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Levelling up and infrastructure policy

How connecting the UK's cities could be the key to boosting productivity

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Summary

From railways to broadband, public infrastructure benefits almost all citizens and so tends to be provided, or at least regulated, by government. Its importance to local economies has long been acknowledged, and investment in infrastructure as a means of boosting productivity in places outside London and the South East has been a major feature of many attempts at regional regeneration, most recently the coalition's Northern Powerhouse initiative.

Today, a focus on infrastructure is at the heart of the Johnson government's levelling up agenda. Two of the 12 'missions' in its *Levelling Up the UK* white paper specifically target improvements to transport and broadband provision as a way to help reduce the country's regional disparities. The government wants the levelling up agenda to be about more than simply improving economic outcomes, but also recognises successive UK governments' failure to solve the 'productivity problem' – the first chapter of the white paper is dedicated to it.

In this Insight paper we look at what infrastructure policies are likely to work best and explore how the government's current approach measures up, looking specifically at evidence relating to transport and broadband.

Our main findings are:

On transport

Better transport increases the quality, speed and capacity of networks and allows cities to grow, leading to 'agglomeration benefits': big, usually urban centres allow for more knowledge-sharing, leading to specialisation and businesses having a wider pool of workers to enable better matches to jobs.

There is also a large evidence base showing that initial infrastructure networks, including British railways in the 19th century, and roads in the former East Germany after reunification, led to major productivity gains. The evidence for marginal improvements to established transport networks – the situation for the UK today – is not as strong, in large part because evaluation is difficult.

That bigger cities tend to be more productive holds across many countries. The consensus from the evidence – for example, based on analysis by the National Infrastructure Commission (NIC) – is that transport investment should focus on improving links into and around cities. Cities quickly run out of capacity for new roads, meaning an important role for public transport, though the type of investment – for instance, rail or bus – will differ depending on local context.

The major caveat is that the marked increase in home-working since the pandemic has reduced demand for transport networks. It is far too soon to know how this will affect cities in the long term, so the broad findings from the evidence are still relevant, but the government must keep this under review.

Transport between regions – including high-speed long-distance rail, such as HS2 – may also drive productivity improvements, although via a different channel, increasing trade of goods and services more than by improving commuting times. However, there is little robust evidence to allow us to evaluate how much these projects will contribute to productivity levels, especially in 'left-behind' places.

As such, transport policy is more likely to 'level up' the UK by prioritising intra-urban transport – focusing its efforts on the big UK cities outside of London, like Manchester and Birmingham, which underperform relative to international comparators and which are held back in part by their existing transport networks.

The government's approach on transport broadly matches this evidence, focusing on improving transport within cities and using the Integrated Rail Plan to increase links between cities in the North and Midlands to create a more cohesive regional economy. Views differ on whether the latter will deliver what is proposed, although new lines will also free up capacity to allow more frequent local services on existing lines.

However, transport investment alone will not be enough to level up left-behind places. Increasing transport capacity will drive growth only if the area is already attractive to businesses and workers (that is, where transport capacity is the main constraint on growth). In many low-productivity places, it will also be critical to make complementary investments in skills, innovation and broader business support.* Housing and transport plans should also be aligned, so that housing supply is increased where transport capacity grows.

On broadband

As with transport, there is evidence that the early rollout of broadband led to major productivity gains across advanced economies, but that benefits beyond that tend to be small. This is the conclusion of the What Works Centre for Local Economic Growth (WWCLEG) and the Organisation for Economic Co-operation and Development (OECD) among others. The evidence also shows that broadband has its biggest impacts in urban areas, where it benefits more businesses. Further productivity gains from new digital advances are possible, but again are most likely to benefit higher-productivity places with existing skilled workforces.

For these reasons, the government's broadband mission to provide 4G everywhere is unlikely to drive big productivity improvements in left-behind places – most people already have 4G, and areas that do not are those where the private sector has not seen fit to invest, pointing to small economic returns. The ambition to expand the reach of the 5G network will also be delivered by the private sector where there are major economic gains. However, the mission could still contribute to broader levelling up; for example, by enhancing wellbeing – another, if less quantifiable aim of the agenda – for those in rural areas with poor internet access.

On the evidence base

Gaps in the evidence base make it difficult for us and the government to provide precise policy prescriptions; for example, on the relative merits of bus and rail links. Evaluation of transport projects is difficult, but it is much harder if robust evaluation plans have not been built into projects at the outset. The government should prioritise clear evaluation for its ongoing and next tranche of transport projects.

It should also investigate the reasons for – and possible solutions to – the high cost of building transport infrastructure in the UK, which can be up to 30–40% more expensive than in western Europe. The reasons for this are varied, but even partially solving this could release billions of pounds for additional productive infrastructure investments.

This Insight paper first lays out the reasons we would expect better infrastructure to boost productivity in left-behind places, before reviewing the evidence of what policies work. We then compare the lessons from the evidence with the government's current approach.

* Covered in accompanying Insight papers found at www.instituteforgovernment.org.uk/our-work/policy-making

Why better public infrastructure should lead to higher regional productivity

Infrastructure has been a key plank of many attempts to boost productivity in regional UK economies. A recent example is the Northern Powerhouse project, which boasts: "We are driving forward the biggest investment in the North for a generation and are committed to improving everyday journeys, developing skills and rolling out superfast broadband to deliver the improvements that the region needs for the long term."[1]

This section lays out the reasons why we would expect better public infrastructure to boost productivity based on economic theory.

Better intra-city transport infrastructure improves efficiency and supports the growth of productive cities

Improvements to public infrastructure are most commonly concerned with intra-city travel: roads and public transport that help people travel into and around cities from the surrounding areas. Projects could include some combination of new routes, shorter journey times or expanded capacity to allow more people to travel at peak times.

The primary economic benefit of improved intra-city transport is more efficient commuting. This can include lower journey times, but the focus can and should be broader than this.[2] It benefits workers, who could have better commutes, or choose to live in a place with more space while spending the same amount of time commuting. This contributes to productivity because some of the time saved is likely to be spent working and journeys will be more efficient.[3] In addition, better transport allows people to access more services (such as restaurants), which can also bring economic benefits by providing better links between businesses and customers.

Beyond these first-order benefits for commuters, a better intra-city transport system allows more people to work in cities. This might be because people can commute into cities from further away, or because more capacity allows for more people to travel at the same time. This should contribute to enhanced productivity overall due to a phenomenon that economists call 'agglomeration'. A bigger hub city benefits from more efficient knowledge-sharing, allows greater specialisation and gives businesses access to a wider pool of workers to enable more efficient matching between workers and jobs.[4] The Centre for Cities has documented the well-established economic fact that in most countries the most productive places tend to be big cities largely as a result of these agglomeration benefits.[5] Bigger cities will also tend to have better 'amenities' – the services that people can access. A bigger city can sustain a much greater variety of restaurants, for example. This also contributes to the attractiveness of cities to workers.[6]

The main benefits of intra-city transport infrastructure are likely to manifest in more jobs clustered in cities. This does not mean that the benefits will only be felt by inner-city residents, however. Residents of towns – especially those near to big cities – can benefit from greater access to jobs in cities. And better job opportunities for those

living in a town may also lead to greater spending in the local economy and so generate broader benefits.[7] There is a positive correlation between the household income in a town and the productivity of its nearest city.[8] Nonetheless, the economic theory does point to more jobs in cities, rather than high-value jobs in towns, as the primary mechanism by which transport will support regional productivity.

It is also important to note that agglomeration has some downsides. The concentration of people in one place can lead to big increases in the cost of living in an area – mostly through the price of housing – increased congestion and pressure on local public services.[9] Some of these can be mitigated by better transport and other policies.

Interregional transport can also support economic growth

A different form of transport infrastructure enables movement between cities or regions – for example, motorways or high-speed inter-city train lines such as HS2. These are not designed primarily for commuters. Instead, they allow for greater trade between different regions.[10] This includes trade in goods (by facilitating movement of freight) and in services (by facilitating faster business trips).

Trade integration should allow for greater specialisation of different cities and regions, although good inter-city infrastructure may also concentrate high-value activity in already prosperous regions. For example, if the legal services sector can take clients in Newcastle or Manchester while based in London, it may further concentrate that sector in the capital.

Broadband connectivity also drives efficiency improvements

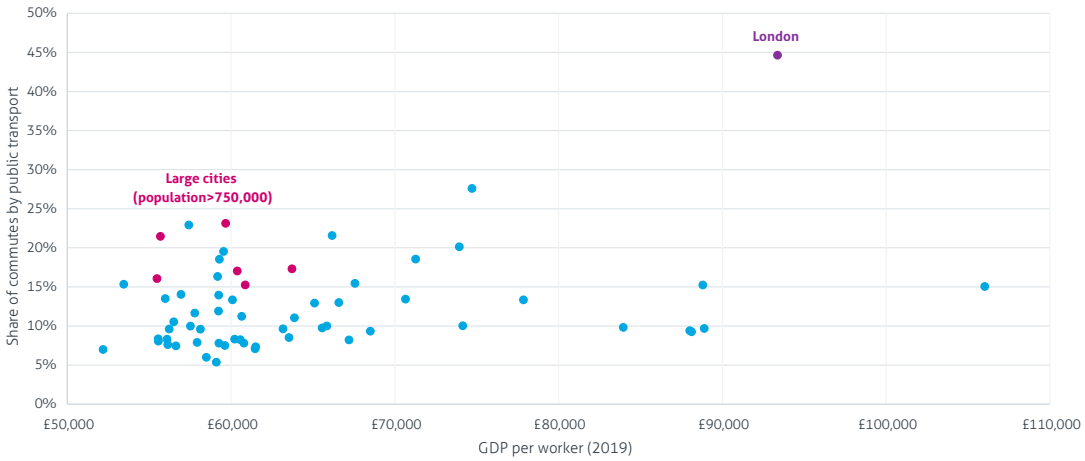
The other main type of public infrastructure that forms part of the levelling up agenda is broadband internet. Enhanced internet connectivity benefits firms in several ways. It can lower costs – for example, by making it easier for businesses and customers to find one another and interact. This is especially true in businesses such as travel agencies and retail banking.[11] With the rise in hybrid and at-home working, good broadband connectivity could potentially play the role that transport infrastructure has done: to expand effective labour markets and allow people to access jobs further away.

Deficient transport infrastructure has been blamed for the poor performance of UK cities

As noted above, in most countries there is a strong positive relationship between city size and productivity. However, the UK's large cities outside of London fare relatively poorly given their populations. This is not because these cities do not benefit from any 'agglomeration' effects – workers in these places tend to be more productive than similarly skilled workers elsewhere. But the skills of workers in these cities are not especially high because they are not attractive places for high-skilled businesses and workers.[12]

Transport infrastructure contributes to this problem. Patterns of transport use are different in London and the UK's other biggest cities. While almost half of commuter journeys in London are taken by public transport, this drops to less than 25% for most other UK cities, including large ones.[13] And public transport networks in the UK's regional cities compare unfavourably to similarly sized cities in continental Europe.

Figure 1 **Productivity and share of commutes by public transport commutes in UK cities**



Source: Institute for Government analysis of Centre for Cities, Cities Data Tool, 2022. Note: Large cities are Manchester, Birmingham, Glasgow, Newcastle, Sheffield and Leeds.

Poor public transport limits how many people can commute into these cities, as road capacity is restricted. If the public transport network allowed these cities to be denser (more people commuting into the centre) it could lead to greater productivity benefits, while also making cities more attractive places to live for workers by enabling greater variety of amenities (restaurants and so on), which are facilitated by large populations.

Even if transport infrastructure alone might not lead to much higher productivity in the UK's regional cities, the relatively poor public transport provision would quickly become a limiter on how productive these cities could become if other policies addressed the other problems facing these cities. As one infrastructure expert told us: "There are low productive cities that have spent a lot on transport to little effect. But I don't think there are any high productive cities that lack really good transport networks."

Which infrastructure policies will work best?

The section above provides a clear rationale for expecting public infrastructure investment to contribute to levelling up. This section summarises the evidence base of whether infrastructure policies have led to higher productivity in practice and which policies are likely to be most effective.

Where there is a total absence of infrastructure, big investment is likely to yield good returns

There is a strong body of evidence from economic history that shows the development of new infrastructure led to big economic gains.[14] Perhaps the best example were the railways, which are estimated to have contributed one sixth of total productivity growth during the mid-19th century in the UK as travel times were reduced and cities could grow.[15] More recently, the initial rollout of broadband contributed to productivity growth in the later 1990s and early 2000s across OECD countries.[16]

More recent case studies also bear out the large productivity gains from new transformational infrastructure. For example, in East Germany, transport and telecommunications infrastructure were in a state of considerable disrepair at the point of reunification.[17] The scale of investment in improving this was considerable: between 1990 and 1994, the German Unity Fund provided around €140 billion of funding to the former GDR,* much of it for infrastructure. Estimates suggest that infrastructure improvements were an important factor that led to the East catching up.[18] In Japan, the transformation of the road network in the 1950s and 1960s supported high economic growth and regional convergence, but – as in Germany – the existing infrastructure started from a low base, with only 23% of the national highway system paved.[19]

More broadly, summaries of the economic evidence consistently find larger effects for infrastructure in less developed contexts. For example, average estimated returns to infrastructure spending are higher in the (on average less economically developed) EU and in developing countries than the US.[20,21]

For the most part, however, the types of infrastructure investment that the UK could undertake to support regional economies are unlikely to be entirely new. While there is undoubtedly room for improvement in many UK cities' transport systems, railways, roads and buses are already in place. And broadband has already been rolled out in most places. The NIC writes that "most UK infrastructure networks are well beyond this initial, step change, point".[22]

The direct evidence for improvements to existing networks increasing productivity is weak

Of more relevance for the UK as a developed economy with mature infrastructure is the evidence of impacts from marginal improvements to existing networks. The consensus across several organisations that have surveyed the literature, including the NIC, WWCLEG and the Productivity Insights Network (PIN),[23,24,25] is that evaluations have shown at best a weak link between improvements to mature infrastructure networks and improved productivity.

The lack of robust studies in this area reflects the difficulty of evaluating the productivity impacts of transport projects directly. In the case of skills or research and development, it is easier to identify the worker or business benefiting directly from the policy and to compare them with otherwise similar people or businesses. Identifying

* Current prices.

the direct beneficiaries of infrastructure is more difficult, and in any case we would expect productivity gains to be diffuse if they will be primarily driven by agglomeration effects. Furthermore, projects may be chosen in areas where more economic growth is already anticipated, or in an attempt to reinvigorate a failing region. Some specific studies have managed to identify 'control' areas and provide robust analyses, but these have tended to be context-specific and cannot be replicated for most studies. An attempt by the NIC to develop a simpler method that could be used more widely to assess transport projects yielded inconsistent results.[26]

Ex-post evaluation evidence points to small positive returns to intra-city road and broadband investments, but neither are likely to play a big role in levelling up

Two types of infrastructure investment that have been more comprehensively evaluated are local road and broadband investments, where evaluations are available based on investments in the US, UK and mainland Europe. In all cases, the evidence overall shows that they do lead to improved economic outcomes but that the returns to investment are likely to be quite modest.

Of 16 papers reviewed by the WWCLEG, 14 found positive effects of broadband expansion on economic outcomes (such as employment and productivity). However, the largest benefits were in towns and cities, with smaller effects in rural areas.[27] Given that urban areas in the UK now have widespread provision of relatively high-speed broadband, the scope for further productivity gains from additional rollouts is likely to be small. In addition, broadband improvements tend to have greater impact where digital skills are stronger.[28] Any broader productivity benefits from improved digital connectivity are therefore more likely to arise in already prosperous areas rather than being an effective tool for levelling up.

Most studies of road investments also found positive effects on economic outcomes,[29] showing that modest improvements in transport infrastructure can drive growth. But the returns are not very large, especially once studies account for 'displacement effects' (the gains in areas that benefit from new transport partly arise because activity moves from other nearby areas that do not benefit from the new infrastructure).[30] And there are limits to how far road investments can be used to increase transport into cities because road capacity is very limited in large built-up areas.[31]

Alternative approaches point towards good value for money from bus and rail investment

The WWCLEG finds very few evaluations of intra-city public transport on economic outcomes, in part due to the difficulties of identifying control groups noted above.[32] Where evaluations are found – for example, on rail investment – evidence is mixed and employment benefits near stations often arise from displacing jobs elsewhere.[33] However, these studies may not capture the broader benefits of greater city size that are expected to drive productivity improvements. And although robust evaluations would be the gold standard, this does not mean that there is no evidence that the government can draw upon to assess different projects and understand what is likely to work.

There is a well-established link between city size and productivity (the 'agglomeration benefits' mentioned above), and so projects can be assessed based on their effect on intra-city transport capacity and use. This does not measure the effects on productivity directly, but on an intermediate step (city size) that has a robust link to productivity growth. Approaches such as this are commonly used to appraise transport projects before they are decided upon.[34]

Taking this approach further, it is also possible to assess which types of transport investment will lead to the biggest increases in transport capacity (and so, in theory, productivity gains). The NIC has assessed the cost of increasing transport capacity by between 5% and 20% across the 20 biggest urban areas in the UK. Overall, it finds that substantial increases in capacity will require a mix of transport modes (including roads, buses and trains).[35] Taking commonly used 'agglomeration elasticities' from the economic literature, the NIC finds high implied returns to well-targeted investments in all three.[36]

Evidence on the effect of big inter-urban railway is almost entirely lacking

The other type of transport infrastructure that the government has considered and implemented in recent years is inter-urban railway (for example, HS2). The rationale for these projects tends to be different: rather than influencing commuting patterns primarily, they allow for more integrated trade.

For these major interregional projects the evaluation problems are even greater, and as a result evaluation is almost entirely lacking. The mechanisms by which these large projects should increase economic outcomes is also more difficult to quantify, based on lower trade costs rather than city size.

Evaluations of these projects are few and far between, although recent studies have found positive effects in Japan, Germany and Spain.[37,38,39] However, evidence based on US interstate highways implies that any studies focusing only on benefits to serviced areas will overstate positive impacts as there is likely to be displacement as businesses move from areas that do not benefit from new access to bigger markets.[40] So while some areas will benefit, it will be at least in part at the expense of others.

Unlike with intra-city public transport, there is not an obvious intermediate benefit (such as city size) which allows governments to estimate the likely productivity benefits with more confidence. Furthermore, the benefits are likely to flow in both directions and could help higher-productivity regions more than lower-productivity ones.

The other role that interregional transport investments can play is to free up capacity on existing lines for better intra-urban connections (this is a major rationale for HS2). In this case, the benefits can be evaluated in a similar way to intra-urban investments. This should be the primary rationale for any interregional transport projects that are designed to promote levelling up.

Otherwise similar infrastructure tends to be more expensive to construct in the UK

The analysis thus far has focused on the benefits of infrastructure projects in terms of economic growth. However, the return on investment also depends on initial costs. And otherwise similar transport infrastructure projects tend to be more expensive in the UK than other advanced economies in mainland Europe, by up to 30-40%.[41] There is also a consistent trend of major projects coming in late and over budget,[42] although this is not specific to the UK and not true across the board.

The precise cause of higher UK costs is uncertain, although reasons proposed include the size and fragmented nature of civil engineering in the UK, the complexity of contracts and the tendency of governments to turn the infrastructure spending taps on and off again.[43]

The consequences are clearer: UK transport infrastructure is worse value for money and any given amount of dedicated spending produces less transport than in other advanced economies. Addressing these problems would allow the government to deliver billions of pounds worth of transport infrastructure each year without increasing budgets.

Infrastructure investment on its own will not level up a place

While the above evidence points to the potential for infrastructure investment to support growth, it is unlikely to be able to bring about the scale of 'levelling up' on its own. Increasing capacity of intra-city transport will lead to growth if there are existing capacity constraints due to high demand from businesses to locate in that place.

The government can be confident that Crossrail, which will increase transport capacity into London, will boost transport use and jobs in the centre. However, places that are less economically successful might have other problems – for example, low skills – that make them unattractive locations for businesses and workers. In that case, increasing supply where transport capacity is not already a big constraint on growth will not necessarily increase footfall in the centre.[44,45] For example, a new tram in Oldham, which should have provided better links into Manchester, did not lead to more commuting due to broader problems with the perceived safety of the tram and a lack of skills among locals to allow them to access jobs in Manchester.[46]

This also applies to broadband investment and interregional transport, where the benefits in terms of efficiency and trade rely on businesses wanting to locate in those places. Given that levelling up is concerned principally with places that are performing poorly (and, as the white paper acknowledges, are often missing more than one of the 'six capitals'),[47] infrastructure investment alone is unlikely to be the answer – although it could help in combination with other interventions.

The evidence points to the importance of complementary investments: other policies that would increase demand for businesses and workers to locate in an area or to use the infrastructure. This is explicitly acknowledged by both the NIC and Department for Transport.[48]

One set of complementary policies would be those that make the use of existing transport infrastructure easier and more attractive where they are operating below maximum capacity. Improvements in the quality of transport could be delivered, for example, through integrated ticketing (such as the Oyster card system in London), which has increased rider numbers by making it easier for people to take journeys that require multiple modes of transport.[49]

However, bigger policies are likely to be necessary where the problems are more fundamentally about demand for jobs in a place. A skills policy is likely to be an important complement to infrastructure investment (to ensure the workforce is attractive to employers) – and digital skills specifically to allow firms to take advantage of broadband improvement. In addition, housing policies can and should be designed alongside transport policies to ensure that transport infrastructure is built where people can take advantage of it.[50]

The biggest returns to infrastructure arise in the long run

A final insight from the evidence is that studies (in the US and UK) find bigger impacts of infrastructure investment in the long run – that is, more than 10 years after build – than in the short term.[51,52] Given that one of the major benefits of infrastructure arises from reorganisation of economic activity, it is not surprising that returns take time to emerge.

This has important implications for the UK levelling up agenda. The initial missions are long term by political standards, extending to 2030. However, given the time it takes to build infrastructure and the lag between the build and economic benefits, it is likely that infrastructure projects will play only a small role in contributing to the economic mission in the early years. However, the evidence suggests that returns can be large in the long run, and so this does not mean that the investments are poor value for money. While the benefits will be beyond the time horizon of most politicians, it is important that transport investments are adopted with a long-term focus and followed through with consistently as far as is possible.

Some other infrastructure policies will be deliverable more quickly, including increases in the provision of buses and light rail, as well as policies such as integrated ticketing. These can play an important role, but they should not be pursued at the expense of long-term infrastructure that could yield bigger returns beyond the 2030 levelling up window.

The rise of home-working means past evidence may not be a reliable guide to the future

The evidence reviewed for this paper, and the conclusions summarised in this section, are based on infrastructure before the pandemic. In that world, most people, including in office jobs, commuted into work every day. Broadband in homes had relatively little impact on economic outcomes because most work happened from offices rather than homes.

Patterns of working have undergone a major shift. As recently as February 2022, one third of the UK workforce was working from home at least one day per week.[53] While it will have fallen since, many employers are now adopting hybrid working patterns. These imply lower demand on transport systems (and many continue to make large losses). This may reduce the need for capacity-enhancing investments.

At the same time, it is possible that hybrid working will change the nature of the agglomeration benefits of cities.[54] If people can work together remotely, they may be able to live further away and still benefit from productivity enhancements. And other advantages may become more important, including people enjoying wider variety and choice. Or, alternatively, less in-person interaction might weaken the productivity benefits of cities.

The future of home-working is uncertain, and its impact on cities even more so. However, a labour market that has more home-working will demand infrastructure, and benefit from infrastructure, in different ways.[55]

The uncertainty over the future of working from home has two implications for the right approach to infrastructure investment. First, projects that will deliver good value for money under a range of future working pattern scenarios should be favoured. And second, the government should build in stages at which projects can be reassessed from the start.

How does the evidence compare with the government's approach?

With caveats about future home-working, the evidence above provides lessons about the policies that are likely to be effective to drive productivity. Investment in roads and broadband might generate positive returns, but they are likely to be small. Public transport investment is likely to be most effective where it is focused on increasing the transport capacity of cities where demand for it is already present or supported by other policies.

The government's approach

The levelling up transport mission is focused on intra-urban transport networks. Specifically, "local public transport connectivity across the country will be significantly closer to the standards of London, with improved services, simpler fares and integrated ticketing".[56]

In addition, the government has recently announced additional funding for bus services outside of London, including more power for mayoral combined authorities to franchise bus routes as has happened in London.

The government's plans for rail are set out in the integrated rail plan. The main focus of that plan is on reducing inter-city travel times, especially in the North and the Midlands. However, the travel times that the government is most interested in reducing are within

regions (for example, Nottingham to Birmingham and Liverpool to Manchester). The rail plan explicitly notes that "significant productivity improvements could flow if the major cities of the North and Midlands functioned more like a single economy and individual city regions were supported to fulfil their economic potential".[57] While the plan also includes faster travel to London via HS2, the primary rationale is to promote agglomeration within regions outside of the South-East.

The government's broadband mission is that everywhere in the country should have access to 4G and gigabit broadband by 2030 (currently 92% and 63% of the population respectively) while over 50% should have access to 5G.[58]

The focus on public transport is sensible despite the paucity of evidence

The primary focus of transport policy is on public transport, rather than additional road investment. The reasons for this are clear and reasonable: levelling up is not happening in a vacuum, and greater use of public transport is an important contributor to the government's drive to reach net zero carbon emissions. London stands out compared with other regions in the large share of people that travel to work by public transport rather than car.[59]

Growing cities further will be more easily achieved by enhancing public transport options rather than providing additional roads. The NIC analysis includes some road enhancements as the most cost-effective way to increase transport capacity in most cities,[60] but this is likely to lead to only relatively small increases in capacity: big increases in capacity will depend on better public transport.

The explicit focus of the integrated rail plan – to generate agglomeration benefits by joining up cities – fits with the economic theory and available evidence as the approach most likely to drive productivity benefits in underperforming regions. However, it is contested whether this will work in practice. The Centre for Cities has argued that the economic structure of northern cities means that it is unlikely that faster rail will lead to a single, integrated labour market as there are not big differences in wages across the cities, nor sufficient specialisation, to encourage mass commuting between the cities.[61] Others have argued that the main benefit of the new rail capacity will be greater capacity on existing lines for shorter journeys, in which case the plan would instead promote better transport within smaller city areas, which would help those areas grow.[62] Overall, the plan is likely to promote a more integrated regional economy, through additional trade, and more local capacity for better intra-urban transport.

There is also evidence that integrated ticketing can lead to greater use of public transport if there is capacity, although it would be surprising if this led to transformational, as opposed to incremental, benefits.[63]

The lack of evidence is a problem for the government. In practice, the effect of different interventions (for example, bus or rail as the predominant approach) will differ by area, and the government would benefit from better evidence to inform which types of transport investment are likely to be most effective in different contexts. The

government must ensure it draws on what evidence is available (for example, by using NIC transport capacity analysis to allocate the £3bn of bus funding) and also prioritise ways to expand the evidence base.

The government's transport mission – for networks outside the South East to be significantly closer in quality and provision to London – is vague and, combined with uncertainty due to the evidence base, it is difficult to predict how much difference achieving this mission should make. The Royal Society of Arts (RSA) has attempted to estimate this, assuming that it will mean improving transport capacity in the 20 biggest towns and cities in the UK by 10–20%.[64] Based on estimates from the economic literature it found that this would boost annual GDP by £4bn per year in today's terms, or 0.2% of GDP.

The broadband target is unlikely to generate big productivity returns

While the initial rollout of broadband led to big productivity gains, the introduction of 4G and gigabit broadband is unlikely to do so. Broadband returns have tended to be greatest in urban areas, whereas the remaining gaps in coverage are primarily rural. Much broadband investment has been taken by the private sector due to large commercial returns, and 5G coverage is likely to expand without much government intervention. That government action is necessary to achieve the last increment of coverage for 4G indicates that economic benefits deriving from it are likely to be smaller. Estimates from the RSA imply meeting this mission would lead to an economic benefit of around £1bn in today's terms,[65] less than 0.1% of GDP.

This does not mean that the mission is without merit. While the focus of this paper is on how to enhance regional productivity, levelling up is explicitly broader than economic outcomes. For example, access to high-speed broadband can contribute to higher wellbeing (another of the 12 levelling up missions).[66]

The pay-off may come after the 2030 target

If major infrastructure projects are to lead to more growth in left-behind regions, they are likely to have the biggest impact beyond 2030 due to the long timescales of projects. The first staging post for the levelling-up missions is designed to be 2030, and they are intended to continue beyond then. But it will be crucial that the government does not only prioritise the 'quick win' projects that might deliver some benefit sooner but less benefit overall. The explicit long-term focus of levelling up should help to keep politicians from these short-termist tendencies.

The long lead times of transport infrastructure in particular mean that it is important that projects are reviewed at each implementation stage. This is something that the government is doing with the integrated rail plan, and is especially important given the uncertainty about the role of transport in the economy going forward with the possible rise of hybrid or home-working.

Recommendations

This paper has reviewed the evidence and found that focusing on improvements to public transport connectivity within regions, and specifically into and around major cities, will be the most effective way to use infrastructure policy to level up productivity. Broadband and interregional transport are unlikely to play a major role, although the former may contribute to other aspects of levelling up and the latter could be appropriate if it frees up capacity for more intra-city journeys.

Based on our analysis of the government's policy approach we recommend:

- That the government makes use of the best available evidence (such as analysis by the NIC) when distributing funds like £3bn for buses to ensure that it focuses on increasing urban transport capacity.
- That the government builds in regular stages for review and evaluation into new long-term infrastructure projects, so that at each stage it can decide whether economic conditions justify continuing with the next stage. This is especially important given the heightened uncertainty about future demand for infrastructure due to changing working patterns.

We also note that gaps in the evidence are stark, so the government should prioritise filling those gaps to allow it to design better infrastructure policies to contribute to levelling up.

It is difficult for researchers to design robust analyses to judge the economic impacts of infrastructure after the fact. However, if evaluation were more explicitly built into the design of projects, including identifying 'counterfactual' areas that will not benefit from the investment, more robust comparison would be possible.

Finally, an ongoing problem for the UK has been the high cost of building infrastructure in the UK. Even a relatively small closure of the gap to average costs in western Europe could release billions of pounds for additional investment, making an in-depth investigation of the reasons behind these cost problems a high priority for further government research.

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