners for Great Britain,). The number of passenger

journeys by bus fell by around 40% from 2010, with a steady decline until 2019 and then a significant fall during the pandemic with numbers only returning slowly (Department for Transport, 2023). Such changes discriminate particularly against certain groups, the less wealthy, the less physically able etc at the same time as economic pressures towards increasing concentration have reduced the supply of banks, post offices, health services etc in the locations less easy to serve effectively. It is notable that the use of concessionary travel passes (mainly older or disabled passengers) has fallen by 36 per cent post-pandemic (CILT, 2023).

The commitment to move towards net zero in the face of climate change is a further external shock to transport as one of the main contributors to greenhouse gases. This has been compounded by the energy price increases resulting from conflict. Similarly to the Covid-19 pandemic such shocks impact unevenly on different communities and individuals. In particular, they present a further challenge to public transport with cost increases and the need to invest in zero emission vehicles. At the same time the loss of revenue from fuel taxes at the same time as governments have given financial incentives to move to zero emission vehicles has posed additional funding problems for public authorities. This requires urgent rethinking of the way private vehicles are charged for the use of public roads, independently of the fuel used.

7.3. Principles for a future model

These changes confirm the need to look carefully at the way public transport is priced and how investment might need to be reappraised if such services are to be sustainable against competing demands for public funding and the pressure to reduce the carbon footprint of transport. Here we set out the likely parameters of an approach. For public transport to serve the public it needs to have acceptability, trust, robust finances and professional operations. Thus, there needs to be representation of all relevant stakeholder groups including users, non-users (who may be potential users) and tax payers as well as professional transport operators and local political and policy makers. A core requirement is to ensure that long-term commitments can be made and kept to ensure robust investment decisions. This takes core decisions out of the political cycle which is usually too short to meet this requirement. Where possible

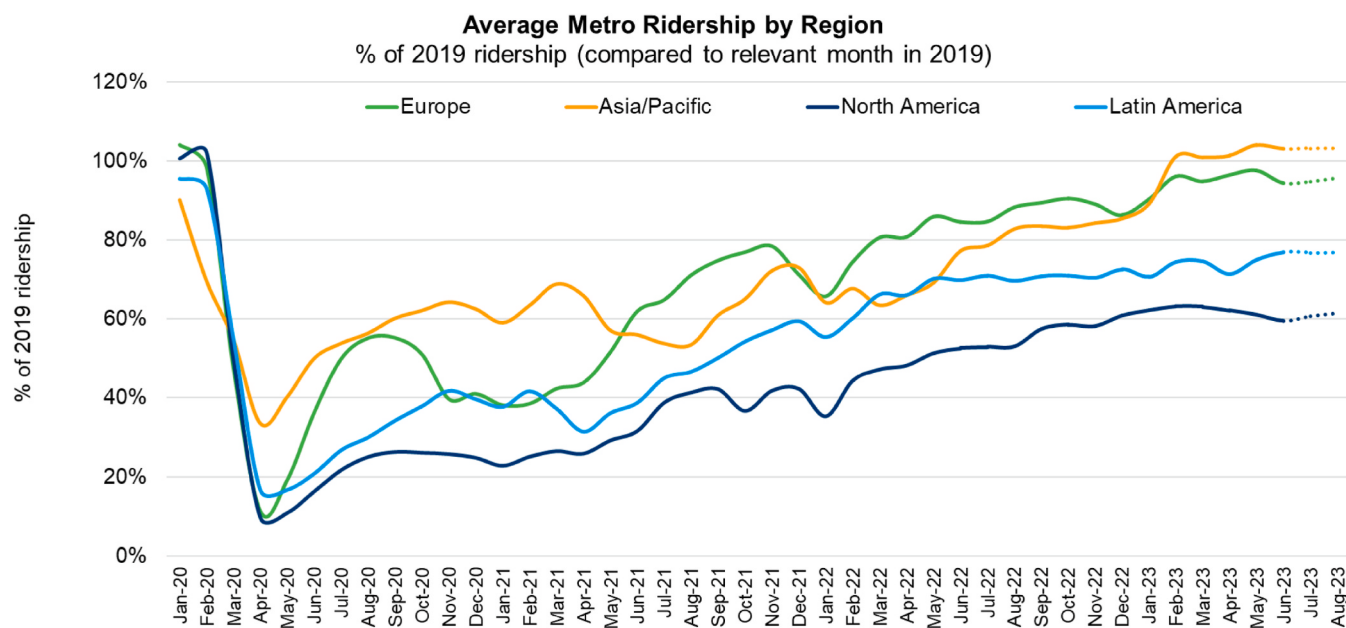
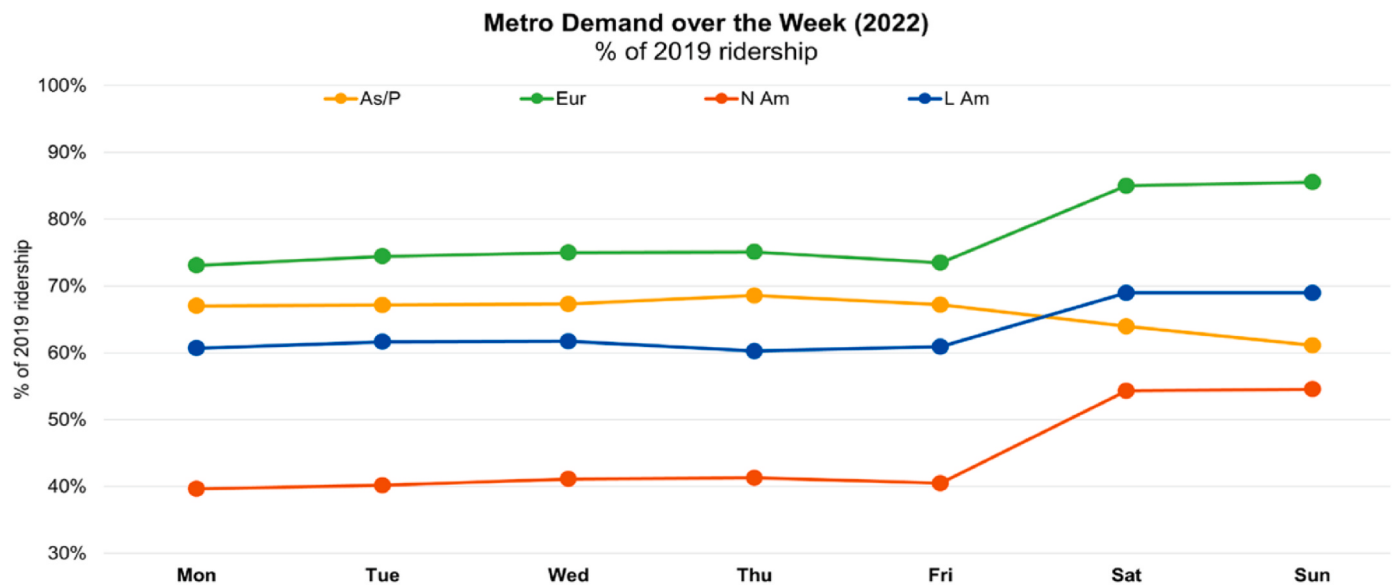


Fig. 3. Metro ridership (updated from Transport Strategy Centre, 2023).



Source: TSC metro benchmarking group

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Fig. 4. Metro demand by day of week, 2022 relative to 2019 (Transport Strategy Centre, 2022).

decisions need to be taken at a local rather than a national level to reflect varying local needs and circumstances, but within an overall national framework that provides for consistency, avoids negative spillovers and allows for transfers to ensure that minimum standards can be met (see, for example, Oates, 1972; Vickerman, 2008; De Borger and Proost, 2016; Hörcher et al., 2023). Given the inequalities in access to all modes of transport it seems unlikely that sorting of populations as envisaged by Tiebout (1956) to provide an optimal mix of public provision and taxation could be a means of ensuring the correct provision of transport services to suit all.

Strategic decisions including an overview of the network should be the responsibility of a transport authority that should ideally be independent of any local government authority with a long-term agreed funding envelope for meeting public service obligations. Operations should be the responsibility of professional operators working within a mutually agreed set of parameters with contracts long enough to ensure commitment to the long-term objectives of the authority but subject to regular performance monitoring.

This is a delicate balance but aims to ensure stability and efficiency as well as meeting the needs of all, including the transport disadvantaged. Marginal services are typically those which serve marginal communities or individuals that do not have the choice of alternatives. Financial stability requires that all forms of transport, including private transport, are subject to a single authority to ensure that there is consistency of pricing, reflecting the full costs of using each available mode and allowing users to make rational decisions on the best options for a given journey. This brings us back to the key argument that pricing lies at the heart of the transport problem.

8. Some conclusions

The emphasis of this discussion is on the need for consistent planning to cope with a situation in which there are public budget constraints, high energy prices, net zero environmental concerns and a lack of equitable access to transport. Consistent planning is needed across all modes in the transport sector and has to reflect individual and household needs, not just area-based needs, it has to reflect accessibility and inability to pay to ensure minimum standards of mobility for all

regardless of ability or disability, regardless of gender and regardless of household structures that affect mobility through care responsibilities. This is all against the background of a changing pattern of trip-making with less regular daily commuting, more working from home, a rebalancing of work and leisure journeys and hence a flattening of the peak. This requires consistent pricing, something that is often an element left out of transport planning. Pricing needs to reflect the diversity of concerns and not just the balance between cost recovery and affordability. Pricing also needs to be consistent across modes, especially when they are in different patterns of ownership or control.

The problem of the bias of policymakers and politicians towards solving perceived transport problems by investment in infrastructure, and particularly big infrastructure, has been emphasised in this discussion. Big infrastructure has the advantage that it can be seen as a tangible product of a policy; pricing works in a more hidden way but it may be a more effective way of getting value for money. On the other hand, changes in the structure of pricing are more obvious to users and often treated with suspicion, perceived as a means of raising revenue rather than as a method of allocating resources efficiently, and hence politically difficult to implement. This is particularly the case in the introduction of congestion charging or low-emission zones.

What does this mean for the role of government? It is not seen as being necessary to return to something like overall control where the state is responsible for both planning and operation. But what is needed is to have governments at the most appropriate level being able to take the right decision and being able to take decisions that are consistent across borders, whether these are national borders, regional borders, or local authority borders. The need is for a framework setting the right level of the right sort of transport and that involves setting the right signals, given by price, but where there is public confidence and trust in a system where policy does not keep changing when governments change (see the discussion in Poon and Vickerman, 2020). The transport investment cycle does not match the typical budget cycle and it certainly does not match the electoral cycle. How do we breakout of this process of constant change in priorities at and get consistent agreement on plans? Without such a system to provide efficient transport the economy will not work efficiently. The technical tools exist to implement such a system, it but we need the will and the consensus to set it in motion and

that means involving all stakeholders in the process. The problem is that many of the stakeholders are in some sense excluded from the process because of the way that the analysis is presented. This can be overcome as experiments in Italy have shown (Carteni et al., 2022) to get an iterative solution towards planning by going back at each stage to a group of stakeholders, getting them to define their position and then working through it.

However, the fundamental position is that only by an understanding of the role that transport plays in the economy as both an enabler and a driver of economic change with the potential of being able to address problems of inequality and inequity will it be possible to achieve consistency in transport planning and provide solutions to both specific transport problems and the major question of the right balance between modes at an aggregate level.

CRediT authorship contribution statement

Roger Vickerman: Conceptualization, Formal analysis, Investigation, Methodology, Writing – original draft, Writing – review & editing.

Data availability

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References

- Beckmann, M.J., Maguire, C.B., Winsten, C.B., 1956. *Studies in the Economics of Transportation*. Yale University Press, New Haven, CT.
- Boiteux, M., 1956. Sur la gestion des monopoles publics astreinte à l'équilibre budgétaire. *Econometrica* 24, 22–40.
- Börjesson, M., Eliasson, J., 2019. Should values of time be differentiated? *Transport Rev.* 39, 357–375.
- Browne, M., Holguin-Vera, J., Allan, J., 2019. Urban logistics and freight transport. In: Vickerman, R. (Ed.), *International Encyclopaedia of Freight Transport*, vol. 3. Elsevier. <https://doi.org/10.1016/B978-0-08-102671-7.10239-8>. Freight Transport and Logistics (ed. K. Cullinane).
- Carbo, J.M., Graham, D.J., Casas, A.D., Melo, P.C., 2019. Evaluating the causal economic impacts of transport investments: evidence from the Madrid-Barcelona high-speed rail corridor. *J. Appl. Stat.* 46, 1714–1723. <https://doi.org/10.1080/02664763.2018.1558188>.
- Carteni, A., Marzano, V., Henke, I., Cascetta, E., 2022. A cognitive and participative decision-making model for transportation planning under different uncertainty levels. *Transport Pol.* 116, 386–398. <https://doi.org/10.1016/j.tranpol.2021.12.013>.
- Chartered Institute of Logistics and Transport (CILT), 2023. The Impact of Covid on English National Concessionary Travel Journeys. https://ciltuk.org.uk/Portals/0/CILT_ENCTJ.pdf?ver=2023-12-18-124350-017.
- Chen, C.-L., Vickerman, R.W., 2017. Can transport infrastructure change regions' economic fortunes: some evidence from Europe and China. *Reg. Stud.* 51, 144–160. <https://doi.org/10.1080/00343404.2016.1262017>.
- De Borger, B., Proost, S., 2016. The political economy of pricing and capacity decisions for congestible local public goods in a federal state. *Int. Tax Publ. Finance* 23, 934–959.
- De Palma, A., Monardo, J., 2021. Natural monopoly in transport. In: Vickerman, R. (Ed.), *International Encyclopaedia of Freight Transport*, Transport Economics, vol. 1. M. Börjesson). Elsevier. <https://doi.org/10.1016/B978-0-08-102671-7.10006-5>.
- Department for Transport, 2022. Transport Analysis Guidance. <https://www.gov.uk/guidance/transport-analysis-guidance-tag>.
- Department for Transport, 2023. Bus Statistics Data Tables. <https://www.gov.uk/government/statistical-data-sets/bus-statistics-data-tables#local-bus-passenger-journeys-bus01>.
- Dobes, L., Bennett, J., 2009. Multi-criteria analysis: 'good enough' for government work? *Agenda: A Journal of Policy Analysis and Reform* 16 (3), 7–29.
- Dupuit, J., 1844. De la mesure de l'utilité des travaux publics. *Ann. Ponts Chaussees* 8, 332–375.
- Dupuit, J., 1849. De l'influence des péages sur l'utilité des voies de communication. *Ann. Ponts Chaussees* 2, 170–248.
- Flyvbjerg, B., Bruzelius, N., Rothengatter, W., 2003. *Megaprojects and Risk: an Anatomy of Ambition*. Cambridge University Press, Cambridge.
- Foster, C.D., 1963. *The Transport Problem*, 2nd revised edition. Croom Helm, London, 1975.
- Foster, C.D., Beesley, M.E., 1963. Estimating the social benefit of constructing an underground railway in London. *J. Roy. Stat. Soc.* 125.
- Giuliano, G., 2019. Freight flows in cities. In: Vickerman, R. (Ed.), *International Encyclopaedia of Freight Transport*, vol. 3. Elsevier. <https://doi.org/10.1016/B978-0-08-102671-7.10238-6>. Freight Transport and Logistics (ed. K. Cullinane).
- Graham, D.J., 2007. Agglomeration, productivity and transport investment. *J. Transport Econ. Pol.* 41, 317–343.
- Graham, D.J., 2019. Causal inference for ex post evaluation of transport interventions. In: Vickerman, R. (Ed.), *International Encyclopaedia of Freight Transport*, Transport Economics Fed, vol. 1. M. Börjesson). Elsevier. <https://doi.org/10.1016/B978-0-08-102671-7.10055-7>.
- Graham, D.J., Gibbons S., 2019. Quantifying Wider Economic Impacts of agglomeration for transport appraisal: existing evidence and future directions. *Economics of Transportation* 19, 100121. <https://doi.org/10.1016/j.ecotra.2019.100121>.
- Graham, D.J., Horcher, D., Vickerman, R., 2022. Infrastructure and the competitiveness of cities. In: Gómez-Ibáñez, J.A., Liu, Z. (Eds.), *Infrastructure Economics and Policy*. Lincoln Institute of Land Policy, Cambridge, Mass, pp. 120–139.
- Gramlich, E., 1994. Infrastructure investment: a review essay. *J. Econ. Lit.* 32, 1176–1196.
- Harris, R., Moffat, J., 2022. The geographical dimension of productivity in Great Britain, 2011–18: the sources of the London productivity advantage. *Reg. Stud.* 56, 1713–1728. <https://doi.org/10.1080/00343404.2021.2004308>.
- Hensher, D., 2021. Regulatory frameworks in public transport including tendering. In: Mulley, C., Nelson, J.D., Ison, S. (Eds.), *The Routledge Handbook of Public Transport*. Routledge, London, pp. 3–20.
- Hörcher, D., Tirachini, A., 2021. A review of public transport economics. *Economics of Transportation* 25, 100196. <https://doi.org/10.1016/j.ecotra.2021.100196>.
- Hörcher, D., De Borger, B., Seifu, W., Graham, D.J., 2020. Public transport provision under agglomeration economies. *Reg. Sci. Urban Econ.* 81, 103503. <https://doi.org/10.1016/j.regsciurbeco.2019.103503>.
- HM Treasury, 2020. The Green Book: Central Government Guidance on Appraisal and Evaluation. HM Treasury, London. <https://www.gov.uk/government/publications/the-green-book-appraisal-and-evaluation-in-central-government>.
- Hörcher, D., De Borger, B., Graham, D.J., 2023. Subsidised transport services in a fiscal federation: why local governments may be against decentralised service provision. *Economics of Transportation* 34, 100312. <https://doi.org/10.1016/j.ecotra.2023.100312>.
- Ika, L.A., Feeny, S., 2022. Optimism bias and World Bank project performance. *J. Dev. Stud.* 58, 2604–2623. <https://doi.org/10.1080/00220388.2022.2102901>.
- ITF (International Transport Forum), 2022. Broadening Transport Appraisal: Summary and Conclusions, vol. 188. OECD Publishing, Paris. ITF Roundtable Reports.
- Knight, F., 1924. Some fallacies in the interpretation of social costs. *Q. J. Econ.* 38, 582–606.
- Love, P.E.D., Ika, L.A., Pinto, J.K., 2022. Homo Heuristicus: from risk management to managing uncertainty in large-scale infrastructure projects. *IEEE Trans. Eng. Manag.* 69 (6), 2588–2602.
- Marsden, G., Reardon, L., 2017. Questions of governance: rethinking the study of transportation policy. *Transport. Res.: Policy and Practice* 101, 238–251.
- Marshall, A., 1899. *Principles of Economics*. Macmillan, London.
- Marshall, A., 1920. *Principles of Economics*, eighth ed. Macmillan, London.
- McCann, P., 2016. *The UK Regional-National Economic Problem: Geography, Globalisation and Governance*. Routledge, London.
- Mohring, H., 1972. Optimisation and scale economies in urban bus transportation. *Am. Econ. Rev.* 62, 591–604.
- Newbery, D., 1988. Road damage externalities and road user charges. *Econometrica* 56, 295–319.
- Nicolaisen, M.S., 2021. Ex-post Evaluation of Transport Projects: Key Challenges and Good Practices. Paper for ITF Roundtable, Broadening Appraisal to Capture the Full Impact of Transport Investments. OECD, ITF, Paris.
- Oakervee Review, 2020. The Oakervee Review. DfT and HDS2Ltd, London. <https://www.gov.uk/government/publications/oakervee-review-of-hs2>.
- Oates, W.E., 1972. *Fiscal Federalism*. Harcourt Brace Jovanovich, New York.
- Pigou, A.C., 1920. *The Economics of Welfare*, first ed. Macmillan, London.
- Pigou, A.C., 1952. *The Economics of Welfare*, fourth ed. Macmillan, London. Reprinted with 8 New Appendices.
- Poon, J.F., Vickerman, R., 2020. Beyond the farebox: sustainable funding of public transport by better understanding service values. *Res. Transport. Econ.* 83, 100923. <https://doi.org/10.1016/j.retrec.2020.100923>.
- Ramsey, F.P., 1927. A contribution to the theory of taxation. *Econ. J.* 37, 47–61.
- SACTRA (Standing Advisory Committee on Trunk Road Assessment), 1999. *Transport and the Economy*. DETR, London.
- Shifan, Y., Sharava, N., Shifan, Y., Martens, K., 2021. Accounting for Equity in Transport Appraisal", Paper Commissioned for the ITF Roundtable "Broadening Appraisal to Capture the Full Impact of Transport Investments", 29 September–1 October 2021.
- Stanley, J., Stanley, J., 2021. Public transport and social inclusion. In: Mulley, C., Nelson, J.D., Ison, S. (Eds.), *The Routledge Handbook of Public Transport*. Routledge, London, pp. 367–380.
- Tiebout, C.M., 1956. A pure theory of local expenditures. *J. Polit. Econ.* 64, 416–424.

- Traffic Commissioners for Great Britain, (annual)., Annual Reports to the Secretary of State <https://www.gov.uk/government/collections/traffic-commissioners-annual-reports>.
- Transport Strategy Centre, 2022. COVID-19 *cross-group benchmarking Review of recent activities: public report*. [https://www.imperial.ac.uk/media/imperial-college/research-centres-and-groups/centre-for-transport-studies/tsc/covid-19/Imperial-College-London-TSC—COVID19-Benchmarking-Review-of-Recent-Activities-\(Public-Report\)—October-2022-1.pdf](https://www.imperial.ac.uk/media/imperial-college/research-centres-and-groups/centre-for-transport-studies/tsc/covid-19/Imperial-College-London-TSC—COVID19-Benchmarking-Review-of-Recent-Activities-(Public-Report)—October-2022-1.pdf).
- Transport Strategy Centre, 2023. COVID-19 *cross-group benchmarking Review of recent activities: public report*. [https://www.imperial.ac.uk/media/imperial-college/research-centres-and-groups/centre-for-transport-studies/tsc/applied-news-and-papers/Imperial-College-London-TSC—Benchmarking-Review-of-Recent-Activities-\(Public-Report\)—February-2023.pdf](https://www.imperial.ac.uk/media/imperial-college/research-centres-and-groups/centre-for-transport-studies/tsc/applied-news-and-papers/Imperial-College-London-TSC—Benchmarking-Review-of-Recent-Activities-(Public-Report)—February-2023.pdf).
- Venables, A.J., 2007. Evaluating urban transport improvement: cost benefit analysis in the presence of agglomeration and income taxation. *J. Transport Econ. Pol.* 41, 173–188.
- Venables, A.J., 2017. Expanding cities and connecting cities: appraising the effects of transport improvements. *J. Transport Econ. Pol.* 51, 1–19.
- Vickerman, R.W., 2008. Multi-level policy making in transport: the problems for border regions. *Int. J. Publ. Pol.* 3, 228–245.
- Vickerman, R.W., 2018. Can high-speed rail have a transformative effect on the economy? *Transport Pol.* 62, 31–37. <https://doi.org/10.1016/j.tranpol.2017.03.008>.
- Vickerman, R.W., 2021. Will Covid-19 put the public back in public transport? A UK perspective. *Transport Pol.* 103, 95–102. <https://doi.org/10.1016/j.tranpol.2021.01.005>.
- Vickerman, R.W., 2023. History of transport pricing. In: Tirachini, A., Hörcher, D., Verhoef, E. (Eds.), *Handbook on Transport Pricing and Finance*. Edward Elgar, Cheltenham, pp. 9–23.
- Walters, A.A., 1954. Track costs and motor taxation. *J. Ind. Econ.* 2, 135–146.
- Walters, A.A., 1961. The theory and measurement of private and social cost of highway congestion. *Econometrica* 29, 676–699.
- Wardman, M., Lyons, G., 2016. The digital revolution and worthwhile use of travel time: implications for appraisal and forecasting. *Transportation* 43, 507–530. <https://doi.org/10.1007/s11116-015-9587-0>.
- Wardman, M., Chintakayala, P., Heywood, C., 2020. The valuation and demand impacts of the worthwhile use of travel time with specific reference to the digital revolution and endogeneity. *Transportation* 47, 1515–1540. <https://doi.org/10.1007/s11116-019-10059-x>.