

# The Eddington Transport Study

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Main report:  
Transport's role in sustaining  
the UK's productivity  
and competitiveness

Sir Rod Eddington  
December 2006

£45.00

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ISBN-10: 0-11-840487-3

ISBN-13: 9-780118-404877

Printed by The Stationery Office 12/06 349621

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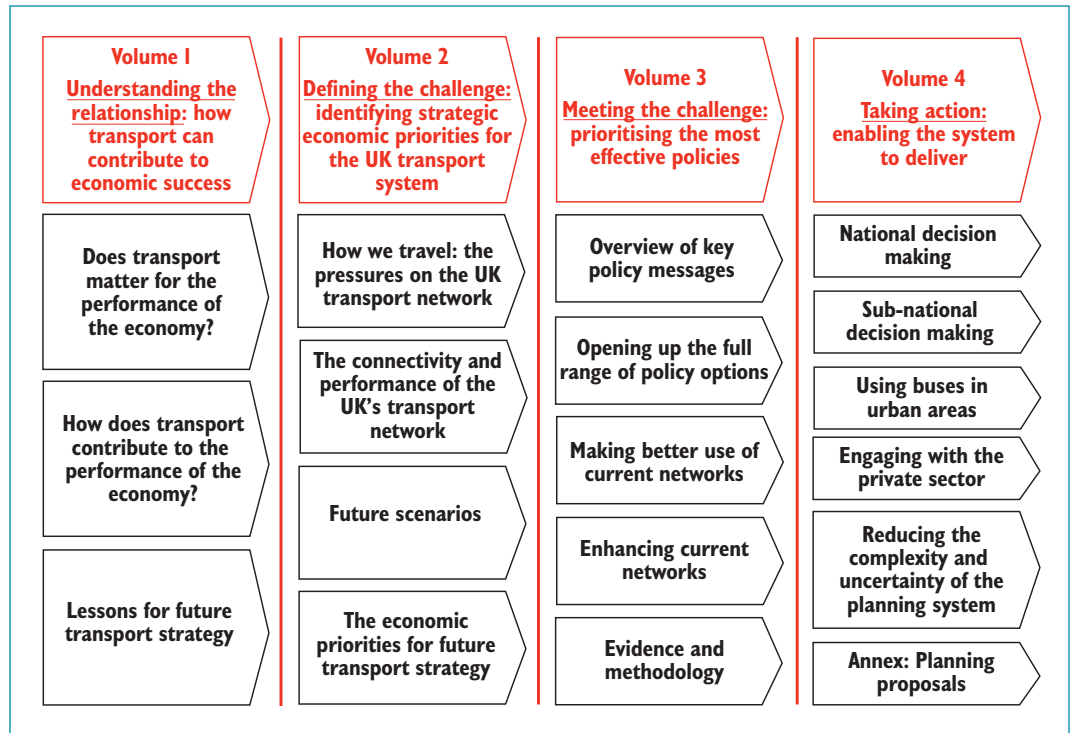
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# MAIN REPORT

## TRANSPORT'S ROLE IN SUSTAINING THE UK'S PRODUCTIVITY AND COMPETITIVENESS

This is the main report of the Eddington Transport Study. It is organised in four volumes, as set out in the diagram below, which present a wide range of evidence, information and recommendations on transport's long-term impact on the UK's economic growth, productivity and stability, within a sustainable development context.



The Study's main findings and key recommendations can be found in summarised form in *The case for action: Sir Rod Eddington's advice to Government*, which accompanies this report.



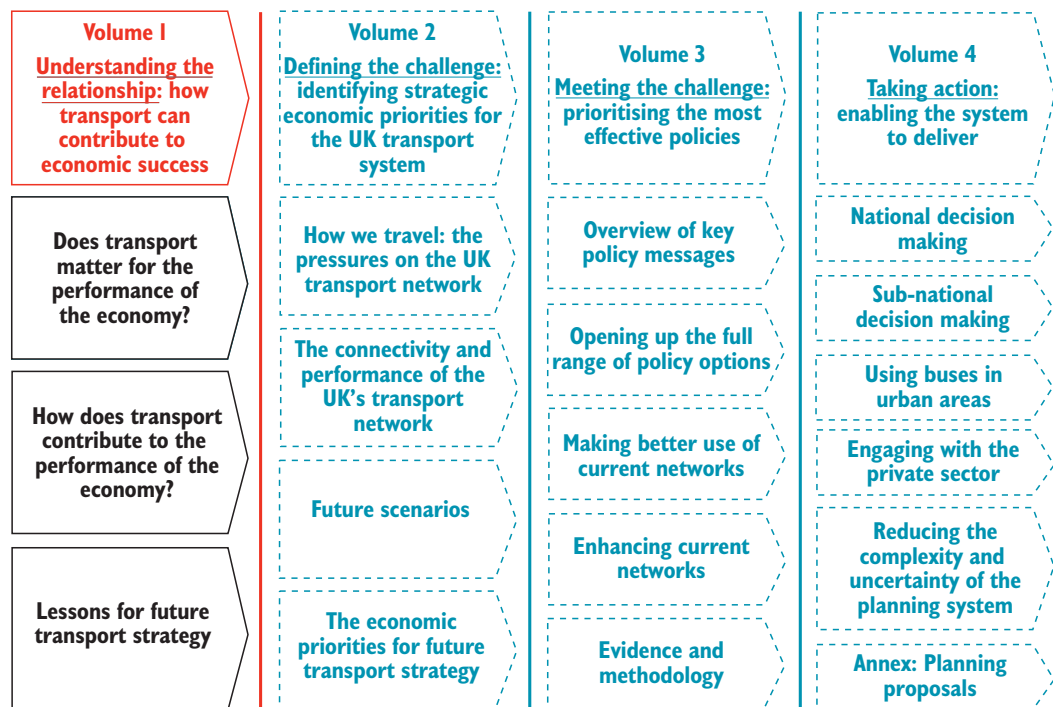
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# UNDERSTANDING THE RELATIONSHIP: HOW TRANSPORT CAN CONTRIBUTE TO ECONOMIC SUCCESS



## INTRODUCTION

The global economy is facing rapid change and witnessing large-scale restructuring of industry and services. For the UK this means a continued shift towards a service and high-value manufacturing based economy, with growing reliance on other countries for raw materials and basic low-value manufactured goods. Alongside this change, economic success resulting in higher incomes and a rising population are expected to generate greater demands for travel for both work and non-work/leisure purposes. This in turn can create congestion and reliability problems on the transport network: increasing costs on business and damaging quality of life. Society as a whole must respond to such challenges, and a well-functioning transport system that supports economic success will be key to securing a long-term sustainable response.

### Relationship between transport and the economy

This volume sets out the evidence to inform a more comprehensive understanding of transport's role in supporting the productivity of the UK economy and its sustainable growth. It begins by looking at the big picture: examining the academic literature and reviewing the historical evidence on the overall relationship between transport and the economy. It then goes on to examine the underlying economic drivers by which transport impacts on economic performance. In doing so, it identifies the nature and types of journeys that users of the transport system want and considers how improvements to these journeys can deliver economic benefits. The volume concludes by identifying a series of principles that should guide the development of transport policies to support sustainable development of the UK economy over the next 15 to 30 years.<sup>1</sup>

<sup>1</sup> The analysis presented in this Study has benefited greatly from comments received from Sir Rod Eddington's Academic Friends' Group, however the Eddington Study takes sole responsibility for the conclusions drawn.

**3** As well as the evidence presented, the volume draws on new research commissioned and undertaken on behalf of the Eddington Study, and published alongside it. This comprises: *The Historical Significance of Transport for Economic Growth and Productivity*, Crafts and Leunig, 2005; *Transport and Labour Market Linkages*, Gibbons and Machin, 2006; *Agglomerations in the UK and the Role of Transport Policy*, DfT and Eddington Study, 2006; and *Step Change Transport Improvements*, Mike Mann, 2006.

**4** The volume is divided into three chapters:

- **Chapter 1.1:** looks at the big picture and considers the overall relationship between transport and the performance of the economy, including exploration of some of the historical evidence;
- **Chapter 1.2:** takes a bottom-up approach and seeks to identify how transport can contribute to the performance of the economy; and
- **Chapter 1.3:** draws together the evidence from this volume and sets out a series of principles for informing a transport strategy for sustainable growth.





# DOES TRANSPORT MATTER FOR THE PERFORMANCE OF THE ECONOMY?

## Headlines

- Transport matters for the economic performance of countries and regions.
- Historically, step changes in transport connectivity have been pivotal in supporting periods of rapid growth of economies as they developed, and critical in driving past phases of globalisation.
- Today, in mature economies like the UK, with well-established networks and where connectivity between economic centres is already in place, the evidence suggests that there is considerably less scope for transport improvements to deliver the periods of rapid growth seen historically.
- Instead, the debate for such countries should be focused on the performance of the existing network, particularly where capacity is stretched, as demonstrated, for instance, through congestion or unreliability.
- Increasingly, studies are suggesting that the efficiency with which existing transport networks are used is just as important as the underlying investment.
- The relationship between transport and the economy in a developed economy is therefore likely to be an incremental one.
- However, economic success can itself generate higher demand for transport and where there is a lack of adequate capacity, transport can start to constrain that success.
- But a ‘one-size-fits-all’ approach to transport policy, in terms of the type of intervention, the modal solution or indeed the level of expenditure, is not appropriate. Shaped by their different social, economic, environmental and geographic characteristics, different countries and regions have different transport needs.
- Equally, in some circumstances, transport is not the answer; there are times when countries have enjoyed economic success without significant improvements to transport; and history highlights that transport does not always deliver expected economic benefits.
- The Stern Review has demonstrated powerfully that tackling climate change is the pro-environment, pro-growth strategy. Transport will need to be part of this response.

## INTRODUCTION

**I.1** A good transport network is important in sustaining economic success in modern economies. The transport network secures connectivity between different parts of a country, as well as to the rest of the world: linking people to jobs; delivering products to markets; underpinning supply chains and logistics; and supporting domestic and international trade. The quality of infrastructure, and how comprehensive the transport network is, will influence the role transport plays and its contribution to the functioning of a successful economy.

**1.2** This chapter examines the evidence and considers the fundamental question at the heart of the Study: does transport matter for the performance of the UK economy? The chapter:

- explores the contribution of transport to the performance of the economy by examining historical examples in the UK and elsewhere;
- considers how important this relationship might be for a modern economy by looking at the academic evidence in this field; and
- considers the conditions necessary to secure the best returns on transport policies.

**1.3** The next chapter goes on to explore in more detail, through a series of economic drivers, the precise mechanisms by which transport influences the performance of the economy.

**1.4** Transport's contributions to the economy can be assessed in a number of different ways. Figure 1.1 defines some of the common metrics that are used throughout this Study.

**Figure 1.1: Assessing transport's contribution to the economy**

Transport can impact on the performance of the economy in a number of different ways:

**1. Transport's impact on GDP**

- Transport can impact on the performance of the economy and will ultimately impact on overall output. **Gross Domestic Product (GDP)** is currently the best measure of the size of the economy as it measures the total value of goods and services produced. Transport can have an impact on economic output (GDP) through two channels:
  - (i) Firstly, transport can affect GDP through the number of inputs that are used, for example transport may increase employment either by allowing greater access to labour or stimulating the creation of new firms, which can increase the number of goods and services produced and lead to an increase in GDP.
  - (ii) Secondly, transport can improve the efficiency with which firms use inputs, in other words transport can have an impact on **productivity**. For instance, a well functioning transport network can raise productivity by reducing journey times. Transport investment can impact on the drivers of productivity by encouraging private investment through raising its profitability; facilitating labour mobility and thereby increasing the returns to investment in skills; and enabling effective competition even when economic activity is geographically dispersed. Identifying the impact of transport on productivity is important because improving productivity is a key determinant of long-term growth and living standards.
- These effects can either have a one-off effect on the level of productivity or a sustained impact on the growth rate of productivity. Transport can impact on the growth rate of productivity by stimulating innovation through its impact on agglomeration economies, trade and foreign direct investment (as Chapter 1.3 goes on to explore). In practice these dynamic impacts are very difficult to measure, but are nevertheless extremely valuable, as they determine how quickly the economy grows and therefore the **rate of growth in GDP**.

**2. Transport's role in supporting structural change in the economy**

- An effective transport system can help an economy better **respond to structural changes**, helping to minimise the impact on the economy; for example, allowing people to access work in growing industries by supporting commuter travel.

However, conventional measures of output and productivity gains fail to capture the full contribution of transport to quality of life or environmental sustainability.

### 3. Transport's role in supporting quality of life

- Transport improvements can increase the variety of products available and create new leisure opportunities (e.g. low cost airlines to new destinations) and lifestyle choices (e.g. living in the suburbs). These benefits to consumers are known as **productivity of consumption**.
- Critically though, GDP measures alone fail to capture the impacts of transport on the environment or its contribution to the wider well-being of society. Transport's impact on the environment, for example through carbon and other emissions, can increasingly lead to unsustainable growth, as well as impacting on people's quality of life. Transport improvements that free up wasted travel time allow people to spend more time with friends and family, and enjoy more leisure activities. An economic welfare measurement would seek to measure such broader impacts of transport on society and the environment rather than just a pure GDP measure. These benefits to general well-being are known as **economic welfare, or welfare**.

This Study seeks to understand transport's contribution to both GDP and welfare.

## TRANSPORT'S RELATIONSHIP WITH ECONOMIC PERFORMANCE: SOME HISTORICAL EXAMPLES

**1.5** History provides some valuable insights into understanding the role of transport in supporting the performance of the economy. Step changes in transport connectivity, often associated with new transport, and facilitated by technological advancements, have been critical in enabling past phases of globalisation and pivotal in supporting significant changes in the economic performance of economies, and their regions, as they have developed.

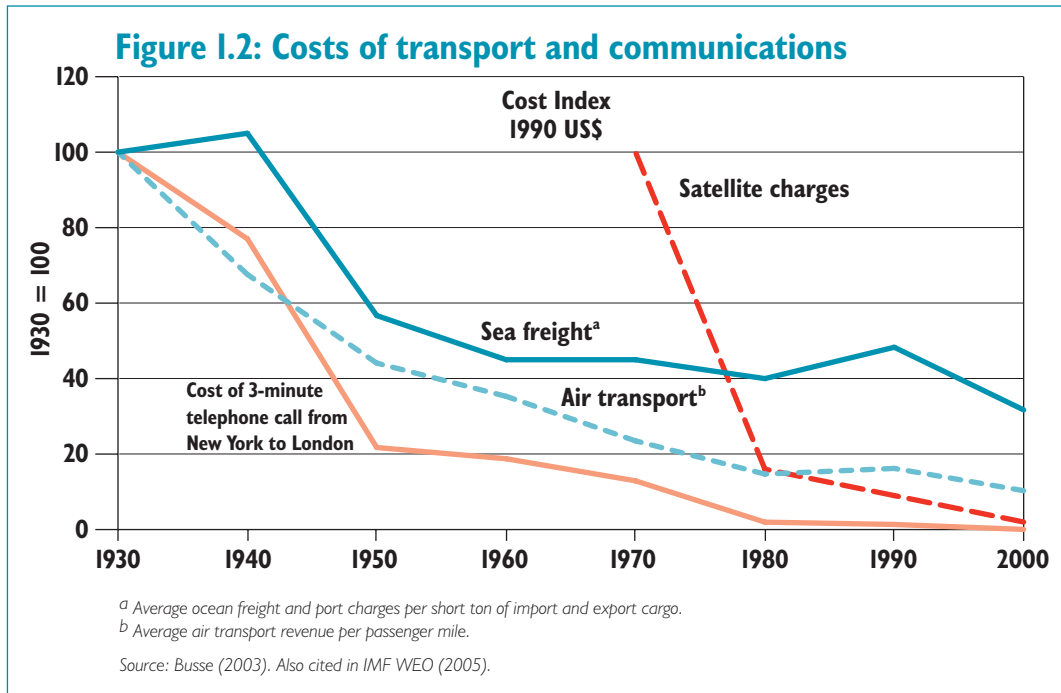
### Transport pivotal in past phases of globalisation

#### Transport supporting globalisation

**1.6** Large step changes in transport infrastructure have been pivotal in driving forward past phases of globalisation in the world economy. Trading patterns between countries and continents were transformed in the nineteenth century by the use of steam power for ocean-going ships. This supported a greater international division of labour and increased global specialisation, with countries focusing their production on the areas where they had most expertise and could operate most cost-effectively. The benefits of these advances were increasingly realised in the twentieth century, as rapidly falling transport costs, together with more significant falls in communications costs, meant goods and services could be traded with growing ease. Figure 1.2 illustrates the downward trend in international transportation and communication costs since 1930.

**1.7** Transport not only played a fundamental role in facilitating globalisation, it also allowed countries' domestic economies to respond to these new economic forces. In 19th century Britain, for instance, rail transport in particular supported internal migration, which was necessary to transfer workers from declining industries to new industries and create labour market flexibility, helping Britain to take advantage of new global opportunities.<sup>1</sup>

<sup>1</sup> See *The Historical Significance of Transport for Economic Growth and Productivity*, Crafts and Leunig, 2005.



## Transport supports the economic performance of countries and regions

**1.8** Step changes in transport connectivity have also helped shape the geography and economic performance of countries and of the regions and urban areas within them.

### Canals and the industrial revolution

**1.9** The expansion of the UK's canal network in the eighteenth and early nineteenth centuries played a key role in the industrial revolution, providing much-needed connectivity between sites of industrial activity, urban areas and ports.

### Railways supporting export growth

**1.10** The expansion of the railways in the second half of the nineteenth century also delivered significant gains for developed economies. See figure 1.3. The head-start that railways (and their associated technology) gave to the performance of the UK economy should not be underestimated. The welfare benefits to society from railways in 1865 have been estimated to be equivalent to some 4.1 per cent and 2.8 per cent of Gross National Product (GNP) for freight and passenger transportation respectively.<sup>2</sup> Interestingly, the returns on creating a railway network have been estimated to be even higher in developing countries, such as Brazil, which had poor alternative transport links, than in more developed ones, such as the UK, where a well developed canal network and extensive coastal shipping remained in operation.

### Transport influencing economic geography

**1.11** The creation of the transport network influenced the UK's economic geography, i.e. the location of its economic activity. Canals were a primary factor in determining the location of industry. Although railways, which followed, had little impact on the location of industry, they revolutionised passenger movement and were critical in the creation and growth of many urban areas. The subsequent development of the strategic road network played a key role in the relocation of new, light industries, attracted by market access and new clusters. This was especially the case in the South East and is evident in the new industrial districts created around outer London, for example, those close to the A406 (North Circular).<sup>3</sup>

<sup>2</sup> *The Historical Significance of Transport for Economic Growth and Productivity*, Crafts and Leunig, 2005.

<sup>3</sup> The South East region attracted 48 per cent of all new manufacturing plants in 1932 to 1982. *New manufacturing plant formation, clustering and locational externalities in 1930s Britain*, Scott and Walsh, *Business History* 47, 2005, as cited in Crafts and Leunig 2005.

**Figure 1.3: Railways delivering for growth in the nineteenth century<sup>a</sup>**

- Railways played a pivotal role in the economic success of the UK economy in the mid-nineteenth century. The UK was the first country in the world to establish a railway network. By 1870, the UK had about 15,000 miles of track, had invested on average about 1.5 per cent of GDP in railways over the previous 40 years and the railway capital stock equalled 30 per cent of GDP.
- The UK became a leading developer and beneficiary of railway technology. During this period, for instance, the UK became the world's largest producer of pig iron, which was essential for the building and maintenance of railways. The UK also became the largest producer of cotton goods, and the Lancashire cotton mill cluster was a key beneficiary of railway technology; see figure 1.4.
- Despite this, it was a long time before productivity benefits from the railways were realised. It was only when they were extended to passenger, as well as freight traffic, that the sector's profitability and its large-scale productivity benefits began to emerge.
- Railways revolutionised passenger travel. Expanding the scope of the railway network from freight traffic to passenger travel enabled the rapid movement of large numbers of people for the first time, allowing many families to access parts of the country, such as the UK's coastline and beaches, that could not previously be reached. Railways were also pivotal in the establishment of national daily newspapers and a national football league.
- The welfare benefits to society have been estimated to be equivalent to some 4.1 per cent and 2.8 per cent of GNP<sup>b</sup> in the UK in 1865, for freight and passenger transportation respectively.<sup>c</sup> The freight benefits, in particular, depended heavily on the alternative forms of transport that were available. The UK had an extensive canal network and cheap coastal shipping, with the latter accounting for 60 per cent of tonne miles. The welfare benefits for Brazil, in comparison, which was a developing economy with poor alternative transport networks, have been estimated at 18.1 per cent and 2.1 per cent of GNP in 1913, for freight and passenger transportation, respectively.

<sup>a</sup> Evidence taken from *The Historical Significance of Transport for Economic Growth and Productivity*, Crafts and Leunig, 2005.

<sup>b</sup> The Gross National Product (GNP) is the value of all the goods and services produced in an economy, plus the value of the goods and services imported, less the goods and services exported.

<sup>c</sup> *The Historical Significance of Transport for Economic Growth and Productivity*, Crafts and Leunig, 2005, estimates that the social rate of return on railway investments between 1840 and 1870 was about 15 per cent compared with the private rate of return of 5 per cent, suggesting the prime beneficiaries of railways were consumers rather than the private business investors.

### Development of urban areas

**1.12** New transport technologies were also fundamental to the development and the success of the major global cities in existence today. The role of transport in the success of the New York city cluster is summarised by Paul Krugman, who notes "...there has been no important commercial traffic on the Erie Canal since 1850, yet the head start that the canal gave to New York city has allowed New York to remain the largest US city to this day."<sup>4</sup>

**1.13** Canals in the mid nineteenth century were also critical in developing London's comparative advantage in maritime services. The widespread use of passenger rail and the creation of the Underground system in the late nineteenth and early twentieth centuries reinforced the emerging economic and geographic trends still observed in London today; see figure 1.4.

<sup>4</sup> *Increasing Returns and Economic Geography*, Krugman 1991a, *Journal of Political Economy*.

**Figure 1.4: Transport facilitating the growth of clusters in the UK**

**Supporting the competitiveness of the Lancashire cotton industry<sup>a</sup>**

- Transport played a pivotal role in the development and longevity of the Lancashire cotton mill cluster in the mid nineteenth century. The productivity advantages were such that the sector was able to prosper with wage levels six times those of its major competitors. By the late nineteenth century the UK was the lowest cost producer of most cotton goods, representing some 80 per cent of the global market for exports.
- The Lancashire cotton mill cluster consisted of a number of textile towns, each specialising in a particular stage of the production process, with no single town offering an advantage over the tight cluster of specialised individual towns. This suggests that the benefits of the cluster occurred at a regional level.
- The industry benefited from innovations in spinning technology and the exploitation of world markets through transport. International shipping provided the regular import of raw cotton and the export of manufactured cotton goods; the rail links within Lancashire supported the movement of intermediate goods from one specialised district to another, and to and from the port.

**Supporting the emergence of the London cluster**

- Transport was also critical to the development of London. Canals and shipping in the eighteenth and early nineteenth centuries allowed the city of London to establish itself inland, whilst also developing expertise in maritime services.
- This led ultimately to the development of other industries. London continued to expand, as complementary services developed in insurance, trading and finance. The geography of the city was very much established by the early nineteenth century.
- The introduction of railways in the mid nineteenth century, originally for freight transportation, supported the movement of labour, with London’s suburbs developing around Underground and electric and diesel-powered railway lines into the city.

<sup>a</sup> See *The Historical Significance of Transport for Economic Growth and Productivity*, Crafts and Leunig, 2005, for further details.

**1.14** In the past few centuries developed economies around the world have experienced step changes in connectivity through new transport technologies: through widespread use of canals in the eighteenth and early nineteenth century; to steam ships and railways in the nineteenth century; to the development of affordable car travel and the completion of the strategic (motorway and trunk) road network in the twentieth century. The evidence is clear that in a developing economy context, establishing basic connectivity is a very significant economic contributor to rapid economic growth.

**Is aviation today’s step change?**

**1.15** Today, it is interesting to consider the rapid expansion in international passenger and freight connectivity in light of historical evidence. The most recent phase of globalisation appears to be driven by rapid expansion in global connectivity provided by a combination of two distinct changes witnessed in recent decades. Firstly, the widespread use of shipping and aviation and its falling costs (as illustrated in figure 1.2), and secondly, the telecoms and IT revolution. Together these two factors may be seen as transforming the connectivity of both the manufacturing and service sectors globally. It is expected that such changes will have the potential to impact on the growth of domestic and world economies, and policy makers need to be alive to this, as well to the fundamental environmental and social challenges this may create.

## UNDERSTANDING THE NATURE OF THE RELATIONSHIP BETWEEN TRANSPORT AND THE ECONOMY

### There is a relationship between transport investment and economic performance

**I.16** Whilst history demonstrates the importance of transport to productivity growth in the economy, the exact nature and scale of the relationship is much debated. Figure 1.5 sets out some of the recent literature in this area.

**I.17** David Aschauer sparked the debate on the relationship between investment in public sector infrastructure and the performance of the economy in 1989. He found that for the United States economy a 1 per cent increase in the stock of public sector capital could boost GDP by 0.38 to 0.56 per cent annually.<sup>5</sup> Subsequent studies suggest a much weaker link between infrastructure and growth. Although there is considerable variance in the empirical evidence, the studies are broadly consistent with the conclusion that a 1 per cent increase in public capital stock could result in a one-off, sustained increase in GDP of 0.2 per cent for a developed economy.<sup>6</sup> The varying returns offered from these studies indicate the importance of targeting investment in the right places.

#### Direction of causality debated

**I.18** Although many of these studies are informative and shed some light on the relationship between transport and the performance of the economy, it would be misleading for transport policy to be developed on the basis of these expected returns to GDP.

**I.19** In particular, there remains some ambiguity over the direction of causality in the relationship between transport investment and the performance of the economy. What comes first? Do countries choose to spend more on transport as they grow richer? Or does an increase in GDP come after transport investment, i.e. transport investment generates economic success?<sup>7</sup> Our analysis of the literature and engagement with expert academics in the field suggests that, in practice, it is likely to be a combination of the two.

**I.20** Such studies also omit the wider economic, social and environmental impacts not accounted for by the narrow definition of GDP. On balance, therefore, the above analyses may be understating the true magnitude of the relationship between transport investment and the performance of the economy. The Study's view is that the link between transport and productivity is clear and is best demonstrated through the micro economic approach which the next chapter goes on to explore.

<sup>5</sup> *Is Public Expenditure Productive?*, Aschauer, Journal of Monetary Economics, Vol. 23, 1989.

<sup>6</sup> The average across OECD countries for the period 1960 to 2001 is estimated to have been 0.2. *New Estimates of government net capital stocks for 22 OECD countries, 1960-2001*, Kamps, IMF working paper, 2004, cited in Crafts and Leunig, 2005.

<sup>7</sup> This would suggest that transport impacts on productivity.

**Figure 1.5: A review of evidence on transport's contribution to GDP**

- A number of empirical studies have looked at the relationship between all public infrastructure investment and GDP growth. On average these studies seem to indicate a positive elasticity of output to public capital of around 0.20. Put another way, a 10 per cent increase in public capital stock increases GDP by around 2 per cent.
- However, there are limitations to these empirical studies and the results should be viewed with caution. OECD (2003) argues that early empirical work on the link between infrastructure investment and economic performance overstated the magnitude of the impact on GDP and productivity growth.<sup>a</sup> In particular, studies that focus on public investment in capital and infrastructure in the broad sense, rather than on transport specifically, do not really distinguish between types of investment in terms of new build, upgrade, maintenance, etc., although some do make specific conclusions about the value of transport infrastructure investment, see below.
- Later studies using more complex modelling suggest a positive, albeit weaker, relationship between infrastructure and GDP. These include: Kocherlakota and Yi (1997), Demetriades and Mamuneas (2000), O'Fallon (2003), and Nijkamp and Poot (2004).<sup>b</sup>
- Others assert that transport investment in particular has a positive impact on growth, these include: Barro (1991), Canning and Fay (1993), Easterly and Rebelo (1993), Kneller, Bleaney and Gemmell (1999), Victoria Transport Policy Institute (2003). Studies looking specifically at transport have offered more precise evidence: Nadiri and Mamuneas (1998) looking at interstate highways in the US found that the output elasticity averaged 0.08 from 1950 to 1991, suggesting that a 1 per cent increase in infrastructure stock increases GDP by 0.08 per cent. Crafts and Leunig (2005) illustrate that highways accounted for a third of all productivity growth in the 1950s and 1960s in the US (although this figure was only 4 per cent in the 1980s).<sup>c</sup>
- However, such studies are often subject to the caveat on causality. The SACTRA Report to the then Department for the Environment, Transport and the Regions (1999) highlights the problem of understanding what is likely to be a two-way causal relationship, suggesting that although the theoretical links are strong, evidence is weak and by no means undisputed.<sup>d</sup> OECD (2003) also suggests that, although the benefits of transport infrastructure to economic growth are generally recognised, a direct causal link is difficult to establish.<sup>e</sup>

<sup>a</sup> *The sources of economic growth in OECD countries*, OECD, 2003.

<sup>b</sup> See: *Is there endogenous long-run growth? Evidence from the United States and the United Kingdom*, Kocherlakota and Yi, 1997; *Intertemporal output employment effects of public infrastructure capital: Evidence from 12 OECD economies*, Demetriades and Mamuneas, 2000; *Linkages between infrastructure and economic growth*, O'Fallon, 2003 and *Meta-analysis of the impact of fiscal policies on long-run growth*, Nijkamp and Poot, 2004.

<sup>c</sup> See: *Economic growth in a cross section of countries*, Barro, 1991; *The effects of transportation networks on economic growth*, Canning and Fay, 1993; *Fiscal policy and economic growth*, Easterly and Rebelo, 1993; *Public policy and the government budget constraint: Evidence from the OECD countries*, Kneller, Bleaney and Gemmell, 1999; *Transport Cost and Benefit Analysis – Evaluating Transportation Benefits*, Victoria Transport Policy Institute, 2003; Nadiri and Mamuneas, 1998; and *The Historical Significance of Transport for Economic Growth and Productivity*, Crafts and Leunig, 2005.

<sup>d</sup> *Transport investment, transport intensity and economic growth*, Standing Advisory Committee on Trunk Road Assessment (SACTRA), 1999.

<sup>e</sup> *The sources of economic growth in OECD countries*, OECD, 2003.



- **Dodgson (1997) points out that empirical evidence to back up theoretical links is extremely hard to obtain and to interpret, because of the difficulty of determining cause and effect when GDP is influenced by so many other factors.<sup>f</sup> Eberts (1999) concludes that there is no definitive estimate of the effect of infrastructure in general, or of transport infrastructure more specifically, on GDP.<sup>g</sup>**

<sup>f</sup> *A framework for assessing studies of the impact of transport infrastructure projects on economic activity*, Dodgson, 1997.

<sup>g</sup> *How levels of investment in transportation affect economic health*, Eberts, 1999.

## Overstretched transport can constrain economic success

**1.21** Although the evidence presented suggests that transport can impact on the performance of the economy, additional transport expenditure is not always beneficial. Many countries and regions around the world have demonstrated that economies can grow without significant step changes to their transport network. However, such economic success can itself generate a higher demand for transport, and where there is a lack of adequate capacity, transport can start to constrain that success. Hence some countries, which at first glance are perceived to be surging ahead with minimal transport investment, may find their transport network stretched if growth of GDP continues significantly to outpace that of infrastructure.

**China: infrastructure leads growth 1.22** It can be argued that two of the world's fastest growing economies, China and India, have taken very different approaches to transport policy and growth. China over the last two decades has followed an infrastructure-heavy approach to growth, with considerable investment going into roads, railways, ports and airports, on the expectation that this will support and fuel additional economic growth. The pace of investment in recent decades is such that the total length of roads in the country is now second only to the United States.

**India: infrastructure lags growth 1.23** Infrastructure investment in India, on the other hand, has lagged the rapid growth of its economy, which in recent years has been driven through investment in human capital (i.e. skills) and information technology, with transport investment given much lower priority within the Government's spending portfolio. Since the early 1990s, India's growing economy has witnessed a rise in demand for transport infrastructure and services of around 10 per cent a year. However, transport provision has not kept pace with rising demand, to the extent that it is now impacting on future growth and competitiveness. The World Bank notes that major improvements in the transport sector are required to support the country's continued economic growth, a challenge that India is now responding to.<sup>8</sup>

**1.24** Turning to an example from among the advanced economies, Ireland's economy, like India's, has surged ahead with limited transport investment. The economy has grown rapidly in recent decades, primarily on the strength of its investment in skills, and fiscal incentives for foreign direct investment. By 2000, foreign-owned firms accounted for 48 per cent of total employment in manufacturing.<sup>9</sup> Only now, as greatly increased demand has started to outstrip supply, has transport become a factor in limiting growth. In particular, during this period, transport investment, with the exception of infrastructure to support international trade, considerably lagged behind growth of the economy. As a consequence, Ireland is now facing serious traffic congestion around its growing urban areas, such as Dublin. It is also becoming apparent that surface access routes to Dublin's port and airport are inadequate.<sup>10</sup>

<sup>8</sup> [www.worldbank.org](http://www.worldbank.org).

<sup>9</sup> *The Historical Significance of Transport for Economic Growth and Productivity*, Crafts and Leunig, 2005.

<sup>10</sup> *The Historical Significance of Transport for Economic Growth and Productivity*, Crafts and Leunig, 2005.

**Cost of not responding to transport pressures can be substantial**

**1.25** Recent experiences from India and Ireland illustrate that there are times when countries can grow without significant improvements to transport. However, economic success can itself generate increasing transport demand, which can then become a constraint on growth in GDP. Potential productivity benefits from growing London in the early twentieth century were lost, due to the absence of adequate passenger transport infrastructure hindering realisation of even the most cautious forecast population growth of the city.<sup>11</sup> This suggests that there would be significant benefits from government reacting quickly to address transport demand when growth is identified.<sup>12</sup> As an illustration of the potential costs to the UK economy, it is estimated by DfT's National Transport Model that eliminating existing congestion on the road network (relative to free flow conditions) would be worth some £7-8 billion of GDP per annum.<sup>15</sup> Although it is not realistic or cost-effective to eliminate congestion completely, this figure does illustrate that the cost of not responding to transport pressures can be substantial.<sup>14</sup>

**1.26** Growing congestion on the network is a clear indication of increasing transport demand outpacing transport supply. This may suggest that either the pricing structures on different parts of the network are not working effectively and/or there is a case for investment, provided that the costs of relieving such congestion are reasonable. This will have an impact on both GDP and quality of life. Volume 2 explores further the cost to UK GDP and welfare if transport policy is not responsive to the needs of the economy, and Volume 3 provides evidence on the case for different pricing structures and investments.

**Little consensus on what constitutes an 'adequate' transport system**

**Transport requirements differ by country**

**1.27** Although it is evident from the academic literature that the transport system can impact on the performance of the economy, it is equally evident that this impact will be of different magnitude at different times and in different places. There is little consensus about how much, at an aggregate level, should be invested in transport, or what an 'adequate' national transport system looks like. What is clear, however, is that a 'one-size-fits-all' approach to transport policy – in terms of types of intervention, modal solution or indeed level expenditure – is not appropriate. Shaped by their different social, economic, environmental and geographic characteristics, different countries and regions have different transport needs.

**1.28** The contribution that transport investments make to the rate of economic growth depends on a number of factors. These include:

- the maturity of the economy and the quality of the existing transport network;
- the degree to which the transport network is managed efficiently; and
- the presence of other external factors material to productivity and growth.

<sup>11</sup> Report of the Royal Commission appointed to inquire into and report upon the means of locomotion and transport in London, Royal Commission, 1905, cited in Crafts and Leunig, 2005.

<sup>12</sup> Vickerman notes the importance of identifying bottlenecks in the infrastructure acting as constraints, see *Transport Infrastructure in the European Community: new developments, regional implications and evaluations*, 1992.

<sup>13</sup> These figures are calculated on the basis of journey time savings to business and freight traffic using 2005 prices and DfT's appraisal guidance. These figures exclude potential reliability and agglomeration benefits that the next chapter goes on to explore.

<sup>14</sup> It would not be sensible to aim for a complete reduction in congestion because the costs in building new infrastructure or in deterring people from driving would outweigh the time savings benefits to travellers; see Volume 2 for more on travel demand.

- Maturity of economy and transport network**
- I.29** The quality of existing transport does matter. The existing size, type and condition of transport infrastructure in a country are all key factors influencing the economic benefits of further transport infrastructure investment.
- I.30** Returns from transport investment are likely to be greatest where no alternatives exist, infrastructure is scarce and basic networks are not complete, as may be the case for some developing economies. As was noted above, for instance, railways had a greater impact on productivity in Brazil than in the UK, where a well-developed canal network already linked major industrial locations.
- I.31** While transport infrastructure accumulation is crucial for developing economies, for mature economies with well-established networks, where connectivity between economic centres is already in place, the evidence suggests that there is considerably less scope for transport improvements to deliver the periods of rapid growth seen historically.
- I.32** For developed economies, the debate should be focused on the capacity and performance of the existing network: productivity benefits from transport may be more closely related to the efficiency of infrastructure use, rather than simply the absolute amount of investment, particularly where capacity is stretched, as demonstrated, for instance, through congestion or unreliability. The relationship between transport and growth in a mature economy is therefore likely to be an incremental one.
- Efficient management of existing network**
- I.33** Increasingly, studies are suggesting that the efficiency with which existing transport networks are used is just as important as the underlying investment. Hence, even if additional infrastructure on its own may not always boost trend growth, transport investment to support performance of the network in developed economies can be economically beneficial and is necessary to maintain a high quality transport infrastructure – a key requirement for continued growth.
- I.34** Efficient management of the infrastructure includes adherence to commercial principles such as competition, efficient pricing across different modes, including roads, user charges to allocate scarce infrastructure, and sufficient resources being devoted to the maintenance and repair of the network. There is some evidence, see figure 1.6, that improving the performance and efficiency of an existing network can be just as, if not substantially more, beneficial than investment in new network capacity. Evidence on efficient management measures is provided in Volume 3.

**Figure 1.6: Economic benefits from efficient use of existing transport network**

- Erenburg (1994) finds that policy measures that make more efficient use of existing transport infrastructure through pricing mechanisms or other traffic management solutions can have a significant impact on growth.<sup>a</sup>
- Hulten and Schwab (1996) estimates that a 1 per cent increase in infrastructure effectiveness would have an impact on growth seven times larger than a 1 per cent increase in the rate of public infrastructure investment.<sup>b</sup>
- OECD / ECMT (2001) paper on the benefits of transport concludes that ‘...wider economic benefits may be achieved more efficiently by introducing prices which correspond more closely to costs, or by reallocating existing infrastructure more efficiently between users, or by adopting other transport policies.’<sup>c</sup>
- Victoria Transport Policy Institute (2003) argues that investment in alternative modes of transport and in management strategies to encourage more efficient use of existing road capacity (e.g. pricing congestion/parking) tends to provide greater economic benefit than expanding existing highways to reduce congestion. The study also argues that the benefits of transport improvements are heavily dependent on local circumstances, in that they will only increase economic development where inadequate transport is a significant constraint on economic activity.<sup>d</sup>

<sup>a</sup> *Linking public capital to economic performance*, Erenburg, 1994.

<sup>b</sup> *The public capital hypothesis: The case of Germany*, Hulten and Schwab, 1996.

<sup>c</sup> *Assessing the benefits of transport*, European Conference of Ministers of Transport, OECD, 2001.

<sup>d</sup> *Transportation cost and benefit analysis – evaluating transportation benefits*, Victoria Transport Policy Institute, 2003.

**Regulatory reform can deliver for growth** **1.35** Delivering productivity benefits from transport does not always mean more investment. There is some evidence to suggest that regulatory reform within the transport-using sector could be an important element in better management of existing networks. For example, trucking deregulation contributed more to reductions in costs for the transport-using sector than public capital spending in both France and the United States after the mid-1980s.<sup>15</sup> Similarly for the UK, recent increases in the maximum weight of trucks from 38 to 41 and then to 44 tonnes in 2001, supported by necessary infrastructure improvements, have been estimated to cut road haulage costs by 19 per cent for weight-constrained loads.<sup>16</sup>

**Conditions necessary to deliver growth benefits** **1.36** Equally, more often than not, transport is unlikely to be the answer to regenerating an area or region. Whilst transport can play an important role in facilitating productivity growth, transport infrastructure alone does not create economic potential. In particular, it is widely accepted that the positive effects of transport investment, and its magnitude, are conditional on certain external pre-conditions complementing any transport provision, namely: stable macroeconomic conditions; the availability of skilled labour; and a favourable environment for business investment to drive output growth. See Figure 1.7.

<sup>15</sup> *The Historical Significance of Transport for Economic Growth and Productivity*, Crafts and Leunig, 2005.

<sup>16</sup> *The economic and environmental benefits of increasing maximum truck weight: the British experience*, A. McKinnon, Transportation research part D 10 (2005) Elsevier. See Chapter 1.2 for more on the impacts of increasing maximum truck weight.

**Figure I.7: Evidence of conditions necessary for transport to impact on the performance of the economy**

- Canning and Fay (1993) assert that infrastructure should not be seen as a factor of production but as a condition for high growth. Kessides (1993) notes that infrastructure does not create economic potential; it only develops such potential where appropriate conditions exist, i.e. other inputs such as labour and capital are available to drive output growth.
- Indeed, Lynde and Richmond (1993), Trinder (2002) and O’Fallon (2003) assert that public and private capital are complements: that physical infrastructure requires the existence of available productive private capital (human or physical) in order to realise economic growth potential, and that infrastructure investment can boost the productivity of such private capital.<sup>a</sup> Infrastructure investment may also indirectly feed through to increased labour productivity.
- Canning and Pedroni (1999), Banister and Berechman (2000), Trinder (2002) and O’Fallon (2003) highlight other important underlying conditions that will influence the impact of transport investment on the economy.<sup>b</sup> In summary:
  - economic conditions: a stable macroeconomic policy climate, local market circumstances, agglomeration, and labour market conditions;
  - investment conditions: availability of funds, timing and structure of investment, type of infrastructure investment, location of investment in terms of network structure; and
  - political and institutional conditions: decision making, planning, sources and methods of finance, level of investment (local, regional or national), supporting legal and organisational/institutional policies and processes, and method and governance of infrastructure delivery and provision.

<sup>a</sup> See: *Public capital and long-run costs in the UK*, Lynde and Richmond, 1993; *Economic growth and transport infrastructure appraisal*, Trinder, 2002; and *Linkages between infrastructure and economic growth*, O’Fallon, 2003.

<sup>b</sup> See: *Infrastructure and long-run economic growth*, Canning and Pedroni, 1999; *Transport investment and economic development*, Banister and Berechman, 2000; and *Linkages between infrastructure and economic growth*, O’Fallon, 2003.

**I.37** The Jubilee Line Extension is often cited as a case study of how transport can support regeneration of an area, in this case the Docklands area of East London. However, in this particular example, it is also clear that other factors contributed, and were essential, to the area’s success. For example, the area benefited from favourable business rates that attracted business investment and it met the existing demand for a convenient alternative office centre to the City, as well as access to London’s skilled labour pool. Transport was the final piece in the jigsaw, releasing a constraint and supporting London’s growth.

**I.38** Hence, although in very limited circumstances, transport investment may be able to unlock under-utilised resources, such as skilled labour and land in the area, or relieve pressure in neighbouring labour market catchments, a blanket “build it and they will come” approach to transport projects is extremely speculative. It is unclear whether a general policy of significantly improving the connections between a peripheral urban area and a core urban area through transport generates productivity benefits for both areas. A link between the two areas can result in a displacement of economic activity, with the core benefiting at the expense of the periphery, and with little or no impact on national productivity.<sup>17</sup>

<sup>17</sup> *Transport investment, transport intensity and economic growth*, Standing Advisory Committee on Trunk Road Assessment (SACTRA), 1999 and *Economic linkages across space, report for ODPM*, Coombes, Duranton, Overman and Venables, 2005.

**I.39** This suggests that a transport link is unlikely to improve an unproductive urban area unless there is underlying demand for this connection, and that productivity returns are likely to be greatest where there is demand for transport, as manifest, for example, through congestion. The evidence suggests that governments need to think carefully about the role of transport in supporting the growth or regeneration of an area or region. This is not to say that transport cannot contribute, where the right complementary conditions are present, but that policies such as skills or fiscal incentives may be more appropriate in driving economic performance.

## **Transport and climate change**

**I.40** This chapter has explored the relationship between transport and the economy. It is also necessary to recognise transport's critical interaction with climate change and the potential for damaging the environment. The Stern Review 2006 has provided compelling evidence of the impact that climate change will have on economic growth unless there is urgent, global action. Figure 1.8 outlines further what this means for the transport sector. This Study has sought to take account of these conclusions of the Stern Review throughout its analysis.

**Figure 1.8: Transport and climate change – findings from the Stern Review 2006**

- A deterioration in environmental quality can lead to a reduction in economic growth. Climate change provides perhaps the starkest example of this.
- The Stern Review on the economics of climate change shows that all countries will be affected by climate change, and that the impacts and risks will intensify as temperatures rise. It finds that if emissions of greenhouse gases continue along a ‘business-as-usual’ path, temperatures could rise by 5 degrees centigrade or more over the following decades. This is the same as the temperature difference between now and the last Ice Age, and would have serious, transformational consequences for the physical and human geography of the world.
- Modelling estimates by the Review show that climate change could generate economic costs equivalent to an average reduction of at least 5 per cent of global consumption each year, now and forever. If a wider range of risks and impacts are taken into account, the estimates of damage could rise to 20 per cent of consumption. In contrast, taking early action to reduce greenhouse gas emissions to stabilise emission concentration levels at 550ppm carbon dioxide equivalent (CO<sub>2</sub>e) or below would cost around 1 per cent of global GDP (Gross Domestic Product) by 2050, if well-designed global policies are implemented soon. The Review finds that the benefits of action to reduce emissions far outweigh the costs.
- To stabilise concentration levels at 550ppm CO<sub>2</sub>e by 2050, the Review argues that total emissions would need to be 25 per cent lower than current levels. Transport will have a role to play in contributing to these emission reductions. However, transport is among the fastest growing carbon-emitting sectors and also has among the highest abatement costs. So, the Review argues, in moving to a low carbon economy the transport sector could be among the last sectors to experience absolute levels of emission cuts because it would be more efficient to focus first on those sectors that can abate more cheaply.<sup>a</sup> The Review highlights, for instance, that it is likely that a 60 per cent reduction in the carbon intensity of electricity production will be necessary. Transport is therefore likely to remain largely oil-based until 2050.
- The Review argues that tackling greenhouse gas emissions from transport and other emission intensive activities will require policy action on broadly three fronts. Firstly, polluters should be faced with a carbon price; this could be via taxation, inclusion in a trading scheme or implicitly by regulation. (From an economics perspective, carbon pricing and road pricing are very similar as they both involve presenting the user with the external costs of their activities.) Secondly, innovation policy is necessary to bring forward new clean technologies. Thirdly, barriers to behavioural change should be removed using, for example, information policy.
- In the transport sector, carbon savings in the period to 2050 are likely to come from improvements in vehicle efficiency, biofuels, and behavioural change. Beyond this date, low carbon technologies such as hydrogen or electric powered vehicles could play more of a role.
- **Source: Stern Review 2006.<sup>b</sup>**

<sup>a</sup> Abatement costs in transport are high relative to other sectors for two reasons. Firstly, the low carbon technologies in transport (electric and hydrogen powered vehicles) are currently relatively expensive. Secondly, the welfare costs associated with reducing demand for travel or switching to more fuel-efficient vehicles are fairly high.

<sup>b</sup> *The Stern Review: The Economics of Climate Change*, HM Treasury, 2006.

## CONCLUSIONS

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**1.41** This chapter has set out the historical evidence and academic literature on the relationship between transport and the economy at the macro level. The evidence presented shows that transport, under the right conditions, can deliver GDP and productivity benefits, although the scale of this contribution is difficult to assess. This analysis provides useful indicators on the economic case for transport in supporting the economy at the broader strategic level. It illustrates how lack of transport infrastructure can also constrain growth but that transport alone will not transform economic performance.

**1.42** The macro approach offers limited help in identifying where individual investments might yield large benefits. Chapter 1.2 sets out a framework for examining the precise mechanisms by which transport can contribute and drive economic growth at the micro level. It is only this kind of understanding that will properly equip policy makers to focus their actions where they will help productivity growth.



# 1.2 HOW DOES TRANSPORT CONTRIBUTE TO THE PERFORMANCE OF THE ECONOMY?

## Headlines:

- Transport impacts on the economy in a number of different ways. These can be assessed through a series of micro economic drivers of growth: business efficiency, investment and innovation; agglomeration economies; labour markets; competition; trade; and globally mobile activity.
- Such impacts are made by improvements to the speed, cost, reliability, network coverage, comfort or safety of the journey.
- While conventional cost benefit appraisal techniques, especially the valuation of journey time savings, capture an important part of expected gains to GDP, until recently the scale of many of these micro drivers has been little explored. Some can also influence the rate of change as well as the level of GDP, and hence are extremely important.
- The fact that the UK has an existing established transport network suggests transport improvements are most likely to deliver for the economy when responding both to signals of underlying transport demand exceeding capacity, manifest through congestion, and to signs of growth and productivity, manifest, for example, through high wages and land prices.
- The service sector and international trade are of growing economic importance to the UK. This points to the need for a responsive transport policy to meet the requirements of congested and growing urban areas which benefit from deep labour markets, as well as facilitating the trade of goods and services through key ports and airports.
- It is essential for transport policy and appraisal to recognise and consider the full range of transport impacts on the economy. Appraisal frameworks must continue to develop, seeking to capture economic, social and environmental impacts to allow sensible prioritisation of policies that will support government objectives or goals.

## INTRODUCTION

**A micro approach is crucial to guide policy**

**2.1** The previous chapter explored the overall relationship between transport and the performance of the economy. Although understanding this big picture is important, the analysis provides little insight into the actual economic mechanisms through which transport contributes to economic success. A better understanding of this relationship is essential to inform strategy and transport appraisal and thereby help policy makers determine the most effective and appropriate policy interventions.

**2.2** This chapter seeks to explore the different ways in which transport can contribute to the performance of the economy by:

- (i) exploring the nature and type of journeys that are important to different users;
- (ii) introducing a set of 'micro economic drivers' for analysing how improvements to the quality of these journeys can support productivity;
- (iii) considering the scale of these benefits and the extent to which they are captured in current transport appraisal; and
- (iv) identifying the nature and type of journeys that are most likely to support productivity over the next 30 years.

### TRANSPORT USERS AND THEIR REQUIREMENTS

**2.3** A useful starting point for understanding how transport impacts on the economy is to examine the users of the transport network and their requirements. This helps build a picture of how users respond to specific transport interventions and consequently impact on the drivers of productivity, and wider welfare.

**2.4** For the purpose of this Study transport users have been split into four broad categories: business travel, freight traffic, commuter travel, and non-work/leisure travel. Business, freight and commuter transport are economically important because of their direct contribution to GDP, for instance, through investment and labour markets. Extending the analysis to broader well-being (economic welfare) reflects the fact that journeys made by all users are important, including non-work/leisure travel, which contributes directly to people's quality of life and ultimately to GDP.

#### Users' requirements from the transport network

**2.5** The evidence is very clear that users want several things from the transport system, placing different weights on their relative importance. The key characteristics that transport improvements can influence are: cost, speed or journey time, reliability, network coverage, comfort, safety and security.

#### Costs and journey time

**2.6** The most obvious and direct benefit of an improvement in transport is a reduction in the time spent travelling. The benefit of a transport improvement with regard to time savings is the value of the time that becomes available to do things that could not be done whilst travelling, and for business this translates directly into a reduction in costs and/or an increase in output.<sup>1</sup>

**2.7** Transport costs typically account for 4-5 per cent of total input costs for firms but form a much higher share for some.<sup>2</sup> However, despite what may be seen as a small share of firms' total input costs, for many, transport remains necessary to their operation. Poor transport can therefore have a disproportionate impact on firms' variable costs and their profit margins. Reducing the cost and time that businesses spend on travel could bring significant gains for individual firms.

#### Reliability

**2.8** In addition to the importance of costs and journey time, journey reliability also matters.<sup>3</sup> This is supported by survey evidence and economic analysis.<sup>4</sup> Travellers and business want to know not only whether a particular journey will take 30 minutes on average but whether it will take 30 minutes every day, rather than 30 minutes most days and 60

<sup>1</sup> The monetary value of these time savings form the practical foundation of the appraisal of benefits to specific transport schemes, see <http://www.webtag.org.uk>. It is also worthwhile noting that small improvements to journey time savings are just as valuable as much larger scale improvements in journey times, see *Value of travel time savings in the UK, report to DfT*, Mackie, Wardman, Fowkes, Whela, Nellthrop and Bates, 2003.

<sup>2</sup> UK Input Output Analyses, Office for National Statistics.

<sup>3</sup> For road schemes, the variability (the standard deviation) around the average journey time is used as a measure of reliability. Reliability is expressed in terms of minutes and can be valued in money terms along with travel time savings. The available evidence suggests that the value car users place on a one-minute change in the standard deviation of their travel time is equal to approximately 80 per cent of the value they place on reducing their travel time by one minute. In contrast, the available evidence suggests that the value to goods traffic of a one-minute change in the standard deviation of their travel time is equal to about 120 per cent of the value they place on a one-minute reduction in their travel time. See: *Value of Reliability in Transport, [Provisional values for the Netherlands based on expert opinions]*, TR-240-AW, June 2005.

<sup>4</sup> *Note of Freight Scheme Benefits*, Fowkes, A.S, Institute of Transport Studies, 2005, paper prepared for the Department of Transport. In addition, reliability was a key factor reflected in comments from stakeholders received by, and published alongside, this Study.

minutes once a week.<sup>5</sup> It is estimated that for motorway widening schemes the total value of reliability benefits are in the order of an additional 50 per cent above the value of total time savings benefits.<sup>6</sup> Emerging evidence from the Netherlands suggest that this percentage could be higher for public transport schemes.<sup>7</sup>

**Figure 2.1: The importance of reliability**

**Journey reliability is becoming an increasingly important requirement for many transport users. The significance of reliability increases as transport systems become more congested, as it deteriorates disproportionately as congestion increases.**

- **Reliability is particularly important to certain business sectors, such as those dealing in perishable goods or those that rely upon Just In Time (JIT) delivery. The rapid growth of the express delivery sector in the UK in recent years demonstrates the importance that some businesses attach to predictable and time-critical deliveries. A CBI survey noted that 84 per cent of new economy firms would be very badly affected if next day delivery services to or from the UK were no longer available, with 93 per cent saying that orders would be lost because of longer delivery times.<sup>a</sup>**
- **Freight movement more generally could be better managed through improved reliability, which would allow reductions in inventories and optimisation of vehicle use.**
- **Reliability is also highly valued by business travellers and commuters. The CBI's 2005 survey found that 47 per cent of companies depended upon a significant number of staff commuting long distances and could therefore lose significant working time if transport links were unreliable.<sup>b</sup> Predictable transport services are important to commuters as well, whose quality of life can be adversely affected by irregular journeys and the stress of being late. Business travellers also value completing their journey reliably, as planned, and for this reason many airlines and train operating companies market their services based on punctuality.**

<sup>a</sup> *The business of transport*, CBI, 2005.

<sup>b</sup> *The business of transport*, CBI, 2005.

**2.9** Congestion on the network, failure to maintain assets<sup>8</sup> and incidents can all affect the reliability of a journey. Figure 2.2 shows that between 29-52 per cent of road freight journey legs are delayed mainly due to congestion. For business, if materials or workers do not arrive on time, this can create bottlenecks and delays to production processes or result in the loss of perishable goods and service contracts. In today's low inventory world, stocks and lead times are often so low that distribution and production systems are highly vulnerable to even small delays. As a result, unreliability can also cost business in terms of contingency measures that need to be put in place. These include building slack capacity into the supply chain, hiring additional drivers, or holding 'buffer stocks'.

<sup>5</sup> The vast majority of schemes have some beneficial impact on reliability. However, that value will vary considerably across schemes. On road schemes the value of reliability benefits will, amongst other things, be a function of the level of incidents that occur in the study area without the scheme in place and the extent to which the scheme helps to reduce those incidents. For instance, a scheme designed primarily to reduce the number of accidents on a route would be expected to have quite significant reliability benefits.

<sup>6</sup> In the past, it has proven difficult to empirically distinguish the value users apply to reliability to that attributable to journey time savings. *Uncovering the Distribution of Motorists' Preferences for Travel Time Reliability*, Small, Winston and Yan, 2005, *Econometrica*, found that reliability accounts for roughly one-third of the attraction of using the tolled Californian Express Ways, during peak times.

<sup>7</sup> See: *The Value of Reliability in Transport: Provisional values for the Netherlands based on expert opinions*, Ministerie van Verkeer en Waterstaat, 2005.

<sup>8</sup> This includes both vehicle standards and infrastructure conditions.

**Figure 2.2: Incidents of traffic related road delays for various freight sectors, 2002-2006**

Sector	Year	Number of journey legs	Per cent delayed	Per cent delays due mainly to congestion
Food retailers	2002	11115	33	34
Other food firms	2002	4137	18	29
Non-food retailers	2002	6411	19	52
Pallet networks	2004	833	35	34
Builders' merchants	2006	478	7	34

Source: Analysis of DfT commissioned transport KPI surveys for the Eddington Study by Prof. A McKinnon. For further information on KPI surveys see: <http://www.freightbestpractice.org.uk/pubsub.aspx?SectionID=5>.

**Network coverage also matters** **2.10** Users also value the network coverage or connectivity that a transport system offers. Without network connectivity, many journeys that matter for the economy simply could not happen. Network connectivity not only allows people and goods to get to destinations more quickly but also opens up opportunities for new destinations and new combinations of journeys, which may previously have been too costly and/or lengthy. These are known as network benefits from transport. These are likely to be extremely important where parts of the network are acting as hubs, e.g. airports, freight distribution centres, mainline train station interchanges, and access to major ports. The value of network connectivity can be illustrated, for example, by the weight that travellers attach to accessing Heathrow airport. The airport offers high frequency flights and connections to key business destinations globally but also acts as a 'hub and spoke' network through the choice of onward journeys on offer. This is reflected in the value of air slots at Heathrow.

**As does comfort** **2.11** Journey comfort also matters. Comfort allows business passengers to work whilst travelling and is reflected in business paying considerably higher prices for first class travel. Commuter and non-work/leisure travellers also value comfort, and quality enhancements can significantly improve the attractiveness of travel. Uncomfortable travel conditions manifest, for example, through severe overcrowding, may stop people from travelling or result in travel at different times or by different mode.<sup>9</sup> For commuters, travelling under crowded conditions can ultimately impact on their productivity level at work.

**Safety and security are also important** **2.12** The safety and security of travel is also valued by travellers. Accidents or terrorist attacks on the transport network can cause severe injury and loss of life. As well as the direct social costs, there are costs to the economy through the loss of output from workers and potential adverse effects on the reliability of journeys because of the disruption to the network. In the UK road casualties cost the economy an estimated £2.5 billion or 0.22 per cent in lost GDP in 2004.<sup>10</sup>

<sup>9</sup> For an example of the effect quality can have on public transport, in this case buses, see: *London bus services: A Review of demand and costs*, TAS consultancy for DfT, June 2006.

<sup>10</sup> Analysis undertaken by the Eddington team based upon DfT's standard evaluation of casualty prevention. For more information see: [http://www.webtag.org.uk/webdocuments/3\\_Expert/4\\_Safety\\_Objective/3.4.1.htm](http://www.webtag.org.uk/webdocuments/3_Expert/4_Safety_Objective/3.4.1.htm) and [http://www.dft.gov.uk/stellent/groups/dft\\_rdsafety/documents/divisionhomepage/030763.hcsp](http://www.dft.gov.uk/stellent/groups/dft_rdsafety/documents/divisionhomepage/030763.hcsp).

## WHERE CAN TRANSPORT MAKE A DIFFERENCE: THE MICRO DRIVERS

**2.13** As the previous section explored, the key characteristics that users value are: journey time, reliability, cost, connectivity, comfort, safety and security. When users experience an improvement or worsening of these characteristics, these feed through to impact on productivity and growth.

**Micro drivers 2.14** Figure 2.3 below introduces a framework for analysing these economic benefits through a series of micro drivers of productivity. The Study has identified the following seven micro drivers of productivity that transport can influence:

- (1) business efficiency;
- (2) business investment and innovation;
- (3) clusters/agglomerations;
- (4) labour market;
- (5) competition;
- (6) domestic and international trade; and
- (7) globally mobile activity.

**2.15** Transport, of course, contributes to social and environmental goals, which ultimately impact on GDP and welfare. The importance of this impact is discussed later in this chapter.

**2.16** This section considers for each microeconomic driver its importance to GDP and how significant this impact may be. Detailed appraisal techniques and methods are critical here. A high proportion of expected benefits from a transport intervention accrue in the form of journey time savings to users.<sup>11</sup> These are well researched, and long standing.

**2.17** Where such journey time savings are of work time, i.e. savings mainly to business and freight, there is an equivalent gain in GDP. Although the valuation of such savings continue to remain the most robust indication of likely GDP returns from transport improvements, actual gains can be greater if there are positive spillovers to other parts of the economy including business, capital and labour markets, as highlighted in Figure 2.3. Furthermore, where such changes stimulate innovation, this can also impact on how quickly the economy grows (i.e. the growth rate of GDP). And of course, as illustrated in Figure 1.2, Chapter 1.1, there are of course wider impacts on society and welfare, which a GDP measure alone cannot capture.

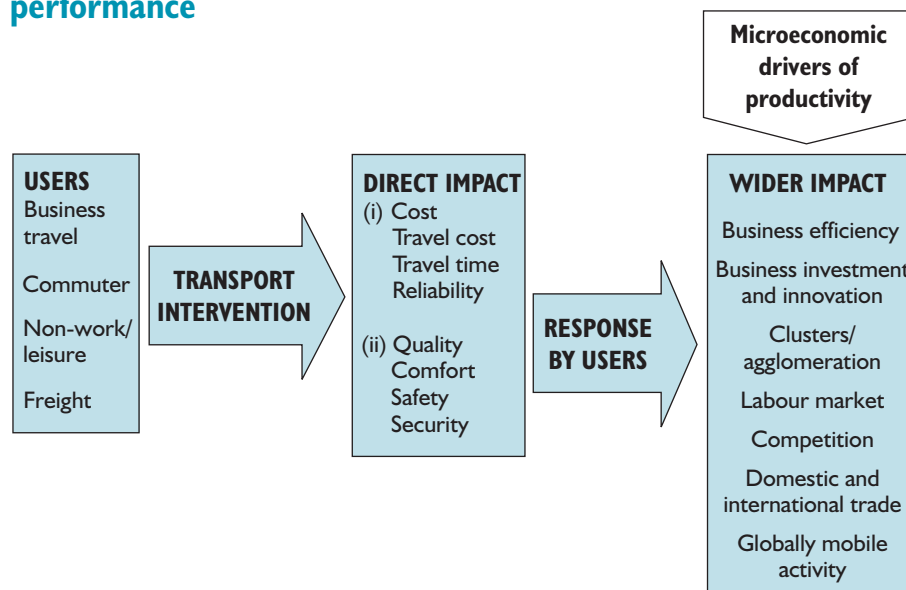
**2.18** The theoretical arguments for many of the additional economic drivers set out in Figure 3 are strong. In practice, quantifying the impact on GDP is difficult. However, there has been real progress in transport appraisal in recent months<sup>12</sup>. In addition, the Study has sought to increase the depth of current understanding in many areas through new research and modelling,<sup>13</sup> but also widening this debate to territory previously unexplored in appraisal (not least because of its obvious complexity, such as trade and global activity impacts).

<sup>11</sup> These have been well researched and form the bedrock of transport appraisal. For more information see DfT guidance: [www.dft.gov.uk/stellent/groups/dft\\_econappr/documents/sectionhomepage/dft\\_econappr\\_page.hcsp](http://www.dft.gov.uk/stellent/groups/dft_econappr/documents/sectionhomepage/dft_econappr_page.hcsp).

<sup>12</sup> The Transport Innovation Fund (TIF) programme, launched in 2004, has begun to factor estimates of the contribution of some of these other drivers into transport appraisal.

<sup>13</sup> For example, see *Transport and Labour Market Linkages*, Gibbons and Machin, 2006; and *Agglomerations in the UK and the Role of Transport Policy*, Eddington Study, 2006, published alongside this report.

**Figure 2.3: Links between transport and economic performance**



Source: Eddington Study.

## (i) Supporting business efficiency

**Business efficiency 2.19** Transport improvements that deliver time, cost and journey reliability savings, particularly for business and freight traffic, can significantly contribute to GDP through an increase in overall cost savings for business. This is especially true where such transport improvements are targeted at congested routes, predominantly used by business and freight. It should be noted that these efficiency gains to business are manifestations of the initial time savings from transport improvements and are captured in appraisal.

**2.20** As an illustrative example, a 5 per cent reduction in travel time for all business travel on the road network in Great Britain could generate cost savings to business in the region of £2.5 billion per annum, equivalent to some 0.2 per cent of GDP.<sup>14</sup> Including the potential reliability benefits could considerably increase this number. However, in practice, this change in journey time represents a large-scale improvement, and costs of delivering it, although difficult to estimate, could be substantial. New technologies and policies, such as road pricing, may make realising such gains feasible and cost effective in the future.

## (ii) Supporting business investment and innovation

**Business investment and economies of scale 2.21** Where direct savings to business lead to a higher rate of business investment there could also be productivity benefits. It could also allow business to benefit from economies of scale – producing more units of goods and services, on a larger scale, at lower cost.

**2.22** Economies of scale from transport can also be obtained by freight through the carrying of greater loads. Regulatory changes and supporting infrastructure investment, such as strengthening bridges or expanding loading gauges on the rail network, that enable freight companies to consolidate loads, can reduce companies' operating costs as it allows them to

<sup>14</sup> This assumes that business journey savings are valued at £30 per hour, as is the standard approach set out in the guidance issued by the DfT.

move the same amount of goods whilst running fewer vehicles for fewer kilometres. This can also result in notable environmental benefits from reduced emissions, as can be seen from figure 2.4 with the example of the 2001 increase in maximum truck weight to 44 tonnes.

**Figure 2.4: Estimated savings from the increase in maximum truck weight to 44 tonnes, 2001-2003**

	2001	2002	2003
Reduction in annual truck kms (million)	53	104	134
Saving in vehicle operating costs (£ million, 2004 prices)	44	85	110
Fuel saving (million litres)	20.1	39.1	50.6
Reduction in emissions (tonnes)			
Carbon dioxide	53800	104800	135700
Nitrogen oxide	351	684	884
Particulates	12.5	24.4	31.5

Source: *The economic and environmental benefits of increasing maximum truck weight: the British experience*, Prof. A McKinnon, 2005

**Innovation 2.23** Such cost savings could also increase the volume of innovative activity, and encourage greater research and development, which although difficult to measure can impact on the growth rate of the economy.

**2.24** One area where transport may have an impact on productivity is in the logistics of distribution. The UK, alongside the US, is at the forefront of innovation in this sector. Many businesses in the UK operate just-in-time inventory controls. Under ‘Just In Time’ (JIT), firms do not hold ‘buffer’ inventories of critical sub-components or spare parts but instead require their suppliers to deliver to a strict timetable to fit in with their production runs or, in the case of retail, re-stocking requirements. It is estimated that JIT practices have contributed to a fall of over 20 per cent in the inventory-output ratio in the UK over the last 20 years, saving UK companies over £6 billion a year.<sup>15</sup>

### **(iii) Supporting productivity through the enhancement of clusters and agglomerations**

**2.25** The concentration or clustering of firms and workers, typically in urban areas or industrial locations, are known as agglomerations. Agglomerations can be observed in all shapes and sizes. They are observed in large, diverse urban areas, for example London, New York, Paris, or in industrial clusters, for example the ceramics industry in the West Midlands. They can occur within an area, for example the science and technology cluster centred at Cambridge, or can be linear in form, for example, the clustering of European headquarters along the M4 corridor.

**Sources of productivity benefits 2.26** Interactions between firms and individuals in such environments allow the sharing of knowledge and the development of new ideas. They also offer individuals a greater choice of jobs and business access to a larger pool of applicants. These interactions can generate productivity benefits; see Figure 2.5 below.

<sup>15</sup> *The economic impact of express carriers for UK PLC*, Oxford Economic Forecasting and Mott McDonald, 2006. Transport no doubt played a role in this. A fifth of firms reported in a 1996 survey that they were able to cut inventory levels and access new markets as a result of transport improvements, see: *Transport infrastructure, business cost and business location*, Ernst & Young, 1996.

### Figure 2.5: Productivity benefits of agglomerations

Most economic activity is concentrated in small areas of the country. This concentration or clustering of firms and workers, typically in urban areas or in industrial clusters, is known as an agglomeration. The existence and development of agglomerations can be driven by production benefits (firms are more productive and therefore choose to locate here) and/or consumption benefits (people prefer living here). Both benefits reflect some underlying scale economies, either in production or consumption, with transport improvements being a potential driver through reducing travel time and costs and bringing firms, workers and consumers closer together.<sup>a</sup>

#### Economies of agglomerations:

- (i) **better matching of people to jobs and access to skilled labour, as a result of dense labour markets:** where firms need similar types of specialised skills, locating together increases the availability of skilled workers (either because the cluster attracts workers or as a result of local training institutions in the area). In a larger labour market, costs of searching are lower for both workers and firms (since potential matches occur more often) and the quality of each match is higher (for each vacancy, the chance of finding a 'perfect' match is better);
- (ii) **connection to suppliers and markets:** where firms are located in close proximity to each other there will be possibilities for specialist inputs to be provided to the group in a more efficient manner than if all the firms were dispersed. With a large choice of suppliers each firm can better select the specific type of input that is optimal for its particular production process;
- (iii) **information spillovers between firms:** for each interaction between firms there is a transfer of knowledge which benefits other firms. The closer the firms are to each other, the more interactions are expected; and

#### Consumption benefits:

- (iv) **People choosing to live in clusters can benefit from the wider range of non-work/leisure opportunities available. In particular, access to a greater choice of goods and services that can only be offered due to scale and are not available elsewhere, for example, a richer variety of 'the arts' is typically available in larger urban areas.**

<sup>a</sup> The majority of the productivity benefits from agglomeration are already captured in transport appraisal through the value placed on time savings. However, the existence of agglomeration economies means that the actions of each individual firm impact on the productivity of all other firms in the agglomeration; these productivity effects on others are additional to appraisal and can be significant.

**2.27** The key question to consider is what role transport can play in facilitating productivity benefits in agglomerations. The literature has been largely unsuccessful in answering this specific question.<sup>16</sup> The Study's assessment of the literature and subsequent analysis based on simulated models suggests that although transport alone cannot generate clusters, it can play an important role in facilitating their expansion by reducing travel time and costs, bringing firms, workers and consumers closer than otherwise would be the case.

<sup>16</sup> However, recent work by Rice and Venables (2005) and Graham (2005) is usefully beginning to inform debate in this area; see: *Spatial determinants of Productivity: Analysis for the regions of Great Britain*, Rice and Venables, 2005, and *Wider economic benefits of transport improvements: link between agglomeration and productivity*, Graham, 2005. In addition, the Study has carried out its own analysis of the role of transport in supporting agglomerations, drawing on the techniques established by the above-mentioned studies. See *Agglomeration and the Role of Transport*, The Eddington Study, 2006, published alongside this Volume.



**2.28** The analysis shows that not all firms and areas are equally agglomerated, and will therefore not benefit equally from a particular transport improvement. The contribution that transport can make to productivity is dependent on the characteristics of the industry, and how productive it is, as well as the existing density of the area. See Figure 2.6 below.

**2.29** For some industries, typically manufacturing clusters, the productivity spillovers tend to be very local in nature, resulting primarily through engagement with similar, closely located firms to share suppliers and to access knowledge capital, such as universities.<sup>17</sup> Where such transport links already exist, many of the benefits from additional improvements will be reflected in direct journey time savings to these sectors. Although the evidence is not conclusive, it points to transport having a limited role in generating additional productivity benefits in these sectors.<sup>18</sup> This does not, however, rule out other policies such as skills or support for research and development, which may be more appropriate for these sectors.

**Growing urban areas matter** **2.30** Other industries, typically services, benefit from large, dense labour markets and proximity not just to similar firms but also to a variety of complementary firms. For example, financial and trading businesses make use of the insurance and legal services in the City of London.<sup>19</sup> Evidence of agglomeration effects can be seen in the high property prices and wages paid in large urban areas, as well as the levels of congestion. Clearly, a firm would not wish to locate in such a high-cost location unless there were compensating productivity effects from doing so.

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<sup>17</sup> The literature refers to these as 'location economies'.

<sup>18</sup> See *Agglomeration and the Role of Transport*, DfT and Eddington Study, 2006, published alongside this Study.

<sup>19</sup> The literature refers to these as 'urbanisation economies'.

**Figure 2.6: The potential role of transport in agglomerations in the UK**

- Manufacturing sectors tend to cluster outside or away from urban areas and the strongest concentrations are contained within small areas. This would suggest that manufacturing agglomerations typically develop for reasons of ‘localisation’ economies. They are typically of small scale and rely on being within immediate vicinity of other, similar firms in order to benefit from knowledge spillovers and being near suppliers or close to particular types of knowledge capital such as universities.
- This could mean that the types of interventions that would support agglomeration in industrial clusters would be those that enable and encourage growth in employment in those clusters. Perhaps improving access to suppliers and customers, or to generate attraction to a specialised labour market, would be the most important transport interventions.
- However, a general policy of targeting transport interventions in industrial clusters to secure additional agglomeration benefits would be unlikely to deliver great benefits. Simulations indicate that it is difficult to predict which clusters would gain agglomeration benefits from transport investment. It is unclear whether this is because the evidence does not allow us to make such an assessment or whether alternative non-transport policies are more appropriate. As a result, clusters would have to be considered on an individual level in order to assess whether there might be impacts beyond those captured in appraisal through journey time savings.
- Services, on the other hand, tend to cluster in urban areas. This would suggest that service sectors that agglomerate typically do so because of urbanisation economies. They locate where high wages, land rents and congestion impose additional costs on their operations, but they reap the benefits from being close to large labour markets, and perhaps to sectors they have close links with.
- Concentration of similar industries within specific parts of urban areas (rather than being randomly spread across them) may suggest that they also benefit from being located in close proximity to similar firms. If this is the case, the type of transport interventions that would support service sector agglomeration would be those that encourage growth in the cluster as well as increasing the size of the labour market and facilitating business to business interactions. It may be that transport interventions concentrating on reducing congestion on commuter links in large urban areas, as well as improving transport for business travellers, would bring the largest agglomeration benefits.
- Simulations confirm that interventions in and around the largest conurbations in the UK are likely to see higher agglomeration benefits than elsewhere. In some cases, connectivity to other agglomerations through transport could be important, especially for urban areas trading and/or competing globally for international business (although, in practice, the impact is difficult to measure).

Source: *Agglomeration and the Role of Transport*, DfT and Eddington Study, 2006.

### Productivity benefits can be large

**2.31** The scale of productivity impacts from transport interventions is significant. As an illustration, a large scale, 10 per cent reduction in journey times for car travel across the country has the potential to raise national productivity by 1.12 per cent;<sup>20</sup> these would be additional to journey time savings and have been previously unmeasured in transport appraisal. As would be expected, the scale of returns is considerably lower than the returns

<sup>20</sup> *Spatial determinants of Productivity: Analysis for the regions of Great Britain*, Rice and Venables, 2005.

which the step changes in transport infrastructure have historically delivered, as illustrated in chapter 1.1.

**2.32** Implementing this scale of improvement could be extremely costly, but, as mentioned above, new technologies and road pricing may be able to deliver net benefits. Some of these are explored further in Volume 3 of the Study. However, more targeted reductions in journey times and reliability improvements to tackle congestion around key labour catchment areas in the most productive clusters, could yield high gains and be worthy of consideration.

**2.33** The London cluster is the biggest agglomeration economy in the UK today. In London, there could be additional GDP benefits from agglomeration effects of 30 per cent over and above direct time savings of a transport intervention currently captured in appraisal. However, other cities, such as Manchester, Leeds and Edinburgh for example, also show strong signs of agglomeration economies, with additional benefits in the region an additional 10 per cent above journey time savings.<sup>21</sup> These can stimulate innovation and impact on the growth rate and hence are extremely valuable. Transport can therefore be fundamental to the future success of major urban areas and their labour catchments, by facilitating business to business interactions and reducing congestion on commuter links.

**2.34** However, transport interventions cannot indefinitely improve the growth of such clusters.<sup>22</sup> Benefits from transport are expected to be greatest within travel to work areas. The productivity gains resulting from a transport improvement up to a 40-minute travel time for commuters by car are estimated at four times the value of that between 40 and 80 minutes and they virtually cease beyond this time.<sup>23</sup>

**Links to housing** **2.35** The combination of housing and transport infrastructure is key to the success of agglomerations. For example, if there is insufficient housing capacity workers may choose to live further away and choose to commute longer distances with limited impact on agglomeration economies.

**2.36** Over coming years, anticipated growth of the bigger urban areas is likely to be fed by increasing population and migration. Where additional housing is needed to support the continued success of a growing urban area, particularly to maintain and expand its labour market catchment, it is intuitive that in some circumstances new or improved transport connections will be needed to deliver potential agglomeration benefits. That is not to say that housing policy should simply drive transport needs: the importance of cost-effective policy-making applies here as in any other area. The location of new housing, its transport and other infrastructure requirements, all need to be planned together in order to maximise the available benefits. Again this is an area which needs a much improved evidence base in order to support robust decision-making.

<sup>21</sup> DfT modelling on the basis of Dr. Dan Graham's work in this area, see: *Investigating the link between productivity and agglomeration for UK industries*, Graham, 2006, published alongside this report.

<sup>22</sup> Modelling work shows that for most industries there are diminishing returns to productivity benefits from agglomerations. The exceptions are retailing, financial services, real estate, business and management consultancy, which are likely to be the biggest beneficiaries, see: *Wider economic benefits of transport improvements: link between agglomeration and productivity*, Graham, 2005.

<sup>23</sup> *Spatial determinants of Productivity: Analysis for the regions of Great Britain*, Rice and Venables, 2005.

<sup>24</sup> Benefits can persist for long periods of time and the characteristics of an urban area can impact on its growth for 20 years or more, see: *Growth in cities*, Glaeser, Kallal, Schienkman and Shleifer, *Journal of political economy*, 1992. In some cases, such as the City of London and New York, they can persist for much longer.

**Agglomerations can support comparative advantage globally** **2.37** Agglomeration economies, especially service clusters, are extremely valuable to the future growth and productivity of the UK economy. They can offer a unique environment and create ‘stickiness’, allowing sectors to remain competitive longer than they otherwise might, in a highly competitive global economy.<sup>24</sup> They can also stimulate further innovation and growth benefits, for instance, by attracting globally mobile activity, which is explored later in this chapter. Consideration of the role of transport (alongside housing policy) in supporting their growth is, therefore, strongly recommended.

### (iv) Supporting the operation of the labour market

**Transport impacts on workers’ decisions** **2.38** Transport policy – whether it is related to transport speed, reliability or safety – is fundamental to the operation of the labour market. It influences people’s decisions to work, where to do so and how far to travel. It can also support labour market adjustment to globalisation. Yet despite these important connections, it is somewhat surprising that there is very little evidence on the precise contribution that transport makes in supporting labour markets.<sup>25</sup>

**2.39** Although transport improvements could encourage people to join the labour force, transport policy alone is unlikely to generate a large number of ‘new’ jobs.<sup>26</sup> For many groups, transport is one of a number of factors influencing their decision to work.

**2.40** Transport costs can represent a much larger share of the income of lower income groups, and it may be these groups where the impacts may be perceived as greatest. But, for particular disadvantaged groups, such as low-skilled workers, other barriers, such as limited travel horizons and lack of appropriate skills, may be more relevant in determining employment rates.<sup>27</sup> Furthermore, even if these groups were attracted to work, limited housing capacity in parts of the country may act as a real constraint. Transport improvements often lead to an increase in house prices and rents in their near vicinity. However this very impact may mean that such groups can no longer afford to live in the area and move further away from the jobs.<sup>28</sup> As discussed above the coordination of transport policy with housing policy can be extremely valuable in securing GDP benefits.

**But could be important for flexibility and efficiency of labour market** **2.41** Although there is little evidence on the scale of contribution to GDP, the Study’s view is that transport interventions can play an important role in supporting the overall efficiency and flexibility of labour markets, through better matching of people and skills to jobs. For workers, faster commuting possibilities can permit easier transfer and increase the range over which they can search for jobs, whilst for employers it can improve the size and diversity of the pool of potential applicants.<sup>29</sup> These effects are important in large urban areas, as discussed in the previous section on agglomerations, but also in the more thinly populated labour markets of towns and rural communities, where local initiatives, such as fare reductions and demand-responsive public transport, have achieved some success in enabling disadvantaged groups to find employment.<sup>30</sup>

<sup>25</sup> The Study commissioned some specific research in this area, see *Transport and Labour Market Linkages*, Gibbons and Machin, 2006.

<sup>26</sup> A transport improvement can reduce what economists refer to as the “reservation wage” or minimum wage necessary before individuals choose to participate in the labour market. For some disadvantaged groups, such as low skill workers, transport costs can represent a significant proportion of income.

<sup>27</sup> *Making the Connections: Final Report on Transport and Social Exclusion*, Social Exclusion Unit, 2003.

<sup>28</sup> See *Transport and Labour Market Linkages*, Gibbons and Machin, 2006, published alongside this report.

<sup>29</sup> *Employment and Rail Access: An Evaluation of the Wider Benefits of Transport Improvements*, Gibbons and Machin, 2003, which explores the Jubilee Line extension in London to illustrate that commuters are attracted to key transport modes.

<sup>30</sup> *Making the Connections: Final Report on Transport and Social Exclusion*, Social Exclusion Unit, Feb. 2003.

**2.42** In some cases, labour markets in the UK extend between urban areas, for example, the development of commuter corridors between Leeds and Manchester, Birmingham and Coventry, and Edinburgh and Glasgow, though these still represent a small proportion of total commuters, for example, 1.4 per cent of commuting trips to Manchester originate in Liverpool, whilst 3.9 per cent of trips to Liverpool originate in Manchester.<sup>31</sup> These flows are considerably lower than that observed for London where 16 per cent of the labour force commute from outside the region.<sup>32</sup> However, transport enhancements may have the potential to support expansion of these labour catchments already in existence to the benefit of both areas. Again evidence on the scale of impact is absent, but there may be merit in exploring such transport interventions where commuter flows are heavy.

**Responding to globalisation**

**2.43** In addition to supporting the efficient functioning of labour markets, especially on key commuter corridors, transport policy can also facilitate geographic and employment mobility in response to shifting economic activity.<sup>33</sup> To realise full benefits, policy needs to be designed with current and future labour market trends in mind; in particular, it needs to consider how trends could impact upon peak time traffic, when congestion is greatest.<sup>34</sup> These include:

- (i) increasing employment and participation driven by growth in part-time (26 per cent of all employees) and flexible working (18 per cent for men); together this leads to higher demand for commuting but at irregular times. Around 14 per cent of men and 8 per cent of women work from home and this seems likely to rise with technology-driven opportunities for e-working and tele-working;
- (ii) the continued growth in participation by women is likely to contribute to the growth in part-time workers and the number of dual-earner households. The latter may cause an increase in demand for jobs accessible to home/school for both workers and is likely to lead to higher average commuting distances; and
- (iii) expansion of low-skill service sector jobs, alongside expansion of high-skill jobs. This, in part, reflects the growth in workers providing services to high earners, for example, in domestic services and catering, and will increase the demand for commuting and work travel, as service providers must travel to where consumers are located.

**(v) Competition**

**2.44** Competition is a key driver of economic growth. Improved accessibility and faster, more reliable journey times for passenger and freight traffic, can have a similar effect on the economy as a reduction in trade barriers and deliver growth benefits by exposing firms to greater competition.<sup>35</sup> Such transport improvements can allow businesses to trade over a wider, previously unattainable, area, access more suppliers and reach more potential customers. It can also offer consumers a greater choice of goods and services.<sup>36</sup>

<sup>31</sup> National Travel Survey, 2002, 2003 and 2004.

<sup>32</sup> Office of National Statistics, 2001 census, see: [www.statistics.gov.uk/census/](http://www.statistics.gov.uk/census/).

<sup>33</sup> Labour market flexibility is characterised by a rapid deployment of labour between industries, occupations or regions, ensuring that any disturbance to the labour market is short lived. This could be achieved through a combination of adjustments in (i) wage flexibility; (ii) functional flexibility (acquiring and applying different skills); (iii) geographic labour mobility (migration or commuting); and (iv) employment flexibility (employers adapt working patterns to meet the demands of prospective employees, e.g. part-time and flexible working arrangements).

<sup>34</sup> For further details on these bullet points see: *Transport and Labour Market Linkages*, Gibbons and Machin, 2006.

<sup>35</sup> This can be either actual competition or 'potential competition' through the threat of a new entrant.

<sup>36</sup> Transport improvements can improve productivity by raising the market share of low cost firms, and increasing the incentives for superior firms to cut costs, see: *On the welfare effects and the political economy of competition-enhancing policies*, Aghion and Schankerman, 2004, cited in Crafts 2005.

**Important for integration of markets** **2.45** As explored in Chapter 1.1, transport has historically played an important role in opening up access to markets, driving down prices and increasing output, as well as stimulating innovation. The integration of markets globally suggests that transport will continue to remain important in retaining these competitive effects. But where transport connections already exist in mature economies like the UK, the contribution that transport improvements at the margin can make to competition, and therefore productivity, is difficult to measure.<sup>37</sup>

**Development of new markets** **2.46** There are also wider qualitative impacts that are difficult to capture in GDP measurements. Transport infrastructure and investment have the potential not only to speed up connections already in existence but also to open up new ones. Many of these transport benefits arise from increases in the ‘connectivity’ between places and are not picked up in direct journey time valuations in transport appraisal.<sup>38</sup> A good illustration of this is the impact that the growth in low cost airlines has had in recent years on opening up new business and non-work/leisure destinations.

### (vi) Domestic and international trade

**2.47** The UK’s reliance on trade for its future prosperity continues to grow. International trade (average value of exports plus imports) currently represents some 28 per cent of UK GDP<sup>39</sup> and is forecast to grow over the next few decades. For the UK this means growth in the export of high value manufactures (typically through air freight) and services such as financial and business and tourism (typically passenger flows through air travel). This also means a greater volume and choice of imports of manufactured goods and raw materials through the ports.

**International trade** **2.48** Trade can directly contribute to productivity and growth. Export growth can enable firms to specialise and benefit from economies of scale. Import growth can stimulate further productivity gains through technological spillovers and increased innovation, as firms compete for custom at an international level. Transport improvements can help reduce costs and therefore barriers to trade, especially as globalisation creates increasingly diverse and far-reaching supply chains.

**2.49** Although transport’s role in supporting trade may seem intuitive, there is little research evidence on the precise contribution that this makes to productivity and how such benefits can be captured through appraisal of individual transport schemes. However, indications are that this relationship is significant: falling transport costs over the forty years since 1960 have boosted international trade of goods by 10-17.5 per cent and are estimated to have raised UK GDP by 2.5-4.4 per cent.<sup>40</sup> The European Council of Transport Ministers cite airport and port infrastructure as one of the critical success factors for economic growth, business location decisions and tourism.<sup>41</sup>

<sup>37</sup> *The Standing Advisory Committee on Trunk Road Assessment (SACTRA) Report, 2001*, concluded that the competition effects from transport were difficult to measure and ambiguous.

<sup>38</sup> GDP measures fail to capture increases in the choice or variety of goods and services available, see Figure 1.1, chapter 1.1 for more details.

<sup>39</sup> *Balance of payments – The pink book*, ONS, 2006.

<sup>40</sup> Transport has accounted for 14 per cent of the increase in trade over the last 40 years, for further details see: *The Historical Significance of Transport for Economic Growth and Productivity*, Crafts and Leunig, 2005.

<sup>41</sup> *Transport and International Trade, Conclusions of Round Table 131*, European Conference of Ministers of Transport, 2005.

**2.50** However it is not just international gateways that matter. The quality of the domestic transport network is essential to allow the final transportation of goods and services to consumers and firms.

**2.51** Despite significant reductions in costs over recent decades, transport costs continues to remain a significant hindrance to the level of trade,<sup>42</sup> which further reductions in transport costs and/or increases in the speed of transport may help overcome. Half of all international trade (by tonnage) takes place between countries located within 3000 km of each other.<sup>43</sup>

**2.52** For some urban areas and their catchments, international links may be important. This is likely to be the case for urban areas trading globally and competing for foreign investment. Historically, this may have meant access to ports but for today's service economy, access to international airports is also important.

**Domestic trade 2.53** There are also benefits to domestic trade. So, for many areas, domestic links between urban areas and their catchments are important. Specialisation supported by trade links is particularly strong for some urban areas and supports their economic success (e.g. Manchester, Leeds, Liverpool). In some cases, links to the economic capital (London) are important to benefit from gains to trade. For example, although there are direct productivity effects where financial services are clustered, effects on demand for ancillary services may be felt in selected urban areas well away from London, such as financial services in Leeds.<sup>44</sup>

### (vii) Globally mobile activity

**Business, capital and labour increasingly mobile 2.54** Businesses, capital investment and labour are becoming globally mobile. Although there is a lack of quantitative evidence on the relationship between transport and globally mobile activity,<sup>45</sup> the survey evidence suggests that good transport links, both internationally and domestically, can be important in attracting, retaining and expanding such business activity in the UK. Surveys show that much commonality exists between the transport requirements of domestic and global firms.<sup>46</sup>

**2.55** Figure 2.7 below points to the particular importance of access to markets, international connectivity, skilled labour, and transport within urban areas, as key factors influencing business investment.<sup>47</sup> It can be argued that transport plays a role in all these areas.

<sup>42</sup> By the 1990s distance was a 24 per cent greater obstacle to trade than it had been in the 1960s, see: *The puzzling persistence of the distance effect on bilateral trade*, Disdier and Head, 2004, cited in Crafts and Leunig, 2005.

<sup>43</sup> *Transport and International Trade, Conclusion Of Round Table 131*, European Conference of Ministers of Transport, 2005. This is supported in the economic literature through gravity trade models, which show that doubling distances between trading areas halves the volume of trade.

<sup>44</sup> *Economic linkages across space, report for ODPM*, Coombes, Duranton, Overman and Venables, 2005.

<sup>45</sup> The Study found only one work that attempts to answer this question. *Infrastructure availability, foreign direct investment inflows, and their export-orientation: A cross-country exploration*, Kumar, 2001, shows that efficient physical infrastructure facilities, including transport, can improve the investment climate for foreign direct investment from multi-national corporations.

<sup>46</sup> UK Trade and Industry survey evidence – various presented to the Eddington Study.

<sup>47</sup> Good air transport links have been important in positioning London as the best city in Europe for business location for the last twelve consecutive years, with one quarter of Europe's largest companies basing their headquarters in the city.

**Figure 2.7: Factors influencing European business location, 2006**

Per cent of European senior executive respondents that perceive characteristics as 'absolutely essential' for business location<sup>a</sup>

Factor	Overall	Consumer retail & industrial	Professional distribution	Services
Easy access to markets, customers and clients	63	61	63	64
Availability of qualified staff	59	61	52	61
Transport links with other cities and internationally	55	59	56	49
The quality of telecommunications	50	47	51	52
Cost of staff	36	39	39	31
Climate governments create for business with tax and financial incentives	31	35	27	28
Availability of office space	27	27	25	30
Value for money of office space	29	25	34	30
Languages spoken	27	24	21	34
Ease of travelling around and within city	26	23	25	30
The quality of life for employees	19	16	21	22
Freedom from pollution	15	16	15	15

Source: European Cities Monitor, Cushman and Wakefield, 2006.

It can be argued that transport plays a key role in the top three factors impacting on business location: market accessibility, access to qualified staff through supporting wider labour markets, and inter-regional and international transport links.

- some variation by sector: External transport links are more significant for the industrial sector, whilst transportation within cities is more important for the service sector;
- transport appears to be more influential on business location than direct financial incentives, suggesting that the gains from the latter are short lived; and
- perceptions of transport can influence business location decisions, suggesting that information dissemination on transport infrastructure could be an important determinant of Foreign Direct Investment (FDI) flows to the UK.

<sup>a</sup> European cities monitor, Cushman and Wakefield, 2006.

**Transport can support productivity spillovers** **2.56** Again, although evidence is limited, international links can, in theory, facilitate productivity spillovers which can impact on the growth rate of the economy. International connections between the home company and its UK base can facilitate the transfer of knowledge and personnel. Domestically, quick and reliable links within an urban area can facilitate spillovers of knowledge, best practice and personnel, to the benefit of domestic firms.

**2.57** These transport characteristics can be important facilitators of expansion for all businesses. However, there is merit in distinguishing the 'globally' mobile activity of domestic and foreign firms from other business investment for a number of reasons:



- flows of foreign direct investment, in particular, remain disproportionately important for the UK, which is the biggest beneficiary in Europe;<sup>48</sup>
- global firms and workers, given their international opportunities, are more sensitive to locational factors, including transport and its contribution to quality of life factors;
- productivity spillovers from global firms can be of a higher order of magnitude than those from similar domestic firms, given their exposure to competition and technology advancements around the world; and
- the failure of transport policy to recognise this contribution could constrain international business expansion within the UK or result in relocation overseas at the expense of UK growth.

**2.58** Gains from these missing benefits could be large. For example, the economic benefits of spillovers from foreign direct investment, although difficult to measure, can revolutionise sectors. One major firm's decision to locate in an area could attract other firms and develop the sector, but these effects will be missed by current appraisals.

## CAPTURING THE RELATIONSHIP THROUGH TRANSPORT APPRAISAL

**2.59** Transport can contribute to productivity and growth through its direct and wider impacts on the economy. It is essential to measure these impacts through detailed appraisal techniques to reflect, as far as possible, the full economic, environmental and social costs and benefits, in order to allow effective prioritisation of funding.

**2.60** Transport appraisal has evolved considerably over the last 30 years. This is a complex area, with a developing evidence base. Internationally, the UK is at the forefront of thinking on appraisal and the measurement of transport's impact on the economy, and its impacts on society and the environment.

**2.61** The measurement of direct time savings to users, which has been the bedrock of transport appraisal, capture a large proportion of the GDP benefits from transport. However, it is clear that traditional appraisal through time savings misses some important benefits of transport investment. In particular, policy to date has not fully appreciated the contribution of reliability of journey times, highly productive agglomerations, or transport's importance in facilitating extensive labour catchment areas in such places, and has been slow to recognise the critical importance of our international connections. There must be continued support for quantification of these impacts through modified transport appraisal.

**2.62** Real progress is being made. Recent methodology developed for transport schemes competing for DfT's Transport Innovation Fund programme explicitly seeks to capture the economic gains through agglomerations and labour markets.<sup>49</sup>

**2.63** Valuable progress has also been made in the way appraisal captures environmental costs and benefits. These can be difficult to quantify and are often assessed in detail by experts in the field in qualitative terms. Increasingly though, as methods of appraisal develop, impacts are being assessed in monetary terms. Recognising the importance of environmental effects and the emerging valuation evidence, recent changes to the appraisal guidance introduced by DfT include the requirement for carbon emissions and noise impacts to be

<sup>48</sup> For more information on UK FDI flows see:

[www.statistics.gov.uk/CCI/SearchRes.asp?term=Foreign+direct+investment](http://www.statistics.gov.uk/CCI/SearchRes.asp?term=Foreign+direct+investment).

<sup>49</sup> See *Transport, wider economic benefits and impacts on GDP*, DfT, July 2005.

assessed and presented in monetary terms. The importance of measuring, and where possible monetising, environmental costs and benefits is given even greater weight by the Stern Review of the economics of climate change. DfT will need to continue to develop and improve its appraisal methodology to meet this challenge.

**2.64** As Figure 2.8 below highlights, there are strong arguments for looking at and strengthening appraisal of transport schemes in a number of areas, in addition to the environmental impacts discussed above, to reflect some of the evidence the Study has gathered on the potential contribution transport can make to productivity and growth.

### **Figure 2.8: Capturing the impacts of transport on the performance of the economy**

The Study suggests that consideration should be given to the following issues in appraisal:

- **valuations of time savings:** Valuation of time based on local wages is essential to capture the true economic gain from a transport improvement in a particular region and to correct for the current anomaly between the calculation of costs and the calculations of benefits in appraisal;
- **freight valuations:** The full GDP benefits realised from freight traffic could be considerably higher than currently assumed, reflecting the wider impact of transport on business operations and logistics. There is a strong case for exploring whether the current valuation of freight time fully reflects the benefits to this sector;
- **reliability:** It is clear that the performance of the transport network in terms of reliability matters. Evidence seems to suggest that these are considerably higher than have been appreciated in the past. There is a strong case for reliability valuations to reflect developing evidence in this field;
- **agglomeration economies:** Thinking on transport's relationship with agglomeration economies is relatively new. There is very little literature that attempts to explain and measure this relationship, particularly in the context of service agglomerations. The UK is at the forefront of establishing techniques on how this relationship can be modelled. However, it is clear that there is merit in better understanding this relationship, not least because of the continuing importance of urban agglomerations to the future prosperity of the UK. The DfT's developing methodology on agglomeration economies should be applied to the appraisal of all transport schemes. This could increase the assessed value of schemes, especially in urban areas;
- **gains from trade:** The contribution of transport policy in supporting trade is not well understood or quantified. But it is clear that acknowledging this relationship, and quantifying its scale through appraisal, is pivotal to informing good transport policy, particularly around ports and airports, and their surface access. Gains from trade are not currently captured in appraisal. New research would need to be undertaken to consider how such gains could be captured; and
- **globally mobile activity:** Additional GDP gains are difficult to quantify for individual schemes, but analysis suggests that it will be important for transport policy to reflect this driver at relevant times.

**Beyond appraisal 2.65** However, it is also important for policy makers to be aware that scheme by scheme appraisal can undervalue the GDP benefits. Quantifying some of the wider productivity impacts from transport can be extremely difficult, as it can be for environmental costs and benefits.

**2.66** Appraisal techniques can also fail to capture fully network-wide benefits that may result. For example, a transport improvement such as a bus or rail interchange may unlock access to the wider transport network for onward journeys. Some transport investment may have long-term network impacts in the sense that their full benefits will only accrue when future complementary network investments also take place.<sup>50</sup> Similarly new investments may have unexpected benefits if they augment the effects of past improvements – e.g. by reaching a ‘tipping point’ at which a journey becomes feasible at all or in a given time.

**2.67** Although full appraisal of individual schemes is an essential and necessary component of transport strategy, it can never be a perfect science: some of the productivity and growth impacts of transport interventions, which are often so valuable, are almost impossible to capture through scheme-by-scheme appraisal. At the macro level it is important for transport strategy to recognise these long-term impacts even if they cannot be captured in appraisal. This will allow policy makers to be smarter about prioritising transport spending targeted at productivity growth, as well as understanding the cost in terms of lost benefits of delaying or not taking action.

## TARGETED TRANSPORT INVESTMENT CAN DELIVER FOR GROWTH

**2.68** Transport policy can contribute to a number of different Government objectives – economic, social and environmental. The microeconomic drivers framework set out in this chapter is a helpful policy tool for developing hypotheses on where transport improvements are most likely to deliver on the first of these, alongside full recognition of environmental and social impacts.

**2.69** Where resources are limited and there is a need for prioritisation it is logical to begin with identifying cost-effective transport interventions in areas which are expected to yield the greatest contributions to sustainable economic performance in the UK. The microeconomic framework can be important both for informing option generation and for improving detailed cost benefit analysis. However, it is also important to consider the future dynamics of the UK economy. Economic change is likely to see different aspects of the relationship become more or less fundamental.

**2.70** The UK economy is changing rapidly, and is likely to continue to do so in the face of the ever-shifting dynamics of the world economy. Over recent decades, the UK economy has increasingly specialised in services and high-value manufacturing, reflecting its comparative advantage in the ‘knowledge-economy’.<sup>51</sup> Looking forward, globalisation will continue to shape the structure of the UK economy towards these sectors. As the economy develops, so will the demands on the transport system: aspects that were vital ten years ago may be all but obsolete in ten years’ time. In that light, the following areas may prove to be of growing significance in the future.

<sup>50</sup> This implies that current investments can also have a positive impact on the appraisal of certain future investments.

<sup>51</sup> *Long term global economic challenges and opportunities for Europe*, HMT, Budget 2005.

### Areas of growing significance

**Urban areas and their labour catchment** 2.71 Agglomerations in urban areas are becoming significant growth centres. The expectation is that urban areas will be central to the services economy and valuable sources of productivity growth. Such areas are likely to demonstrate the typical characteristics of rapid economic growth: high congestion; high wages; and high land prices.

2.72 It seems clear that transport networks will continue to play an increasingly crucial role in supporting the success of these urban agglomerations: enabling commuting journeys to support deep labour markets; facilitating rapid business to business contacts; and providing international connections to support the export of high productivity services.

**Importance of ports and airports** 2.73 The consequence of this specialisation in services and high-value manufacturing, will be an increased reliance on imported food, low-end manufactured goods and raw materials. Adequate capacity, particularly at international airports and for containers at ports, will be necessary, even with the full environmental costs reflected in prices, to support the growth that is likely in trade. These will need to be accessible and well connected through effective rail and road surface links, essential for getting goods and services to the consumer market. Inferior infrastructure or inefficient gateways could significantly reduce international trade.<sup>52</sup>

**Quality of life** 2.74 Although firm evidence is absent, leading world academics, such as Paul Krugman, note that the attractiveness of a place could become a pivotal factor in influencing location choices in a world where labour, capital and business are all mobile. Quality of life and non-work/leisure travel are therefore important considerations. Furthermore transport may improve the desirability of urban areas and their catchments to potential incoming migrant workers and foreign investors.

**Role of transport in the future** 2.75 Looking forward, it seems likely that the transport system will play an increasingly important role in supporting the UK economy in the following ways:

- supporting deep labour markets and business to business connections in agglomerated urban areas; such commuter and intra-urban networks can provide considerable economic value and flexibility. Furthermore, the failure of transport to respond to signals of growth potential from existing agglomerations could choke off these clusters before they develop fully;
- providing international connectivity for services exporters, through aviation capacity and better surface connections;
- enabling the import of food, manufactured goods and raw materials, for which ports and internal distribution and logistics networks are critical;
- ensuring pricing mechanisms are in place so that transport users pay the full external costs of their journeys, including environmental costs; and
- contributing to quality of life factors which will ultimately influence migration and investment decisions.

<sup>52</sup> *Port efficiency, maritime transport costs and bilateral trade*, Clark, Dollar and Micco, 2004, cited in Crafts and Leunig, 2005.

## Where transport does not deliver for growth

**2.76** Logically this analysis implies that in some areas additional transport investment is not necessary to sustain growth. This is entirely natural. For a mature transport network, existing provision is likely to be sufficient in most places. Areas with adequate transport capacity will continue to succeed without requiring significant increases in transport provision. In areas where economic performance is relatively weak, transport will only ever be part of the answer.

**2.77** At any given time, the transport needs of individual places are likely to be different and it would, therefore, be sensible to invest more in some places than others. Prioritisation of investment in the areas where transport is most likely to deliver for growth can quite possibly mean doing things differently in some areas and scaling back investment in others. Seeking to generate the greatest returns from transport through targeted investment in specific areas, whilst reflecting environmental and social objectives, is the best way of securing prosperity for wider society.

## CONCLUSIONS

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**2.78** This chapter has set out a framework for assessing transport's contribution to economic growth through a number of micro economic drivers. It offers an indication of what types of interventions, and where, may deliver for growth. The next chapter explores further how the conclusions reached in this and the previous chapter can inform a transport strategy aimed at supporting the development of the UK economy in the future.



# 1.3 LESSONS FOR FUTURE TRANSPORT STRATEGY

## Headlines

- **The exact role of transport policy and investment in supporting economic success will differ between countries.**
- **Being smart about the location of transport investment can yield considerable benefits for the UK economy. In particular, targeted investment to tackle transport performance in congested and growing areas is likely to deliver economic benefits.**
- **A transparent, long-term, transport strategy can help deliver greater returns from transport, not least because it will help deliver benefits from complementary private sector investment. A clear vision of the future is essential but policy must remain responsive to changing economic, environmental, social and global opportunities and pressures.**
- **Understanding the full effects of transport on the economy and the environment, quantified through appraisal, will help sensible prioritisation of transport interventions. A future strategy must consider and take into account the full range of transport's effects, including economic, environmental and social.**

## INTRODUCTION

**3.1** Chapters 1.1 and 1.2 have focused on the role transport can play in supporting and generating productivity and growth rate benefits. In doing so, analysis has centred on the economic impact that transport interventions such as improvements in speed can achieve, or the deterioration in services that can result in congestion and unreliability. The nature of this relationship has been the focus of much debate and academic study, and no doubt will continue to be so in the future.

**3.2** Despite this on-going debate, countries and governments worldwide recognise that a basic level of connectivity through transport is essential for the functioning of their economies, and that further development of more comprehensive networks and the quality of this infrastructure can ultimately influence the overall efficiency and success of their economies.

**3.3** Whilst this contribution of transport to the economy is often more marked in developing economies with poorly developed and incomplete transport infrastructure, it is also visible in developed economies with a mature transport network. In particular, economic growth and success bring with them an increased need for high quality transport networks, to enable the UK to exploit trade opportunities arising from globalisation, to meet the rising expectations of consumers as incomes increase and to ease pressure as growth-generated demand catches up with existing infrastructure capacity.

**3.4** However, because each country's economy, geography and existing transport network are different, it is likely that the exact role of transport policy and investment in supporting their economic growth will differ. Each country will therefore need to apply an understanding of the relationship between transport and growth to its own unique circumstances.

**3.5** This chapter sets out the principles for taking forward a transport strategy for sustainable growth in the UK over the next 20-30 years.

## TRANSPORT STRATEGY FOR THE LONG TERM

### Long-term transparent framework

**3.6** It is interesting to note that few countries adopt an overarching economic approach to designing transport policy. That is, transport policy is rarely treated as an instrument of economic policy, and appraisals of transport interventions fail to recognise fully the contribution transport policies or schemes can make to economic success. Indeed, at both national and local levels, the economic consequences of transport interventions are often considered only:

- (i) once the transport problem has become extreme;
- (ii) to justify a favoured transport solution; or
- (iii) on the basis that competitor countries have introduced a particular technology or level of service.

**3.7** A transport strategy needs to be sufficiently forward looking to anticipate (as far as possible), and deal proactively with, some very long-term, far-reaching issues. A clear vision on the future of the UK economy is essential to help define the future problems and transport needs. These challenges include:

- the strong growth in transport demand forecast as a consequence of economic success, which without action is expected to lead to increased congestion (see Volume 2 for further details), alongside growing expectations concerning the quality of infrastructure and transport services;
- transport's role in responding to the challenges and opportunities of the knowledge economy and globalisation, which will continue to shape the economic geography of the UK. Change is happening faster than has historically been the case;
- transport's key role in responding to the global challenge of climate change, as well as to more local impacts, such as air quality and biodiversity;
- responding to new technological advances, both general purpose technologies, for example the use of the internet and real-time information influencing demand for transport and its provision, and more transport-specific technology; and
- Demographic, social, environmental and scientific trends, and their implications for transport policy objectives and pressures.

**3.8** A further challenge is that transport lead times are often long (years and often decades) and decisions can involve significant investments in some very long-lived assets, many of which, such as railway lines and airports, are quite inflexible once they are established.

**3.9** Taken together this suggests that a long term strategic outlook for transport policy in the UK must extend over a 20 to 30 year time horizon. This would allow early identification of issues to be addressed, including where transport may contribute to productivity and to other government objectives, as well as consideration of the full range of appropriate policy options. It would also allow sufficient time for preparatory action by the government, and others affected by decisions, and the securing of funding for agreed priorities.



**3.10** This strategic outlook could include, or be supported by, medium-term strategies for achieving particular strategic transport objectives, analysing the problem to be solved and setting out the range of policy options that could be pursued, and identifying those that were likely to be most effective. However, transport policy must be responsive to the changing shape of the economy. Logically, this can involve changing course, and even stopping doing some things, as well as doing more.

**3.11** Governments need to be sufficiently forward looking in order to commit to implementing such long-term strategies, which will not necessarily come to fruition for many years. Furthermore, government decisions on transport can also have significant impacts on related private sector operations, investment and location decisions. As a result, providing certainty about near-term actions and transparency about long-term strategy can increase the impact that transport improvements have on economic success and environmental goals.

**3.12** Hence, accompanying the long term strategic outlook and medium term strategies should be a short to medium term 5-10 year statement of commitment, that clarifies the policies to be implemented over this period of time.

## APPROACH TO THE DEVELOPMENT OF STRATEGY

**3.13** Although governments globally are responding to their citizens' demand for transport, this Study attempts to provide a more sophisticated understanding of this relationship: being smarter about where the UK might want to invest to get the best returns, whilst reflecting environmental, social and other Government objectives. It suggests four key principles that should inform a transport strategy aimed at identifying and funding those policies which most cost-effectively deliver Government's objectives:

- (1) Start with a clear articulation of the policy objectives and the transport outcomes required to deliver these objectives, focusing where relevant on the 'whole journey' rather than particular stages or modes in a journey;
- (2) Consider the full range of policy options for meeting the policy objectives, including different modal options, and policies for making more efficient use of existing capacity as well as small and larger scale capacity enhancements and packages of policy measures;
- (3) Prioritise limited public resources on those policies which most cost-effectively deliver Government's objectives, taking account of the full social, environmental and economic costs and benefits of policy options; and
- (4) Ensure the evidence base can support this process, providing information on the needs of users, current and anticipated use and performance of the network, supporting option generation through modelling and appraisal of options, and evaluating impacts to inform future decision making.

**3.14** Volume 4 explores in more detail the implications of these key principles for Government decision-making and strategy. An initial explanation is set out below.

### **1. Start with a clear articulation of the policy objectives, and the transport outcomes required to deliver these objectives, focusing where relevant on the whole journey, rather than particular stages or modes in a journey**

**3.15** Transport policy should start with an understanding of the goal that is being sought and not with a proposed transport solution. For example, the economic goal may be to facilitate larger and deeper agglomerations. Transport policy could help facilitate commuter travel in such areas and contribute to the expansion of labour markets. Similarly, an environmental objective may be to protect the environment and reduce transport's contribution to carbon and air quality emissions. Policy could help facilitate this through the use of price signals to ensure users pay their external environmental costs, by making best use of existing capacity and promoting more efficient technology.

**3.16** It is clear that these economic objectives are not modally specific and, as such, policy should adopt a whole journey approach without prejudging the importance of a particular mode. Many journeys utilise several modes of transport, or make use of different networks (e.g. local roads and motorways) as part of one end-to-end journey. Failure to understand the requirements of the user, for example, the need for connectivity, speed, reliability and cost, may mean that policy does not fully achieve its goal.

**3.17** The established nature of the UK transport network means that transport improvements are most likely to enable growth where such investments respond to clear market signals about future underlying transport demand and future growth, such as congestion or very high wages and land prices. In the absence of such evidence, and in a world with limited funding, any transport investment is likely to be high risk in terms of delivering economic returns. Consequently it is important to monitor and collect relevant data and information to support the identification of such problems.

**3.18** It is critical for policy to recognise that infrastructure cannot create economic potential: it can only realise such potential where appropriate conditions exist, in particular the availability of business capital and skilled labour to drive output growth. At any given time, the transport needs of individual places are likely to be different, and it would, therefore, be sensible to invest more in some places than others.

**3.19** For areas that are not performing, transport investment might not be the best way to achieve growth. In many cases, it will not be transport capacity that is constraining the growth potential of a particular area. Policy makers should not shy away from these issues, and transport should be considered alongside other types of policy responses for delivering growth.

### **2. Consider the full range of policy options for meeting the policy objectives**

**3.20** Different modes will be best placed to achieve different economic, social and environmental goals in different circumstances. The nature, scale, cost and impacts of different interventions vary considerably. Choice of mode should therefore be a second-order issue centred on the selection of the best solution and not a predetermined policy decision.

**3.21** Transport policy considerations should also take into account complementary policy instruments to secure growth benefits. In particular, although the Study has not explored housing and land-use policy in any detail, it is very clear that such policies will have important read across to transport interventions and their resulting success.

**3.22** In some circumstances, projects may claim to deliver transformational economic benefits, which substantially change the geography of economic activity through the location of business and jobs. There is no substitute for careful cost-benefit analysis based on substantial economic analysis, and there are many examples around the world of speculative projects that did not deliver intended economic benefits. Policy needs to avoid making the mistake of pursuing projects with speculative and unproven returns.

**3.23** As with any other business making an investment decision, Government must seek to get the highest returns on its resources. To be confident of finding the best returns, the option generation process is crucial. The first priority in economic terms must be to explore policy options for relieving pressures and improving performance in areas where there are signals of current or future transport problems or shortages, manifest, for example, through congestion. Investing in such areas has the potential to make a significant and effective contribution to national productivity.

### **3. Prioritise limited public resources on those policies that most cost-effectively deliver Government's objectives**

**3.24** Choosing between different transport solutions would not be possible without some form of monetary valuation of the impact of alternative schemes, delivered through transport appraisal. In the UK, transport appraisal is a highly developed art, well rated in peer opinion; it has been evolving considerably over the last 30 years. However, this is a complex area, with a developing evidence base. Detailed transport appraisal techniques should reflect, as far as possible, the full economic, environmental and social costs and benefits, in order to allow effective prioritisation. It is important for transport appraisal and policy to continue to evolve to capture the full range of impacts.

**3.25** At the macro level, it is important for transport strategy to recognise these long-term dynamic effects of transport policy, even if they cannot be captured in the detailed appraisal of individual schemes. This will allow policy makers to be smarter about prioritising transport spending targeted at growth, as well as understanding the cost of not taking action: that a delay or lack of response will forgo growth and productivity benefits provided by a transport intervention.

### **4. Ensure the evidence base can support this process**

**3.26** It is important to collect evidence and develop analytical tools to support this process, providing information on the needs of users, current and anticipated use and performance of the network, supporting option generation through modelling and appraisal of options, and evaluating impacts to inform future decision making.

**3.27** Volume 4 explores in more detail the implications of these key principles for Government decision-making and strategy, and sets out the recommendation which emerges from this analysis.

