International Transport Forum

Strategic Investment Packages

Case-Specific Policy Analysis

OECD

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The International Transport Forum

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Case-Specific Policy Analysis Reports

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Executive summary

What we did

The Deputy Prime Minister's Office for Investments and Informatisation of the Slovak Republic (DPMO) asked the International Transport Forum (ITF) at the OECD to contribute to the reform of its National Investment Plan, by identifying best practice in transport appraisal with particular focus on how the existing policy frameworks can be better used by governments to strategically address regional challenges. The resulting project was part of an OECD-wide effort, co-ordinated by the Office of the Secretary-General, to help the Slovak Republic improve its strategic investment planning.

As part of the project, the ITF organised an Expert Workshop on Strategic Investment Packages on 15-16 March 2018 in Bratislava, Slovak Republic. The meeting gathered key experts from France, Sweden, and the UK to set out best practice in appraising regional economic benefits of transport investment and to discuss how governments could strategically address regional challenges through implementing integrated policies combining transport infrastructure investment with other measures ("strategic investment packages"). This report summarises findings from the project.

What we found

While economic disparities among OECD countries have been diminishing, the long-term trend of increasing inequality among regions has continued. Many governments in OECD countries face the growing socio-economic divide between the metropolitan areas and the periphery as one of the greatest political challenges.

Improving connections between and within cities can help governments lift productivity in those lagging regions that suffer from shortcomings in transport infrastructure. Transport investment, however, is not the only driver of productivity. Beyond investment in transport and other types of physical infrastructure, any assessment of productivity disparities also needs to determine any potential shortfall of investment into knowledge-based and human capital as well as consider aspects of governance and regulation that may have a bearing on regional productivity.

The participants of the Expert Workshop agreed that a more integrated approach to infrastructure investment planning is needed to identify packages of policies that can help address regional productivity challenges. This will entail conducting a systematic assessment of the determinants of productivity to identify the nature and the location of economic disparities.

Some of the productivity assessment exercises discussed at the Workshop provide useful pointers as to how that could be achieved in practice. In particular, work conducted by the Manchester Independent Economic Review (MIER, 2009) and Independent Economic Review (IER, 2016) in the UK serve as good examples of how to assess the extent to which different factors account for economic disparities across regions. Among the surveyed countries, Sweden is the only one that conducts systematic reviews of the potential regional economic impacts of all planned government transport investments. The Swedish Transport Authority conducts one joint regional economic impact assessment of all transport schemes included in the National Transport Plan. An important feature of this assessment is that it is nation-wide, hence it accounts for regional displacement.

To assess any possible productivity impacts of investments in transformative projects, transport departments in France, Sweden and the UK complement standard cost-benefit analysis with wider economic impacts assessments. The participants of the Expert Workshop discussed the methodological challenges pertaining to such assessments and how they could be mitigated.

What we recommend

- Transport investment alone is not enough to unlock productivity improvements. To identify the productivity challenge, the first step should be an assessment of the determinants of productivity. This should be coupled with both a bottom-up and top-down assessment of infrastructure need across all sectors of infrastructure.

- Once the productivity challenge is identified and an assessment of infrastructure needs is conducted, policy makers should devise "strategic investment packages" i.e. sets of integrated policies and investments across different sectors of economic infrastructure and multiple policy areas to help unlock regional economic growth.

- The transport appraisal framework based on CBA is a helpful tool in making investment choices. An assessment of wider economic impacts and GDP effects should become part of transport appraisal of schemes that may be transformative to the economy. Explicit assessment of the distributive impacts of potential investments should also be undertaken to help the decision makers think strategically about how the planned investments and policy changes are likely to affect the economic disparities between regions. The GDP metrics can provide an intuitive indication for policy makers of the project's impacts on the economy, possibly making it easier to communicate the results to the public.

Chapter 1. Transport investment and regional economic development: Why do we need strategic investment packages?

Background

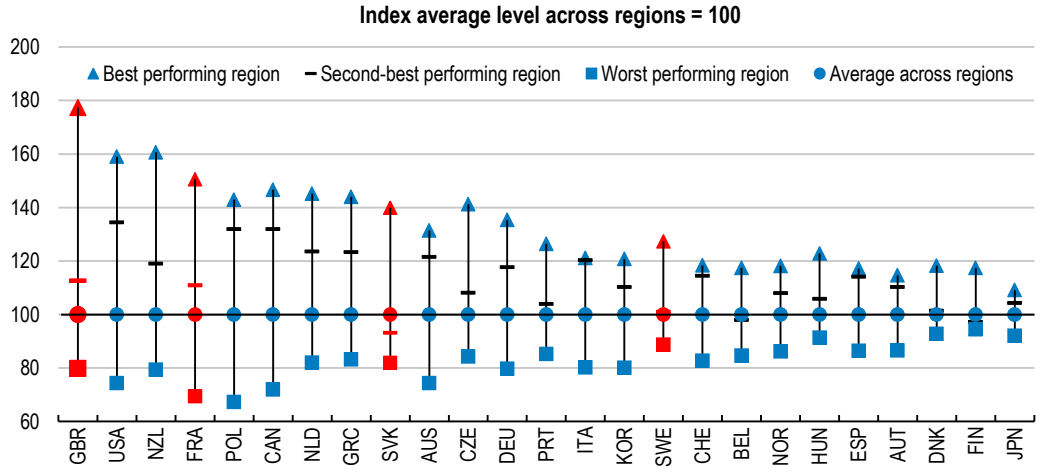
The Deputy Prime Minister's Office for Investments and Informatisation of the Slovak Republic (DPMO) asked the International Transport Forum (ITF) at the OECD to contribute to the reform of its National Investment Plan, by identifying best practice in transport appraisal with particular focus on how the existing policy frameworks can be better used by governments to strategically address regional challenges. The resulting project was part of an OECD-wide effort, co-ordinated by the Office of the Secretary-General, to help the Slovak Republic improve its strategic investment planning.

As part of the project, the ITF organised an Expert Workshop on Strategic Investment Packages on 15-16 March 2018 in Bratislava, Slovak Republic. The meeting gathered key experts from France, Sweden, and the UK to set out best practice in appraising regional economic benefits of transport investment and to discuss how governments could strategically address regional challenges through implementing integrated policies combining transport infrastructure investment with other measures ("Investment Packages"). This report summarises findings from this project.

The challenge of widening economic disparities across regions

The global economy is currently growing at its fastest pace since the global financial crisis, but the apparent economic growth has been uneven. While economic disparities among OECD countries have been diminishing, the long-term trend of increasing inequality among regions has continued. Economic disparities between regions are now higher than they were a decade or two ago (Bartolini et al., 2016). This trend is reflected in significant regional disparities in labour productivity across the OECD (Figure 1.1).

Figure 1.1. **Regional disparities in labour productivity for a selection of OECD countries**
Gross value added (GVA) per worker by region, 2014



Note: Regions are defined at the Territorial Level 2, see: http://www.oecd.org/cfe/regional-policy/42392313.pdf. Countries are ranked in descending order of the difference in the level of productivity between the best and the worst performing region. All data are for 2014, except for Finland and Hungary (2013), and Japan, New Zealand and Switzerland (2012).

Source: OECD, "Regional Economy", *OECD Regional Statistics* (database), April 2017.

Many governments in OECD countries perceive the growing socio-economic divide between the metropolitan areas and the periphery as one of the greatest political challenges. Widening economic disparities may erode social cohesion, can result in lower economic growth and fuel anti-market sentiments as well as disillusionment with politics and globalisation, which may result in macroeconomic and political instability. Fostering inclusive growth is thus a very important policy objective for governments across the OECD. Whether they will be able to do so effectively will largely depend on two considerations:

- Are planning frameworks suited to creating "strategic investment packages" i.e. packages of measures spanning not only transport, but also measures on education, labour markets, etc.? Such a "packaged" approach is needed to tackle the productivity challenge.

- Do the transport appraisal tools employed by government provide decision-makers with useful information on the regional effects of policies, in particular any potential productivity impacts of transport investment?

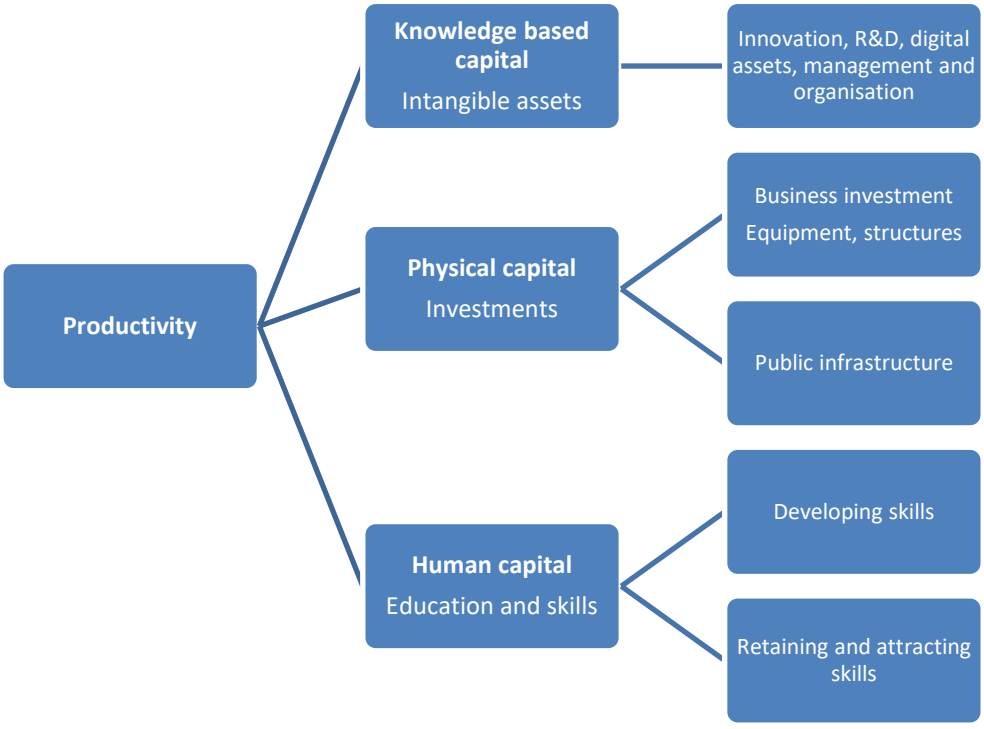
Planning for "packaged" transport investments

Adequate provision of transport infrastructure is a very important component of social and economic success of any society. Transport connectivity brings individuals and firms closer together. Better matching of people to jobs enhances labour market efficiency and translates into productivity increases from which the entire economy benefits. Businesses benefit from transport connectivity – better connectivity increases their access to suppliers and customers. Moreover, connectivity provided by the transport network extends the range of job opportunities, brings individuals closer to their friends and relatives, holiday destinations as well as services such as education or health care (ITF, 2017a).

Improving connections between and within cities can help lift productivity in those lagging regions that suffer from shortcomings of transport infrastructure. Transport investment, however, is not the only driver of productivity.

In general, the factors that determine labour productivity can be divided up into three broad categories: knowledge-based or intangible capital, physical capital, and human capital (Figure 1.2). Beyond investment in transport and other types of physical infrastructure, any study of productivity disparities also needs to determine any potential shortfall of investment into knowledge-based and human capital. Any aspects of governance and regulation that may have a bearing on regional productivity should be considered as well.

Figure 1.2. **Structural determinants of regional productivity**



Source: Adapted from Gal and Egeland (2018).

The widening labour productivity disparities within OECD counties are a reflection of accumulation of physical, knowledge-based, and human capital in cities and its outflow from other parts of the country. These factors tend to reinforce one another, hence further deepening labour productivity divisions between successful and lagging regions. Economically strong regions attract workers from elsewhere with job prospects, excellent transport connectivity, better hospitals, schools, more attractive cultural offer, etc.

The labour productivity disparities between regions are a function of the sectoral composition of their economies. Due to the sectoral composition of a region being a function of its geography, demography, pre-existing investments and policies, it would be unrealistic to expect that bringing workers and businesses closer together in regions will be able to bridge the productivity gap relative to the centres of economic activity. Increasing agglomeration alone is unlikely to fundamentally change the sectoral composition of a region. Furthermore, the productivity impact with respect to agglomeration is found to be highly inelastic and decay rapidly with distance. Thus, for agglomeration to make an impact on regional productivity gaps, very significant investments would be required.[1]

The participants of the Expert Workshop agreed that a more integrated approach to infrastructure investment planning is needed to identify packages of policies that can help address regional productivity challenges. This will entail conducting a systematic assessment of the determinants of productivity to identify the nature and the location of economic disparities.

The participants discussed examples of planning and delivery of transport projects that provide useful pointers of how a more integrated approach to planning could be achieved in practice. Projects like the Oresund Bridge in Sweden or the Jubilee Line in London demonstrate how transport investment

can deliver significant regional economic benefits if it is coupled with investment in attracting and retaining skills, e.g. through building science parks in case of the Oresund project.

Moreover, Australia and, more recently, the UK have established independent planning bodies with an objective to determine the need for infrastructure investment across sectors and policies. An important role of these agencies is to identify and suggest strategic ways of addressing key national challenges, to complement the conventional bottom-up project-by-project infrastructure planning (ITF, 2017a).

Some previous studies on regional economic imbalances provide helpful guidance as to how Investment Packages could be developed in practice. Work conducted by the Manchester Independent Economic Review (MIER, 2009) and Independent Economic Review (IER, 2016) in the UK serves as a good example of how to assess the extent to which different factors account for economic disparities across regions. The studies demonstrate that it is not the lack of adequate transport provision that explains why the north of England lags behind the south, but predominantly the shortage of skills (IER, 2016; MIER, 2009). Addressing skills shortage would require a multi-pronged approach geared not only towards developing skills in the north of England, but also to retaining them – by making the north of England an attractive place to live and work.

While inadequate transport investment can restrict growth, too much focus on economic infrastructure in general, and transport infrastructure in particular, may however lead to wasteful investment or it may obfuscate the need to review other policy areas relevant for achieving productivity improvements. Conversely, economic growth of regions may sometimes be wrongly attributed to transport investment in the public debate.

For example, France has been experiencing significant and growing disparities between its metropolitan regions. In the public debate, transport investment is often portrayed as a driver of economic growth. In fact, as discussed at the Expert Workshop, the rapid growth of employment in the cities connected to Paris by TGV[2], such as Lyon or Marseille, has been linked to the development of high-speed rail. But there is no evidence supporting an often repeated claim that the high-speed rail network supported economic development in other cities alongside the route. The only tangible positive impact on the employment levels was observed in the areas in the immediate vicinity of some of the rail stations (the estimates however ignore the possible displacement of economic activity from other parts of a region). As discussed at the Expert Workshop, other important factors that actually did have positive impacts on regional economic development in the French regions, in particular population increases, urbanisation, and location of investment production in particular areas of the country are often underplayed in the political debate on transport investment.[3]

The UK is one country where economic disparities among regions have been increasing at least since the early 2000s, and have accelerated since the global financial crisis. They are now among the highest in the OECD (Gal and Egeland, 2018). Fostering economic growth in the lagging regions of the north of England has been high on the political agenda in the UK. In 2016 the Government launched the Northern Powerhouse strategy to increase productivity in the north of England and Wales, through investment in new transport links, improvements to governance, and investment in other areas, such as science, skills and innovation.[4]

Improved transport connectivity that will by brought by High Speed Two (HS2) is seen as a major contribution to economic rebalancing. The benefits from greater labour and business connectivity are estimated to be proportionately greater in the North and the Midlands than in London and the South East. Connectivity improvements will be complemented with a number of investments at regional and city levels, to fully capitalise on the opportunities for economic growth. Policy initiatives include integration of high-speed, regional and municipal transport services, mixed-use regeneration developments around

stations (e.g. of the Mayfield area near the Manchester station, of the South Bank area in Leeds, of the area near Birmingham station), and regional initiatives and local partnerships supporting business, high tech and manufacturing hubs (e.g. Arden Cross in Solihull, South Bank in Leeds, Northern Gateway Development Zone) (HS2, 2017a, b). In terms of productivity gains, HS2 is expected to, for instance, contribute up to GBP 517 million per year to Liverpool City Region's Gross Value Added (GVA) (Steer Davies Gleave, 2014), and add GBP 54 billion GVA to Leeds City Region's economy by 2050 (West Yorkshire Combined Authority, 2018).

Quantifying regional productivity impacts in government transport appraisal

Quantifying the benefits and costs of transport investment or policy change is broadly accepted as a very valuable input to government decision-making, although its precise role and scope of its use differ across the OECD.[5] The most commonly used assessment tool is the cost-benefit analysis (CBA). It provides politicians and officials with information about the expected costs and benefits of a project, and has enabled them to understand which investments are likely to represent the prudent use of public money on the grounds that their benefits substantially exceed their costs. Metrics such as the benefit-cost ratio (BCR) enable decision-makers to prioritise schemes and make the best use of limited financial resources (ITF, 2017b).[6]

To assess the impact of a project on the economy, standard CBA values time and operating savings, reductions in road accidents, and project costs. Other valuations are monetised and included in the CBA as well, for example a range of environmental impacts. Wherever impacts are impossible to monetise, they are often assessed through a system of scores.

Standard CBA tends to capture most of the impacts of marginal transport projects. This, however, is not the case for non-marginal and transformative projects, which require additional assessments to be conducted in order to capture most of their impacts (ITF, 2014):

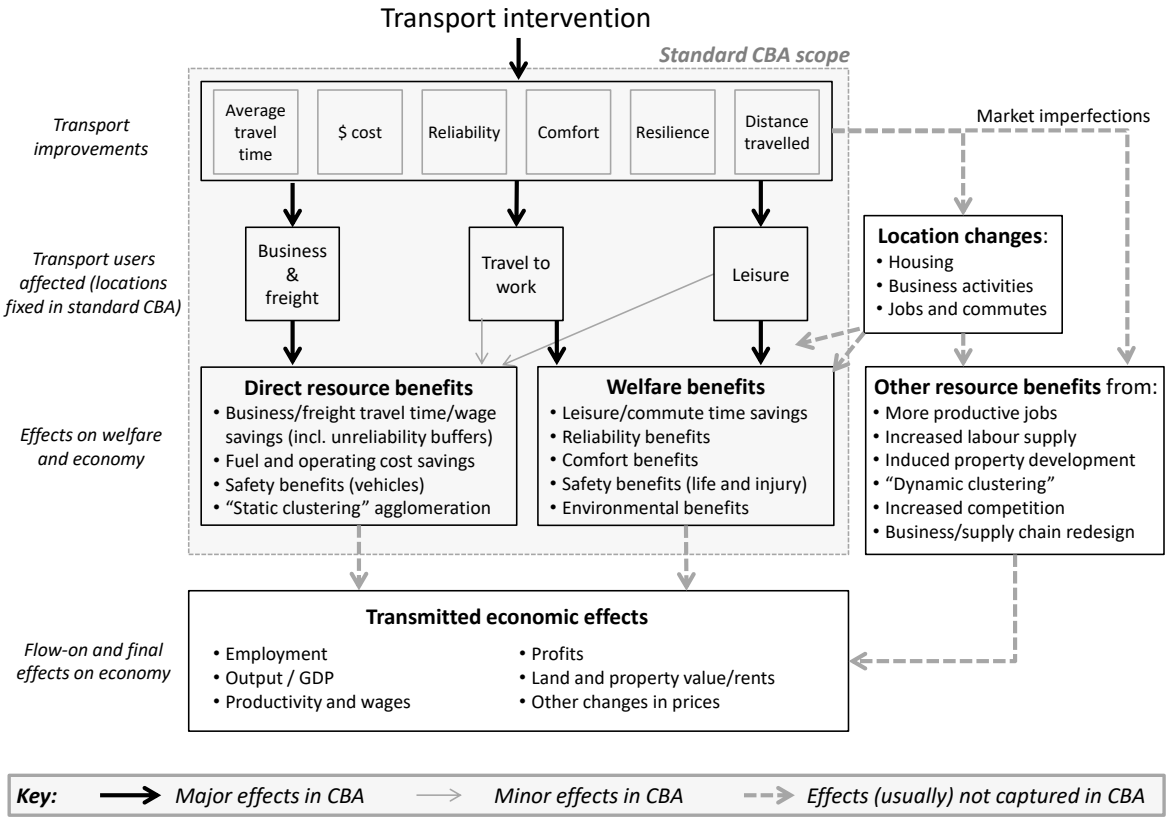
- *Marginal schemes* have small and local impacts on the spatial distribution of land use. Quantifying such impacts is thus largely irrelevant to the decision maker. Conventional economic welfare analysis focused on direct user and operator benefits will provide a sufficient and coherent framework for estimating the scheme benefits. Wider economic impacts can be ignored in the appraisal of marginal schemes.

- Schemes can be classified as *non-marginal and non-transformational* if there are sources of market failure present (such as agglomeration externalities or imperfect competition) that require complementing the conventional welfare analysis with an analysis of wider impacts of a project to account for all possible impacts of the scheme. Such projects constitute a significant proportion of schemes and a larger proportion of the transport budget. Their evaluation should consider any induced land use and economy change due to the implementation of a project as well as any agglomeration and wider impacts on the economy.

- *Transformational schemes* are schemes that induce changes in accessibility that are associated with large changes in zonal attractiveness, i.e. the regional economy is significantly different with the project in place than without it. Very few projects fall into this category, though several were discussed at the Expert Workshop (for example, Crossrail or Grand Paris Express). To account for the impacts of such projects, the appraisal framework should ideally capture the impacts on the regional economy within the national context and across the key sectors.

Figure 1.3 below illustrates the relationship between standard CBA, wider benefits, and economic effects of a transport project.

Figure1.3. **Relationship between standard CBA and final economic effects of a transport project**



Source: ITF (2017a).

France, Sweden and the UK share important high-level similarities in terms of how they quantify the impacts of transport investment. The key features of appraisal frameworks in France, Sweden and the UK are summarised in Annex 1. All three countries rely on assessments of which CBA is the most important part. While CBA is a key component of every assessment, it is usually complemented by a set of other important considerations. For transformative projects, France, Sweden, and the UK have developed methodologies to account for wider economic benefits of transport investment. In the Expert Workshop, the participants discussed how such methodologies were applied to Crossrail and HS2 in the UK[7] and Grand Paris Express in France.[8]

Other additional assessments include considerations of how well a scheme would fit with local, regional and national strategies in the UK, or analyses of accessibility and regional economic impacts in France. With social equity high on the political agenda, the Swedish Transport Authority conducts one joint regional economic impact assessment of all transport schemes included in the National Transport Plan. An important feature of this assessment is that it is nation-wide, hence it accounts for regional displacement.

Estimating the wider economic benefits and GDP effects of transport investment faces a number of methodological challenges. The process is data-heavy, with some data sets not available or potentially

incompatible. It is also reliant on complex modelling techniques. It is not uncommon for the assessments to be criticised for being reliant on assumptions that are arbitrary or on the lack of understanding of interaction between certain economic factors.

Efforts are currently under way to revise, harmonise and expand transport appraisal methodology in Slovakia. Under the co-ordination of DPMO, inputs from line ministries are to inform the creation of a new universal appraisal framework, which will apply to all existing and future transport infrastructure projects[9]. For transformative projects, the framework should include wider economic impacts assessment, to inform the decision-makers on how such projects may support regional economic development.

Policy recommendations

- Transport investment alone is not enough to unlock productivity improvements. To identify the productivity challenge, the first step should be an assessment of the determinants of productivity. This should be coupled with both a bottom-up and top-down assessment of infrastructure needs across all sectors of infrastructure.

- Once the productivity challenge is identified and an assessment of infrastructure needs is conducted, policy makers should devise "strategic investment packages" i.e. sets of integrated policies and investments across different sectors of economic infrastructure and multiple policy areas to help unlock regional economic growth.

- The transport appraisal framework based on CBA is a helpful tool in making investment choices. An assessment of wider economic impacts and GDP effects should become part of transport appraisal of schemes that may be transformative to the economy. Explicit assessment of the distributive impacts of potential investments should also be undertaken to help the decision makers think strategically about how the planned investments and policy changes are likely to affect the economic disparities between regions. The GDP metrics can provide an intuitive indication for policy makers of the project's impacts on the economy, possibly making it easier to communicate the results to the public.

References

Bartolini, D., S. Stossberg and H. Blöchliger (2016), "Fiscal Decentralisation and Regional Disparities", *OECD Economics Department Working Papers*, No. 1330, OECD Publishing, Paris, http://dx.doi.org/10.1787/5jlpq7v3j237-en.

Gal, P. and J. Egeland (2018), "Reducing regional disparities in productivity in the United Kingdom", *OECD Economics Department Working Papers*, No. 1456, OECD Publishing, Paris, http://dx.doi.org/10.1787/54293958-en.

HS2 (2017a), High Speed Two Phase Two: Strategic Case: Moving Britain Ahead, Department for Transport, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/629393/high-speed-two-phase-two-strategic-case.pdf.

HS2 (2017b), High Speed Two Phase Two: Economic case advice for the Department for Transport, Department for Transport, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/628526/CS866_A_HS2_Phase_2a_Economic_case.pdf.

IER (2016), "The Northern Powerhouse Independent Economic Review", SQW Ltd and Cambridge Econometrics Ltd, *Final Executive Summary Report commissioned by Transport for the North*, http://www.sqw.co.uk/files/5414/6723/8824/16987_-_TfN_-_NPH_IER_-_Executive_Summary_-_Final_24_June_2016.pdf.

ITF (2014), "Appraising Transformational Projects: The Case of the Grand Paris Express", *International Transport Forum Policy Papers*, No. 3, OECD Publishing, Paris, https://doi.org/10.1787/5jlwvzhlj935-en.

ITF (2017a), *Strategic Infrastructure Planning: International Best Practice*, OECD Publishing, Paris.

ITF (2017b*), Quantifying the Socio-economic Benefits of Transport*, ITF Roundtable Reports, No. 160, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789282108093-en.

MIER (2009), *Manchester Independent Economic Review: The Case for Agglomeration Economies*, www.manchester-review.org.uk/project_718.html.

Steer Davies Gleave (2014), "Independent Economics Study: HS2 and the Liverpool City Region", Report commission by Merseytravel, http://www.linkingliverpool.org/uploadedfiles/documents/Independent%20Economic%20Benefit%20Study.pdf.

West Yorkshire Combined Authority (2018), Leeds City Region HS2 Growth Strategy, https://www.westyorks-ca.gov.uk/media/2808/hs2-growth-strategy-20122017.pdf.

Notes

[1] See Chapter 2 for a review of evidence in the UK.

[2] The TGV is France's intercity high-speed rail service, operated by the SNCF, the national rail operator.

[3] See Chapter 4 for a discussion.

[4] See https://northernpowerhouse.gov.uk/..

[5] See Annex 1 for a comparison of CBA practice in France, Sweden, and the UK. For a comparison of how different countries apply CBA to transport projects, see https://www.gov.uk/government/publications/international-comparisons-of-transport-appraisal-practice.

[6] See Chapter 3 for an overview of transport appraisal in the UK and Chapter 5 for an overview of transport appraisal in Sweden.

[7] See Chapter 3 for details.

[8] See Chapter 4.

[9] Currently, transport appraisal framework in Slovakia is only applied to those schemes that rely on EU funding. The framework does not explicitly a requirement to appraise wider economic benefits of non-marginal transport investments.

Chapter 2. Reducing productivity disparities across different regions of the United Kingdom

Introduction

Over the course of the 20th century the UK experienced significant economic structural changes as a result of a number of external shocks. These shocks have led to a change in the UK's comparative advantage away from manufacturing, where in the 1800s the UK had been the world's pre-eminent industrial power, towards the service sector. Service exports now account for approximately 45 % of total exports (ONS, 2018) with a surplus of about 4.7 % of GDP (ONS, 2017).

This structural change has gone hand in hand with the growth in regional imbalances. This phenomenon is termed the "North-South divide" to reflect the fact that much of the growth has been concentrated in the south of United Kingdom, particularly in and around London, while the rest of the country has been characterised by deindustrialisation: only the regions of London and the South East have levels of productivity above the UK average. Thus, in the UK context, rebalancing is focused on rejuvenating former industrial heartlands.

Rebalancing is fundamentally about re-allocating resources to achieve better economic outcomes. Resources could be re-allocated among regions, whereby labour and capital are moved from better performing to lagging regions. Whilst this would raise the performance of lagging regions, it would occur at the expense of better performing regions and would not necessarily improve outcomes for the original inhabitants. Alternatively, resources could be re-allocated within regions to more productive activity. This would act to improve both the national and regional economic performance and outcomes for the inhabitants of lagging regions. In the case of the UK, policy is primarily focussed on the latter of these approaches.

Policy makers around the world are often concerned with trying to achieve a rebalancing through a single, large scale intervention, such as transport investment. Such an approach is reminiscent of the "financing gap model" of development economics, which espoused large scale investments (Easterly, 1999). However, policy-makers are likely to find, just as development economists did in the 1980s, that such approaches more often fail than succeed. Indeed, one of the key lessons from development economics is the need for a comprehensive strategy, with clearly defined objectives and a variety of policy levers (Root and Campos, 1996).

Transport economic theory sets out the potential impacts and transmission mechanisms through which they occur. Key points for rebalancing include the context specific nature of the impacts and the potential for impacts to represent the displacement of activity rather than national improvement (Venables et al., 2014).

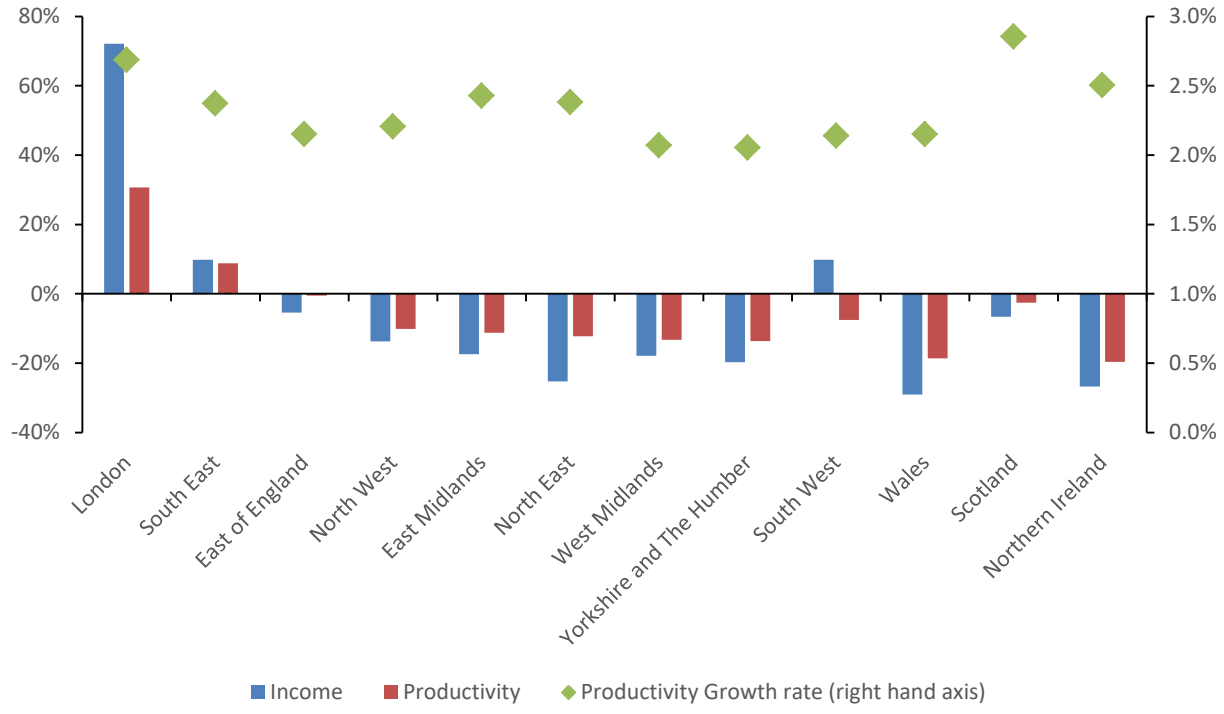
There are also lessons to be drawn from spatial theories. Whilst there is no overarching theory of place, the theories are not mutually exclusive and provide many pertinent insights for rebalancing. Of particular interest is the emphasis regional economics puts on the performance of the tradeable sector as the key determinant of a city's overall economic health. This would appear to strongly concur with the UK's recent experience.

One of the biggest hindrances to policy debates is the limited availability of empirical evidence and evaluation. Nevertheless, the available evidence does suggest the economic impacts will be modest and depend upon the specific context, depending upon such factors as the type of intervention and the state of the existing network (Melo et al., 2013 and Fernald, 1999).

The scale of regional economic imbalances

The UK is characterised by significant regional economic imbalances (Figure 2.1). These imbalances are particularly pronounced when measured in terms of income per capita, with London approximately 70% above the UK average, and Wales approximately 30% below. Productivity differentials account for a significant proportion of the regional imbalances, though not all, which suggests that rates of economic activity and the number of hours worked are also important.

Figure 2.1. **Income per capita and productivity per hour relative to UK average by region (2015) and regional average annual productivity rate by region (2004-2015)**



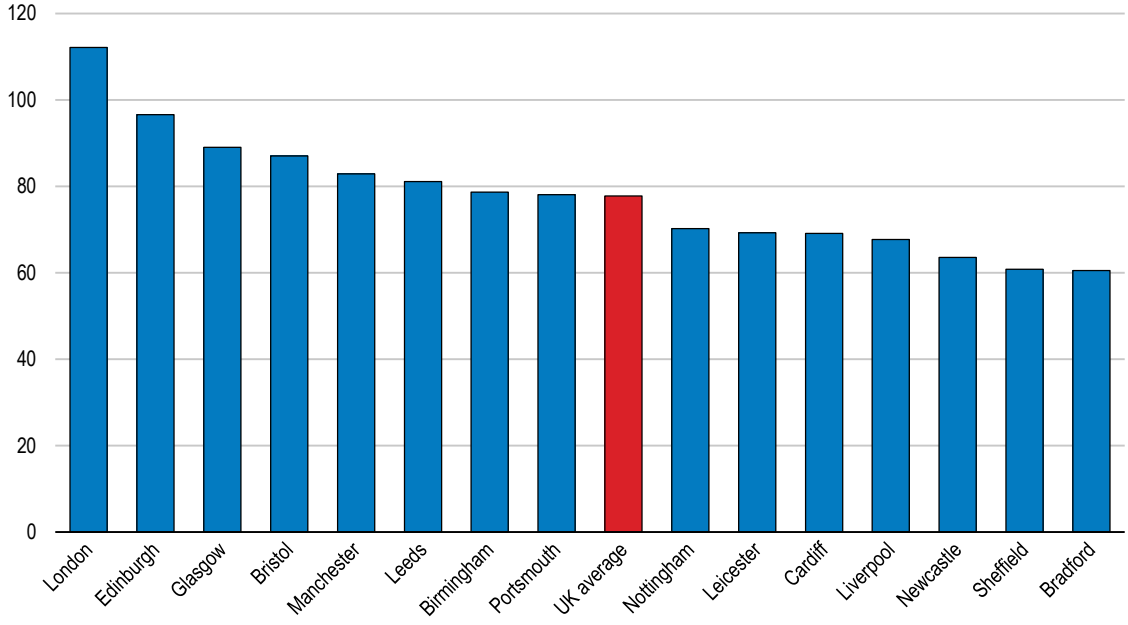
Source: ONS.

The challenge of convergence should not be underestimated. The UK's regional imbalances are large compared to most other OECD countries (Gal and Egeland, 2018). However, the focus on NUTS 2 is not necessarily the best comparison group. This is because the administrative division of regions reflects mainly political, rather than economic, considerations. For example, London does not actually capture the full extent of the metropolitan area; the latter extends into the South East and East of England. In a similar vein, Scotland covers several metropolitan areas as well as over 790 islands. Thus, regional comparisons, particularly with respect to London, are not on a like-for-like basis.

When imbalances across metropolitan areas are examined, a slightly different picture emerges (Figure 2.2). Whilst London is still the most productive region, there is a more even distribution of areas around the average UK level of productivity. This demonstrates that even within regions there is a large variation in performance. Nevertheless, there remain large imbalances between London and lagging metropolitan areas.

Figure 2.2. **Productivity performance of UK metropolitan areas**

Labour productivity of metropolitan areas, in constant 2010 USD PPP thousand, 2013



Notes: Labour productivity is defined as the ratio between GDP and total employment. Metropolitan area is defined as a functional urban area with a population of 500 000 or more. 2012 for France, Germany, Italy, Japan, Poland, Spain and the OECD aggregate. The OECD aggregate is calculated as an unweighted average of the metropolitan areas of 28 OECD countries for which data are available. PPP: purchasing power parity.

Source: OECD (2017).

Achieving convergence on productivity levels would require a period in which growth rates of currently lagging regions exceed that of London, which would require a rapid acceleration of growth in many regions. Thereafter, for convergence to be sustained, regional growth rates would need to remain in line with those in London.

The pattern of regional inequality is long-standing but is not fixed and such patterns vary markedly across countries and time. In the aftermaths of the First and Second World Wars, the United Kingdom experienced a number of shocks, which adversely affected the competitiveness of British industry (Aldercroft, 1982). Given the concentration of industry outside of the South of England, the impact of deindustrialisation has not been evenly distributed across regions. For example, in the early 20th century the UK produced 60% of the world's shipping output (metric tonnage), with 94% of the industry located in North East England and Glasgow (Ritchie, 1992). However, by 1990 the UK "ceased to have any

effective merchant shipbuilding industry" (Ritchie, 1992: p. 22). In the UK context, former industrial areas are often the primary focus of the rebalancing debate.

Drivers of regional economic imbalances

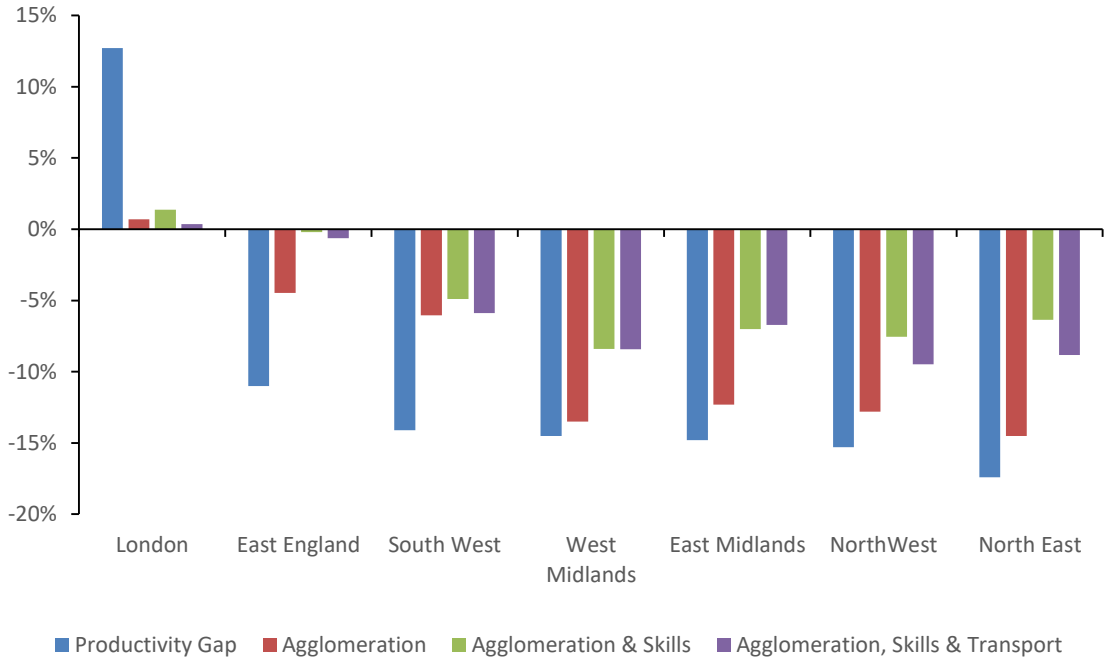
Understanding the drivers of weak regional productivity is vital to identifying the appropriate policy solutions to reduce imbalances. The Manchester Independent Economic Review (MIER) (2009) examined the productivity of English regions relative to those in the South East, and the extent to which the differentials were caused by agglomeration, skills and transport (Figure 2.3).

The importance of these factors in explaining regional productivity gaps varies markedly across regions. This implies that policies aimed at reducing imbalances must be tailored to each region.

For the four least productive regions, agglomeration and transport were not identified as particularly important in explaining their performance relative to the South East. This is not surprising given these regions are highly urbanised with dense transport networks, having emerged as key centres during Britain's industrialisation.

For these four regions, the MIER found the key driver of weak productivity was skills. Furthermore, a significant part of such weak productivity was due to unexplained factors. The explanation could include economic structure, size of companies or levels of business investment, but further analysis would be needed to determine the causes.

Figure 2.3. **Productivity of English regions relative to the South East region and the factors accounting for the productivity gap**



Note: The blue bars demonstrate the actual productivity gap with respect to the South East region. The remaining bars illustrate the size of the productivity gap if a region had the same characteristics as the South East region.

Source: MIER (2009)

This evidence suggests transport investment alone will not be sufficient to achieve rebalancing – as often skills and other policies are equally or more important. However, transport may still be a necessary component complementing other policy interventions as part of a broader spatial growth strategy. For example, the redevelopment of Canary Wharf in London, which transformed former docks into one of the UK's largest financial centres, benefitted from a number of policy interventions, including the Jubilee Line Extension and the creation of the Docklands Light Railway.

Theory

When considering the role of transport investment in rebalancing, an obvious place to start is transport economics. However, transport economics is very much focussed on the role transport can have in place-making to the neglect of other, potentially more important factors. The following sections outline the key points for rebalancing and the potential role for transport investment from transport economics and a number of location theories.

Transport economics

Transport investment is considered to affect economic performance through the following transmission mechanisms (Venables et al., 2014):

- Induced investment: accessibility improvements make an area more attractive to private sector investment.
- Employment effects: accessibility improvements increase the size of job search areas, reducing barriers to employment.
- Productivity impacts: transport improvements reduce travel costs for businesses and foster agglomeration economies through increasing the density of economic activity.

The scale of impact will be context specific, depending upon the scale, type and location of investment, and the type of problem being addressed (Venables et al. 2014).

Theory suggests that these changes can occur simultaneously and reinforce one another (Venables et al., 2014). For example, an expansion of activity as a result of induced investment could result in productivity gains from agglomeration economies by increasing the density of economic activity and, as a result, inducing further investment.

Theory also suggests that the economic impacts of transport investment are likely to be greater at the local or regional level than at the national level because of the displacement of economic activity (Venables et al., 2014). Areas are not homogenous and transport investment is by definition geographically specific, so target areas become relatively, and potentially also absolutely, more attractive compared to unaffected areas, thereby affecting businesses' and households' location decisions.

For transport investment to improve economic performance, it is crucial that final users (firms and households) take advantage of new opportunities provided by the investment (e.g. expanding production in response to improved access to markets). If businesses and households do not change behaviour, the economic impact is likely to be limited to a productivity increase as a result of lower travel times and costs.

However, when considering the role of transport in supporting rebalancing, it is important to consider the theories about what drives spatial growth and development.

Theories of spatial development

Since the publication of Von Thuenen's seminal work, *The Isolated State,* in 1826, several theories have been developed to explain the location of economic activity. Each of these theories addresses slightly different aspects, such as the determinants of city size and optimal business location. As a result, evidence indicating the importance of one theory does not necessarily preclude the relevance of another. For this reason, a full understanding of a region's past economic development and future prospects will likely draw insights from a number of theories. Many of these only place a limited emphasis, if any, on transport.

Central place theory

Central place theory seeks to explain the number, size and distribution of settlements (Christaller, 1933). The theory predicts a hierarchy, in which the size of the market served is positively related to a settlement's rank. Because products require different minimum market sizes to sustain production, the range of goods and services produced at any given settlement depends upon the size of the market it serves, which is determined by its accessibility to the surrounding area. Thus, the greater a settlement's accessibility, the larger its market area, the broader the variety of goods and services it produces, and the higher its rank in the hierarchy (Christaller, 1933).

It is important to note that settlements are not considered to be in competition with one another. Rather, they work together to fulfil their core function, namely to serve the market in the most efficient manner. Thus, although the lowest-ranking settlements do not produce certain goods and services, the local population has access to these via higher-ranking, neighbouring settlements.

Whilst central place theory relies on several simplifying assumptions and is a static model of urban hierarchies, it provides pertinent insights for any discussion of rebalancing. Firstly, economic equality across all settlements is unattainable and, from an efficiency perspective, undesirable. Secondly, the extent of the inequality is determined by differences in accessibility and hence market size.

Agglomeration economies

The theory of agglomeration economies seeks to explain the tendency for economic activity to cluster (Marshall, 1890). In contrast to central place theory, which focusses on the minimum market sizes required for firms to achieve internal economies of scale, agglomeration theory explains this tendency through external economies of scale. In other words, central place theory focusses on serving a given market in the most efficient manner, whilst agglomeration economies theory focusses on the relationship between market size and efficiency. The external economies of scale are measured in terms of their impact on productivity, and are generally considered to occur in the markets for labour, intermediate inputs and innovation. Thus, bigger clusters, by virtue of their larger markets, have higher productivity.

Whilst the theory is very much premised on the benefits of proximity, it does not directly assign a role for transport in achieving this. Nevertheless, we can differentiate between two distinct mechanisms through which transport could improve proximity: (1) it could effectively bring economic activity closer together by reducing journey times and costs (static clustering), or (2) facilitate cluster expansion by opening up land for development (dynamic clustering) (DfT, 2018).

The theory of agglomeration economies provides several pertinent insights for rebalancing. Firstly, economic imbalances are the natural result of differing settlement size. Secondly, the theory implies a core-periphery dynamic, in which there will be a continual movement of economic activity away from less urbanised areas towards the centre in order to take advantage of the external economies of scale. Thirdly, attempts to counter the core-periphery dynamic by encouraging economic activity to move away from the centre will be economically inefficient.

Regional economics

Regional economics explains city size and the resulting distribution of economic activity on the basis of size and relative performance of the tradeable sector (Hirschman, 1964). Cities generally lack the necessary natural resources and agricultural output to sustain their populations. Instead, output from the primary sector is typically imported in exchange for exports of secondary and tertiary industries. Thus, cities with larger tradeable sectors can sustain larger populations.

The size of a tradeable sector, and hence a city, is determined by its absolute advantage (Hirschman, 1964). Whilst international trade is based on comparative advantage, at the national level cities compete on absolute advantage. This difference occurs because of factor mobility.

The factors of production are considerably less mobile internationally than at the national level, therefore trade shocks primarily lead to changes in relative prices, and hence a country's comparative advantage. Whereas at the national level, where factors are more mobile, relative price changes lead to a re-allocation of resources to those industries, and their host cities, which provide the highest returns for capital and labour. Thus, cities which have a tradeable sector with an absolute advantage will attract capital and labour from rivals: city growth occurs at the expense of rivals.

In the case of rebalancing, regional economic theory provides several pertinent insights. Firstly, the best performing tradeable sectors are those in which a country has a number of comparative advantages. Secondly, if the tradeable sectors, for which a country has a comparative advantage, are concentrated in a select number of cities, regional imbalances will emerge. Thirdly, improving export performance of lagging regions is crucial to reducing regional imbalances.

Industrial path dependency

"The Atlas of Economic Complexity" (Hausmann et al., 2013) is an economic development theory, which considers the emergence of new industries within a country to be path-dependent. Whilst the theory does not directly consider geography and the location of economic activity, its implications for industrial development provide insights for regional rebalancing.

The theory considers products in terms of the type of knowledge required in their production (productive knowledge). Because acquiring productive knowledge is difficult, the theory hypothesises that countries will develop new activities which draw upon the know-how of existing industries. In this manner, economic development occurs through "adding modest amounts of productive knowledge" (Hausmann et al., 2013: p. 7). As a result, economic development will be path-dependent, not transformational.

The rebalancing perspective often explicitly or implicitly considers cities and regions that have been adversely affected by deindustrialisation and are looking to transform their economies by expanding into new industries. This theory would suggest the following: (1) transforming an economy is likely to prove very difficult as entirely new productive knowledge must be acquired, and (2) transport investment is unlikely to be the most important factor in facilitating this transformation.

New economic geography

New economic geography has gone further than most theories in seeking to explain how transport investment affects the location of economic activity. It has a particular focus on agglomeration economies and the factors which lead to the concentration and dispersal of economic activity (Fujita et al., 1999).

The theory considers the key transmission mechanism to be changes in accessibility (Fujita et al., 1999). However, it acknowledges that the economic impacts will be context specific: a given absolute change in accessibility will in certain circumstances lead to a dispersal of economic activity from the agglomerated core, whereas in others it will lead to concentration. The precise outcome will be determined by the relative strength of centripetal and centrifugal forces, such as the benefits of being located next to suppliers versus the benefits of lower land costs (Fujita et al., 1999).

It is the relative strength of centripetal and centrifugal forces which gives rise to the two-way road effect. Whether a lagging region benefits from accessibility improvements, and hence increased competition with the leading region, ultimately depends upon whether the advantages of being a lower-cost location outweigh the agglomeration economies.

From the rebalancing perspective, the key messages are as follows. Firstly, transport investment can change firms' views about the optimal location. Secondly, transport investment does not guarantee a reduction in regional imbalances.

In conclusion, this section has reviewed a number of theories of spatial development. Whilst there is no single unifying theory, these different perspectives provide several pertinent insights for the rebalancing debate. The relevance of these insights will depend upon the specific context of the place under investigation.

Empirical evidence

The empirical evidence of the economic impacts of transport investment is limited and there are two primary reasons for this. Firstly, transport investments are not always followed by an evaluation of their impacts. Secondly, where evaluations have been undertaken, it has proven difficult to set up robust techniques with which to isolate the precise impact of transport investment from the myriad of other factors that affect economic performance (What Works Centre for Local Economic Growth, 2015).

The evidence on the relationship between transport investment and economic performance is context specific, and this affects the conclusions we can draw and the policy implications. The sections below summarise the evidence on the impacts of infrastructure in different contexts.

The macroeconomic impacts of transport investment

There have been many econometric studies investigating the impact of transport investment on economic performance. Melo et al. (2013) conducted a meta-analysis of 33 international studies and found the economic impacts to be highly inelastic (< 0.1), with the largest effects for roads. In addition, the impact on manufacturing output was much higher than for the service sector, and the impacts were most pronounced five years after the opening of transport infrastructure. The evidence suggests that the effect of transport investment on economic output appears to be stronger in the long run than in the short and medium run (Melo et al., 2013).

Fernald (1999) found that road building in the US (including the building of the interstate highway network) increased average annual productivity by a total of 1.4 percentage points between 1951 and 1973. But the impact on productivity slowed down after 1973 when the interstate network was largely complete. In other words, transport investment is subject to diminishing marginal returns.

On the basis of these findings, transport investment could have a role to play in rebalancing. However, the presence of diminishing marginal returns and an inability to permanently raise growth rates suggest that transport investment alone is not a long-term solution to reducing imbalances.

Agglomeration elasticities

As mentioned above, theory suggests there is a productivity boost from economic activity agglomerating, whether through the formation of industrial clusters or through urbanisation. There have been numerous studies to estimate the productivity returns of agglomeration, such as Rice et al. (2006), Puga and De La Roca (2012) and Overman et al. (2009). Whilst empirical studies have used a variety of data sets, estimation techniques and control variables, the results are remarkably consistent, finding the productivity impact with respect to agglomeration to be highly inelastic (< 0.1). In addition, Graham et al. (2009) found that the productivity impacts of agglomeration decay exponentially with distance such that they are highly localised (see Table 2.1). Thus significant investments would be needed to drive substantial productivity changes in cities across the UK.

Within transport appraisals, agglomeration impacts, whilst significant, typically account for a minority of the expected economic impacts. For example, agglomeration impacts are expected to account for about 18 % of the total GDP impact of HS2 Phase 2b (DfT, 2016) and around 15 % of the total GDP impact of Crossrail (DfT, 2005).

Table 2.1. **Estimates of productivity elasticities and distance decay by sector**

	Elasticities	Distance Decay
Construction	0.021	1.562
Manufacturing	0.034	1.097
Consumer services	0.024	1.818
Producer services	0.083	1.746
Weighted average	**0.043**	**1.655**

Source: Graham et al. (2009).

Lucci and Hildreth (2008) suggest that urban hierarchies are an important aspect of agglomeration benefits, with small and medium satellite towns or cities supporting core cities. However, for these benefits to be fully realised, the economic structures of the surrounding areas must complement those of the core – for example by providing specialised parts of supply chains. The authors argue that this explains why Reading forms a more productive satellite for London than Burnley does for Manchester. From a policy perspective, this evidence suggests that links which extend beyond the core urban area are important to the operation and success of the city-region.

Context specific evidence: The state of the existing network

As mentioned above, studies find that the productivity impacts of transport investment are subject to diminishing marginal returns: when the network is first developed, there are relatively large productivity gains, but subsequent investments have a smaller effect. This makes sense as once most areas in a country are connected, there are fewer possibilities for significant changes through connectivity improvements – the focus should be on capacity and reliability.

The Eddington Review (DfT, 2006) presented a range of evidence to demonstrate that the UK had good levels of domestic and international connectivity, and concluded that much of the future economic benefits to be derived from transport investment should come from easing bottlenecks and pinch points and addressing areas where transport is a binding constraint to economic performance, i.e. adding more capacity in and around major urban centres and international gateways, rather than through improved connectivity. Evidence from the Manchester Independent Economic Review broadly supported the findings in the Eddington Review.

Whilst many of the major UK population centres are highly connected with one another and internationally, there may still be a case for transport investment to improve local and regional connectivity. This would be particularly pertinent to facilitating the expansion of population centres, opening up land for development – such as the Borders Railway, which improved connectivity to Edinburgh to unlock land for housing – or to connect areas internally and to international gateways.

Transport infrastructure is a highly specific asset in terms of the connectivity and services it provides. Economic structural changes may change the connectivity or the services that users require: the existing transport infrastructure may be of the wrong type or go to the wrong places. For example, the successful redevelopment of the docklands area in East London into one of the United Kingdom's largest financial centres involved improving the area's accessibility for commuters by re-using the former rail freight lines to create the Docklands Light Railway. Thus, connectivity improvements could be important to support the development of new industry.

In order to identify areas that are constrained by the legacy of the local transport infrastructure, one needs to understand the current and future needs of users: congestion may not be a useful marker of need for such areas if it is the type rather than the capacity of infrastructure which is the barrier to development. This would necessitate a much closer engagement with local businesses to understand their investment plans and the role that transport investment could have in shaping these.

Context specific evidence: Trade and connectivity

Empirical evidence demonstrates an important relationship between international trade and productivity (Alcalá and Ciccone, 2004), with businesses operating internationally often being more productive than their domestically focussed counterparts (Harris, 2009). This lends weight to the conclusions of regional economic theory which argues that regions with the highest productivity are those with the best performing tradeable sectors.

Empirical evidence also demonstrates that international trade tends to be greater for areas in close proximity to large markets (Yotov, 2016). Transport is a key factor in connecting large international markets and enabling the benefits from trade. Ports and airports provide greater access to wider markets, and the resulting gains from trade have the potential to raise regional productivity.

Much of the transport infrastructure in the UK which provides access to international markets, in other words airports and ports, operates according to a "hub and spoke" model, with regional centres

(spokes) directing customers towards a single international gateway (the hub). This allows the hub to achieve economies of scale, as customers are grouped in a single location, such that it can provide a greater variety of destinations than could be achieved if each of the regional centres sought international connections.

Improving access and proximity to markets both internationally and within the UK is important for regional economic performance. However, somewhat counter-intuitively, this may require transport investment to improve accessibility to the hub rather than direct links to the final destination.

Context specific evidence: The type of transport investment

The evidence suggests that the type and nature of transport investment – be it road or rail, or be it intra-city or inter-city infrastructure – can potentially affect the economic structure of regions or areas, the location of economic activity and agglomeration economies (Baum-Snow, 2007 and Duranton et al., 2014). Given that industries have different levels of productivity, transport investment can play a role in supporting local rebalancing.

Evidence on the US interstate highway network demonstrates that the development of radial links into cities led to the development of suburbs, with each additional "ray" reducing population density in the city centre by 9 % (Baum-Snow, 2007) but increasing city centre employment. A 10 % increase in the total length of interstate highways into a city increased city centre employment by about 1.5 % over 20 years (Duranton and Turner, 2012), implying possible agglomeration impacts.

In addition, Duranton et al. (2014) found that transport investment in the USA had a greater impact on the local economic structure of an area rather than on its economic performance. The study determined that road improvements disproportionately affected the weight of trade rather than its value, suggesting a refocussing of economic structure towards heavy manufacturing.

The most comprehensive review of evidence in the UK was carried out by the What Works Centre for Local Economic Growth (2015). From over 2 300 international policy evaluations and evidence reviews identified, only 29 were considered robust enough to warrant inclusion in the final review. The findings concluded the following:

- Road projects can positively impact local employment. But effects are not always positive and a majority of evaluations shows no (or mixed) effects.
- Road projects may increase firm entry (either through new firms starting up, or existing firms relocating). However, this does not necessarily increase the overall number of businesses (since new arrivals may displace existing firms).
- Road projects tend to have a positive effect on property prices, although effects depend on distance to the project (and can also vary over time).
- The impact of roads projects on the size of the local population may vary depending on whether the project is urban, suburban or rural.
- Some evidence on road projects has shown positive effects on wages or incomes.
- Rail projects tend to have a positive effect on property prices, although effects depend on distance to the project (and the effects can also vary over time).

- The study also found there to be few high-quality evaluations of a number important impact areas, such as: the impact of rail schemes on employment, the impact of bus, cycling and walking schemes, the impact of transport schemes on productivity, and on displacement impacts.

Consistent with this, other studies focussed on specific types of spend have also found mixed effects:

- Gibbons et al. (2012) found that road projects can have positive productivity impacts on local areas – improvements to the UK road network between 1998 and 2007 that increased accessibility led to a rise in wages by 0.2% and productivity per worker by 0.4%, for firms within 20 km of the improvements.

- Studies have found the growth impact of high speed rail to be positive under the right conditions. For example, Ahlfeldt and Feddersen (2015) found positive effects on output when looking at small towns that received a connection to the Cologne-Frankfurt high speed line, as did Bernard et al. (2014) for the extension of the Shinkansen high speed network in southern Japan.

- However, Cheng et al. (2015) found high speed rail in France and Spain led to a centralisation of economic activity around stations but no redistribution of activity among regions. In addition, Vickerman (2015) found the economic benefits depend upon successful integration of the high speed rail station into the local transport network.

Whilst there are relatively few robust evaluations, certainly by the standards of the What Works Centre for Local Economic Growth, they do suggest a relationship between the type of transport intervention and the form of spatial development. Thus, in the context of rebalancing, transport investment decisions should be viewed with an explicit understanding of the links between different types of investment and their spatial impacts.

In conclusion, whilst transport investment can improve economic performance, on its own it is unlikely to be sufficient to significantly reduce regional growth imbalances. The available evidence suggests the economic impacts of transport are modest, and for a country with a mature network, such as the UK, there are fewer opportunities for transport investment in isolation to have transformational impacts. Nevertheless, transport investment may be necessary to facilitate economic expansion in specific contexts by increasing capacity or connectivity in former industrial areas. Finally, given the scale and nature of impacts depends upon the type of transport infrastructure, investments should be carefully aligned with broader development strategies.

Conclusion

The UK displays significant regional disparities often characterised as the North-South divide. This pattern reflects the deindustrialisation of the UK's industrial heartlands, particularly over the past 40 years. In this context, rebalancing often refers to the economic rejuvenation rather than development per se. Nonetheless, many of the problems are the same, namely how to make lagging regions more attractive places to live, work and invest.

Many policy debates on rebalancing focus on the impacts of agglomeration economies. However, evidence from growth accounting exercises such as the MIER suggest a mixed picture in terms of what drives area productivity performance, with skills often the most important factor. As a result, policy needs to be context specific. Furthermore, the empirical evidence suggests the impacts are relatively small and highly localised, implying that policies aimed at fostering agglomeration economies alone should not be expected to have significant impacts on reducing regional imbalances.

Transport economic theory suggests that transport investment can affect economic performance through productivity, employment and induced investment impacts. However, in the context of rebalancing, spatial theories may provide better insights as to what drives city growth, and hence the potential role for transport.

There are a large number of spatial theories, each of which emphasise different factors that affect city size and economic performance. These theories are not mutually exclusive. For a full understanding of a city's performance, one likely needs to draw on many spatial theories.

In the UK context, regional economic theory may be particularly relevant given its emphasis on the role of trade, as lagging regions tend to be former industrial areas that have been adversely affected by trade shocks. In this context, transport investments which support the growth of export industries could be considered helpful to support rebalancing.

The empirical evidence demonstrates that the economic impacts from transport investment in isolation are likely to be modest. This is in part due to the mature nature of the transport network: regions are relatively well connected. Whilst this implies transport investment will not be sufficient to close the regional productivity gap, it may nonetheless be a necessary part of any development strategy. Capacity improvements, connectivity to support new business clusters and markets, or repurposing existing infrastructure for the modern economy, could all support regional economic performance. As a result, transport investment may be best considered a facilitator of growth.

References

Ahlfeldt, G and A. Feddersen (2015), "From periphery to core: measuring agglomeration effects using high-speed rail", *Spatial Economics Research Centre Discussion Paper*, No. 172.

Alcalá, F. and A. Ciccone (2004), "Trade and Productivity", *The Quarterly Journal of Economics*, Vol. 119/2, pp. 613-646.

Aldercroft, D.H. (1982), "Britain's Economic Decline 1870-1980", in Roderick, G. and M. Stephens (eds), *The British Malaise*, The Farmer Press.

Baum-Snow, N. (2007), "Did Highways Cause Suburbanization?", *The Quarterly Journal of Economics*, Vol. 122/2, pp. 775-805.

Cheng, Y-S. et al. (2015), "High-speed rail networks, economic integration and regional specialisation in China and Europe", *Travel Behaviour and Society*, Vol. 2/1, pp. 1-14.

Christaller, W (1933), *Die zentralen Orte in Süddeutschland*, Gustav Fischer, Jena.

Department for Transport (DfT) (2018), *Transport Analysis Guidance A2.4: Appraisal of Productivity Impacts*, https://www.gov.uk/transport-analysis-guidance-webtag.

Department for Transport (DfT) (2016), "High Speed Two Phase 2b Strategic Outline Business Case: Economic Case", https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/570845/hs2-phase-2b-sobc-economic-case.pdf.

Department for Transport (DfT) (2006), "The Eddington Transport Study", http://webarchive.nationalarchives.gov.uk/20081230093524/http://www.dft.gov.uk/about/strategy/transportstrategy/eddingtonstudy/.

Department for Transport (DfT) (2005), "Transport, Wider Economic Benefits, and Impacts on GDP", http://webarchive.nationalarchives.gov.uk/+/http:/www.dft.gov.uk/pgr/economics/rdg/webia/webmethodology/sportwidereconomicbenefi3137.pdf.

Duranton, G. and M.A. Turner (2012), "Urban Growth and Transportation'", *Review of Economic Studies*, pp. 1-36.

Duranton, G. et al. (2014) "Roads and Trade: Evidence from the US", *Review of Economic Studies*, Vol. 81/2, pp. 681-724.

Easterly, W. (1999), "The Ghost of Financing Gap: Testing the Growth Model Used in the International Financial Institutions", *Journal of Development Economics*, Vol. 60/2, pp. 423-438.

Fernald, J. (1999), "Roads to Prosperity? Assessing the Link between Public Capital and Productivity". *The American Economic Review*, Vol. 89/3, pp. 619-638.

Fujita, M., P. Krugman and A. Venables (1999), *The Spatial Economy: Cities, Regions and International Trade*, The MIT Press, Cambridge, MA.

Gal, P. and J. Egeland (2018), "Reducing regional disparities in productivity in the United Kingdom", *OECD Economics Department Working Papers*, No. 1456, OECD Publishing, Paris.

Gibbons, S. et al. (2012), "New road infrastructure: the effect on firms", *Spatial Economics Research Centre Discussion Paper*, No. 117.

Graham D.J. et al. (2009), "Transport Investment and the Distance Decay of Agglomeration Benefits", Centre for Transport Studies, Imperial College London.

Harris, R. (2009), "Spillover and Backward Linkage Effects of FDI: Empirical Evidence for the UK", *SERC Discussion Paper*, No. 16.

Hausmann, R. et al. (2013), The Atlas of Economic Complexity: Mapping Paths to Prosperity, The MIT Press, Cambridge, MA.

Hirschman, A.O. (1964), "Interregional and International Transmission of Economic Growth", in Friedman, J. and A. William (eds), *Regional development and planning: a reader*, The MIT Press, Cambridge, MA.

Lucci, P. and P. Hildreth (2008), "City Links: Integration and Isolation", Centre for Cities.

Manchester Independent Economic Review (2009), *The Case for Agglomeration Economies*, www.manchester-review.org.uk/project_718.html.

Marshall, A. (1890), *Principles of Economics*, Macmillan, London.

Melo, P., D.J. Graham and R. Brage-Ardao (2013), "The productivity of transport infrastructure investment: A meta-analysis of empirical evidence", *Regional Science and Urban Economics*, Vol. 42, pp. 695-706.

OECD (2017), "Metropolitan areas", *OECD Regional Statistics* (database), April.

ONS (2018), *Statistical bulletin: UK Trade: February 2018*, Office for National Statistics.

ONS (2017), Statistical bulletin: UK Balance of Payments, The Pink Book: 2017, Office for National Statistics.

Overman, H. et al. (2009), "Strengthening economic linkages between Leeds and Manchester: feasibility and implications", *Full report*, The Northern Way, Newcastle upon Tyne.

Puga, D. and J. De la Roca (2012), "Learning by Working in Big Cities" *CEPR Discussion Paper*, No. 9243.

Rice, P.G. et al. (2006), "Spatial determinants of productivity: Analysis for the regions of Great Britain", *Regional Science and Urban Economics*, Vol. 36/6, pp. 727-752.

Ritchie, L.A. (1992), The Shipbuilding Industry: A guide to historical records, Manchester University Press.

Root, H. and J. Campos (1996), *The key to Asian Miracle: Making Shared Growth Credible*, The Brooking Institute, Washington, DC.

Venables, A.J., J. Laird and H. Overman. et al. (2014) "Transport investment and economic performance: Implications for project appraisal", *Paper commissioned by UK Department for Transport*.

Vickerman, R. (2015), "High-speed rail and regional development: the case of intermediate stations", *Journal of Transport Geography*, Vol. 42, pp. 157-165.

Von Thuenen, J.H., (1826) *The Isolated State*, Pergamon Press.

What Works Centre for Local Economic Growth (2015), *Evidence Review 7: Transport.*

Yotov, Y.V. et al. (2016), "An Advanced Guide to Trade Policy Analysis: The Structural Gravity Model", *World Trade Organisation.*

Chapter 3. Transport projects aimed at fostering economic growth: experience of Crossrail and HS2 in the UK

Transport appraisal in the UK

Cost-benefit analysis (CBA) has been used by the UK's Department for Transport (DfT) for more than fifty years. It has provided politicians and officials with information about the expected costs and benefits of a project or policy, and has enabled them to understand which investments are likely to represent the prudent use of public money on the grounds that their benefits substantially exceed their costs. Metrics such as the benefit-cost ratio (BCR) enable decision-makers to prioritise schemes and make the best use of a limited budget. When first implemented, the method was restricted to valuing time and operating savings, reductions in road accidents and project costs. Over time it has been extended to include a wide range of environmental and other impacts. Most of these are now measured in terms of money values, with those that are difficult to quantify or value, such as the impact of a road on the landscape, assessed through a system of scores. The DfT's methods are codified in its web-based guidance – WebTAG (DfT, 2017a) – which all promoters of transport schemes requiring public funding are obliged to use.

Despite the widespread acceptance of CBA as a means of informing decision-makers and providing Parliament with evidence that public money is being spent efficiently, the method has certain limitations. For example, prior to the inclusion of the wider benefits analysis in 2004/5, urban transport schemes tended to show lower benefit/cost ratios than was the case for inter-urban roads. Land costs in urban areas were high because urban land was more productive than the agricultural land purchased for inter-urban schemes. But the CBA failed to account for any increase in productivity that might follow from improving accessibility in dense urban areas.

Research undertaken on the relationship between transport, cities and productivity established a measure of "economic mass", "effective density", or "agglomeration". There are two parts to the measure of economic mass. The first is the number of workers in each zone in the city, with the zones often defined so as to correspond with the structure of zoning adopted in the transport model. The second is the accessibility or travel costs between that zone and all other zones, with the value of the measure for the other zones each weighted by the number of employees in that zone. Transport costs are an integral part of the measure of economic mass. Analysis of data on productivity – defined as output per worker – showed a causal relationship between economic mass and productivity. Investment in transport would increase economic mass and this would result in an increase in productivity. Better connected cities are more productive places. The analysis showed that the effect of changes in economic mass on productivity declines with distance, with minimal productivity effect in places further away than around 20 km from the scheme.

Cities which have experienced an increase in economic mass induced by a transport scheme tend to benefit from a second-round effect. Firms are attracted from elsewhere and relocate in the city, while existing firms expand because of both the better access to workers, suppliers and customers, and because each expanding or relocating firm benefits from the increase in productivity from the first-round effect. Both components of the economic mass term change – each nearby zone becomes more accessible and each zone has an increased employment density because of the relocation of activity. The current DfT appraisal guidance defines the first round effect as a "level 2", or static impact and the changes following from the relocation of economic activity as a "level 3", or dynamic impact (DfT, 2017a). The "level 1"

analysis is restricted to the more conventional benefits of time and cost savings, and social and environmental impacts.

Welfare economics and GDP: Two different metrics

CBA is founded on the concepts of welfare economics, aimed at maximising people's utility or the value they place on all the changes related to the transport scheme that affect them. It is not intended to measure changes in gross domestic product (GDP), a metric restricted to marketed goods and services. Impacts such as savings in travel time on leisure trips or environmental impacts figure in the cost-benefit methodology, but are not part of the conventional national GDP accounting process.

The wider benefits of a transport scheme can be valued either in the context of a welfare cost-benefit framework or in terms of GDP and national accounting methods. The "level 2" increase in output per worker is caused by the transport investment, the costs of which are already part of the cost-benefit calculation. No additional input is required of the workers who benefit from working in a better connected city, with the opportunities that this facilitates. CBA includes both the additional post-tax income earned by workers, who gain utility from this effort-free increment to their earnings, and the tax they pay on these earnings because society as a whole benefits on the grounds that the other taxes they pay can now be reduced, albeit by a very small amount. But the additional pre-tax earnings attributable to the scheme can also be considered as a measure of increased productivity and hence an impact on GDP.

The additional earnings generated by relocation are treated differently between a CBA and a GDP metric. In order to earn the additional income, workers are obliged to change where they work, a change they are induced to make because of the new transport opportunities. Given that they could always have worked in the new location before the scheme opened, the maximum benefit that can be attributed to them is the change in transport costs, with the most marginal person who moves gaining a minimal benefit and hence the average generated traveller getting half of the benefit of existing users – the well-established "rule of a half". Their decision to move jobs is based on the trade-off they face between transport costs and post-tax wages. Society again benefits from the additional tax revenue on their higher earnings, a further addition to the cost-benefit calculation. But the GDP metric counts the entire increase in output since the additional commuting costs or the additional demands on the worker when in the higher paid job do not count as costs to be offset against the increase in productivity.

The effects of a transport scheme on the relocation of economic activity requires modelling methods, for example a land-use transport interaction model (LUTI), to represent how households, firms, developers and planning authorities respond to a change in the transport network, and to supplement the conventional transport model. DfT's WebTAG guidance gives an outline of the various supplementary economic modelling methods that have recently been used to estimate the GDP effects of a number of major UK schemes.

The appraisal of wider benefits makes it possible to provide decision-makers with an additional measure of the effects of a transport scheme and supplement the welfare-based CBA with an additional and conceptually different metric for a GDP effect. Politicians in the UK find such a metric of value when prioritising projects since increasing the UK's low rate of productivity growth has for long been a policy objective. The business case for any transport scheme to be approved for UK government funding is made up of five parts – the strategic, economic, financial, management and commercial cases (DfT, 2017b). While the economic case sets out the full CBA, the strategic case provides the opportunity to explain to decision-makers how a scheme might contribute to the objective of fostering economic growth based on evidence from the supplementary economic modelling.

The analysis required to estimate the wider benefits has the additional advantage of helping to inform decision-makers about the locations where the impacts, both positive and negative, of a transport scheme are likely to occur. Conventional CBA fails to indicate whether, when a new transport link is built between cities A and B, both cities will benefit or whether A will benefit at the expense of B or B to the disadvantage of A. The methods used to estimate the wider benefits and GDP effects can help conceptualise the spatial distribution of the impacts throughout the affected zones.

London's Crossrail scheme

London's Crossrail[1], now named the Elizabeth Line, runs in an east-to-west direction tunnelled under the centre of London, with London stations at Canary Wharf, Whitechapel, Liverpool Street, Farringdon, Tottenham Court Road, Bond Street and Paddington (Figure 3.1). The line extends, for the most part on existing tracks, to Abbey Wood and Shenfield in the south-east and east respectively and to Heathrow airport and Reading in the west. The project cost GBP 14.8 billion, will add around 10% to Central London's rail capacity, and will open at the end of 2018. As has been the case for multiple major transport investments in the UK, many years elapsed between the initial plans and the final approval of the project in 2009.

Figure 3.1. **Crossrail route map**

Source: Crossrail (2017).

The first full economic appraisal of a number of cross-London rail options was undertaken as part of the *Central London Rail Study* (DfT et al., 1989). All schemes were appraised using the conventional CBA of the period, with the benefits of time savings augmented by evidence that passengers were willing to pay for congestion reductions, thus increasing the benefits for passengers from additional capacity. The BCRs for the cross-London options were in the range of 0.9-2.1 – adequate, but not as high as the returns on most inter-urban road investments. Moreover, the scheme could not be funded without an increase in public subsidy and the majority of the benefits would accrue to London rail passengers. Politicians could see no reason for providing additional subsidy to rail users, in particular to passengers in London who earned significantly more than the average tax payer. The Government decided not to approve any of the schemes proposed in the *Central London Rail Study*, a decision whose consequences were less adverse than might have been expected, as the recession of 1990 led to London employment and commuting levels declining over the following five years.

A number of changes had occurred by the start of the 2000s, when the case for Crossrail was reconsidered. The institutions responsible for local and regional government had been strengthened, with the creation of the post of the Mayor of London to represent London's interests and who acted as a champion for the scheme. Full responsibility for strategic planning and for transport in the London area

was handed over by central government to an authority which reported to the Mayor and hence to Londoners. Effective lobbying by London business interests resulted in London employers declaring themselves willing to pay an increase in local taxation, if such taxes were used to fund transport in the capital. The Government responded by including a provision for a change in the law to enable a supplement to the standard tax on London businesses to be imposed in order to contribute to the costs of transport projects.

It can be argued that changes in cost-benefit methods to include wider benefits also contributed to the decision by Parliament to agree in 2007 to the East-West Crossrail option, plans for which had been worked up over the previous 5 years. The final updated Crossrail business case showed a conventional BCR of 1.97, which increased to 3.09 when static agglomeration effects were included, and to 3.53 when the dynamic effects of relocation (described in the appraisal as the move to more productive jobs)were included (DfT, 2011). The inclusion of wider benefits in the Crossrail appraisal strengthened the case for the project in a number of ways. It demonstrated that the project provided good value for money, with a BCR above 3.0. It also showed that London rail users were by no means the only beneficiaries – the benefits of increased productivity and tax revenues are spread across the entire UK, thus justifying government subsidy. The transport model was used to show that almost all zones in London would benefit to some extent from an increase in economic mass delivered by Crossrail. Since productivity in each of these zones could be expected to increase, it was possible to justify an increase in the tax on London businesses that had been imposed to contribute to the costs of the scheme. Thus an indirect consequence of the wider benefits guidance was that the means adopted for the funding of Crossrail – in part from generated fare revenues, in part from a contribution from London businesses, and in part from central government in respect of productivity and tax increases – was seen as equitable.

Estimating the wider benefits of Crossrail presented certain challenges. The static agglomeration impacts could be derived directly from the transport model, combining the model's estimates of the changes in transport costs with the input data on zonal employment, on productivity by zone and by sector, and on the sectoral parameter values for the elasticity of productivity with respect to changes in economic mass. However, estimates of the dynamic effects require a model which allows for changes in the location of economic activity, and no such model was readily available at the time.

Analysis of the different routes used by rail commuters into London (London is unusual among world cities in the dominance of public transport as a mode, with less than 5% commuting by car) showed that over the past decade, growth in demand was constrained by crowding, with faster growth on routes where crowding was less extreme. Since employment densities were higher in other world cities than in London, it was assumed that rail capacity was the constraint on Central London growth and that, if more rail capacity was provided, jobs would move to more productive locations in Central London, over time filling the capacity. A range of assumptions was made for estimates of the additional output from these jobs when they moved from elsewhere in the UK (or from other countries) to London.

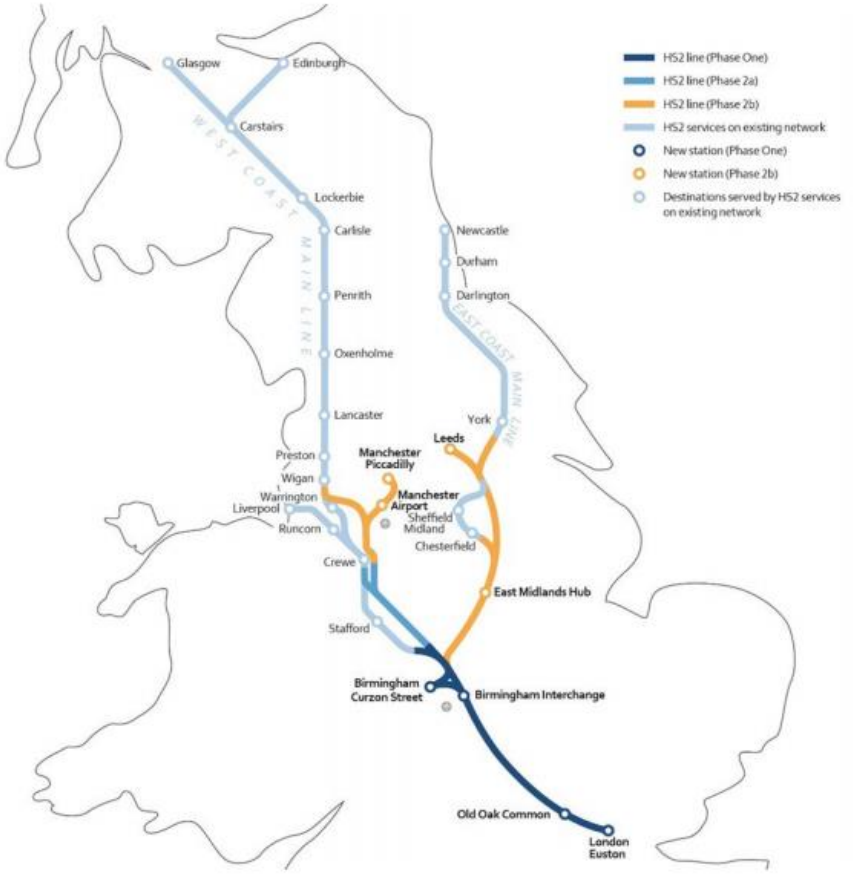
The Crossrail scheme provided a test bed for the methods being established by the DfT for estimating the wider benefits of a transport scheme. The estimation of the static agglomeration effects presented few problems as both a suitable multi-modal transport model, and the necessary elasticities and data on output and productivity were available. But the assumption used in the estimation of the dynamic effects – that demand increases to fill capacity – lacks any theoretical basis.

High Speed Two

There are two objectives for High Speed Two (HS2): to provide additional rail capacity to relieve the crowded line between London, Birmingham and the North of England, and to rebalance the economy

of Britain by fostering economic growth, which has been concentrated on London and the south-east, to the benefit of cities in the North. The project is for a new high speed line from London to Birmingham, described as Phase 1, to open in 2026, continuing north with Phase 2 made up of a new line to Manchester and another line heading north-east to Leeds, scheduled to open in 2033 (Figure 3.2). It will reduce journey times substantially and make it possible to run more frequent and less crowded commuter and other trains on the existing route, thus further benefitting the cities that it serves. The economic case (HS2, 2013a) shows a central estimate of the BCR for Phase 1 of 1.4 on a "level 1" appraisal, increasing to 1.7 at "level 2" when static agglomeration benefits are included. Comparable ratios for the whole scheme, including both Phases 1 and 2, are 1.8 and 2.3.

Figure 3.2. **HS2 route map**



Note: Phase 1 route – London to the West Midlands
Phase 2a route – West Midlands to Crewe
Phase 2b route – Crewe to Manchester and West Midlands to Leeds.

Source: DfT (2017c).

In 2013, HS2 commissioned KPMG to assess the impacts of HS2 on regional and national GDP (HS2 Ltd, 2013b). The approach took into account the impact of transport on both productivity and on business location, the latter a necessary part of a model aimed at estimating the spatial distribution of impacts across a wide geographical area. The first stage of the analysis provided estimates of the change in connectivity that would follow from HS2. Estimates were made of the change in connectivity (defined

in terms of travel times and costs) by rail for business and commuting travel as a result of HS2 for the cities served by the line. The measure of connectivity was based on data on people's propensity to make trips as the generalised cost of travel increases. Rather than being directly based on a change in generalised costs, the inclusion of the variable defining propensity to travel demonstrated that the effect on the connectivity term is greater towards the average generalised cost for all travellers for that purpose and by that mode than for the ends of the distribution.

Analysis of data on output per worker and of measures of connectivity for car, rail, commuting and business for each of the zones in the HS2 transport model helped identify a series of parameters for elasticity of productivity for the four major sectors of the economy. In this way the increases in connectivity delivered by HS2 could be shown to result in increases in productivity in the zones served by the scheme.

The impact of HS2 on the geographical distribution of this higher level of economic activity was estimated from a model of business location. The model, which predicts the spatial distribution of economic activity in 2037 (the year for which the forecasts of productivity were made), is based on the trade-off made by firms between the benefits from agglomeration and hence higher productivity as a result of accessibility, and the lower costs of doing business in more dispersed locations, where land and labour costs are lower. The model is based on data on the production and consumption of goods and services by sector and by zone, on production costs by location and on estimates of trade between zones by business sector. It allows for an increase in accessibility to reduce costs and increase output in a zone, with activity inflow from less accessible zones. But it also shows how, if production costs fall enough in a zone not served by HS2, output in certain sectors might increase after a zone has become relatively less accessible.

The ""headline" figures from the HS2 economic impact study showed an increase in UK GDP in 2037 attributable to the scheme of GBP 15 billion in 2013 prices, equivalent to 0.8% of GDP in that year. Both the cities in the North and London would benefit, with activity moving away from locations in the east and south-west of the country. Several experts cast doubt on the method used to estimate the productivity elasticities and on the plausibility of such a high value for the overall impact. There was less academic debate about the relocation estimates, perhaps as there were no alternative methods against which they might be compared. More recently, HS2 has commissioned a spatial strategic economic model based on LUTI methods following the approach described below.

Recent developments

Several major infrastructure programmes and projects are currently being planned in the UK, including the Crossrail 2 project for a north-east-to-south-west railway under central London, the second Roads Investment Strategy programme, a package of road and rail schemes for the North of England, and a mix of road and rail schemes in an east-to-west corridor between Oxford and Cambridge. All of these programmes are intended to foster economic growth and to open up land for housing and commercial development. England has experienced high and rising house prices and a shortage of housing, in part because land with good transport access suitable for new housing is in short supply.

To date, relatively little has been published on the methods being used to estimate the regional economic impacts of these projects. All of them have made use of the proprietary LUTI models that have been developed by a number of commercial consultants. Models of this type have been used for many years to inform land-use planners about possible responses of developers to a major transport scheme, and to show how, if unchecked, these changes in location might increase the initial traffic predictions. More recently, the analysis of agglomeration-based differences in productivity by location has made it

possible to extend the LUTI modelling framework to a spatial model of the economy. The LUTI model shows how transport-induced changes in location can increase the number of workers in more accessible zones, resulting in higher employment densities and compounding the impact of increased accessibility of economic mass on output per worker, further enabling the employment density of the zone to increase alongside its accessibility.

LUTI models include a number of agents whose behaviour results in the changes in location predicted in the model, with most such models representing firms, workers or households, land developers and land-use planners, acting as agents of local or central government. Firms' decisions to move to more accessible locations are influenced by changes in the productivity of different locations, the rents they will expect to pay, and changes in the cost of accessing workers, customers and suppliers. Changes in the rent paid by firms and by households depend on changes in their demand for space in each zone, and on the willingness of developers to build new commercial and residential space. The relationship between increases in the cost of commercial or residential space and increases in their quantity depends on the likelihood of both the profitability of development, and of developers being granted consent to build by the local or national government agents responsible for land-use planning. Workers' willingness to move is influenced by changes in house rents (or prices), wages and commuting costs. Land-use planners' willingness to consent to new developments depends in part on the capacity of the transport network that gives access to the planned developments.

Strategic regional spatial economic models transform transport modelling and appraisal into a new and more complex framework. The approach has the potential to resolve a number of the limitations of the conventional cost-benefit method. It transforms the way in which an improvement in accessibility is measured, replacing the value of time savings, which is at most a transitory outcome of a transport scheme, with a more realistic approach that shows how people and firms use the time savings to change where they live and work. In contrast to the spatially agnostic BCR, the method provides decision-makers with a forecast of how the benefits will be distributed across the city, region or country. And for many decision-makers, a GDP-based metric is far more meaningful than the unrealisable economic welfare benefits measured in the CBA. Scheme promoters have claimed that, if the income and sales tax paid on the GDP generated by a scheme exceeds its costs, then the scheme can be considered as funding itself and should therefore be approved.

But such models face a number of challenges. They require large amounts of data, some of which, such as regional trade flows in the case of the UK, is not collected as part of the official statistics and therefore has to be based on estimates. The responses of different agents to changes in demand and supply as a consequence of changes in accessibility are derived from a wide range of sources that are not necessarily based on consistent methods and assumptions. The overall structure of some models has been challenged, since economic theory assumes that firms respond to changes in profitability rather than to changes in accessibility: work is in hand to modify one of the models used in the UK to incorporate a profits-led objective. The approach takes transport and land use as the only constraints on changes in economic activity and ignores factors such as requirements for education, skills, or accounting for those who in absence of the scheme are unemployed but who have the skills required to move into new jobs generated by the spending of workers whose productivity has increased.

More fundamental, perhaps, is the challenge faced in validating the predictions from such models. Transport modellers have had some success in demonstrating whether, some years after the opening of a scheme, the model of traffic flows used in the appraisal of the scheme is able to predict these flows within an acceptable margin of error. But the changes predicted in a strategic spatial economic model take many years to materialise and are subject to many influences other than transport, thus ruling out any meaningful attempt at validation. And even reaching a judgement about the reasonableness of an

estimate of the contribution of a scheme to GDP, and about its distribution is challenging – might HS2 add GBP 15 billion to the UK's economy? Is the estimated split between London and the North plausible?

There are no easy answers to these questions. DfT's WebTAG guidance (DfT, 2017a) provides some helpful pointers. It suggests that any assessment of GDP impacts of a project should be linked to the changes in accessibility as estimated in the transport model. This should be set out in terms of an economic narrative, explaining the transmission mechanism between the transport cost changes and the anticipated changes in the level and location of economic activity. It should consider other possible constraints on local economic growth, such as the availability of skilled workers and housing, and whether the transport project will be linked to initiatives aimed at addressing these constraints. The economic narrative should identify both positive and negative effects and set out the evidence on which estimates of the GDP effects are based.

References

Crossrail (2017), "Elizabeth line regional route connections map", http://74f85f59f39b887b696f-ab656259048fb93837ecc0ecbcf0c557.r23.cf3.rackcdn.com/assets/library/document/c/original/crossrail_regional_route_map_2017_connections_and_boroughs.pdf (accessed 9 February 2018).

DfT (2017a), "Transport analysis guidance: WebTAG", https://www.gov.uk/guidance/transport-analysis-guidance-webtag (accessed 21 March 2018).

DfT (2017b), "Transport business case: assessment and process procedures", https://www.gov.uk/government/publications/transport-business-case (accessed 21 March 2018).

DfT (2017c), *High Speed Two – From Concept to Reality: Moving Britain Ahead*, Department for Transport, London, https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/629380/high-speed-two-from-concept-to-reality.pdf.

DfT (2011), "Crossrail Business Case Update", *Summary report*, July 2011, http://webarchive.nationalarchives.gov.uk/20120215100250/http://assets.dft.gov.uk/publications/crossrail-business-case-update/crossrail-business-case-update-summary-report-july-2011.pdf.

DfT, British Rail Network South East, London Regional Transport and London Underground Ltd (1989), *Central London Rail Study*, Department for Transport, London Regional Transport and British Rail, London, www.railwaysarchive.co.uk/documents/DoT_CentralLondonRailStudy1989.pdf.

Graham, D.J., S. Gibbons, R. Martin (2010), "The spatial decay of agglomeration economies: estimates for use in transport appraisal", *Report commissioned by the Department for Transport*, October, http://webarchive.nationalarchives.gov.uk/20110722015555/http://www.dft.gov.uk/publications/spatial-decay-of-agglomeration-economies-estimates-for-use-in-transport-appraisal.

HS2 Ltd (2013a), *The Economic Case for HS2*, High Speed Two Limited, London, https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/365065/S_A_1_Economic_case_0.pdf.

HS2 Ltd (2013b), "High Speed Two (HS2) Limited: HS2 Regional Economic Impacts", *Report commissioned by High Speed Two Limited*, KPMG, September, http://assets.hs2.org.uk/sites/default/files/inserts/HS2%20Regional%20Economic%20Impacts.pdf.

Note

[1] By "Crossrail", this paper refers to Crossrail 1 scheme, except where otherwise stated.

Chapter 4. Regional economic development in France: High speed rail and Grand Paris Express

Among all the French passions, two talk to each other: the cult of equality and the love of transport infrastructure.

- The passion for infrastructure has resulted in the construction, over a few decades, of 10 000 km of motorways, 2 700 km of new high speed rail (HSR) lines, as well as extensive urban public transport networks. Over the last 30 years, more than 600 km of new tramway lines were built in nearly 30 cities. Overall, France invests around 1% of its gross domestic product (GDP) annually in transport infrastructure.

- The cult of equality is reflected in a strong demand for infrastructure investment from the territories. Local decision makers, chambers of commerce, and big companies want to be connected to major national transport networks. A motorway, a HSR line, an airport are all signs of progress. Their construction creates jobs, and the traffic they generate is considered an important contributor to economic growth.

On this basis, in 2009, a national infrastructure plan (SNIT) was approved by the Parliament. It included the construction, over 25 years, of nearly 4 000 km of new HSR lines. Around the same time, the Grand Paris Express (GPE) project was launched. A network of more than 200 km of automatic metro lines should, in 15 years, surround Paris and thus improve accessibility for the majority of workers. Moreover, the time savings to commuters are expected to accelerate economic growth.

This paper examines the assumption of a causal relationship between improvement of transport accessibility and economic development, by focusing on two case studies:

1) The potential impact on regional economic development of investment in high-speed rail

2) Challenges to the methodology that was used to estimate wider economic benefits (WEBs) of GPE.

Regional economic disparities in France

Table 4.1 demonstrates significant and growing economic disparities between the metropolitan regions of France (see Figure 4.1). The Île-de-France region (Paris) accounts for almost one-fifth of the French population, but its GDP per capita is nearly double that of most other regions. Île-de-France's GDP accounts for 30% of French GDP.

Table 4.1. **France: economic indicators by metropolitan regions**

Metropolitan region	Population (2018, million)	Average annual growth rate (1990-2018)	GDP per capita (2014, (thousand EUR)	GDP per capita growth rate (1990-2014, %)	Main agglomeration	Population of the main agglomeration (2018, million)
Auvergne-Rhône-Alpes	8. 04	0.70%	30.946	16.20	Lyon	1.40
Bourgogne-Franche-Comté	2. 81	0.00%	25.767	8.40	Dijon	0.26
Brittany	3. 33	0.50%	26.655	23.60	Rennes	0.44
Centre-Val-de-Loire	2.59	0.20%	26.847	6.70	Orléans	0.28
Corsica	0.33	1.10%	26.554	25.60	Ajaccio	0.07
Grand Est	5.55	0.00%	26.821	8.60	Strasbourg	0.50
Hauts-de-France	6.02	0.10%	25.380	17.10	Lille	1.15
Île-de-France	12.25	0.50%	52.298	29.50	Paris	7.10
Normandy	3.34	0.10%	27.196	12.70	Rouen	0.50
Nouvelle-Aquitaine	5.99	0.50%	27.060	18.10	Bordeaux	0.77
Occitanie	5.90	0.80%	26.613	19.20	Toulouse	0.76
Pays de la Loire	3.79	0.70%	28.646	25.50	Nantes	0.63
Provence-Alpes-Côte d'Azur	5.06	0.40%	30.337	20.30	Marseille	1.90
France (metropolitan)	65.02	0.40%	32.317	20.20		

Source: Institut national de la statistique et des études économiques (INSEE).

Figure 4.1. **Map of French metropolitan regions**

Source: Ouest France (2015).

The demographic and economic importance of the main agglomerations in France explains the logic behind the sequencing of HSR developments. Paris, the biggest and wealthiest population centre, became the heart of the HSR network. The first high-speed rail link was built between Paris and Lyon (one of the biggest poles of economic activity). The network was then gradually extended to connect Paris to other regional capitals further afield, hence achieving significant time savings between main centres of population. There is a question, however, of whether these decisions were sensible in terms of value for money considerations.

High speed rail investment: A source of urban and regional dynamism?

The cities connected by HSR have experienced strong economic growth, reflected in increased employment levels over the past two decades.

Figure 4.2. **High speed rail network**

Source: SNCF Réseau (2017).

The first HSR line between Paris and Lyon was opened in 1981 and very quickly became a commercially successful connection (Crozet, 2017, 2014). This part of the HSR network still attracts very high levels of traffic, with more than 200 daily train services from Paris to Lyon, and further on to Marseille. Both cities have experienced strong economic growth over the past two decades. Between 2001 and 2014, the number of jobs in Lyon and the Aix-Marseille-Provence Metropolis (of which Marseilles is an integral part) increased by 12% and 14% respectively, while the average employment growth rates during the same period amounted to 5.5% in France and 4.5% in Paris. Relatively high employment growth rates over the same period were also observed in other cities served by HSR lines: Nantes (20%), Rennes (15%), and Lille (10%).

In the public debate, the high employment growth in these cities has been linked to the development of HSR lines. The impact of HSR developments on economic growth, however, has been largely exaggerated. Other important drivers of economic growth, such as population growth or investment in industrial production, have often been underplayed, and their impacts have been wrongly attributed to transport investment. The following facts should be considered:

- Agglomerations without a HSR connection also experienced significant growth in the level of employment. For example, in Toulouse the number of jobs increased by 23% between 2001 and 2014, in particular due to the establishment of Airbus as well as other aerospace

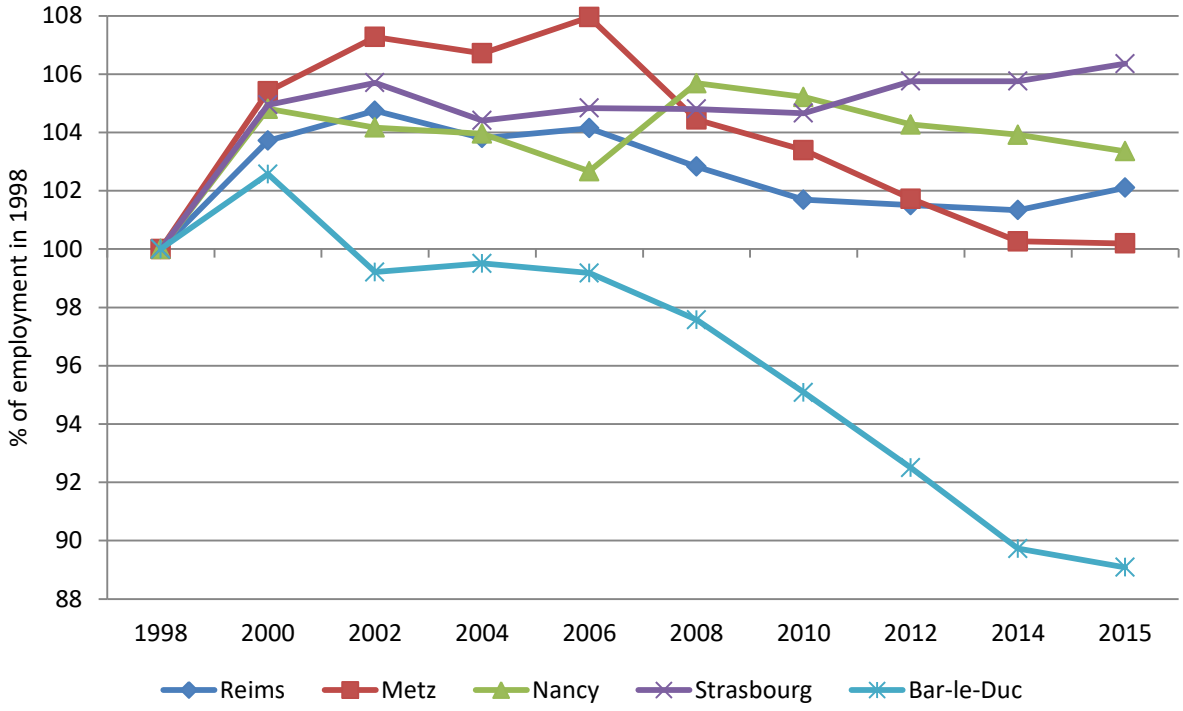
industry headquarters in the city. Moreover, the strongest increase in employment, almost 50% from 1990 to 2014, at an even faster rate than the early high population growth over the same period (30%), was experienced in Corsica – an island that is not served by either HSR or other modern transport infrastructure, such as motorways.

- Demographic developments play an important role in fostering the economic growth of regions. Coastal areas have experienced relatively high levels of population growth between 1990 and 2018: 1.1% per year in Corsica, 0.8% in Occitanie, 0.7% in Pays de la Loire, 0.5% in Nouvelle-Aquitaine and Brittany. At the same time, the population growth stagnated in the northern (Hauts-de-France), eastern (Grand Est, Bourgogne-Franche-Comté) and central (Centre-Val de Loire) regions.

- Another important phenomenon to consider is urbanisation, i.e. an increase in the proportion of population living in urban areas (UN, 1997). This has lead, in almost all regions, to an influx of jobs into large cities, irrespective of whether they are part of the HSR network or not. This has often been accompanied by an outflow of jobs from the surrounding regions. For example, while employment levels increases significantly for the city of Lille, the surrounding region of Hauts-de-France has been losing jobs since 2001. The same is the case for Strasbourg and the Grand Est region, Dijon, Besançon and Franche-Comté.

The number of jobs in France has been greatly affected by the recent global financial crisis. The recovery was late and uneven. The Grand Est and Bourgogne-Franche-Comté regions were particularly affected by the fall of employment in the industrial sector. But as the data below shows, the downsizing often took place before the crisis of 2008. Along the East HSR line (opened in 2007) the downsizing of employment occurred as early as 2000 – in Reims, Metz or Bar-le-Duc. In the latter zone, the fall was remarkable, with a 13.1% job loss over 15 years. As detailed by a study comparing more than 400 French cities (Delaplace, 2011), it is very difficult to see any positive impacts of HSR developments in those cities, except for very local impacts on employment in the areas surrounding some of the rail stations.

Figure 4.3. **Employment along the East HSR line relative to 1998**

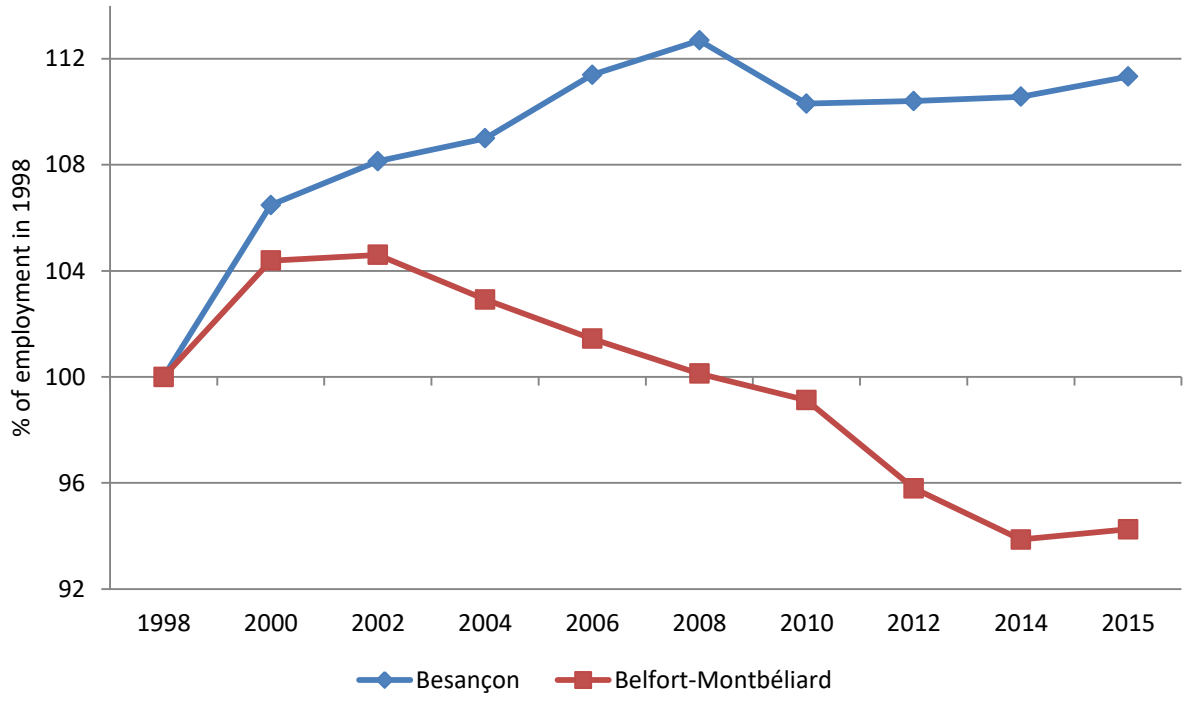


Notes: The figure presents employment levels in the employment zones of Reims, Metz, Nancy, Strasbourg and Bar-le-Duc. An employment zone is defined by INSEE as a geographical area in which most of the labour force lives and works.

Source: INSEE.

The same is true along the Rhine-Rhône HSR line that was opened in December 2011. Again, macroeconomic factors and local employment dynamics explain the employment developments in the region. In the Belfort-Montbéliard area, the sharp decline of employment in the automotive industry started at the beginning of the 2000s. The arrival of the HSR line did not change this situation. The Besançon area has been more resilient, but the level of employment in 2015 was lower than in 2008, with the rate of employment stagnant since 2010.

Figure 4.4. **Employment along the Rhine-Rhône HSR line relative to 1998**



Note: The figure presents employment levels in the employment zones of Besançon and Belfort-Montbéliard. An employment zone is defined by INSEE as a geographical area in which most of the labour force lives and works.

Source: INSEE.

In particular, arguing that investment in HSR will deliver employment and GDP growth suffers from two fallacies:

- The argument ignores the considerations of displacement of economic activity from other locations (Vickerman, 2007). New infrastructure attracts new activities, but often to the detriment of other areas (Delaplace, 2011). A local elected representative may be motivated by the creation of new infrastructure, but the national or regional community must not exaggerate the net gains of such projects.

- The argument relies on an assumption that transport investment generates economic growth. In fact, it is economic growth that gives rise to transport demand, not vice-versa. In France, the attractiveness of sea and sun and internal migration patterns have created more jobs than transport infrastructure investment.

The changes in the number of jobs between 1989 and 2012 were not linked to the presence of HSR services (Table 4.1). For instance, the former Nord-Pas-de-Calais region has a very good HSR relation to Paris, Brussels and London, but the number of jobs has been stagnant since the beginning of the 2000s.

In conclusion, the main lesson of HSR investment in France is that there exists at best a weak relationship between these investments and regional economic development. Other factors – industrial, economic and demographic – seem to be more important explanatory factors of regional economic development.

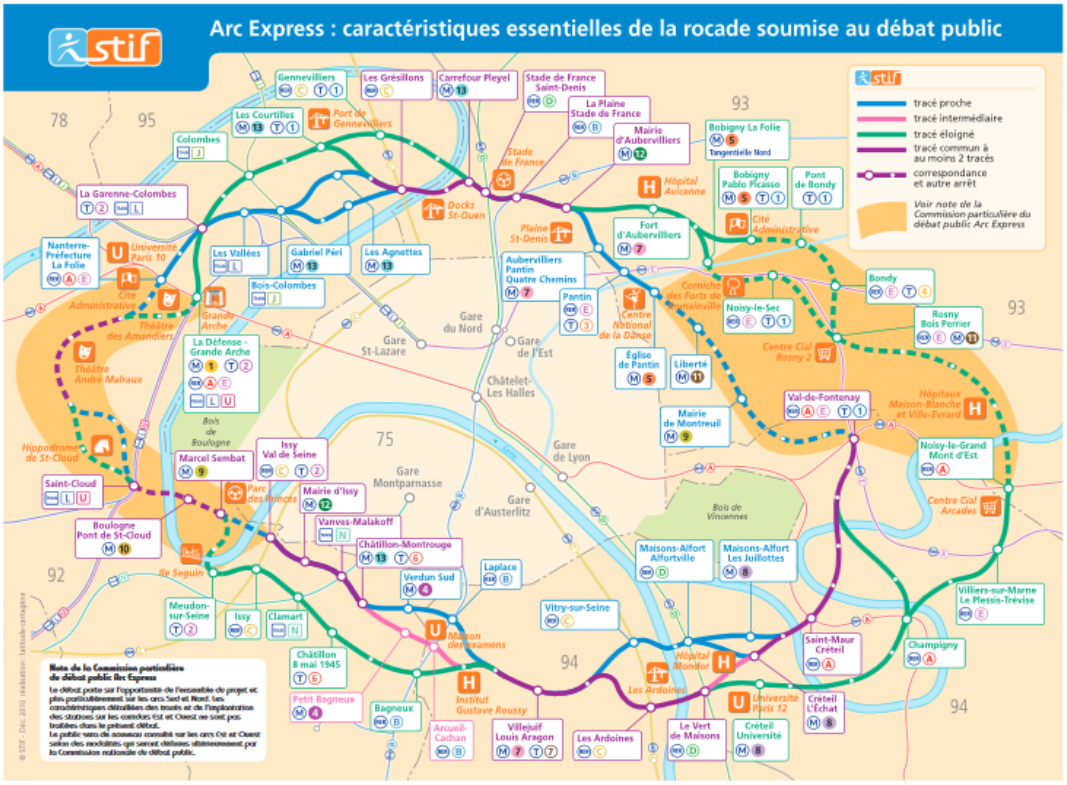
The expected WEBs are not obvious because, from a theoretical point of view, these effects are related to agglomeration effects linked to the impacts of density and local connectivity on productivity gains. But accessibility gains due to HSR must not be assimilated to proximity and density, namely because the number of workers using HSR is very small compared to the number of jobs in a region and even in an agglomeration. Agglomeration effects are probably more obvious when local accessibility gains concern a great number of workers as it is the case for the Grand Paris Express.

Grand Paris Express for Île-de-France: How were wider economic benefits estimated?

The GPE (Grand Paris Express) project was introduced by President Nicolas Sarkozy in April 2009. The economic objective of the project was to increase the attractiveness of the entire Île-de-France region by improving the transport links and hence increasing the size of the agglomeration.

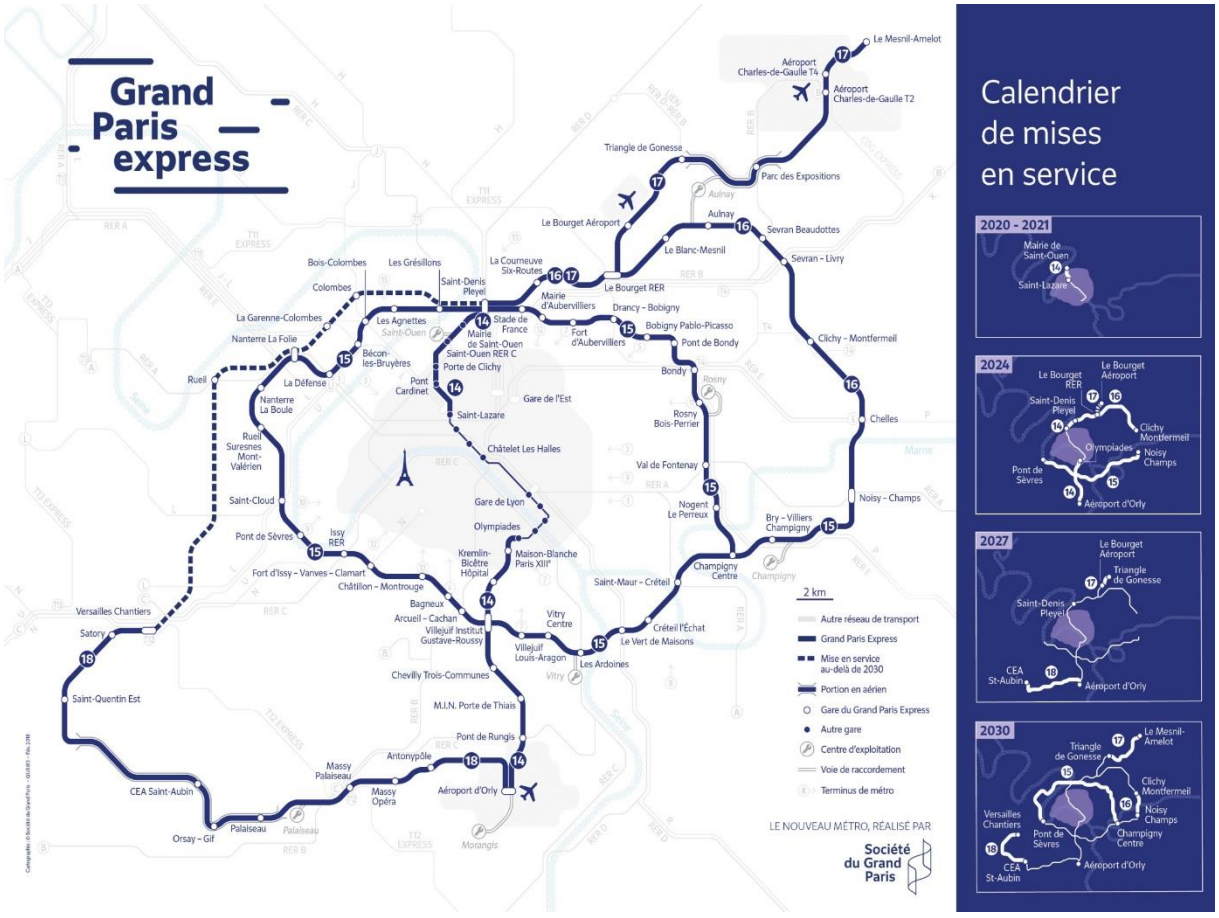
At a first glance, the Île-de-France region already has an excellent network of public transport, which includes 14 metro lines that connect the city of Paris and some of the nearby municipalities, several tram lines (some of which are still under construction), as well as 13 suburban train lines. However, the suburban train lines (called RER) are saturated and the quality of service is often suboptimal. Moreover, while the network is extensive and provides excellent connectivity in the centre of Paris, the lines do not provide adequate connectivity between different suburbs of Paris. This challenge is particularly acute due to the fact that the suburbs of Paris have a large potential for economic growth and employment (see Table 4.3). To address this challenge, the organising authority of transport of the Île de France region had planned a circular metro line around Paris called "Arc Express" in the early 2000s.

Figure 4.5. **Map of Arc Express Project**



Source: CNDP (2010).

Figure 4.6. **Map of Grand Paris Express**



Source: Société du Grand Paris.

The GPE has partly taken up this idea (see line 15 in Figure 4.6) by adding new sections to the network: the extension of line 14 to the south (Orly airport) and north to Saint-Denis; line 16 to the east, line 17 to Charles de Gaulle airport, and finally line 18 to the south-west to serve in particular the Saclay cluster comprising several prestigious universities and research centres.

The GPE is an ambitious, transformative project for Île-de-France. To calculate the net present value (NPV) of the investment, the Société du Grand Paris (SGP) proposed to add an assessment of the wider economic benefits resulting, inter alia, from agglomeration effects. This assessment was then added to the standard cost-benefit analysis (CBA) which has been conducted for all transport investment projects in France since the 1960s.

The assessment of WEBs by the SGP was inspired by the work carried out in the UK, in particular the methodology developed by Daniel Graham (2007) and Tony Venables (2007), adopted by the UK Department for Transport (DfT). The first CBA (including a WEBs assessment) was conducted in 2013. The high-level results from that work are presented in Table 4.2.

Table 4.2. **CBA and NPV 2010-2060**

	(2010, billion EUR)
Time gains	27.6
Reliability	3.4
Comfort	2.2
Environmental and urban gains	10.4
Directs effects of jobs reallocation	5.5
Agglomeration effects	6.3
New jobs	12.2
Total benefits	**67.6**
Building and operating costs	-37.9
Taxes on road	-0.8
Total cost	**38.7**
NPV	**28.9**
Internal Rate of Return	8.0%

Source: SGP (2014a), p. 37.

The total cost of the project as well as its operating costs is expected to amount to EUR 38.7 billion by 2035. When the WEBs are excluded from the calculation, the project's benefits exceed the costs by EUR 4.9 billion. The rate of return on the project derived from such net gain is lower than 4%, the criteria set out for public projects in France. The official government rules on CBA also require the ratio of NPV per public euro public invested to be calculated. With a NPV of EUR 4.9 billion, that ratio amounted to 0.16. When WEBs, amounting to EUR 24 billion, are considered, the ratio increases to 1.05, which implies that the benefits of the project exceed its cost, increasing the attractiveness of the project.

Lines 5, 6 and 7 in Table 4.2 indicate that WEBs come from agglomeration effects (EUR 6.3 billion) and productivity impacts related to job growth (EUR 12.2 billion) and relocation (EUR 5.5 billion). Agglomeration effects were estimated by applying elasticity rates based on research on the relationship between urban density and productivity of labour. Reallocation of jobs was based on the assumption that new GPE stations would attract new jobs in the vicinity of the stations due to improved accessibility of these locations. The results of this assessment are provided in Table 4.3.

Table 4.3. **Observed and estimated growth of total employment, 2005-2030**

	Total employment (2005, million)	Rate of growth of total employment (1990-2006)	Rate of growth of total employment (2005-2030)
Paris	1.65	**-4.10%**	3.87%
Hauts-de-Seine	0.86	14.40%	**16.83%**
Seine-Saint-Denis	0.54	7.30%	**33.15%**
Val-de-Marne	0.51	6.20%	**24.60%**
Seine-et-Marne	0.43	**29.60%**	11.97%
Yvelines	0.53	**17.00%**	19.68%
Essonne	0.43	**14.20%**	14.96%
Val-d'Oise	0.42	**30.60%**	16.32%

Source: SGP (2014b), p. 21.

Finally, the additional economic activity resulting from the GPE project was expected to bring new jobs to Île-de-France (Table 4.4). Most of these jobs were expected to come from abroad.

Before the GPE project, the Île-de-France master plan (SDRIF) provided for an additional 610 391 jobs to be created between 2007 and 2035. With the GPE, the number of jobs expected in 2035 is much higher: 750 141 in the "low" scenario and 990 154 in the "high" scenario (Table 4.4). With GPE, the growth of employment is greater at the centre of the agglomeration, where gains from productivity are expected to be higher.

Table 4.4. **Job estimates in Île-de-France, with and without GPE, estimated for three different scenarios of total employment, for 2007-2035**

	Total employment (2007, million)	Total employment: baseline scenario (2035, million)	Total employment: low scenario (2035, million)	Total employment: high scenario (2035, million)
Total	5.57	6.18	6.32	6.56
Centre	3.65	4.06	4.24	4.59
Periphery	2.01	2.12	2.08	1.97

Source: SGP and SETEC (2014).

By adding the WEBs of the GPE project to the future growth estimates, Île-de-France's GDP could grow by as much as 70% between 2007 and 2035, or 1.9% per year on average in the "low" scenario. This result would come from jobs that are both more productive (+50%) and more numerous (+13.5%). In comparison, without the project, the economic growth trajectory over the past year amounted to about 1.5%, and the GDP of Île-de-France increased by 45% between 1990 and 2014.

The above figures illustrate the potential significance of GPE. Caution, however, is needed when interpreting the results of WEB assessments of the project. First, almost 75% of the WEBs are estimated

to accrue from generation of new jobs and reallocation of jobs in the economy. These estimates, however, rely on a host of assumptions.

In particular, the study does not account for the fact that many additional jobs estimated for Île-de-France due to the GPE investment are likely to come from elsewhere in Île-de-France, or from other regions of France. The GPE project will have winners, but there will be losers too. This implies that the assessments of job creation are overstated. Moreover, the agglomeration benefits are conditional on the predictions of macroeconomic trends for France. These concerns were raised by the Commissariat Général à l'Investissement (CGI) as part of its review of the GPE project:

"The opinions of the CGI and the counter-expert reports on which they are based have highlighted the following concerns (Commissaire Général à l'Investissement, 2016):

1) A negative or low socio-economic profitability of certain sections if they were evaluated according to the traditional assessment methods of transport infrastructure used by other operators. The innovative evaluation methods used rely heavily on the pace of growth and location of populations and jobs, which are outside the purview of the SGP;

2) Risks of undervaluing the costs of building and operating the network;

3) Operating costs very little covered by the new revenues, and an operating deficit probably widened by the unique pricing of the Navigo Pass".

The CGI's report called for caution in interpreting the GPE's CBA results. The report also called to postpone or even cancel the construction of those sections of GPE that were expected to experience light loads of traffic, in order to improve the profitability of the entire project. Since this letter, the project has been facing a cost drift (of more than EUR 10 billion) and the Government has been obliged to postpone the realisation of the first segments of the GPE. Nonetheless, the whole project is still scheduled for delivery by 2030.

References

CNDP (2010), "Arc Express: caractéristiques essentielles de la rocade soumise au débat public », http://cpdp.debatpublic.fr/cpdp-arcexpress/docs/carte_projet/carte-traces-correspondance-metro-a.pdf (accessed on 12 March 2018).

Commissaire Général à l'Investissement (2016), *Letter of the Commissionner Louis Schweitzer to the Prime Minister*, 22 March 2016, N°133/CGI/LS/SG/GD.

Crozet, Y. (2017), "Where high-speed rail is relevant: the French case study", in Perez Henriquez, B.L. and E. Deakin (eds.) *High-Speed Rail and Sustainability*, Routledge, pp. 50-65.

Crozet, Y. (2014), "High Speed Rail performance in France: from appraisal methodologies to ex-post evaluations", in ITF, *The economics of Investment in High Speed Rail*, Roundtable Report, No. 155, OECD Publishing, Paris, pp. 73-105.

Delaplace, M. (2011), "Why are the wider effects of High-Speed-Rail so different according to places?", *Communication to the 9th World Congress on Railway Research*, Lille, May 2011, pp. 22-26.

Gouvernement de la République française (2018), "Grand Paris Express: les nouvelles lignes de métro et RER pour les Franciliens", www.gouvernement.fr/grand-paris-express-les-nouvelles-lignes-de-metro-et-rer-pour-les-franciliens (accessed on 5 March 2018).

Graham, D.J. (2007), "Agglomeration, productivity and transport investment", *Journal of Transport economics and Policy*, Vol. 41/3, pp. 317-343.

Ouest France (2015), "Connaissez-vous les nouvelles capitales régionales? [carte]", https://www.ouest-france.fr/europe/france/rouen-lille-et-dijon-choisies-comme-capitales-regionales-3594953 (accessed on 1 March 2018).

SNCF Réseau (2017), "Carte interactive du réseau ferré français", https://www.sncf-reseau.fr/fr/projets-chantiers-ferroviaires/cartes/carte-interactive-reseau-ferre-francais (accessed on 5 March 2018).

Société du Grand Paris (2017), "Le Grand Paris Express", https://www.societedugrandparis.fr/gpe/carte#lignes (accessed on 5 March 2018).

Société du Grand Paris (2014a), *Dossier d'enquête préalable à la déclaration d'utilité publique*, Pièce H, Évaluation socio-économique.

Société du Grand Paris (2014b), *Dossier d'enquête préalable à la déclaration d'utilité publique*, Pièce J10, Avis du Commissaire général à l'investissement sur l'évaluation socio-économique du tronçon Noisy – Champs <> Mairie de Saint-Ouen (lignes 16, 14 et 17) du Grand Paris Express et rapport de contre-expertise.

Société du Grand Paris and SETEC (2014), "Mission d'evaluation de l'impact socio-économique du métro du Grand Paris Express, Calculs et fourniture des résultats d'évaluation de l'impact socio-économique", *Rapport final*.

United Nations (1997), *Glossary of Environment Statistics*, Studies in Methods, Series F, No. 67, United Nations, New York.

Venables, A.J. (2007), "Evaluating urban transport improvements, cost–benefit analysis in the presence of agglomeration and income taxation", *Journal of Transport Economics and Policy*, Vol. 41/2, pp. 173-188.

Vickerman, R. (2007), Macro-, Meso- and Micro- Infrastructure Planning and Assessment Tools: Recent Evolution of Research into the Wider Economic Benefits of Transport Infrastructure Investments, *ECMT Roundtable 140: The Wider Economic Benefits of Transport*, OECD Publishing, Paris.

Chapter 5. Labour market effects and regional impacts of transport infrastructure investments in Sweden

Introduction

The overall goal of transport policy in Sweden is to ensure the economic efficiency and long-term sustainability of transport provisions for citizens and enterprise throughout the country. To support this overall goal, the Parliament has added two main objectives: 1) the objective of functionality, and 2) the objective of consideration (Government Offices of Sweden, 2015). The former pertains to providing everyone with basic accessibility to address transport needs of women and men in an equivalent manner and to contribute to the development potential of the entire country. The latter pertains to safety, environmental and health outcomes. Each of these two objectives is supplemented with a list of specifications to make each objective more precise.[1]

The two objectives shape the formal assessment framework of transport projects in Sweden. The full assessment results are presented in a document called "the summary table of impacts" ("SEB" for short in Swedish), in which a project is evaluated against the objectives of transport policy. Consequently, the SEB comprises:

i. A description of the project

ii. A description of the impacts resulting from the project

iii. An economic cost-benefit analysis (CBA) consisting of both monetised effects and a description/assessment of utility effects that have not been valued in monetary terms

iv. An analysis of the distributional effects of the project

v. An analysis of the project's contribution to policy goals.

The focus of this paper is on the application of CBA and the analyses of distributional effects of projects, i.e. (iii) and (iv) mentioned in the list above, primarily along a geographical dimension. The CBA is required to follow the guidelines outlined in the so-called ASEK-report (Trafikverket, 2016a); i.e. the document setting out the principles, costs, prices and shadow-prices to be used in economic CBA in the transport sector. The guidelines are decided by the Swedish Transport Administration (STA) and the current version of the report is published on the web site of the STA. There is also a summary in English (Trafikverket, 2016b). For the purpose of this paper, an important distinction is made between two applications of CBA in the Swedish transport sector: "the main analysis" and "supplementary analyses". The main analysis follows the guidelines strictly, whereas the latter may be used to test the robustness of specific assumptions considered too restrictive in the main analysis.

Furthermore, the guidelines of the standard analysis of distributional effects reported in the SEB are not as detailed as the guidelines pertaining to the economic analysis. The basic analysis of a project's distributional effects pertains to a high-level assessment along the dimensions of gender, geography, industry, category of individuals or firms, age of individuals affected by the project, mode of transport,

and any other dimension considered relevant to the assessed project. Various models are occasionally used to assess the geographical scope of distributional impacts. In addition, there are methods to assess how the consumer surplus in the CBA is distributed at a municipal level. The results from such analyses are reported as an "extensive distributional analysis" in the SEB.

The issue of how to treat potential wider economic impacts in the context of transport project appraisal has received substantial attention for a number of years both in Sweden and elsewhere.[2] The positive effects of transport investments on regional enlargement, agglomeration benefits and increased productivity are often mentioned in the public (and academic) debate. More specifically, these positive effects are assumed to be related to such economic mechanisms as better matching of employees and jobs in the labour market, reduced duration of unemployment, reduced market imperfections, and human capital externalities (knowledge spillovers). Thus, it is not surprising that effects on the labour market, potentially not included in the conventional CBA, have been considered important in this context.

The current recommendations of the Swedish ASEK guidelines regarding wider economic impacts is that such effects are not likely to be significant for small and medium-sized projects and should therefore not be considered as part of the main analysis. For large or strategically important projects, an analysis of wider economic impacts may be conducted, provided that a relevant market imperfection is identified and a relevant model is used. However, the results of such analysis should not be included in the main economic analysis but instead be presented as a supplementary analysis. If these effects are considered substantial they can be described in the main economic analysis. A major motivation for not including them in the main CBA is the risk of double-counting effects that were already captured by the benefits of the project, in particular by the value of travel time savings.

In sum, labour market effects and regional impacts are occasionally assessed for large transport projects in Sweden. These assessments pertain both to distributional impacts along the geographical dimension and to potential wider economic impacts. With respect to wider economic impacts on the labour market, the focus has been on the effects of improved job accessibility (or effective density) on wage earnings rather than on unemployment. The remainder of this paper discusses the labour market effects and regional impacts of two sets of major investments in Swedish infrastructure: the proposed investment plan for the period 2018-2029, and the proposed investment in high speed rail (HSR) between Stockholm and Göteborg/Malmö.

The proposed national plan of investments in the transport infrastructure for the period 2018-2029: Labour market effects and regional impacts

In late August 2017, the STA presented a proposal to the government concerning the national plan for the transport infrastructure between 2018 and 2029. The total cost of this plan is estimated to be EUR 62 billion.[3] The total cost is primarily allocated to investment, reinvestment and maintenance. Additional analyses of this proposal were delivered during autumn 2017 and winter 2018. The government's guidelines pertaining to the contents of the plan required the STA to, *inter alia*, specifically assess direct short run employment effects in the construction industry and long run employment effects in the Swedish economy. The paragraphs below describe: 1) how the assessment of the direct short run effects was conducted and what the corresponding result was, as well as 2) the assessment of the long run effects of the plan.

The direct short run employment effects of the plan were assessed using simple rules of thumb based on historical employment data for different infrastructure projects in Sweden and the related costs. The direct short run employment effect was estimated to be 235 000 annual full-time equivalent jobs.

The long run employment impacts of the national infrastructure investments set out in the plan (approximately a third of the plan's total cost) were assessed by using a model that has been employed a number of times in the context of infrastructure planning in Sweden – the so-called SAMLOK model.[4] The model consists of four different sub-models of: location of population, location of employment, reduced unemployment (increased employment), and wage earnings.

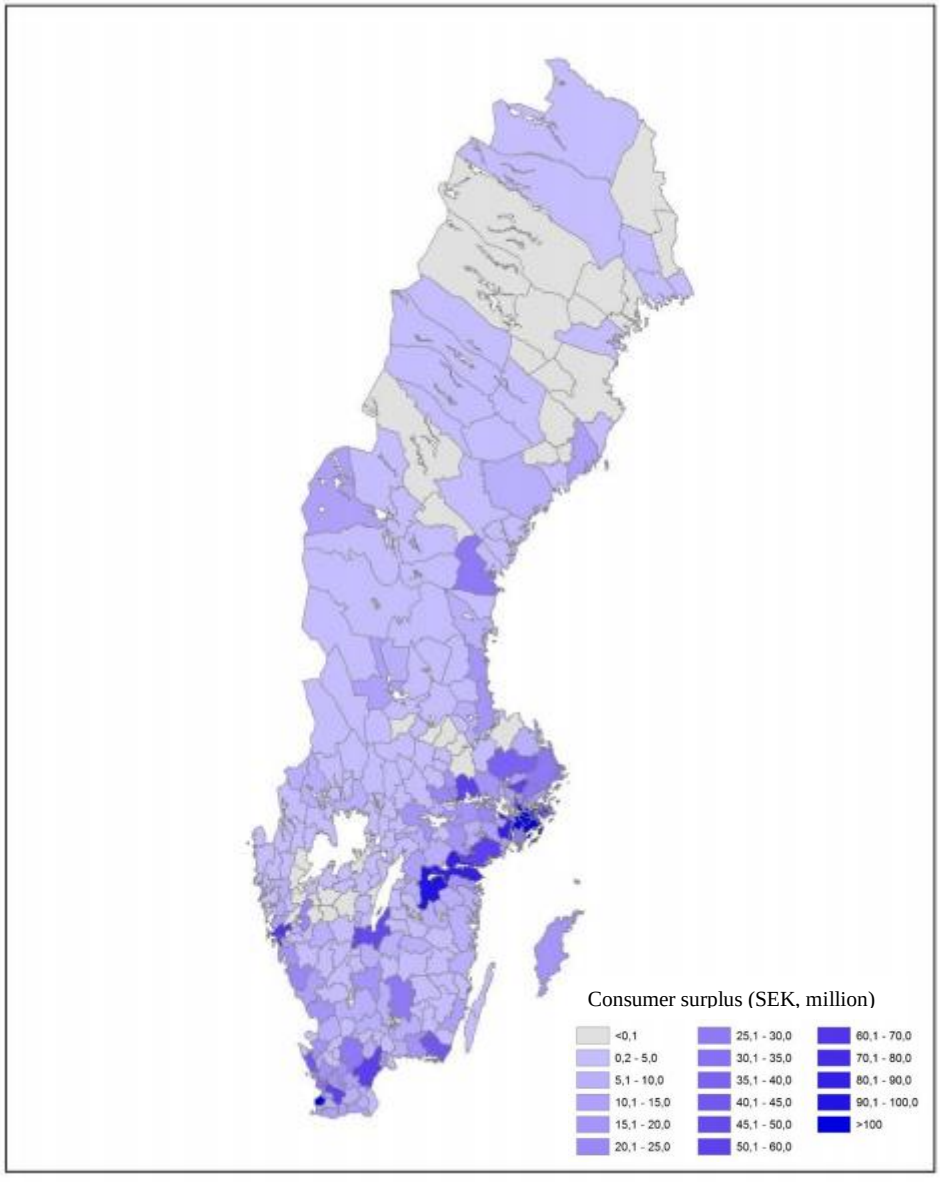
The location models are estimated jointly, whereas the other two models are independently estimated. The general idea behind the location models for population and employment is a Carlino-Mills kind of relationship between population (employment) and accessibility of workplaces (effective density). The wage model is based on constant wage-accessibility elasticity and is used to estimate the impact of improved accessibility on wages. The general idea is to capture agglomeration benefits related to better matching in the labour market and/or spillovers. Second-round effects on accessibility due to relocation of jobs are not considered. The model of increased employment is based on the work of Norman et al. (2017) and was novel in this application of the SAMLOK model. In Norman et al.'s model, temporal changes in unemployment were related to changes in accessibility, and a reduction in unemployment was counted as an increase in employment in the application.

The accessibility measure used in the SAMLOK-model derives from the national travel demand model (SAMPERS). The analyses made with the model are therefore directly related to the models used by the STA in the conventional CBAs. The counterfactual scenario of the SAMLOK-model analysis consequently corresponds to the reference scenario used for the CBA of the investments in the national plan.

According to the SAMLOK analysis, the relative change in accessibility resulting from the implementation of the plan will be largest outside the three major cities (Stockholm, Göteborg and Malmö). The connection between the south-eastern region of the country and Malmö will benefit from a planned improvement of road E22. A major railway investment ("The East Link") will improve the level of accessibility in Östergötland through a significant reduction in travel time between Stockholm and Linköping (the fifth largest city in Sweden, located in Östergötland). Relatively large increases in accessibility, as a result of investments in road E4 and "The East Coast Line" railway, were identified for the county of Gävleborg on the east coast.

A related analysis of the geographical impact of major rail and road investments listed in the national plan was also presented. This consisted of a regional division of the consumer surplus estimated in the CBA. The spatial pattern of the consumer surplus distribution closely resembled the distribution of accessibility improvements, i.e. municipalities with relatively large increases in accessibility tend to have relatively large shares of consumer surplus (see Figure 5.1).

Figure 5.1. **Map of estimated geographical distribution of consumer surplus resulting from road and rail investments**



Source: Swedish Transport Administration (2018).

Accessibility improvements were translated using the SAMLOK-model into estimated labour market effects and regional impacts. First of all, 0.25% of the population and 0.24% of employment were estimated to relocate from one municipality to another as a result of relative accessibility improvements. As the national plan aims to improve accessibility of peripheral regions, it encourages relocation of employment along the lines of improved relative accessibility and away from Stockholm and Göteborg, implicitly targeting a more balanced distribution of economic activity in Sweden.

The wage earnings model also follows the geographical distribution of accessibility improvements. The largest wage increases that are expected to result from the plan are located in the south-east of the country, where wages in the municipalities of Karlskrona and Ronneby are estimated to increase by 0.5%. The total increase in wage earnings in the country amounts to 0.04%. Eliasson and Fosgerau's analysis (2017) indicates that direct user benefits in the CBA should be increased by some 5 to 14%, depending on whether the estimated wage earnings effect reflects matching effects or spillovers in the labour market.

In addition to the estimated wage earnings effects, the long run effects of the plan on total employment are estimated to amount to 640 additional full-time jobs annually. This may seem like a modest effect considering the cost of the planned investments. To assess the effect of an increased employment level relative to other benefits included in the CBA, each additional job was valued at 75% of the average employed individual's wage earnings (to reflect the lower wages associated with transitions from unemployment to employment usually observed in practice). The value of an increased employment level is thus not included in the CBA, but it corresponds to 3% of direct user benefits in CBA. This suggests that inclusion of the plan's long run employment effects in the CBA would only have a modest impact on the result of the CBA.

In sum, the estimated wider economic impacts of the plan correspond to 8-16% of direct user benefits in the CBA. The range depends on the interpretation of the estimated wage earnings effect. In line with the ASEK guidelines, the wider economic impacts are not included in the CBA but are reported as a result of a supplementary analysis. The results on wider economic impacts may be compared to a recent assessment of wider economic impacts of transport investments in Norway (Institute of Transport Economics, 2016), in which the impact of nine investments was assessed using a computable spatial general equilibrium model. The estimated wider economic impacts ranged between negligible to 25% of direct user benefits, with a weighted average of 12%.

The economic analysis of an investment in HSR between Stockholm and Göteborg/Malmö

In 2016, a proposal of an investment in HSR between Stockholm and Göteborg/Malmö was made by a government committee on "National Negotiation on Housing and Infrastructure" ("Sverigeförhandlingen" in Swedish). The final report of the committee was presented to the Government in December 2017 (Government Offices of Sweden, 2017). The railway line and the stations along the line are shown in Figure 5.2 below. The investment consists of approximately 750 km of double-tracks for a maximum speed of 320 km per hour. The investment proposal was subsequently assessed by the STA, in a process that included a standard CBA and a number of supplementary analyses. The ratio between the net present value (NPV) and investment cost in the standard CBA was calculated at -0.6, meaning that the NPV is negative and the investment is not socially profitable.

Figure 5.2. **Map of the planned investment in HSR between Stockholm and Göteborg/Malmö**

Note: Non-HSR tracks are marked in yellow.

Source: Government Offices of Sweden (2016).

A standard CBA applied on large investments might fail to include some impacts. A significant concern in this case was the impact on the location of households (and, by extension, of the labour force). This was especially relevant since the National Negotiation covered the construction of new transport infrastructure and of approximately 100 000 new homes. In a standard CBA, the location of population and employment is the same in the investment and reference scenarios. Any potential changes to housing patterns between the two scenarios are not included in the standard analysis. Therefore, in this CBA, a sensitivity test was conducted based on the number of additional train passengers.

Instead of applying a fully-fledged model to assess the impacts of relocation of households in the country and the resulting change in travel demand, a simpler supplementary analysis was conducted by estimating the increase in the number of additional train passengers necessary to ensure benefits that are equal to the costs of the project. The calculation gave an indirect indication of how large the relocation of households must be in order to make the economic result of the investment reach break-even. The number of necessary additional train passengers was estimated as 420% greater than the projection in the main analysis. It should also be noted that the cost of new housing is not included in the cost of the

railway line. Thus, the relocation of households would have to be quite large to change the conclusions of the main analysis.

Another supplementary analysis assessed wider economic impacts on the labour market. A simple rule of thumb was used here that assumed that a 50% increase in consumer surplus related to work trips may capture the improvements in labour market matching. This implies an increase in the NPV identified in the main analysis by approximately 2%. It seems unlikely that wider economic impacts would change the conclusion of the main analysis.

Three alternative routes of the railway for high speed (HS) trains between Stockholm and Göteborg/Malmö were analysed in 2015 (Trafikverket, 2015a, 2015b and 2015c). The economic analyses were supplemented with robust regional economic analyses. Two different models were used to assess effects on the location of population and on wage earnings: the aforementioned SAMLOK-model and the DYNLOK model (WSP, 2015 and JIBS, 2015). The STA also commissioned a review of these two models and their application to HSR analyses (Westin, 2015).

Both of these models link changes in accessibility to "potentials" for relocation of population and economic activity. The main reason for calling such developments "potentials" is that the models do not consider constraints on residential development that may be relevant for the realisation of the effects. It is well-established that both geographical characteristics and local regulations may be important in the context of housing supply (e.g. Saiz, 2010).

Both models predict that the population in the municipalities affected by the investment will increase. The results vary between the three alternative routes of the HSR considered in the analyses of the STA. The results obtained with the two models are therefore reported as intervals in the following. The results of the SAMLOK model analysis suggest that the population aged 20-64 years old in affected municipalities will increase by around 19 000-20 000, with similar increases in employment. The results of the DYNLOK model suggest that the increase in population will amount to approximately 23 000-25 000 and that the number of jobs will increase by 14 000–15 000. The SAMLOK model predicts that wage earnings will increase by approximately SEK 435-458 million within ten years of opening the HSR line for traffic. The results of the DYNLOK model suggest that the sum of wage earnings (net of taxes) will increase by SEK 4-4.5 billion in "a typical year" as a result of the construction of HSR.

The review commissioned by the STA noted that both models primarily pertain to estimating economic effects related to commuting. Thus, it is not obvious that these two models are suitable for analysing the effects of HSR, where a large share of the trips is related to travel for purposes other than daily commute. The review of these reports concluded that the large differences in the results obtained with the two models imply major uncertainties regarding estimation of regional impacts of an investment in HSR. The need for further research and sensitivity analyses of assumptions and models were also acknowledged. One specific aspect raised by the reviewer was the need for a better understanding of the effect of accessibility changes on the interaction and competition between regions.

References

Eliasson, J. (2016). "Förbättrade metoder för samhällsekonomisk analys av kollektivtrafikinvesteringar," *Working papers in Transport Economics*, No. 6, Centre for Transport Studies, Stockholm.

Eliasson, J. and M. Fosgerau (2017), "Cost-benefit analysis of transport improvements in the presence of spillovers, matching and an income tax", *Working papers in Transport Economics*, No. 3, Centre for Transport Studies, Stockholm.

Government Offices of Sweden (2017), "Slutrapport från Sverigeförhandlingen Infrastruktur och bostäder – ett gemensamt samhällsbygge", *SOU 2017*, No. 107, http://www.regeringen.se/4afeba/contentassets/1299d9b5e4d24843ad132316569d036c/sou-2017_107_webb_total.pdf

Government Offices of Sweden (2016), *Lägesrapport från Sverigeförhandlingen: Aktuellt om höghastighetsjärnvägen*, Stockholm, http://media.sverigeforhandlingen.se/2016/07/Lagesrapport-fran-Sverigeforhandlingen-2016-07-01-final-4-till-webben-3-juli.pdf.

Government Offices of Sweden (2015), "Objectives for transport and infrastructure", www.government.se/government-policy/transport-and-infrastructure/goals-for-transport-and-infrastructure/

Institute of Transport Economics (Transportøkonomisk institutt, TØI) (2016), "Beregning av netto ringvirkninger på utvalgte prosjekter", *NTP 2018-2029*, Oslo, https://www.toi.no/getfile.php/1342233/Publikasjoner/T%C3%98I%20rapporter/2016/1471-2016/1471-2016-elektronisk.pdf.

JIBS (2015), *Höghastighetsbanornas betydelse för regional utveckling*, Jönköping International Business School, Jönköping University, May 2015.

Norman, T, M., Börjesson and C., Anderstig (2017), "Labour market accessibility and unemployment", *Journal of Transportation Economics and Policy*, Vol. 51/1, pp. 1-23.

Saiz, A. (2010), "The geographic determinants of housing supply", *Quarterly Journal of Economics*, Vol. 125/3, pp. 1253-1296.

Swedish Transport Administration (Trafikverket) (2018), Samlad effektbedömning av förslag till nationell plan och länsplaner för transportsystemet 2018–2029: Underlags PM Systemkalkyl ÅP 2018-2029, Borlänge, https://www.trafikverket.se/contentassets/040f8d0aafb643068cdd91609c3f63c2/underlags_pm_systemkalkyl_ap_2018-2029.pdf.

Swedish Transport Administration (Trafikverket) (2016a), *Analysmetod och samhällsekonomiska kalkylvärden för transportsektorn: ASEK 6.1*, https://www.trafikverket.se/contentassets/4b1c1005597d47bda386d81dd3444b24/asek-6.1/asek_6_1_hela_rapporten_180412.pdf.

Swedish Transport Administration (Trafikverket) (2016b), *Analysmetod och samhällsekonomiska kalkylvärden för transportsektorn: ASEK 6.1 – Kapitel 20: English summary of ASEK Guidelines*,

https://www.trafikverket.se/contentassets/4b1c1005597d47bda386d81dd3444b24/asek-6.1/20_english_summary_a61.pdf.

Swedish Transport Administration (Trafikverket) (2015a), *Höghastighetsbanor (Linköping-Bollebygd, Mölnlycke-Almedal, Jönköping-Lund)*, US1, YTR001, https://www.trafikverket.se/TrvSeFiler/Foretag/Planera_o_utreda/Samhallsekonomiskt_beslutsunderlag/Regionoverskridande/3.%20Investering/YTR001%20Höghastighetsbanor/Version%202015-12/US1/ytr001_hoghastighetsbanor_us1_seb_151204_g.pdf.

Swedish Transport Administration (Trafikverket) (2015b), *Höghastighetsbanor (Linköping-Bollebygd, Mölnlycke-Almedal, Jönköping-Lund)*, US2D, YTR001, https://www.trafikverket.se/TrvSeFiler/Foretag/Planera_o_utreda/Samhallsekonomiskt_beslutsunderlag/Regionoverskridande/3.%20Investering/YTR001%20Höghastighetsbanor/Version%202015-12/US2D/ytr001_hoghastighetsbanor_us2d_seb_151204_g.pdf.

Swedish Transport Administration (Trafikverket) (2015c), *Höghastighetsbanor (Linköping-Bollebygd, Mölnlycke-Almedal, Jönköping-Lund)*, US5, YTR001, https://www.trafikverket.se/TrvSeFiler/Foretag/Planera_o_utreda/Samhallsekonomiskt_beslutsunderlag/Regionoverskridande/3.%20Investering/YTR001%20Höghastighetsbanor/Version%202015-12/US5/ytr001_hoghastighetsbanor_us5_seb_151204_g.pdf.

Westin, J. (2015), Metodgranskning av regionalekonomiska effekter av höghastighetståg, Umeå: CERUM, Umeå universitet.

WSP (2015), "Regionalekonomiska av Sverigebygget – Bakgrund, modell och resultat", *Rapport*, No. 2015-05-27.

Notes

[1] Annex 2 presents the two lists. See also: http://malportal.trafa.se/Global/Excelfiler%20M%C3%A5lportalen/Transportpolitiska%20m%C3%A5l.pdf?_ga=2.31296703.1022837164.1524065430-102630109.1444372813 (in Swedish) (accessed on 3 May 2018).

[2] In the CBA literature this type of impact is sometimes considered under the category of indirect effects in secondary markets.

[3] Here 10 Swedish Krona (SEK) are converted to 1 Euro (EUR) for simplicity. At the time of writing the rate is actually around 10.40 SEK per EUR.

[4] The SAMLOK model was developed by the firm WSP.

Annex 1: Summary of transport appraisal frameworks in France, Sweden, and the UK

	France	Sweden	United Kingdom
Who has the overall responsibility for transport appraisal?	Ministère de la Transition écologique et solidaire (Ministry for the Ecological and Inclusive Transition)	Trafikverket (Swedish Transport Administration)	Department for Transport (DfT)
Which documents define the appraisal framework?	**Note technique du 27 juin 2014 relative à l'évaluation des projets de transport** (together with associated evaluative toolkits), developed by the then Ministère de l'Écologie, du Développement durable et l'Énergie in 2014, and last updated in October 2014. See more at: https://www.ecologique-solidaire.gouv.fr/evaluation-des-projets-transport.	**ASEK** (Analysmetod och samhällsekonomiska kalkylvärden för transportsektorn) report, developed by the STA in 1996, and reviewed annually, with major updates every 3-4 years (last one in 2016). See more at: https://www.trafikverket.se/ASEK.	**WebTAG** (Web-based Transport Analysis Guidance), developed by the DfT in 2013 in line with HM Treasury's Green Book (2018), and updated twice a year (last in May 2018). See more at: https://www.gov.uk/guidance/transport-analysis-guidance-webtag.
Which projects are subject to the transport appraisal process?	All publicly funded transport projects should be decided based on the assessments of economic and social efficiency. Large transport projects (including all the projects with costs above EUR 83 million) are subject to a socio-economic analysis.	All investments in transport infrastructure.	Transport investments, rail franchise awards, transport policy decisions.
What are the elements of the appraisal process?	– Quantitative and qualitative analysis (of social, environmental and economic impacts) – Analysis of monetised impacts – Financial analysis	– Cost-benefit analysis: – Main analysis – Supplementary analyses – Analysis of distributional impacts for all transport projects in the National Transport Plan – Analysis of the project's contribution to policy goals	– Cost-benefit analysis – Appraisal of economic impacts – Appraisal of environmental impacts – Appraisal of social and distributional impacts
How relevant is transport appraisal in project selection?	The CBA, together with a strategic analysis and a synthesis of impacts, forms a part of the framework for evaluating transport projects.	The analyses included in the summary table of impacts (SEB) affect both specific design features of a projects and the selection of projects.	Cost-benefit analysis and assessment of wider economic impacts form part of the economic and strategic cases of the "5 case model". The two cases are considered alongside commercial, financial and management cases in the project selection process.
Are wider economic benefits accounted for?	Wider economic benefits are not yet automatically accounted for in the quantitative analysis, although some scheme promoters have chosen to include such impacts.	Yes, as part of the supplementary analysis for large or strategically important projects. Whenever the impacts are considered significant, they can be described in the main analysis.	Yes, the guidance sets out methodologies for capturing productivity, employment and induced investment effects.
Are distributive impacts accounted for?	Yes, some distributive impacts across time, space and stakeholders are considered in the so-called synthesis of project evaluation.	Yes, but outside cost-benefit analysis. SEB includes an analysis of distributional impacts. Analysis can cover a wider variety of socio-economic dimensions.	Yes, the accessibility aspect of accessing employment, services and social networks is considered as part of appraisal of distributional impacts.
What is the appraisal period?	The appraisal period covers the period between the opening of the infrastructure and 2070.	Standard 40 or 60 year appraisal period (counting from when the scheme opens).	Standard 60 year appraisal period (counting from when the scheme opens).
How are ex-post analyses conducted?	All major projects are assessed within 3-5 years of their completion. Ex-post assessments are conducted by the project developer under the supervision of the Ministry for the Ecological and Inclusive Transition.	Some projects are evaluated five years after completion. Evaluations are conducted by the STA.	For major road projects, a baseline study is conducted and followed by ex-post evaluation one year and five years after opening. Practice varies for other types of scheme.

Annex 2: Objectives of functionality and consideration in transport policy-making in Sweden

The overall goal of transport policy in Sweden is to ensure the economic efficiency and long-term sustainability of transport provisions for citizens and enterprise throughout the country. To support this overall goal, the Parliament has added two main objectives: 1) the objective of functionality, and 2) the objective of consideration. The specific provisions of the objective of functionality and the objective of consideration are outlined below.

Objective of functionality provides that:

1. The citizens' trips are improved through increased reliability, safety and convenience.
2. The quality of transport in the business sector is improved and strengthens the international competiveness of Swedish businesses.
3. Accessibility is improved within and between regions, as well as between Sweden and other countries.
4. The work practices, implementation and results of transport policy contribute to an equal society.
5. The transportation system is designed to be useful to people with disabilities.
6. Children's abilities to safely use the transport system and stay in traffic environments increases.
7. The opportunities for choosing public transport, walking and cycling are improved.

Objective of consideration provides that:

1. The number of fatalities in road transport is halved and the number of injured persons reduced by a quarter between 2007 and 2020.
2. The number of fatalities in occupational and recreational sea traffic is decreasing continuously and the number of seriously injured halves between 2007 and 2020.
3. The number of fatalities and severely injured in rail transport and aerospace is decreasing continuously.
4. The transport sector contributes to achieving the environmental quality objective of Limited Climate Impact through gradual improvements in energy efficiency in the transport system and by breaking the dependency on fossil fuels. By 2030, Sweden should have a vehicle fleet that is independent of fossil fuels.
5. The transport sector contributes to achieving the overall generational goal for the environment and other environmental quality objectives as well as to increased health. Priority is given to those environmental policy goals where the development of the transport system is of great importance for the possibility to achieve set targets.

Annex 3: Expert Workshop: List of Participants

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International Transport Forum

Strategic Investment Packages

This report reviews international best practice of transport appraisal and considers how the existing policy frameworks can help governments strategically address regional challenges. The report is the product of the work undertaken by the International Transport Forum (ITF) at the OECD to inform the reform of the National Investment Plan of the Slovak Republic.

As part of the project, the ITF organised an Expert Workshop on Strategic Investment Packages in March 2018 in Bratislava. The meeting gathered key experts from France, Sweden, and the UK to set out best practice in appraising regional economic benefits of transport investment and to discuss how governments could strategically address regional challenges through implementing integrated policies combining transport infrastructure investment with other measures ("Strategic Investment Packages"). This report summarises findings from this project.

This report is part of the International Transport Forum's Case-Specific Policy Analysis series. These are topical studies on specific issues carried out by the ITF in agreement with local institutions.

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