Transport works for growth and jobs

Why urban transport drives successful economies

pteg
the voice of urban transport

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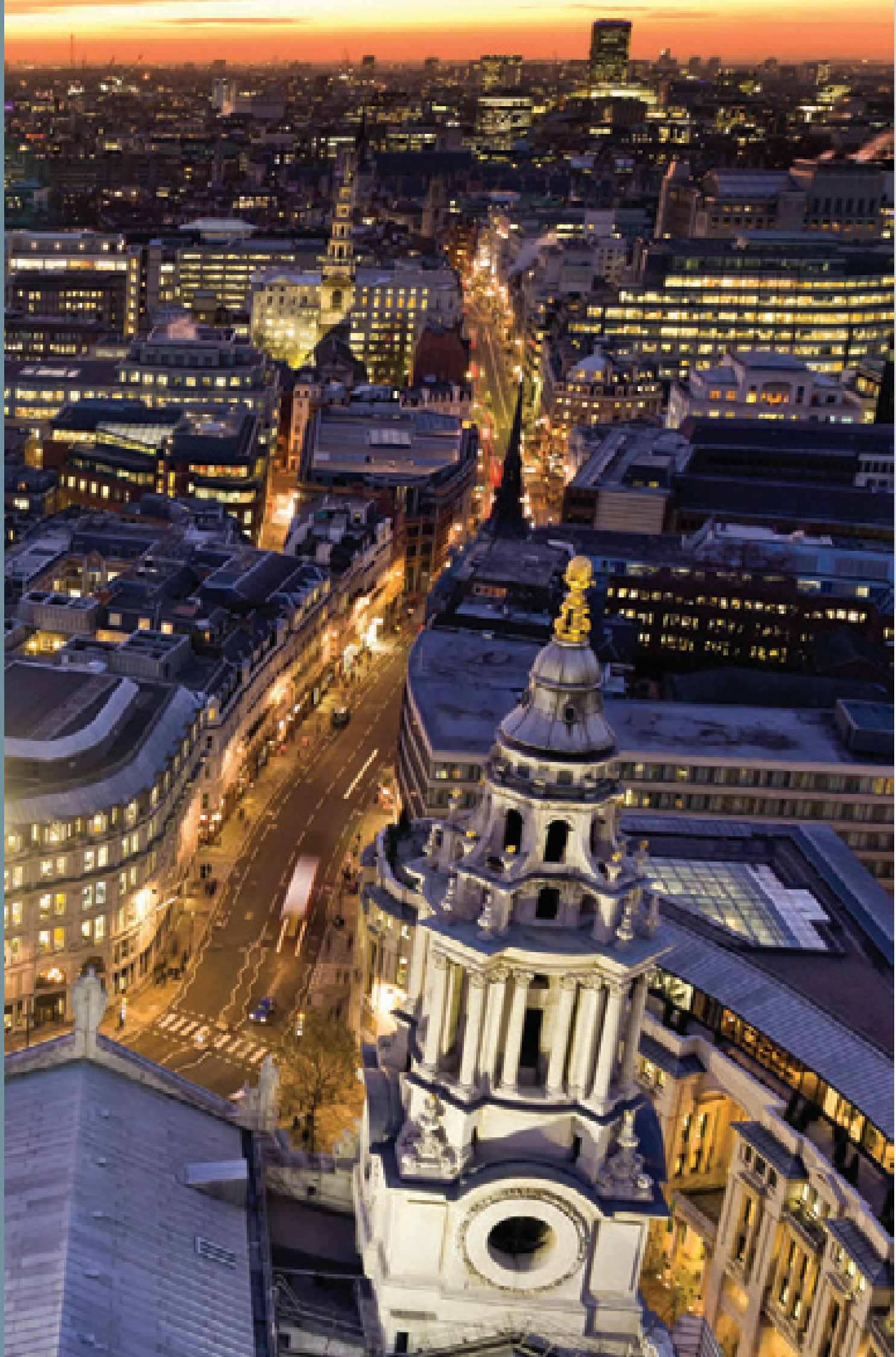
Contents



Executive Summary

City regions are at the core of productivity growth in modern economies. This report explains how transport networks contribute directly to this process and remove constraints on economic growth. We show that transport is one of the most productive forms of government spending and that urban transport in particular can deliver unusually high economic and social returns. In order to realise its full potential, however, it is necessary to target government funding in more effective ways.

At times of fiscal austerity, it is easy to forget that some forms of government spending can significantly boost productivity. In these cases, funding cuts, which may appear to be a saving in the short run, are more likely to become a drag on economic growth.

Local transport funding outside London is a good example as it was first in line for government cuts in 2010 and had fallen over a quarter in real terms by 2013. Yet, urban transport is a key driver of economic growth in modern service economies. Evidence shows that many businesses derive significant productivity benefits from close proximity to other businesses and to large labour pools[1]. Better urban transport networks bring firms and workers closer together, and provide access to wider local markets. But they can also address many of the constraints on growth which face large urban areas, such as land and housing availability, environmental quality and congestion.

In this report, we show that there is a strong empirical relationship between transport spending and national economic growth, greater than for most other sectors of government activity. Lower levels of transport spending between 1990 and 2004 can explain a 2% difference in GDP between the UK and Germany over that period.

Schemes in congested urban areas are a particularly effective form of transport spending, offering an average economic and social return of £4 for every £1 spent[2]. We show that transport spending can also provide a highly effective short term boost to jobs and economic output.

Given the overwhelming evidence pointing to the value of urban transport spending, how can we ensure that government funding is allocated and targeted in the most effective way? In the final section of this report, we make some suggestions on how existing funding mechanisms could be adapted to ensure that urban transport makes an even more effective contribution towards national economic growth.

01 Cities matter to the economy

Economic activity is disproportionately concentrated in large cities, in particular in their densest central areas. But why do so many firms choose to flock precisely towards these crowded and expensive locations?

It is now generally accepted that the concentration of economic resources in cities is, in large measure, due to agglomeration economies[3]. This is the notion that firms benefit from proximity to other firms, as well as between their own employees[4]. Put simply, proximity lowers the cost of exchanging goods and ideas, and increases the pool of shared resources[5] available – which all lead to higher productivity.

In turn, households are attracted to areas which benefit from agglomeration economies because more productive firms will offer higher pay and larger job markets increase workers' chances of finding suitable work. Authors such as Richard Florida[6] have argued that it is the ability to draw in larger numbers of highly qualified workers that gives cities their competitive edge.

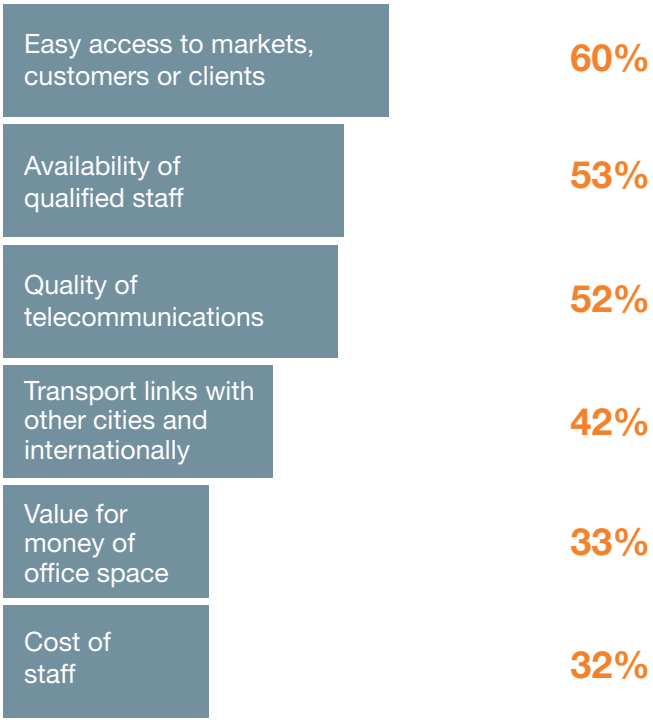
"What can people be paying Manhattan or Chicago rents for if not for being near other people?"

Robert Lucas (Economics Nobel Prize Winner)[7]

Agglomeration economies are a concept familiar to managers, even if by different names. The European Cities Monitor has consistently found that businesses cite easy access to markets, customers, clients, and the availability of qualified staff as the key factors when deciding where to locate their operations[8]. It's interesting to note that these two factors are cited far more often than the cost of premises or staff. Agglomeration economies are clearly at play.

Fig 1. Six key factors for deciding where to locate a business

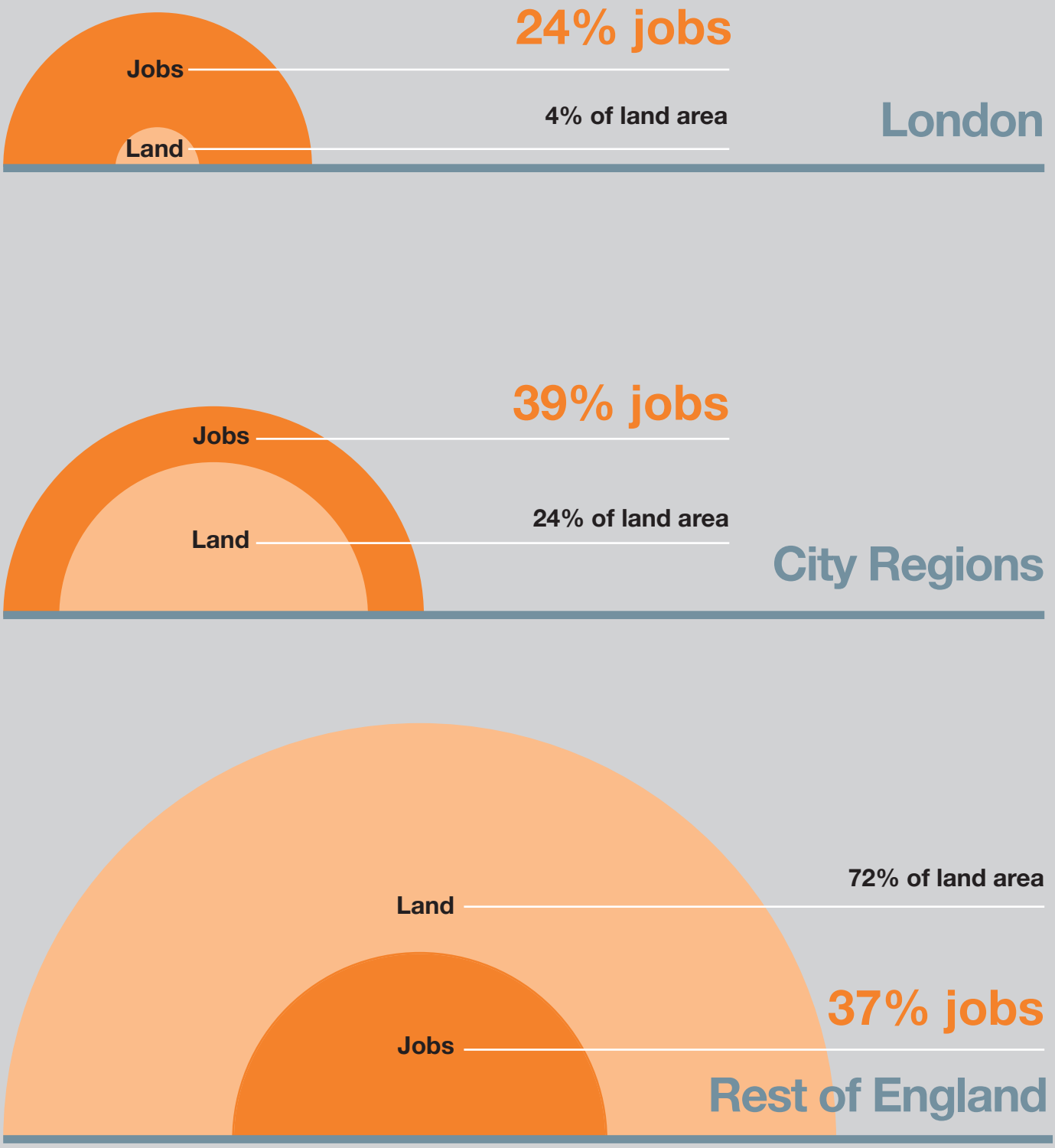
% of businesses who consider this to be an 'absolutely essential' location factor



Source: European Cities Monitor 2011, Cushman Wakefield

Fig 2. Distribution of jobs and land area.

63% of all jobs in England are within 40km of London and the Core Cities.



Source: ***pteg*** analysis of ONS Business Register and Enquiry 2011 survey data

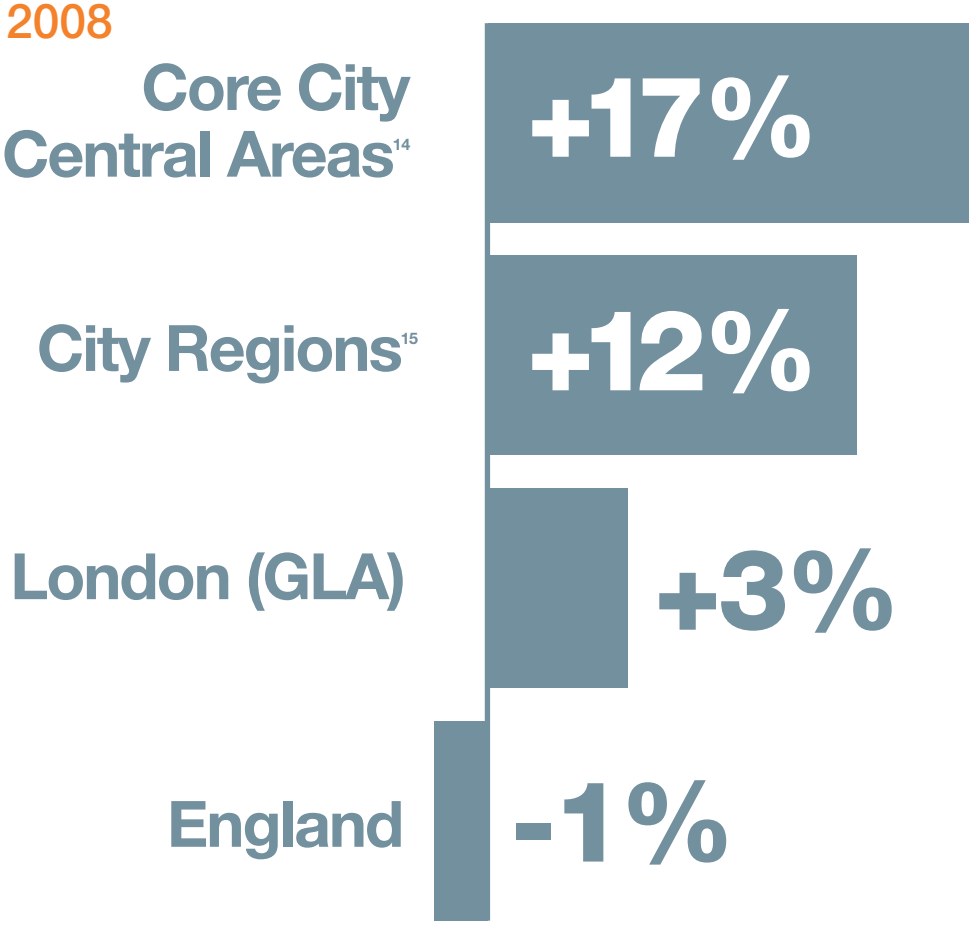
The Eddington Transport Study[9] investigated the link between economic density and productivity. In what remains the most comprehensive UK study to date, Professor Dan Graham estimated that a doubling of economic density leads to an average increase in productivity of 4% for manufacturing firms and 12% for the service sector as a whole. The productivity of financial and business services (FBS) was found to be most strongly linked to economic density: a doubling of economic density would lead to a 20% increase in FBS productivity.

The strong link between service sector productivity and economic density is consistent with observed changes in business behaviour. Data from the Annual Business Inquiry (ABI) shows that, between 1998 and 2008, employment increased by 7% in the main City Region central areas and 14% in Central London[10]. But more interestingly, the figures show that the growth in financial sector jobs[11] was higher in the central areas of City Regions than almost anywhere else.

A recent report by NIESR for Google[12] shows that the UK's fast growing digital economy sector has also tended to concentrate in the largest urban areas, notably in London and its hinterland, but also in large cities, like Birmingham and Manchester.

Although digital economy firms do not necessarily benefit from agglomeration economies to the same extent as some other service industries, their preference for urban areas could be explained by Richard Florida's argument that creative and skilled workers have some intrinsic preference for urban areas[13]. It is also interesting to note that London and the city regions together have 60% of all university students.

Fig 3. Change in financial sector jobs between 1998 and 2008



Source: ***pteg*** analysis of ONS 1998 and 2008 Annual Business Inquiry data

Fig 4. Proportion of university students

6 in 10 university students in England are based in London or the City Regions.

Source: ***pteg*** analysis of Higher Education Statistics Agency data on total students by HE institution, 2011/12

This evidence suggests that, despite London's continued dominance as a global financial hub, the UK's city regions offer a degree of economic density which makes them attractive locations to some of the businesses which we expect to benefit from agglomeration economies the most. Part of the explanation is that land is a finite resource, and so, with increasing density, come higher costs (for example, through property prices and congestion). This is likely to lead to a sorting process whereby those firms or activities which value agglomeration the most and are able to pay higher costs come to replace others, which try to find a better trade-off between agglomeration and the cost of doing business.

At the same time, large firms do not necessarily operate as single monolithic entities but rather as a collection of interdependent units. While there may be strong agglomeration economies within each unit, these may be weaker for the firm as a whole. As firms try to balance internal economies with operating costs, proximity to customers and suppliers, they may decide to locate their activities across two or more city regions.

Seen from this perspective, there could be significant benefits from closer integration between different urban areas. In a study of the economic interaction between Greater Manchester and the Leeds City Region[17], Professor Henry Overman found that commuting between the two neighbouring areas is about 40% lower than expected given their size and proximity - high commuting costs are given as a possible cause. Reduced access between the two markets is expected to hinder productivity gains through competition and specialisation.

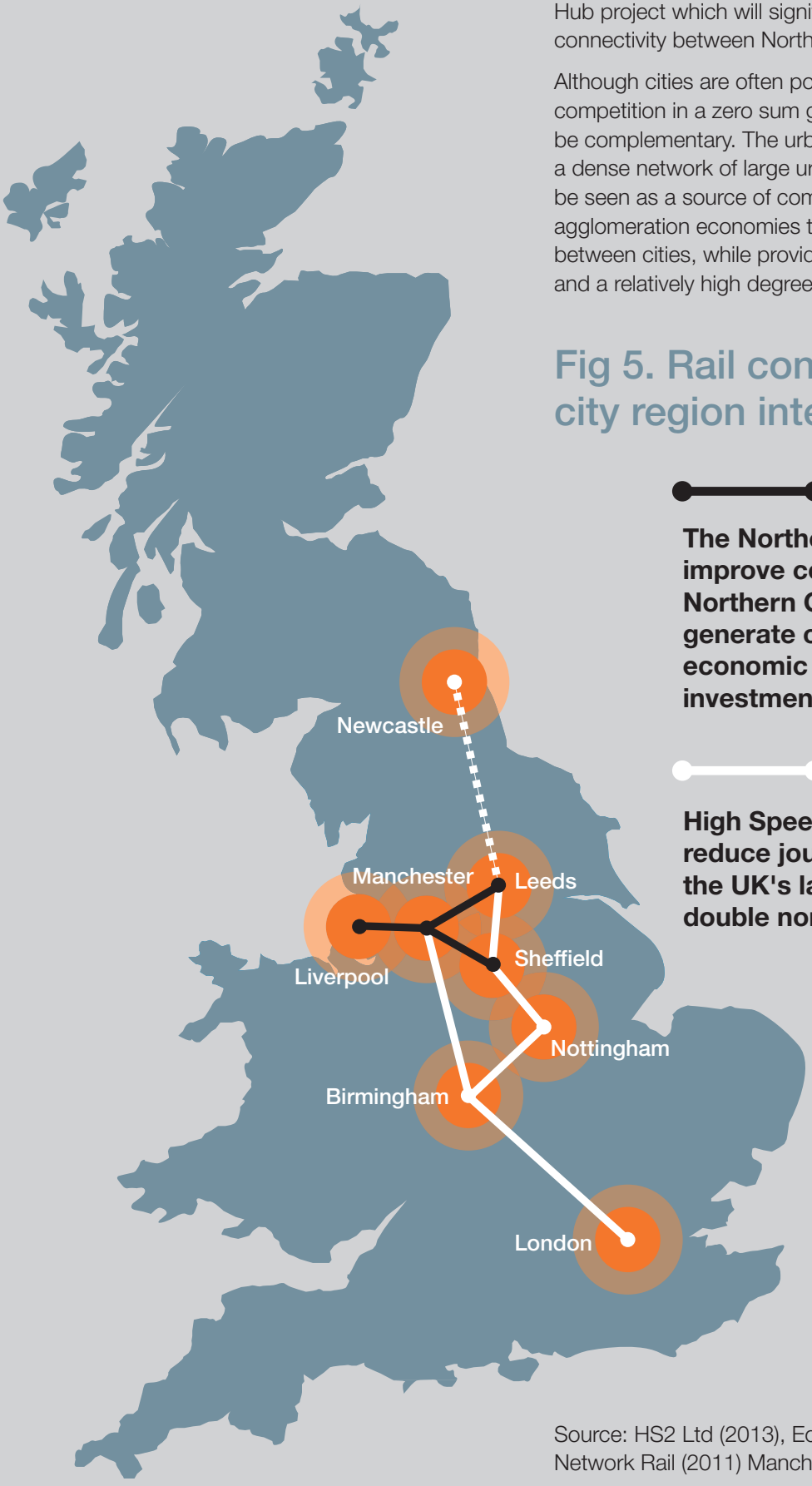
"Britain's cities are becoming global centres of technological innovation"

Rohan Silva, former Technology adviser to Downing Street[16]

The study goes on to estimate that a 20 minute reduction in train journey time between Leeds and Manchester could increase average wages by between 1 and 2.7%. Over time, this would represent economic benefits with a present value (in 2009 prices) of £6.7bn. This result demonstrates the importance of the Northern Hub project which will significantly improve rail connectivity between Northern England city regions.

Although cities are often portrayed as being in competition in a zero sum game[18], their role can often be complementary. The urban structure of the UK, with a dense network of large urban areas, could therefore be seen as a source of competitive advantage. It allows agglomeration economies to develop both within and between cities, while providing close access to markets and a relatively high degree of environmental quality.

Fig 5. Rail connectivity and city region integration



The Northern Hub scheme will improve connectivity between Northern City Regions and generate over £4bn of economic benefits for a capital investment of under £0.6bn

High Speed 2 will significantly reduce journey times between the UK's largest city regions and double north-south rail capacity

Source: HS2 Ltd (2013), Economic case for HS2; Network Rail (2011) Manchester Hub Rail Study

02 Transport matters to cities

Agglomeration economies help explain why 16% of all jobs in England are crammed into nine urban centres with a combined area corresponding to just 0.4% of the total land available; and why a further 47% of all jobs are found in the surrounding conurbations (around 28% of total land area).

However, if agglomeration economies are such an important location factor why isn't an even larger proportion of jobs concentrated in central London, the part of the country with the highest economic density?

One part of the answer is that not all sectors of the economy benefit from agglomeration to the same extent. In the case of car manufacturing, for example, the gains from agglomeration economies need to be balanced against the need for large plant size, which is important to achieve economies of scale. Take the example of Nissan's Sunderland plant, the largest in the UK and the country's leading car exporter, with a footprint equivalent to two thirds of the City of London. It would be clearly uneconomical to locate the plant in central London (think of how many City jobs would have to go to make way for it). But even in this case, Nissan decided to locate within a large urban area, albeit one with more (hence cheaper) land available than London.

On the other hand, as cities grow, the marginal costs of doing business and providing infrastructure increase as well. As land becomes ever more scarce, housing and commercial property go up in price. As traffic rises, it takes longer to move around and environmental quality is likely to suffer. These factors constrain the extent to which firms can grow or take advantage of agglomeration economies to become more productive. Fortunately, transport solutions can directly address many of these constraints on growth.

"As economic growth leads to increasing demand, an economy can ultimately become the victim of its own success because as congestion rises, so it starts to dampen growth. This is the most direct way in which transport will impact on growth in a developed economy."

Eddington Transport Study[19]

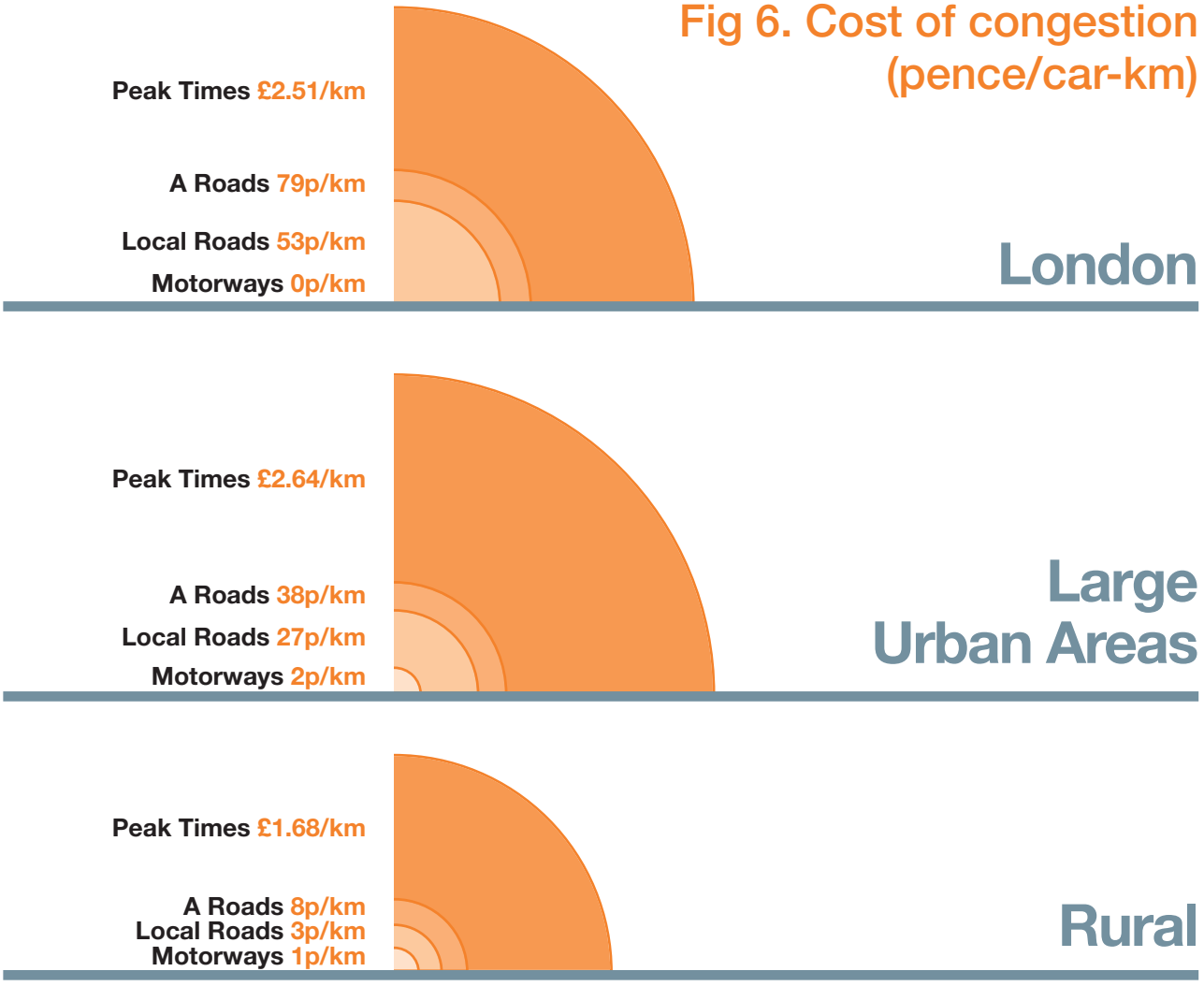
Congestion, environmental quality and safety - the economic costs of growth

As the population and the number of jobs grow, an increasing number of people need to make use of the existing transport infrastructure[20]. If the distribution of economic activity was evenly spread across the country then this increase in demand could be tackled through incremental expansion of the transport infrastructure stock. Unfortunately for transport planners, agglomeration economies mean that economic activity is disproportionately concentrated in dense urban centres. Urban transport infrastructure is therefore likely to be operating much closer to capacity than the rest of the network. This also means that a small increase in economic activity will lead to a more than proportional increase in urban congestion. A small change in the pace of economic growth can lead to congestion quickly spiralling out of control.

But what is the economic impact of congestion? The Department for Transport produces estimates of the delay, accident and fuel costs incurred as traffic increases on different types of road[21]. For Great Britain as a whole, the average cost of congestion is 13p for every additional car-km, and set to double by 2030 (for comparison, fuel duty is paid at an average rate of 5p/km).

However, this figure varies widely by area, road type and pre-existing level of congestion. For example, the cost is several times higher on trunk roads in the largest urban areas, and higher again at peak times on the most congested streets. On the other hand, it is virtually negligible on motorways and in rural areas during most of the day.

Fig 6. Cost of congestion (pence/car-km)



Source: Department for Transport Transport Analysis Guidance, Section 3.9.5

Although these figures may sound somewhat abstract, they represent real costs to businesses in terms of lost work time, increased fuel consumption and foregone business opportunities. A survey by the British Chambers of Commerce (BCC)[22] found congestion to be a problem for around 90% of businesses, with around 45% viewing it as a significant problem. Based on the results, the BCC put the annual cost of congestion at £17,350 per business, or over £23bn for British businesses as a whole.

In a recent survey focussing on the export market[23], one in four businesses felt that the quality of local transport connections is a barrier to export. This is greater than the number of respondents who felt poor international connections creates a barrier to export (1 in 5).

But although businesses pay a very significant cost for congestion, the overall impact on society as a whole is even higher. In 2009, the Cabinet Office estimated the overall economic and social cost of road transport in urban areas alone at over £40bn in today's prices[24], equivalent to twice the Gross Value Added of South Yorkshire. The cost of excess congestion is around a quarter of the figure with the remaining being made up of the cost of accidents, the impact of poor environmental quality, physical inactivity and greenhouse gas emissions.

20%

of businesses believe international transport connections are a barrier to export

25%

of businesses believe the quality of local transport connections is a barrier to export

Fig 7. Congestion costs account for a third of the measurable costs of transport in urban areas

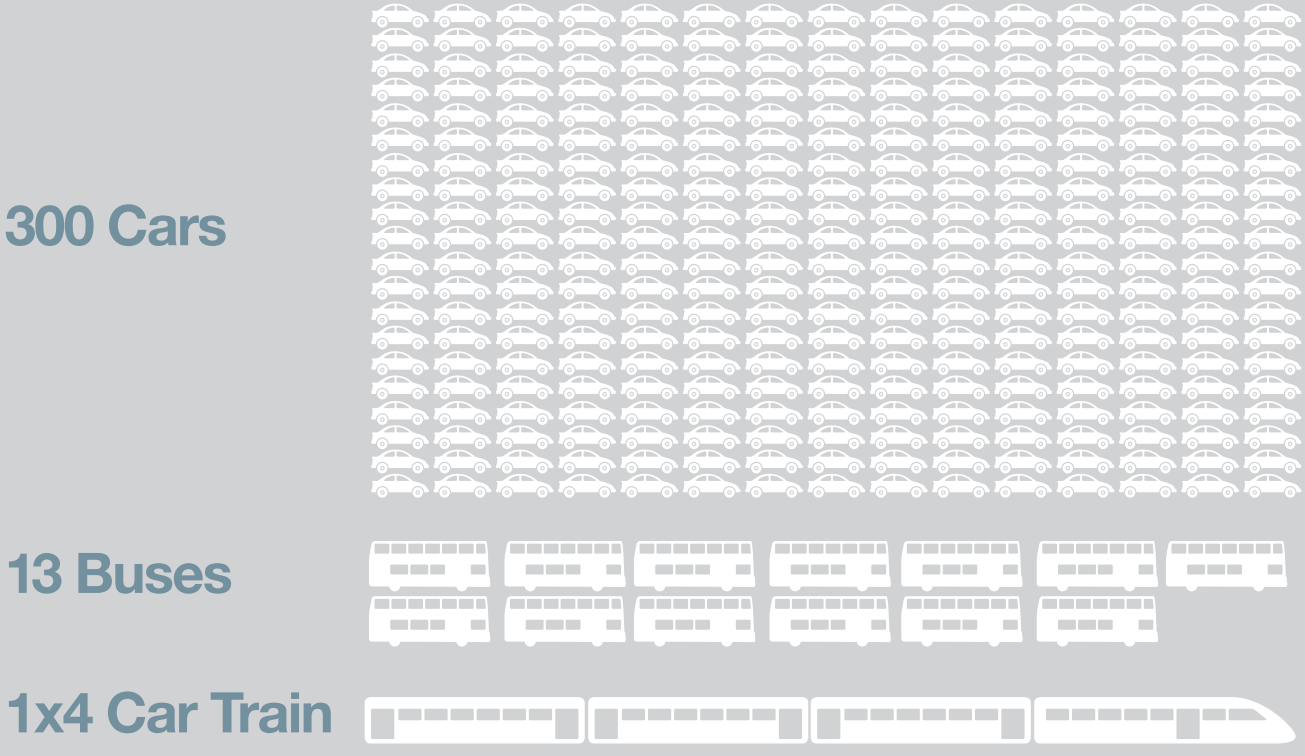
Source: Cabinet Office (2009), An analysis of urban transport

The Solution

The economic attractiveness of urban areas poses a conundrum for governments. As urban areas grow, so does the pull of agglomeration, in turn making them more productive and therefore increasingly attractive to businesses. On the other hand, increased economic density leads to congestion and poorer environmental quality[25]. This works in the opposite direction to agglomeration economies by increasing the cost of doing business, thereby driving firms and households away[26]. The challenge which governments and planners face is how to increase the productivity and economic output of urban areas while countering the costs of increased density in the most effective way[27]. This is especially difficult in established cities where the capacity of the road network in central areas may largely be fixed.

One obvious solution is to increase the productivity of transport networks. By moving more people within the space available, modern public transport systems can allow cities to grow while preserving agglomeration effects and an acceptable quality of life.

Fig 8. The number of cars, buses and trains which are needed to carry a similar number of people:



Source: Manchester city centre cordon counts, 2010/11

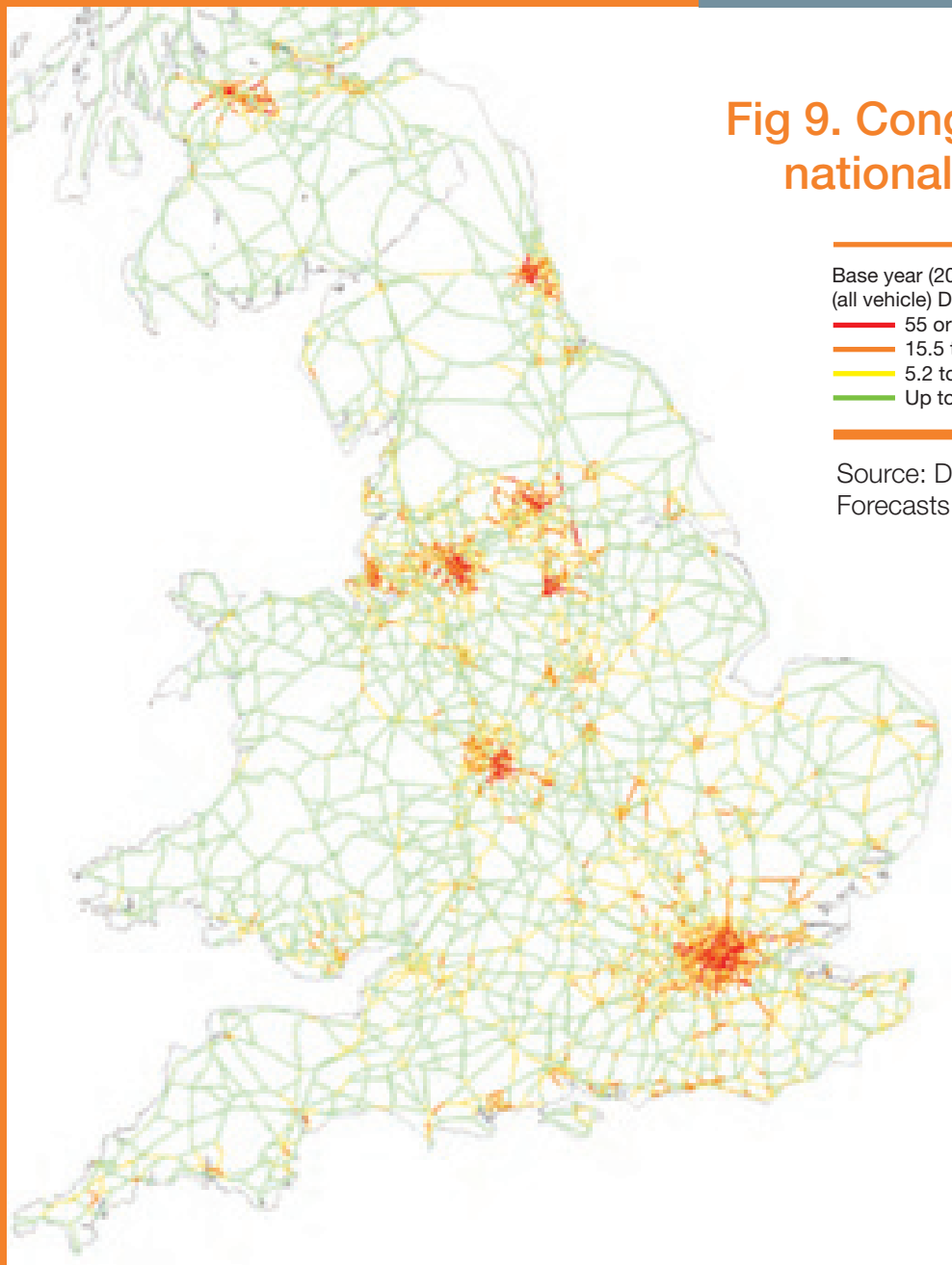


Fig 9. Congestion on the national road network

Base year (2003) Average
(all vehicle) Delay - Seconds per vkm
- 55 or more (663)
- 15.5 to 55 (2668)
- 5.2 to 15.5 (5360)
- Up to 5.2 (5754)

Source: DfT (2008) Road Transport Forecasts 2008

But aren't the worst traffic bottlenecks on the motorway network?

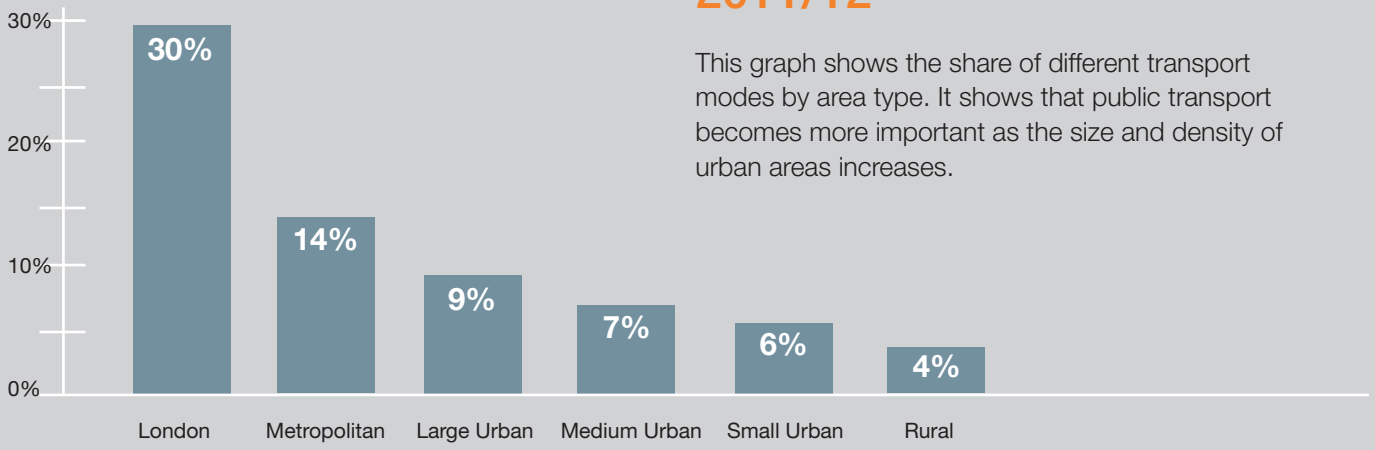
DfT analysis using the National Transport Model shows that the worst congestion hotspots are heavily concentrated in and around the largest urban areas (although this does include some urban motorways).

This is because the majority of trips using the motorway network start/end or travel through the largest urban areas – trips do not stop at the motorway junction. This means motorway traffic relies heavily on local road networks where congestion levels can quickly rise. A large proportion of motorway traffic is also due to freight traffic which, although forecast to rise, is more evenly spread in space and time than commuting trips.

Although it does often make sense to invest in bottlenecks on the strategic road network, large scale spending on motorways which fails to take into account the urban constraints on transport networks is likely to be poor value for money. Spending is therefore better targeted at ensuring that the existing infrastructure runs smoothly. This was the key focus of Transport for Greater Manchester's recent bid to the Government's Pinchpoint Fund, which used a thorough prioritisation process to target interventions at very specific constraints around five town and city centres, at Manchester airport and at four other short sections of the local road network.

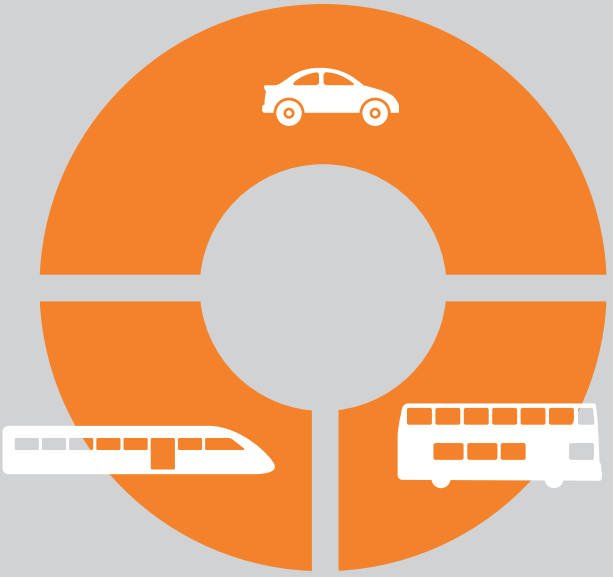
Fig 10. Mode share of public transport (trips), 2011/12

This graph shows the share of different transport modes by area type. It shows that public transport becomes more important as the size and density of urban areas increases.



Source: DfT National Travel Survey, table 9903.

Fig11. Share of motorised morning peak trips into the six largest city centres in metropolitan areas



However, this is not the full story - public transport actually carries as many commuters into the densest and most productive metropolitan city centres as do private vehicles, but using only a fraction of the road space. In the case of central London, the share of public transport trips is higher still making it difficult to conceive how such a high concentration of jobs could be achieved without the support of high quality bus and rail infrastructure.

Source: 2011 city centre cordon traffic counts for Birmingham, Manchester, Leeds, Sheffield and Liverpool.

In a recent report, ***pteg***[28] estimated the impact on city centre economies if local bus networks were suddenly to collapse. In the worst case scenario, which assumed road networks are operating roughly at capacity, this would lead to a 12.4% reduction in city centre jobs. Across the six English metropolitan areas, this would equate to a loss of over 100,000 jobs, equivalent to over £4.6bn per year in lost GDP. To put things into perspective, this is roughly 20 times the amount of operating subsidy which metropolitan bus networks receive as a whole.

How transport can address housing affordability and environmental quality

Although we have so far focused on the relationship between urban transport and the economic performance of firms, there is also a crucial link to the wellbeing of households.

To understand this, it is useful to start by comparing housing affordability levels in the UK relative to other parts of the world (see figure 12 below). The figures show that the cost of housing relative to wages is much higher in London than in New York, Singapore or Tokyo. Notably, even the city regions outside London have comparably high price to income ratios relative to other parts of the world. Not surprisingly, a recent Ipsos MORI opinion poll of Londoners shows housing affordability to be most often cited as the key issue facing the capital, closely followed by transport[29]. In a separate UK-wide poll, almost half of respondents felt that house prices in their area were too high. Amongst those aged 18-24, the figure is even higher at 63%[30].

Fig 12. Housing affordability in UK cities versus rest of the world

Figures represent the ratio between median house prices and median households incomes

San Francisco	9.2	Birmingham (Metropolitan area)	4.8
Sydney	9.0	Newcastle (Metropolitan area)	4.8
London (GLA)	7.3	Greater Manchester	4.6
London (East and South East England)	6.4	Sheffield (Metropolitan area)	4.6
New York	6.2	Washington DC	4.4
Toronto	6.2	Tokyo	4.4
Bristol and Bath	5.4	Nottingham-Derby (conurbation)	4.3
Liverpool (Metropolitan area)	5.3	Leeds (Metropolitan area)	4.0
Singapore	5.1	Chicago	3.5

Source: Demographia (2014), 10th Annual Demographia International Housing Affordability Survey: 2014, http://www.demographia.com/dhi.pdf; data from 3rd quarter 2013

"A good transport network is important in sustaining economic success in modern economies: the transport system links people to jobs; delivers products to markets; underpins supply chains and logistics networks; and is the lifeblood of domestic and international trade.

Eddington Transport Study[31]

We would argue that the UK housing market is influenced by three key factors[32]:

1. Agglomeration economies, which draw workers towards dense urban areas where higher wages and a greater variety of jobs are on offer, but land is in scarce supply[33].
2. The relatively high value placed on environmental amenities, including protected areas, private gardens and open space. Gibbons et al (2014) find that access to the best range of such amenities can explain disparities in house prices as high as £100k. Houses located in Green Belt land, which combine access to cities with high environmental quality are found to be worth £7,000 more on average[34] than an average house in the same travel to work market.
3. People demand larger houses as they become wealthier.

Households want to be within reach of a large variety of high paying jobs but close enough to environmental amenities. It is also likely that the demand for environmental amenities and desired house size will increase over time as income grows. Under these conditions, it is easy to see that there is a finite amount of population and income growth which a given area can sustain.

This is where transport comes in. By widening the catchment area of economic centres, and hence making more land available, transport is a key enabler of population growth. But it is also playing a key role in improving quality of life by increasing access to environmental amenities and reducing congestion on the existing infrastructure. This was the role played by the London Underground in the 19th century and by London's suburban rail networks in the 20th century. As figure 11 suggests, bus, rail and light rail networks are increasingly playing this role in the city regions outside London.

In the Leeds City Region, expected growth in jobs and housing has played a key role in defining long term transport investment priorities. According to Metro, the local Passenger Transport Executive (PTE), the area could miss out on 22,000 potential jobs by 2026 due to worsening transport constraints, as firms would struggle to recruit from a shrinking labour pool. Starting from 120 proposed schemes, local leaders then identified the set of 33 projects which would make the greatest relative contribution to linking jobs and housing. This will be paid for by the West Yorkshire Plus Transport Fund, worth in excess of £1bn.

As a result of this investment, the PTE expects that, by 2036, the city region will be able to accommodate around 20,000 more jobs, and generate £1.3bn in annual Gross Value Added, than would otherwise have been the case. Many other city regions are following a similar process to identify the transport schemes which can make the greatest contribution to jobs and growth.

In the West Midlands, an extension of the existing tram system to the key employment and regeneration site of Brierley Hill would significantly improve access to the strategic centres of Birmingham, Wolverhampton, Walsall and West Bromwich. Centro, the local PTE, has estimated that the economic development unlocked by this scheme would be worth £170m in annual GVA and could increase commercial land values in the catchment area by 8%[35].

03 Transport works for growth and jobs

We believe that there is strong empirical evidence to suggest that a shift in UK government spending towards urban transport would improve the country's economic prospects

We have shown why city regions matter to the economy and why urban transport is a key enabler of city region growth. This is useful information but it is not enough to help governments decide how much to spend on transport vis-à-vis other policy areas, let alone how much to allocate on individual measures or schemes. Clearly, individual spending decisions need to be assessed on their own merits and that is the remit of local transport authorities (LTAs)[36] as well as central government bodies such as the Department for Transport.

Nevertheless, we believe that there is strong empirical evidence to suggest that a shift in UK government spending towards urban transport would improve the country's economic prospects. In turn, the decision making mechanisms in place across LTAs will ensure that whatever funding is available is spent in the most effective ways.

Short term economic impacts

When the economy is thought to be operating below capacity, increased government spending can in itself generate a short term economic boost, regardless of how productive that investment is likely to be in the long run. These effects can be particularly important as economies go through recessionary periods but are also of wider relevance to areas with persistent unemployment.

Short term impacts are typically estimated through an input-output framework, which essentially tracks a unit of government spending as it travels through the economy to employees (as wages), suppliers and beyond[37]. In this way, it is possible to estimate the number of jobs and the volume of output generated from each pound of additional government spending in a given industry. Taking the bus industry as an example, we would expect direct job creation to be relatively large given that more than half of all expenditure goes towards staff costs, and average wages are relatively low. In addition, vehicles and maintenance parts, two other key inputs, are largely manufactured in the UK so the level of leakage is likely to be small.

Arriving at comparable and robust estimates of direct, indirect and induced impacts of spending for small industrial sub-sectors is notably difficult. In the UK, this type of analysis was last undertaken by the Office of National Statistics in 1995. However, there have been two recent US studies which provide some useful benchmarks:

- A study of US transport investment through the American Recovery and Reinvestment Act (ARRA) found that $1 of public transport capital spending generates 90% more jobs as $1 spent on road infrastructure[38, 39].
- And a previous study by the American Public Transportation Association (APTA) found that $1 of public transport revenue spend (e.g. service operation) generates even 70% more jobs than $1 of public transport capital spend. That means that public transport services can generate more than three times as many jobs as highways infrastructure[40].
- The research estimated that each unit of government revenue and capital spending would generate, respectively 3 and 3.8 times as much overall economic output[41]. In comparison, a recent study for the UK Contractors Group[42] estimated that £1 spent on construction output generates £2.84 in total economic activity.

The APTA and ARRA studies were broadly consistent in terms of their estimates of the job creation potential of public transport investment.

Spending on public transport services generates over three times as many jobs as highway infrastructure

American Public Transportation Association/Centre for Neighbourhood Technologies

This evidence shows that the short term impacts of public transport expenditure are high compared to other areas and that revenue spending is more effective for this purpose than capital spending.

Long term economic benefits

Short term impacts can have an important role to play in smoothing out the impact of economic slumps. They can also contribute to long term growth by keeping people in the labour market and generally maintaining productive capacity at a level close to the economy's potential. In the long run, however, it is improvements in productivity that are critical to economic growth. And this is where things start to get really interesting for transport.

One way to investigate this link is to estimate the statistical relationship between public spending and economic output. Since the seminal work of Aschauer (1989) and Munnell (1990)[43], a number of researchers have attempted this exercise using data from different groups of countries and time periods[44]. Overall, the link between public capital investment and economic growth appears to be robust across methodologies and datasets. Results suggest that there is at least a 0.14% increase in productivity for every 1% increase in public infrastructure spending, but with much stronger effects emerging out of some studies[45]. Those studies which were able to distinguish between types of expenditure show that transport has a bigger impact on economic growth than nearly any other type of public spending.

In a particularly insightful recent study, Gemmel et al (2009)[46] analysed the effect of combined revenue and capital spend by key sector of government spending. The study used 1990-2004 data from OECD countries and so is also arguably one of the most relevant to the current UK context. The results show that transport and communications (T&C) are, by some margin, the most productive forms of public expenditure; taking this spending from, say, 1% to 2% of GDP would increase national output by 0.15%[47].

The authors go on to examine the impact of changes in government spending, country by country, over the period of analysis. Notably, they show that increases in T&C spending in Germany between 1990 and 2004 will have contributed an increase in 2004 GDP of 1.8%. In contrast, reductions in transport spending[48] in the UK will have led to a decrease in 2004 GDP of 0.2%. Had the UK increased its share of government spending on T&C in line with Germany, these figures suggest that 2004 GDP would have been around £24bn higher.

If we take as the optimum, Germany's average transport infrastructure expenditure (road and rail) between 1995 and 2004 as a share of GDP, then the UK's shortfall would have been around £2bn in 2004 and £4bn in 2011.

Fig 14. Transport infrastructure spending as a share of GDP between 1995 and 2004

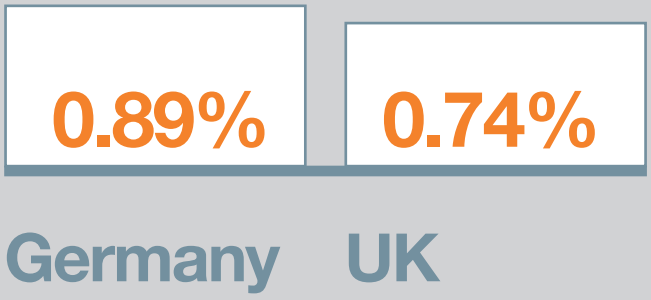
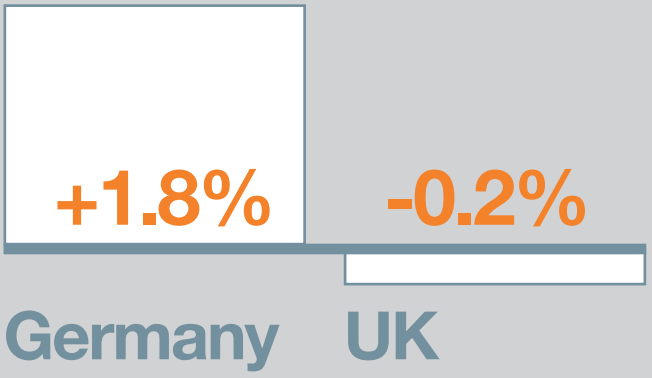


Fig 15. Impact on GDP of changes in transport share of government spending between 1990 and 2004:



Source: International Transport Forum (2013), Understanding the value of transport infrastructure: guidelines for macro-level measurement of spending and assets

The evidence above suggests that UK transport spending is below its optimum level.

Turning back to earlier sections of the report, however, we have claimed that it is specifically urban transport which is key to economic performance[49]. There is very limited data available on the composition of national transport expenditure across countries and over time. Aggregate statistical evidence is therefore of little value in settling this question.

Fortunately, there are well developed and robust frameworks for quantifying the economic and social returns of individual transport schemes[50]. The key focus of these methods are the cost savings to businesses from reduced transport and travel costs, the economic benefits to society as a whole from reduced traffic accidents, the productivity gains from increased agglomeration (which is enhanced by reduced travel times) and the increase in the wellbeing of individuals as the result of reductions in travel costs[51] (time and money). The economic value of a project is typically expressed as the ratio between the discounted value of benefits and the discounted value of costs (known as the Benefit Cost Ratio or BCR).

The Eddington Transport Study devoted an entire volume to understanding which are likely to be the most effective transport policies[52]. It considered 159 different schemes ranging from small scale walking and cycling schemes to large scale international gateways. It estimated that urban network improvements have an average benefit cost ratio in excess of 3:1, going up to 4:1 for growing and congested urban areas[53]. This is broadly in agreement with a more recent analysis of city regions public transport schemes[54], which found a median BCR of 3.5:1.

In comparison, the average BCR for inter-urban transport schemes is somewhat lower at 2:1. The report also found that urban transport schemes generate about seven times higher productivity benefits (due to agglomeration economies) per unit of cost than inter-urban schemes.

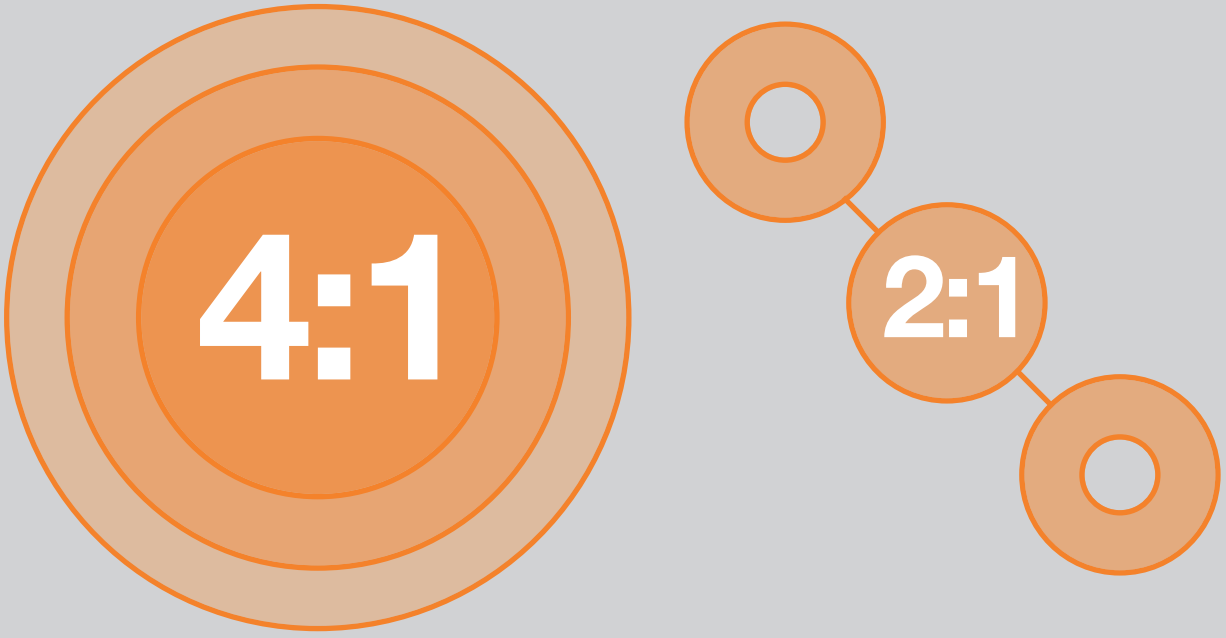
"62% of British firms agree that the UK's transport infrastructure inhibits inward investment in their region"

British Chambers of Commerce 2008[55]

“Failure to invest in worthwhile projects reduces future economic growth - it reduces debt, but also reduces GDP.”

Chris Riley, Associate - Oxera (former DfT Chief Economist), giving evidence to Transport Select Committee in 2010[56]

Fig 16. Average Benefit : Cost Ratio of transport schemes...



In growing and congested urban areas...

...compared to inter-urban networks

Interestingly, the study highlighted that some small scale projects (ranging from walking and cycling schemes to junction specific improvements) can have especially high returns. This is strongly supported by a subsequent extension of Eddington’s analysis by Professor Phil Goodwin[57], who concluded that very low cost local safety, cycling and smarter choices[58] schemes can achieve BCRs in excess of 20:1. This is perhaps less surprising if we think of these schemes as a cheap way of releasing some of the most congested infrastructure for more productive uses. In addition, some of these schemes are directly targeted at discrete bottlenecks which, once addressed, allow wider sections of the network to function more efficiently.

If urban transport schemes generate such high economic and social returns, then it should be possible to measure their impact on the economic performance of local areas. In recently published research, US academics Daniel Chatman and Bob Noland[59] have tried to empirically identify the link from public transport level of service to central area employment, wider employment density and population, using data from 300 US metropolitan areas. They find that:

- A 10% increase in public transport seat capacity or rail service miles per capita is associated with a 0.23% to 0.26% increase in net wages
- A 10% increase in public transport seats per capita or rail service mile density are associated with an increase in local output per capita of 1% to 1.9%, after controlling for central area employment density and population size. This means that taking two metropolitan areas of similar population and with similar city centre employment density, small differences in the quality of public transport network can lead to large differences in output.

Another way to detect the economic impact of urban transport improvements is through changes in land use prices. If, as we suggest, transport makes available land more productive then this should be reflected in real estate prices surrounding the areas benefiting from the improvement[60].

Although it can often be difficult to distinguish the impact of smaller schemes from background trends, there is a wealth of case study evidence from larger projects, in particular rail schemes. A study by APTA[61] looked at the changes in house prices between 2006 and 2011 across five US metropolitan areas. It shows that properties in the catchment area of public transport stations proved more resilient to the recession, with sales prices outperforming the wider metropolitan area by between 30% and 129%.

In the UK, a study of the impact of railway station improvements has shown that these can significantly increase the value of neighbouring commercial properties[62]:

- Investment in Sheffield Station and the surrounding area contributed to an increase in rateable value in the vicinity of the station of 67% over a five year period - three times the city-wide average.
- In Manchester, investment in Piccadilly Station helped to create enough new and refurbished office space to house around 3000 workers, and was linked to a one-off 33% increase in property values.

A study of the impact of new stations on the London Underground and the Docklands Light Railway in the late 1990s, found that, between 1997 and 2001, house prices near new stations rose 9.3 percentage points more than elsewhere[63]. In 2001, a house adjacent to a new station would have been worth £2,500 more than a house 1km away. This is largely consistent with a number of US studies quoted in a report by APTA[64].

A similar study of the Manchester Metrolink[65], found a strong relationship between reductions in travel time to central Manchester and changes in house prices. A five minute travel time saving increased house prices by 1.8% whereas a 15 minute travel time saving increased prices by 5.4%. Using these results, the authors estimated that the recent Metrolink extension to Oldham and Rochdale could increase house prices by between £3,000 and £5,000 around new stations.

Although it is often difficult to disentangle the impact of transport network improvements from wider socio-economic trends, this sample of studies strongly supports the idea that transport accessibility does improve the productivity of urban areas.

In the US, properties in the catchment area of public transport stations proved more resilient to the recession, with sales prices outperforming the wider metropolitan area by between 30% and 129%.

American Public Transportation Association (2012)[66]

Funding facts

- DfT funding for local transport was cut by 16% in 2010 and fell another 11 percentage points over the following two years (in real terms).
- The resource spending power of metropolitan districts will fall by 30% in real terms between 2010/11 and 2015/16.
- Less than 20% of local government net spending on highways and transport in England is funded by the Department for Transport[67].
- The proportion of locally raised taxes which are controlled by local people is 5% in English Core Cities, 30% in Germany, 37.5% in US, 50% in Canada[68].

04 Conclusions: Government funding and economic growth

Large urban areas have a key role to play in modern economies. Many firms are more productive when they cluster close together as this means they can benefit from easier contact between workers, suppliers, clients and from access to a deeper labour market.

But as economies and cities grow, land becomes increasingly scarce, congestion drives up operating costs and firms find it more difficult to reach markets and find the right workers for the job. This eventually puts a cap on productivity growth.

But there is a solution to this conundrum: more efficient and higher capacity urban transport networks. The Eddington Transport Study found that transport schemes in congested urban areas return economic and social benefits, on average, four times higher than costs. And there is strong evidence to show that transport spending has a much greater impact on long term GDP growth than most other areas of government policy. Not only that, but transport spending can also deliver a greater short term boost to jobs than other areas of public or private spending.

Yet, in the English city regions, the key government sources for urban transport funding suffered a severe cut in 2010 and have been on a downward spiral since. The Government has more recently recognised the general case for transport and funding is slowly beginning to move in an upward direction. However, the biggest planned increases will be on national road and rail networks. Urban transport funding outside London will continue to be well below where it should be[69]. As we have seen, national networks have an important role to play in integrating the economies of complementary urban areas so as to optimise growth opportunities. But it is in dense centres of urban areas that the most severe constraints lie.

At the same time, we estimate that DfT contributes less than a quarter of local transport spending. The majority comes through a much larger all-purpose grant from Department for Communities and Local Government, which is set to decline for the foreseeable future and has been cut the fastest in the most congested urban areas. Importantly, this is the key funding source which pays for bus network improvements and the planners, engineers and economists which are needed to develop and implement schemes.

By keeping hold of the majority of locally raised taxes, yet cutting local government funding, central government is tying its hands together. The result is that the country's ability to deliver the transport improvements which underlie urban productivity growth is declining, when it should be going in the opposite direction.

In order to ensure that transport boosts, rather than hinders, economic growth central government funding mechanisms need to better recognise the economic value of urban transport and target this type of spending more effectively. Virtually none of the Regional Growth Fund money found its way to urban transport schemes, despite the DfT's generous contribution towards this pot. And there is a risk that the Single Local Growth Fund will follow in the same vein, unless Government as a whole recognises the broad benefits of urban transport to the UK economy.

At the same time, it needs to be recognised that some types of government spending are much more effectively prioritised and delivered at the local level. Given how the UK compares with its peers, this would suggest a much greater degree of funding devolution is warranted[70].

Urban transport is one of those rare forms of government expenditure: highly productive and with substantial economic and social returns. It is time to let transport work harder for jobs and long term economic growth.

References and Endnotes

[1] Graham, D. (2006) Investigating the link between productivity and agglomeration for UK industries.

[2] Eddington, R. (2006) Eddington Transport Study: Main Report: Volume 3.

[3] See Fujita and Thisse, 2002, Economies of Agglomeration or Fujita, M. and Thisse, J.-F. (2002), Economics of Agglomeration: Cities, Industrial Location, and Regional Growth, Cambridge University Press or Fujita, M., Krugman, P. and Venables, A.J. (2001), The Spatial Economy: Cities, Regions and International Trade, MIT Press.

[4] For a more detailed explanation of these effects, see http://www.transportworks.org/evidence-base/agglomeration-effects

[5] Shared resources can include physical infrastructure, centres of knowledge and research, labour pools as well as intangible goods such as information, knowledge, business culture and technological innovation.

[6] Florida, R. (2003), The Rise of the Creative Class: and How It's Transforming Work, Leisure, Community and Everyday Life, Basic Books.

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[10] The national average for England was 7%.

[11] Defined as Standard Industrial Code (SIC) 2003 Industry Group J.

[12] NIESR (2013), Measuring the UK digital economy with Big Data.

[13] Florida, R. (2003), The Rise of the Creative Class: and How It's Transforming Work, Leisure, Community and Everyday Life, Basic Books.

[14] These are defined as 5km buffers around the centre of the 8 Core Cities.

[15] This is defined as a 40km buffer around the centre of the 8 Core Cities.

[16] The Observer, 12 January 2014.

[17] SERC (2009), Strengthening Economics Linkages between Leeds and Manchester: Feasibility and Implications. Report for the Northern Way.

[18] Which is not to say that this may not be the case in some sectors of the economy.

[19] Eddington, R. (2006) Eddington Transport Study: Main Report: Volume 3.

[20] See the Department for Transport's National Travel Survey table NTS0101 for detailed trends.

[21] This is the additional delay and resource cost (e.g.: fuel) imposed on all other road users when an additional car travels on a road.

[22] BCC (2008), The Congestion Question: A Business Transport Survey.

[23] BCC (2012), Exporting is Good for Britain: Transport Connections.

[24] Cabinet Office (2009), An analysis of urban transport.

[25] Gibbons, S., Mourato, S. and Resende, G.M. (2013),The Amenity Value of English Nature: a Hedonic Price Approach, Environmental Resource Economics.

[26] The effect of this is for the economy to perform below its maximum potential level.

[27] By this we mean that the return from increased agglomeration must outweigh the cost of providing the required infrastructure.

[28] ***pteg*** (2013), The Case for the Urban Bus – the Economic and Social Value of Bus Networks in the Metropolitan Areas. pp 31-32.

[29] Without prompting, 27% of respondents cited housing as the key issue facing London. Transport/public transport came second with 23% of responses; Ipsos MORI January 2014 survey for London Councils (research carried out in October 2013).

[30] Ipsos MORI November 2013 survey for BBC Panorama programme (research carried out in November 2013).

[31] Eddington, R. (2006) Eddington Transport Study: Main Report: Volume 3.

[32] Assuming that potential market failure in the house building market is largely a second order issue.

[33] Research by Melo and Graham shows that doubling labour market density increases average earnings by only 1%. This is a much weaker effect than was found between firm productivity and economic density, which suggests that households are probably a lot more flexible than firms about their preferred location. Reference: Melo, P. and Graham. D. (2009), Agglomeration Economies and Labour Productivity: Evidence from Longitudinal Worker Data for GB's Travel to work Areas, SERC Discussion Paper 31.

[34] Gibbons, S., Mourato, S. and Resende, G.M. (2013), The Amenity Value of English Nature: a Hedonic Price Approach, Environmental Resource Economics.

Note that greater economic density is likely to have a positive effect on certain types of amenity (e.g.: cultural facilities). However, it will have an evidently negative impact on environmental quality (including poorer air quality, higher noise levels and reduced access to green spaces).

[35] CBI (2013), The next regeneration – unlocking local growth.

[36] For an overview of transport decision making processes in metropolitan areas/city regions see JMP (2013), Delivering Successful Local Transport - the City Region Experience.

[37] For a discussion of the methodology adopted by the Office of National Statistics in the UK to quantify direct, indirect and induced impacts see http://www.ons.gov.uk/ons/guide-method/method-quality/specific/economy/input-output—uk-national-accounts/articles-and-analyses/index.html

[38] Centre for Neighborhood Technologies (2010), What we learned from the stimulus.

[39] Based on a separate study by Heintz et al (2009), $1 of road infrastructure spending generates roughly the same number of jobs as a tax cut to households (~15,000 jobs per $1bn) Reference: Heintz, J., Pollin, R., Garrett-Peltier H. (2009), How Infrastructure Investments Support the US Economy: Employment, Productivity and Growth, Political Economy Research Institute.

[40] APTA (2009), Economic Impact of Public Transportation Investment.

[41] These figures include direct, indirect and induced impacts (i.e.: type I and type II multipliers). Output is taken to mean total business sales (the corresponding figures for Gross Value Added (GVA) are $2.0 and $1.5, respectively). The absolute figures, based on 2007 data, were 41,000 and 24,000 jobs per $1bn of, respectively, revenue and capital spend. Taking the 2007 USD-GBP exchange rate and re-basing the figures to 2013 using the

CPI index, gives figures of approximately £15,000 and £26,000 of, respectively, revenue and capital expenditure per job created. These figures are broadly consistent with estimates by TAS (2010) and Invensys Rail (2010) for the UK bus and rail industries respectively. TAS estimated a figure of around £20k per job, excluding induced impacts. Taking a typical ratio between direct+indirect and induced impacts, this is entirely consistent with APTA's £15,000 figure for revenue spend. Invensys came up with a figure of £44,000 per job created (including direct, indirect and induced impacts). This reflects the relatively high average wage in the UK rail industry. For comparison, BIS estimates that each job created or protected by the Regional Growth Fund through direct and indirect impacts requires around £26.6k of public and private expenditure. References: TAS (2010), The Value of Buses to the Economy, report to CPT ; Invensys Rail (2010), Written Submission to the Transport Select Committee enquiry into Transport and the Economy; Department for Business, Innovation and Skills (2013), Regional Growth Fund: Annual Monitoring Report 2013.

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[44] See transportworks.org for a summary of key results.

[45] The magnitude of the effect will of course depend on the pre-existing capital stock and the type of technology which new infrastructure relies on.

[46] Gemmell N., Kneller, R. and Sanz, I. (2009), The Composition of government expenditure and economic growth: some evidence from OECD countries, in EC Occasional Papers 45.

[47] The authors assume that increases in one area of government spending are funded by equivalent decreases in other areas. Hence, the result needs to be interpreted as meaning that a given increase in T&C spending, which is funded by an equivalent uniform decrease in other areas of government spending would increase GDP by the margin cited.

[48] By reductions in transport spending, we mean reductions in the proportion of total government expenditure going towards this sector.

[49] If so, then increasing urban transport expenditure while cutting back on other less productive types of transport spending could increase economic output while transport spending remained constant. Aggregate expenditure is therefore only of limited value in understanding the relative impact of different schemes.

[50] For further information, see the Department for Transport's appraisal guidance: https://www.gov.uk/transport-analysis-guidance-webtag.

[51] There is disagreement as to whether improvements in the wellbeing of individuals is reflected in increases in national output. One point to emphasise is that national output measured for example as GDP is typically used as a proxy for wellbeing but it is overall wellbeing that economists are ultimately interested in. In any case, it is a well established result that, in perfectly competitive markets operating close to full employment, the direct consumer and producer benefits derived from transport investment lead to equivalent short term gains in economic efficiency. Reference: Jara-Diaz, S. (1986), On the relation between Users' benefits and the economic effects of transportation activities, Journal of Regional Science, 26(2), pp. 379-391.

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[54] Jacobs (2011), Value for money and appraisal of small scale public transport schemes.

[55] Other findings from the BCC 2008 transport survey include:

- 62% of businesses agree that transport infrastructure inhibits inward investment in their region, with the figure rising to 69% for firms with 50+ employees.
- 40% of respondents feel transport infrastructure hinders the expansion of their business.
- 59% of firms claim UK infrastructure had a major influence on their choice of location. The figure was highest in London at 69%.
- Only 18% of firms said the UK infrastructure met their needs fully although this has gone up from 10% since 2004.

[56] Written evidence to Transport Select Committee enquiry into Transport and the Economy (Reference: TE108), available at: http://www.publications.parliament.uk/pa/cm201011/cmselect/cmtran/473/473we40.htm.

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[70] For concrete proposals, see, for example, recent work by Core Cities (2013) Competitive Cities, Prosperous People.

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pteg represents the six Passenger Transport Executives (PTEs) which between them serve more than eleven million people in Greater Manchester (Transport for Greater Manchester), Merseyside (Merseytravel), South Yorkshire (SYPTE), Tyne and Wear (Nexus), the West Midlands (Centro) and West Yorkshire (Metro). ***pteg*** is also a wider professional network for Britain's largest urban transport authorities.

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