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THE LINKS BETWEEN TRANSPORT INVESTMENT & ECONOMIC GROWTH

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Introduction

At a time when financial resources are limited, how can our cities and regions prioritise transport needs and make intelligent investments that boost their economic competitiveness? Recent research using case studies from the Leeds City Region, has shown the scale of the 'hidden' economic benefits – known as agglomeration benefits – that transport schemes can deliver in Britain's major cities.

Currently, transport investment decisions are based on assumptions that underestimate their economic impact. However, a new methodology has recently been developed which allows people to better measure the value of these 'wider economic benefits'. The Leeds City Region research pilots this new methodology by applying it to three packages of transport improvements. The findings suggest that targeted improvements to urban transport networks could add tens of millions of pounds to a city's economic 'bottom line' each year, especially when access to city centre concentrations of high-value jobs and services is improved. The research finds that incorporating wider economic benefits into our selected investments adds between 12 and 25 percent to their value. Including these agglomeration benefits could radically improve the economic case for transport investment in cities across the UK.

With the Comprehensive Spending Review, the Government's renewed drive to improve regional economic performance, and the implementation of the Eddington Transport Study, which urged a more 'economic' approach to transport policy, there is an important window of opportunity to make the case for the wider economic benefits of transport investment and, more broadly, to reconnect the worlds of economic development and transport.

Theory and practice: What we know about agglomeration

The biggest sources of 'wider economic benefits' are technically known as agglomeration benefits. Simply put, agglomerations are geographical concentrations of workers and businesses[1]. Cities are the most commonly referred to form of agglomeration, but specialised industrial clusters - such as those observed in the City of London and with the biotech sector around Cambridge – and city-regions can also be termed agglomeration benefits. Over the past 15 years, researchers have invested a great deal of time trying to understand the economic reasons behind this clustering of workers and businesses.[2]

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[1] This section of the report borrows from the Centre for Cities' earlier paper on agglomeration economies: See Webber C and Athey G (2007) *The route to growth: transport, density and productivity*, London: Centre for Cities

[2] See Rosenthal and Strange, 2004, for a review of the literature.

Cities are not cheap places to conduct our economic activities. Property prices, wages and transport costs all tend to be higher. Why do firms accept these higher costs? The reason is that when workers and businesses locate close to one another it creates a range of economic benefits that more than offset the higher costs of city locations.

Cities generate three main types of agglomeration benefits:

- there are large pools of labour upon which firms can easily draw (Simmie *et al* 2002).
- firms have easier access to their suppliers (Saxenian 1999, 2002).
- business knowledge is acquired, exchanged and circulated more rapidly.

Importantly, researchers have also found that, roughly speaking, the larger an agglomeration economy gets, the greater the agglomeration benefits[3]. The clear implication of this for policy-makers is that if they can increase the size of a city they can increase the agglomeration economies available and therefore enhance economic performance (Rice and Venables, 2003; Overman et al, 2007). However, it is not the physical size of a city that matters, rather it's the *effective density.*

Increasing effective density means increasing the number of people and firms who can access the city quickly by improving the quality of the transport network. For example, if two large cities with workforces of one-million each were connected by a motorway that, through its construction, brought journey times to under one hour, this would create a labour market of two million.

Agglomeration and transport

So, increasing the effective density of an area can intensify the agglomeration economies available and thereby improve economic performance. However, decision-makers need to understand that the extent of agglomeration benefits achieved through a transport package will vary depending on the specific area. Three factors need to be considered:

- **Density** – what is the impact of the scheme on the effective density of an agglomeration?
- **Responsiveness to changes in effective density** – different sectors of the economy respond to changes in effective density in different ways. For example, services firms tend to be more responsive than manufacturing firms.
- **Existing productivity of an area** – increasing the effective density of a city that is already highly productive is likely to lead to a greater total benefit than increasing the effective density of an area that is less productive at the start.

Conventional appraisals already capture some of the economic gains from reduced travel times, but when we talk about the agglomeration benefits of transport investment we mean the productivity gains over and above those already measured.[4] Of course, the Department for Transport (DfT) is well aware of these potential benefits, but until recently no reliable methodology has existed for quantifying their impact. As a result, analysis of agglomeration benefits has been excluded from standard appraisals. Figure 1 illustrates those benefits captured by traditional appraisal techniques as well as those that are not.

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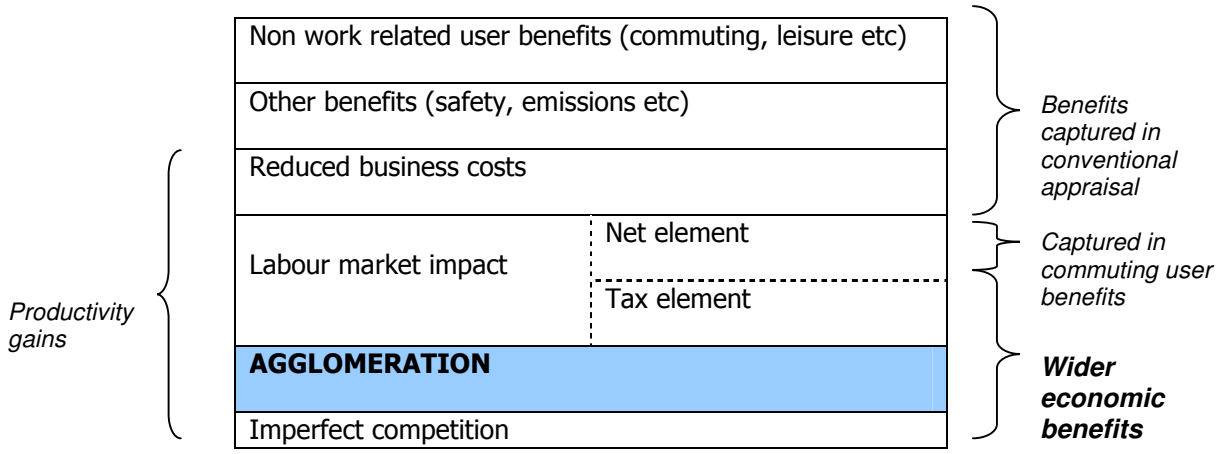
[3] Described as 'increasing returns to density' (Graham, 2005; 2006).

[4] For a thorough discussion of the positive and negative aspects of conventional transport appraisal, see Graham (2005, 2006); Vickerman (2000, 2007); SACTRA (1999); and the Department for Transport's appraisal website www.webtag.org.uk.

Figure 1: Relationship between conventionally measured benefits, wider economic benefits and productivity gains



However, the DfT has now developed a methodology capable of measuring agglomeration. In order to test the DfT's new methodology, the Centre for Cities teamed up with the West Yorkshire Passenger Transport Executive, Dr Dan Graham of Imperial College London and transport consultancy firm, Steer Davies Gleave to produce a detailed analysis of selected transport improvements across the Leeds City Region.

New research: Wider economic benefits in the Leeds City Region[5]

Scope and methodology

The research team selected three different transport investment packages in the Leeds City Region, and analysed both the conventional and the agglomeration benefits associated with each.

Table 1: Packages of Schemes Assessed in the Leeds City-Region

Package 1: Improved access to Leeds City Centre Includes the proposed Leeds Bus Rapid Transit system, park and ride sites, selected rail upgrades, and improvements to the Leeds ring road.
Package 2: Improved links between centres within the Leeds City Region Centred on improved links between the city-region's employment centres – including inter-city highway improvements, elements of a tram-train system, rail electrification schemes, and some conventional bus corridor upgrades.
Package 3: Upgraded Leeds-Manchester links Improved connectivity between the Leeds City Region and Greater Manchester via the upgrading of Calder Valley rail line linking Bradford, Halifax and Hebden Bridge to Manchester; targeted improvements to the Trans Pennine rail route; and targeted improvements to the M1 and M62.

[5] The Leeds City Region comprises the 10 local authority districts of Barnsley, Bradford, Calderdale, Craven, Harrogate, Kirklees, Leeds, Selby, Wakefield, and York; with the participation of North Yorkshire County Council. More information is available at http://www.leeds.gov.uk/leedscityregion.

Using conventional methods (i.e. not incorporating agglomeration benefits), the predicted gains of these schemes were:[6]

Table 2: Conventional benefits by user group (2016 values, £M 2002 prices[7])

	Package 1	Package 2	Package 3
Business	23.0	6.1	12.2
Commuting	23.6	34.7	131.4
Other	7.4	19.7	57.5
Total	**54.0**	**60.5**	**201.1**

These results show that, by conventional appraisal methods, the Leeds-Manchester package (Package 3) offers substantially more benefits than packages 1 and 2. Had package 3 been introduced in 2006 it would have generated £201.1m worth of benefits per year by 2016 as compared to £54m and £60.5m per year for packages 1 and 2 respectively.

The next step for the research team was to assess the agglomeration benefits associated with each of these schemes by employing the DfT's new draft guidance on evaluating agglomeration impacts. As explained, different cities (and areas within cities) have varying degrees of responsiveness to changes in effective density. Understanding these differences is essential to the accurate assessment of a transport scheme's agglomeration benefits. We need to understand the *local* responsiveness to changes in effective density rather than generalising by assuming that each city or area is equally responsive[8]. This process enabled us to build a detailed picture of levels of responsiveness to changes in effective density throughout the Leeds city-region. Using these figures, we were then able to accurately predict the agglomeration gains associated with each of our selected transport investment packages.

Findings

Tables 3 and 4 present the findings of the analysis. Table 3 lists both conventional and agglomeration benefits for all three of the investment packages, broken down by local authorities within the study area. Table 4 summarises the total conventional and agglomeration benefits for each package and highlights the percentage of the total benefit for each scheme accounted for by agglomeration gains.

Overall, there are four key conclusions to be drawn from these findings:

- **Conventional benefits still accounted for most of the gains from these transport investments** – in all the case studies the greater part of the economic benefit in the schemes lay in the value of reduced journey times rather than agglomeration gains. However, this may not be the case with every transport investment.
- **Agglomeration benefits were significant** – in all cases, incorporating agglomeration benefits into the investment appraisals substantially increased the expected benefit.
- **Agglomeration gains varied between areas** - all three packages produced different levels of agglomeration benefits across the study area.
- **Overall, the agglomeration benefits achieved by improving access to Leeds city centre outstripped those projected for the other packages.**

[6] The study used a simplified version of the conventional appraisal method. This was sufficient for our needs because we were interested in testing the agglomeration impacts of investment packages with a range of conventional user benefits. This meant that it was more important to obtain the relative conventional benefits of the packages rather than exact conventional benefits. The methodology used was robust from this purpose. A full explanation of the methodology employed is available on request.

[7] The figures in Table 1 and subsequent tables refer to the *annual net benefit* from the package of schemes in 2016, assuming that the full package was completed in 2006. In other words, the figures quoted for agglomeration benefits are based on the evolution of the economy from 2006 to 2016, assuming that the required transport investments were put in place.

[8] For more information on the method used here please refer to: Marshall, A, and Webber, C. (2007)The case for better transport investment: Agglomeration and growth in the Leeds City Region, Centre for cities, London

Table 3: Conventional, agglomeration and total benefits for packages 1, 2 and 3 (2016 values, £m 2002 prices)

	Package 1			Package 2			Package 3		
	User (£m)	Agg (£m)	Total (£m)	User (£m)	Agg (£m)	Total (£m)	User (£m)	Agg (£m)	Total (£m)
Leeds CR	**52.7**	**12.4**	**65.2**	**57.6**	**7.9**	**65.5**	**83.6**	**12.1**	**95.8**
Barnsley	0.0	0.0	0.0	2.4	0.2	2.6	0.9	0.2	1.1
Bradford	9.4	1.8	11.2	8.6	1.2	9.8	0.4	0.4	0.8
Calderdale	2.4	0.5	2.9	0.2	0.1	0.2	0.9	0.2	1.1
Kirklees	1.1	0.4	1.4	1.7	0.3	2.1	12.8	1.2	13.9
Leeds	31.2	8.0	39.1	34.0	4.6	38.6	53.3	8.6	61.9
Wakefield	5.2	0.9	6.0	5.8	0.5	6.4	0.5	0.3	0.8
York	1.7	0.5	2.2	2.4	0.6	3.0	11.2	1.0	12.3
Harrogate	0.0	0.1	0.1	1.1	0.3	1.4	0.0	0.1	0.1
Selby	1.9	0.4	2.2	0.9	0.1	0.9	3.5	0.2	3.7
Craven	0.0	0.0	0.0	0.5	0.1	0.5	0.1	0.1	0.2
Sheffield CR	**0.1**	**0.2**	**0.3**	**1.9**	**0.4**	**2.3**	**1.1**	**0.5**	**1.6**
Doncaster	0.1	0.1	0.2	0.9	0.1	1.0	0.0	0.1	0.1
Rotherham	0.0	0.0	0.0	0.0	0.1	0.1	0.6	0.2	0.8
Sheffield	0.0	0.1	0.1	1.0	0.2	1.1	0.3	0.2	0.5
Bolsover	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.1
Chesterfield	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.1
High Peak	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
North East Derbyshire	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1
Rest of study area	**1.2**	**1.1**	**2.3**	**1.1**	**1.6**	**2.6**	**116.4**	**11.9**	**128.3**
Rest of Derbyshire	0.0	0.1	0.1	0.0	0.1	0.1	0.3	0.2	0.4
Rest of N. Yorkshire	0.0	0.0	0.0	1.0	0.2	1.2	0.0	0.0	0.0
Rest of Notts.	0.0	0.1	0.1	0.0	0.1	0.2	0.4	0.2	0.6
Humberside	0.4	0.2	0.6	0.0	0.2	0.2	0.0	0.1	0.1
Manchester	0.6	0.2	0.8	0.0	0.2	0.2	115.6	10.8	126.3
Rest of North West	0.1	0.3	0.4	0.0	0.3	0.3	0.0	0.2	0.2
Lincolnshire	0.0	0.1	0.1	0.0	0.1	0.1	0.2	0.2	0.4
West Midlands	0.0	0.2	0.2	0.0	0.3	0.3	0.0	0.2	0.2
Total	**54.0**	**13.7**	**67.7**	**60.5**	**9.8**	**70.4**	**201.1**	**24.5**	**225.6**

Table 4: Summary: agglomeration benefits in proportion to user benefits (2016 values, £m 2002 prices)

	Package 1	Package 2	Package 3
User benefits (£m)	54.0	60.5	201.1
Agglomeration (£m)	13.7	9.8	24.5
Proportion	**25.4%**	**16.2%**	**12.2%**

Analysis of findings

So what does this mean for transport investment in the Leeds City Region, especially in the context of the Eddington Transport Study, the Rail White Paper and the Review Sub-National Economic Development and Regeneration?

Agglomeration benefits arising from transport investment in the Leeds City Region are significant. The value of transport investment to the city-regional economy has been systematically underestimated, with up to 25% of the benefits going un-counted. The scale of agglomeration gains illustrated in Table 3, above, confirms the importance of agglomeration and density to the performance of the city-region's economy. Decision-makers must take account of these additional benefits if they are to prioritise limited investment resources effectively.

Agglomeration benefits must be fully integrated into the city region transport investment proposals. The figures in Table 3 show the wider economic effects of systematic and prioritised investment in the city-region. This could help to raise additional finance from Regional Funding Allocations, private investors, and central government by suggesting that some investments result in substantial business gains.

Improved connections to Leeds city centre (Package 1) would provide proportionally greater agglomeration benefits than improved connections between the urban centres in the Leeds City Region (Package 2). Decision-makers in the Leeds City Region may need to weigh up the potential benefits of the two approaches – as an economic assessment suggests that improved access to Leeds city centre from around the city-region delivers greater, but more concentrated, economic benefits.

Inter-regional transport investment (Package 3) can deliver substantial agglomeration gains. Although improved Leeds-Manchester connections showed the lowest agglomeration benefits in percentage terms, the *gross benefits* were quite high. The Leeds City Region should work closely with neighbouring city-regions, such as Manchester and Sheffield, as well as the Northern Way, to explore the full economic consequences of inter-regional transport connections.

The geographic distribution of agglomeration benefits must be taken into account in the appraisal of transport investment packages. The scale of agglomeration gains varies between different locations. As our analysis shows, both intra-regional and inter-regional schemes concentrate agglomeration benefits in large, dense city centres – with less benefits accruing to peripheral areas.

Conclusions and recommendations

What does all this mean for policy-makers? The evidence suggests that policy changes are needed at national, regional and city-regional level – so that the UK can capitalise on the 'agglomeration potential' of its major cities.

Recommendations for central government

1. **Make agglomeration benefits a key ingredient of the transport appraisal process and include it in guidance for future Regional Funding Allocations.** Our evidence shows the relative importance of these benefits – and how they can be used to prioritise transport spend to achieve maximum economic impact. The DfT should work with RDAs and other regional stakeholders to include agglomeration as a factor in the project appraisal process. This flows from the Review of Sub-National Economic Development and Regeneration (HM Treasury et al, 2007) that noted the Government's interest in increasing Regional Funding Allocations, and therefore flexibility to tackle specific regional priorities.

2. **Incentivise the development of transport appraisal capacity at city-regional level through the Local Transport Bill.** City-regions that invest in expertise and appraisal, alongside stronger transport governance structures, should be rewarded with greater financial freedoms and flexibilities.

Recommendations for regional agencies

3. **Develop capacity to analyse agglomeration and wider economic benefits within RDAs.** Given their existing role in the prioritisation of Regional Funding Allocations and Transport Innovation Fund monies, and their expected lead on Single Regional Strategies from 2010, RDAs need in-house capacity to explore agglomeration effects both within and between regions.

4. **Conduct agglomeration analysis for specific inter-regional schemes.** The Northern Way RDAs should follow up their general work on agglomeration with modelling of specific schemes – especially Trans-Pennine rail improvements – that are considered priority investments. Since the benefits of these schemes will occur across the North, the cost of conducting analysis should also be shared.

Recommendations for city-regions

5. **Use agglomeration analysis to prioritise transport resources.** Integrated Transport Strategies should consider agglomeration effects when prioritising local resources. In city-regions and sub-regions, cross-boundary collaboration will be required to deliver this analysis, and to ensure maximum economic impact and value for money.

6. **Conduct agglomeration analyses alongside scheme costing.** This could help bolster the case for funding transport projects earlier in the project development process – and will help city-regional leaders to prioritise worked-up schemes, rather than submit 'shopping lists' for funding.

7. **Share best practice on wider economic benefits with other city-regions.** The Leeds City Region, for example, should share the positive lessons from the development of its *Transport Vision,* and the calculation of agglomeration benefits, with other Core Cities.

As this study shows, the wider economic benefits of transport improvements, and especially agglomeration effects, are set to play an increasingly important role in investment decisions. Cities, regional agencies, and Whitehall departments must account for wider economic benefits when planning their long-term investment strategies – and prioritise the 'smart investments' that deliver clear economic dividends.

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