CHAPTER 3. TRANSPORT FOR GROWTH

This chapter discusses how to improve transport's contribution to economic growth with the focus on advanced economies. It reviews evidence on the contribution that investment in transport infrastructure can make to productivity and output growth. The chapter provides evidence of current transport infrastructure spending levels. Finally, it gives policy guidance on how to strengthening appraisal for goal-oriented spending decisions, taking into account also wider economic benefits.

How much does investment in transport infrastructure contribute to growth?

Transport contributes to economic growth and to welfare by facilitating access to labour and output markets and to welfare-enhancing activities in general. There is ample evidence that transport activity rises with economic development, and that this is both because transport enables development and development leads to more demand for movement of people and goods. Global economic development is supported by fast, smooth and cheap transport as it facilitates reaping gains from specialisation and from economies of scale while maintaining good connections with markets.

With lacklustre growth in advanced economies in particular, the question arises if transport policy could enhance the sector's contribution to growth while containing the negative side effects on the environment and ensuring sustainable development over the long run. Without aiming for a comprehensive treatment of the issue, this section discusses some ideas on how to improve transport's contribution to growth, with a focus on advanced economies.

Within a short run perspective, discussions on transport for growth are part of the broader discussion on the desirability of stimulus programmes and what concrete form they should take. Opinions on the effectiveness of stimulus policies differ. If austerity is seen as the opposite of expansionary macroeconomic policy, then the emerging view appears to be that the merits of austerity have been overstated[1], and that there is a good case for expansionary spending, in particular on items that strengthen economies' long-run productive capacity. The point was made with some force by Amartya Sen in his keynote speech at the International Transport Forum (ITF) Summit in May 2013:

> "Many countries in the world still need more institutional reform (there has been some reform in Europe, but much more needs to be done), but they do not need any more austerity – in fact the opposite. In thinking about spending and investment on transport infrastructure, it is important to see clearly that an expansion in that field does not make reform any more difficult, while helping to stimulate the economy in a powerful way, if the process is well chosen. That is the context in which, I would argue, the challenges of transport spending and funding have to be viewed today, especially in Europe." (Sen, 2013).

But what exactly is the potential contribution that investment in transport infrastructure can make to productivity and output growth? Attempts have been made to measure this contribution empirically, with at first sight somewhat underwhelming results. Early findings of large growth effects from spending on public infrastructure, e.g. in the seminal study by Aschauer (Aschauer, 1989), were put into question when more sophisticated econometric work produced a wide range of results, including findings of no growth effects at all. For example, a recent International Monetary Fund (IMF) study (Acosta-Ormaechea and Morozumi, 2013) finds that reallocation spending to transport and telecommunications infrastructure has no significant impact on output, in a study for 14 low-, 16 medium-, and 24 high-income countries from 1970 through 2010. This is in contrast to quite strong output effects from more spending on education. Similar results on growth effects from infrastructure spending have been found in some earlier studies using aggregate data, so it is not a foregone conclusion that such spending increases growth.

Deeper insight in the distribution of growth impacts of transport infrastructure is provided by Melo et al. (2013), who carried out a meta-analysis of 563 estimates of the output elasticity of investments in transport infrastructure. The studies included in the meta-analysis estimate a production function, where output depends on inputs including labour, capital and transport infrastructure investment. The average estimated output elasticity of transport infrastructure investment is 0.06, meaning that a 10% increase in infrastructure investment raises output by 0.6%. The median elasticity is much lower at 0.016, suggesting that the average is affected by a small number of high elasticity estimates. Furthermore, the standard deviation of the mean is 0.288, indicating a very broad range of estimates and suggesting that the finding

of a positive average output elasticity may not be very meaningful in itself. Interestingly, Melo et al. find larger output effects from investment in roads than from investments in railways and airports. The effects are also larger for output from manufacturing than from the economy as a whole. The range of effects found within these subgroups remains large, however. The overall conclusion is that output effects from infrastructure investment are highly context-specific, and not every investment should be expected to engender strong output growth.

One possible explanation for the absence of robust findings on growth effects from transport spending in aggregate data is that the growth effects are too diffuse over time and space to be traceable in such data. Alternatively, it may be the case that in fact there is no strong effect on average, and this could occur because not all spending decisions are made solely with growth objectives in mind – instead distributional or broad accessibility concerns can underlie spending decisions – or are poorly made in the sense of not adequately allocating resources in line with stated policy objectives.

In this context, a study by Duranton and Turner (2012) on the effects of interstate highway provision on employment growth in US cities' is noteworthy. Through careful econometric analysis, the authors find that raising the stock of a city's highways by 10% increases employment by around 1.5% over 20 years. Obtaining this result requires controlling (through the use of instrumental variables) for the way decisions on infrastructure are made; for if no such controls are used the (wrongly) measured employment effect is much *smaller*. This means that the decision process appears to favour investment in areas with lower growth potential, so that the employment effects of such investment are smaller than they could have been under different project selection approaches. Furthermore, the results also suggest (albeit with a lower degree of confidence than applies to the estimation results) that building more highways by the same process and at the same rate as in the period 1983 – 2003 is not worth the cost, so is not a good investment.

The upshot of these empirical results is not that productivity-improving transport investments no longer exist in advanced economies, but that prevailing project selection mechanisms do not guarantee, or perhaps do not envisage, putting investment funds to their best possible productive use. This may be the result of an explicit and legitimate policy choice, if objectives other than productivity and growth carry weight in the decision process. A less benign explanation is that project selection is subject to political economy pressures that reduce the overall social returns from infrastructure investment and from transport policy in general. It is also sometimes argued that investment decisions are too strongly centred on supply of general purpose infrastructure, in the assumption that usage will be forthcoming if general economic conditions are favourable. In reality, large infrastructure users (e.g. major companies) can have substantial bargaining power over what infrastructure they require before they make location decisions, and by leveraging this power they influence the ultimate economic returns from infrastructure investment (Ansar, 2013).

Chapter 4 discusses how current transport funding approaches sometimes amplify the risk of sub-optimal funding decisions. Below we discuss what broad indications exist on funding levels and needs, and on the role of appraisal in making good investment decisions.

Spending on transport infrastructure

Table 3.1 shows what share of Gross Domestic Product (GDP) countries devoted to overall investment, to infrastructure investment and to transport infrastructure investment in 1980 and 2008. Total investment is between a quarter and a fifth of GDP, and is on the rise in emerging economies while it declines in developed economies. These opposite movements make sense given the differences in levels of economic development, but at the same time there is rising concern about too much investment in at least some emerging economies (with China the best known example) and too strong a consumption-orientation

in developed economies (with the United States as one example among others, particularly in the decade leading up to the crisis of 2008).

The pattern of infrastructure and transport infrastructure spending is similar to that of total investment, with declining shares of GDP in developed economies and rising shares in emerging economies.

Figure 3.1 shows how much ITF countries spend on road transport infrastructure as a share of GDP in relation to their per capita GDP. ITF countries include advanced as well as emerging economies, and the differences between both are as clear as in Table 3.1, although there is considerable heterogeneity within the group of emerging economies. In emerging economies, investment in transport and other infrastructure contributes to economic development by establishing connectivity, i.e. expanding the reach of transport networks, and by improving quality, i.e. faster and more reliable connections. Infrastructure spending has also been used as a macroeconomic policy lever to support demand, with the inherent risk that social returns in the long run are limited or even negative (i.e. overinvestment). As mentioned in chapter 1, growth in China emphasises investment as a domestic source of growth. Over-reliance on investment leads to unbalanced growth and implies a risk of overinvestment. Chapter 4 discusses high-speed rail development as an example of likely overinvestment.

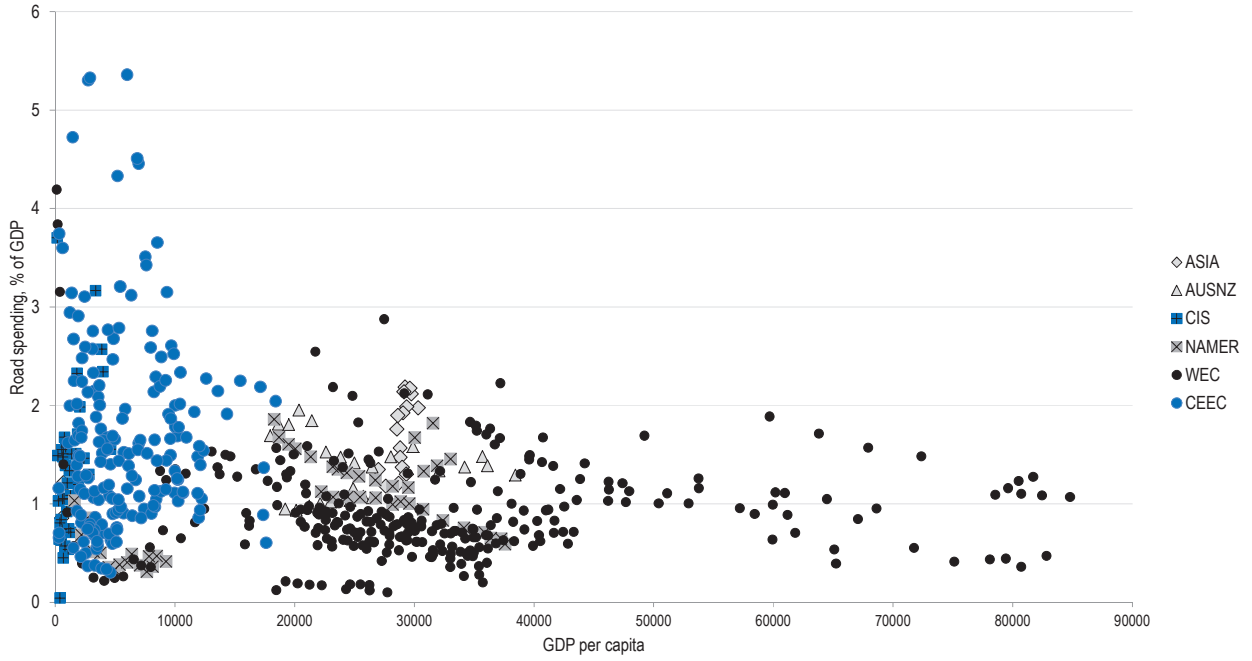
In advanced economies, the share of transport investment in GDP is lower than in emerging economies and it is lower in 2008 than in 1980 (see ITF, 2013). More generally, Figure 3.1 strongly suggests a negative correlation between per capita income and the share of GDP spent on road investments. For the highest income countries, investment in inland transport infrastructure (which is broader than just road investment shown in Figure 3.1), the average GDP share is roughly constant at 1% since the 1980s. It is sometimes argued that this particular GDP share has become a *de facto* political benchmark in Western European countries in the 1980s (Short and Kopp, 2005). There is of course no guarantee that this leads to adequate budgets and even less to appropriate spending decisions. To the contrary, such a benchmark suggests budgeting through maintaining a status quo rather than allocating available resources on the basis of needs in transport and in other sectors.

Table 3.1**. Transport infrastructure, infrastructure, and total investment spending**
Percentage of GDP, developed and emerging economies

		1980	2008
Developed economies	Transport infrastructure	1.5	1.3
	Infrastructure	3.6	2.8
	Total investment	24.3	20.9
Emerging economies	Transport infrastructure	1.9	3.1
	Infrastructure	3.5	5.7
	Total investment	Approx. 20	Approx. 25

Source: McKinsey Global Institute, 2010, Farewell to cheap capital?, p.15, 26, 27.

Figure 3.1. **Road infrastructure spending**
Percentage of GDP, constant 2005 euros



StatLink http://dx.doi.org/10.1787/888932944806

Note: WECs include Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, Turkey and the United Kingdom. CEECs include Albania, Bulgaria, Croatia, Czech Republic, Estonia, FYROM, Hungary, Latvia, Lithuania, Montenegro, Poland, Romania, Serbia, Slovakia and Slovenia. CISs include Azerbaijan, Gerogia and Moldova. North America includes Canada, Mexico and the United States. Australasia includes Australia and New Zealand. Data for Japan exclude private investment.

The question of whether current spending is 'enough' is not easily answered. The empirical evidence reviewed earlier in this section appears to suggest no shortage of spending on new infrastructure, as growth effects are small on average and vary widely. Furthermore, one of the most solid and most often repeated insights from transport economics is that prevailing pricing structures in transport almost everywhere lead to inefficient use of infrastructure. Reducing such inefficiencies would mean that more social value can be obtained from better use of existing infrastructure – better pricing is a much cheaper way of getting larger social returns from transport infrastructure than expanding the infrastructure itself. However, the empirical evidence is (naturally) based on past expenditures and does not cover all expenditure types or not in sufficient detail to draw conclusions about the desirability of particular investment options. While better pricing is a 'no brainer' policy recommendation, it does not follow that the case for more or better infrastructure evaporates completely.

Are there reasons to think that future needs in high income economies might differ from past needs, or that reorientation of infrastructure spending might produce larger payoffs than those seen in the past? The relative decline of infrastructure investment spending over time in advanced economies may well have been justified as connectivity and quality of networks increased and the marginal benefits of additional investment declined. However, maintaining or improving the quality of infrastructure to meet higher expectations is likely to require increased spending on maintenance and upgrading as networks age.

There is widespread concern that maintenance spending has been lower than ideal, so that future costs to maintain network integrity can turn out to be high. It is difficult to give this concern a strong empirical basis as consistent data on the performance of transport networks are not available (see ITF, 2013 for some

suggestive evidence on the strong dependence of maintenance outlays on macroeconomic conditions). Political economy arguments do go in the same direction, however, as they point to a political preference for building new infrastructure, and a strong sensitivity of maintenance spending on business and budget cycles.

Since delaying maintenance increases future costs more than it saves on current costs, such dependence tends to drive up life cycle costs of infrastructure. As a consequence, future infrastructure spending in high income economies likely requires a stronger emphasis on maintenance than seen in the past, and total spending needs may increase. For new infrastructure, careful evaluation of benefits and costs of potential investment, embedded in a coherent strategic view of what transport is for and how goals are to be achieved, is required. This is discussed under the next subtitle.

Strengthening appraisal for goal-oriented spending decisions

If transport policy makers are to make credible claims on resources to ensure the sector can make its full contribution to overall welfare, it is imperative to assess as well as possible what the social returns of various ways of deploying the budget are likely to be. In many countries, such systematic assessment takes the form of cost-benefit analysis (CBA).

The prominence of CBA for evaluating transport sector projects in the countries that use it systematically means that the sector has a clear idea of how much value for money it generates, and this can strengthen its case in arguing for budgets. It is, for example, plausible that this helped limit the impact on the transport sector of the significant overall public spending cuts that took place in the UK in the Autumn of 2010 (ITF, 2010). The relevance of appraisal to funding was highlighted at the ITF Summit in 2013 by Alberto González of CINTRA, when he stated that "Most [PPP] projects in [financial] trouble turn out not to address a real need for mobility and are based on poor cost-benefit assessment".

Appraisal-informed project selection strengthens the legitimacy of spending decisions over the long term. At the same time, the practice of appraisal needs to meet decision makers' needs, and these evolve over time. In order to live up to its potential, continual improvements to project appraisal must be made. Below we briefly discuss some points of debate on this issue.

Evaluate strategies, not just projects

With increasing awareness of the contribution of mobility to welfare, but also of the considerable costs and potential threats to sustainability, transport policy needs a clear sense of purpose and the best possible guidance on how to attain strategic objectives. Careful assessment can support the development and execution of this strategy by determining what pathways offer best value for money. As remarked Sir Peter Hendy at the ITF Summit in 2013, when commenting on the challenges facing transport policy in London: "Settling the funding sources is important, but what we have benefitted from most, is having a long-term plan."

CBA has been developed as a method for project appraisal, i.e. for assessing the impact that a project is likely to have on social welfare. Such evaluation implies comparison to other projects and to a do-nothing-scenario. Projects are broadly defined as discrete changes to the prevailing situation. CBA can be used for the appraisal of technical variants of a project, e.g. comparing different alignments for a planned bypass of a congested transport link. It can also be used for assessing clusters of projects, e.g. the construction of rail networks, for programming and hierarchising a set of independent projects, either for the same mode or for different modes under a given budget allocation, and for strategic policy choices, e.g. in the context of decarbonisation or broader sustainability policy, or for deciding the relative shares of the public budget to allocate to transport versus other sectors.

The level of detail and the emphasis of the modelling work needs to be adapted to the particular context of the appraisal. For example, when comparing two bypasses, the focus will be on calculating time savings through a transport network model and on construction costs and environmental and safety impacts. But where, for example, decarbonisation is concerned, broad trade-offs between environmental concerns, public finance, and the pros and cons of various types of spatial development patterns need to be addressed. When appraisal moves into the planning and policy arena, narrow time, cost and safety concerns will no longer suffice to obtain a good appraisal; instead, more attention will need to go to the impacts on spatial distribution of activities, on macro-economic impacts and on the definition of the transport problem itself.

In order to maximise its potential value for strategic policy orientations, CBA needs to be sufficiently broad. Excluding impacts on the grounds they are poorly understood becomes problematic when these impacts are essential to the project. The better approach is to account explicitly for uncertainty. This imposes rigour on how trade-offs between various objectives are handled. It also highlights the need for more research to improve knowledge of the impacts of investments in relation to strategic objectives.

CBA is evolving, with a gradual expansion of the scope of the analysis. Coupled with the use of transparent summary tables to present results alongside distributional effects and other indicators critical to political priorities, CBA is well suited to addressing changing strategic policy priorities and emerging demands for project programming.

Policy alternatives are not limited to building new infrastructure

Project appraisal, and particularly cost-benefit analysis, has often been used to compare several ways of solving a capacity problem in transport networks. This boils down to comparing the various impacts of technical alternatives, which have in common that they are infrastructure investments. However, there is generally no reason to restrict the set of policy alternatives to physical investments in infrastructure. Pricing of road use or of parking, for example, has the potential to improve network use at lower costs, and should be considered as routinely as building new capacity. Similarly, upgrading available capacity can be a valid alternative to expanding it.

Considering a sufficiently broad set of alternative policy approaches is particularly important as appraisal moves from narrow project selection to broader support of strategic choices, both because the set of potential instruments becomes broader and because the potential costs of choosing suboptimal policy approaches rises.

Consider a sufficiently wide range of benefits

The apparatus of CBA is designed to estimate costs and benefits as well as possible, in order to make statements on net benefits ("value for money") with a reasonable degree of confidence. The core methodological approach of CBA for transport infrastructure is to measure benefits through the willingness of users to pay for the transport benefits, i.e. the "direct benefits" of the infrastructure.

The approach of working with direct benefits to users can be seen as one rooted in practicality. A transport infrastructure project will affect travel times and more generally the benefits of travel that accrue directly to users. Traffic models help analysts form a picture of what these direct effects will look like. The direct benefits from improved travel conditions include travel time, but also increased reliability of travel time and the benefits of more convenient and more comfortable travel. Recognising these various dimensions of direct benefits is important as they relate not just to travel speed and therefore avoid a bias towards faster modes of travel.

Measuring user benefits is far easier than tracing the ultimate incidence of project impacts throughout the economy, and therefore provides a practical avenue to producing robust results relatively quickly. Practicality, however, comes at a cost in terms of scope and policy relevance. Relevance becomes a problem when policy makers are less interested in total benefits than in distributional impacts, whether by income group or spatially. The scope issue arises because direct user benefits represent total benefits only under restricted conditions, and in recent years some productivity effects (particularly from agglomeration) have been shown to be additional to the ones captured in direct benefit-based assessment.

The influential Eddington study (Eddington, 2006) argues there is sufficient empirical evidence that agglomeration economies are important for some, typically large, projects and that they should be included in appraisal of these types of project especially when investments significantly alter access to places of work. The case for including such benefits in routine appraisal is weaker, as it is not yet possible to transfer this evidence to the context of a typical, smaller, transport infrastructure project. The conclusion is that using rules of thumb to account for agglomeration benefits in CBA is not best practice. Investigating the existence and size of agglomeration benefits makes sense for large and very costly projects but the evidence suggests it would be misguided to treat agglomeration as a general boost to the benefits of transport infrastructure investment, representable by some kind of average mark-up over direct user benefits.

Even if CBA produces a good approximation to total costs and benefits, this knowledge provides little information on how cost and benefits are ultimately distributed in the economy (incidence). This is a problem because incidence is relevant to decision making. In order to determine the full distributional impact of transport projects, it is not enough to establish the direct impact of the project on different user groups, because direct impacts can differ strongly from the ultimate impact after all channels of transfers (and wider impacts) have played out. Tracing the ultimate incidence of project impacts requires a model of the economy that distinguishes at least the main groups that could be affected by that project, for example a spatial general equilibrium model that distinguishes between various types of households and the effects on various locations. Operational models to accomplish this are not yet routinely available and customised applications are expensive and time-consuming. The consequence is that attempts to describe the likely ultimate incidence of the impacts of transport projects are relatively rare and cannot up to now aspire to a high degree of accuracy.

Insight into the distributional effects of transport policy in general is of clear interest, given the importance of distributional outcomes in determining the welfare derived from aggregate production. It does not follow, however, that transport policy always needs to be modified in order to obtain preferred distributional results. Often there will be better instruments to attain desired equity objectives, e.g. social security systems and tax systems.[2] It is plausible nevertheless that in some situations transport policy itself plays a role in distributional policy, e.g. by providing access to labour markets. Careful consideration of alternatives, e.g. promoting geographical household mobility, is needed to evaluate the relative appeal of several access-related policy options. In any case, there is no justification for using transport policy as a distributional instrument by default.

Systematic appraisal provides decision makers with coherent information on core costs and benefits from a set of policy options, which can be defined at the strategic level or at the operational project level. The method clearly has merit, and its limits are equally clear. Good appraisal facilitates access to funding for worthwhile projects, and can help bring innovations to funding mechanisms. For example, the Special Business Rate that helps fund the Crossrail project in London was partly made acceptable by the appraisal, which showed clear benefits for the business community in particular.

Appraisal provides information that can help create acceptance of infrastructure investments, but acceptance nevertheless remains a major challenge. Socially worthwhile projects for which funds are

available can be, and often are, resisted by stakeholders faced with negative impacts. Policy makers sometimes see such action as the main hurdle to effective decision making, as testified by the following comment from the German Minister of Transport, Dr Peter Ramsauer, at the ITF Summit in 2013: "The main problem for advancing with needed investments is not funding but public acceptance."

NOTES

1. See for example questions regarding the size of the output gap in European economies. If the output gap is larger than thought, the case for austerity to address structural sources of excessive government spending weakens. (http://online.wsj.com/article/SB10001424127887323899704578585661751307472.html)

2. See OECD (2006) for an in-depth discussion.

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From:

ITF Transport Outlook 2013

Funding Transport

Access the complete publication at:
https://doi.org/10.1787/9789282103937-en

Please cite this chapter as:

International Transport Forum (2013), "Transport for growth", in *ITF Transport Outlook 2013: Funding Transport*, OECD Publishing, Paris.

DOI: https://doi.org/10.1787/9789282103937-6-en

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