

The Case for Agglomeration Economies



About the Review

The Manchester Independent Economic Review provides a detailed and rigorous assessment of the current state and future potential of Manchester's economy. It contains a rich seam of evidence to inform the actions of public and private sector decision-makers so that Manchester can achieve long-term sustainable economic growth and boost the performance of the national economy.

Completely independent of local and national government, the Review is led by a panel of five prominent economists and business leaders:

*Sir Tom McKillop:
Chairman, Manchester Independent Economic Review*

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Managing Director, Enlightenment Economics*

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Chief Economist and Head of Global Economic Research,
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The Review Panel commissioned seven world-class organisations to work on seven strands of analysis which provide a deep and cutting-edge analysis of the economics of the Manchester City Region: the way businesses and people interact in terms of trade and skills, the causes and impact of innovation, how investment comes about and the effect it has, and why, despite all this economic activity and growth, stubborn pockets of deprivation still persist.

An ambitious agenda-setting report pulls together the seven strands of analysis, output from the comprehensive economic baseline study, as well as incorporating the extensive intelligence gathered from a year long consultation across the public, private and voluntary sector, which will be the foundation of an ambitious economic strategy so that the world-class research the Review has produced is used to drive Manchester's aspirations forward.

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FOREWORD

This important report on the economy of the Manchester City Region (MCR), in the context of the rest of the UK and the North as a whole, provides an over-arching framework for thinking about future prospects.

It is important at a time of severe recession, of still-unknown depth and duration, to keep in mind the strategic and long-term aims indicated by the research reported here. We hope that the evidence provided here of Manchester's great economic potential – as well as some shortcomings – will encourage an appropriate sense of ambition in the city region.

For one of the main messages in the LSE work is that well-governed city regions with appropriate policies do have an ability to create their own destiny to some degree. The UK's cities vary in their economic outcomes. Of course London dominates the UK economy in its size and productivity. Outside of London the city region with the highest productivity is Bristol, which is relatively small. In the North, a group of three city regions – Leeds-Bradford, Liverpool and Manchester – have higher productivity than other Northern locations; and of these, firms in MCR have higher productivity than firms elsewhere in the Northwest region. These rankings point to the potential for Manchester ahead of all other cities outside London (due to Bristol's small size and peripheral location) to take advantage of the benefits of agglomeration and increase its growth.

Overall, there is some potential for higher productivity and growth in Manchester. This is probably the most realistic way to raise overall economic growth in the North and, depending on how this was achieved, such growth would be good for the UK economy. At the same time, the counterpart to this potential is that in terms of productivity levels, Manchester is currently punching below its weight, and policies need to focus on raising productivity in order to deliver on that potential.

The report gives us some clear guidelines on the strategic issues involved in this task, although there will remain much important detailed work to be done on specific areas of policy.

Within the nation as a whole, productivity differences are driven by the size of the city region economy, by the availability and quality of factors of production, such as skills and access to transport, as well as the efficiency with which these factors are deployed.

A larger economy increases productivity because it allows firms and workers to benefit from agglomeration. Agglomeration economies are important for understanding why firms in MCR have higher productivity than firms elsewhere in the Northwest region. There is no evidence that the clustering of specific industries improves productivity, and sector-based policies on the whole are the wrong focus. Being in a large urban environment is more important. The exception is when a sector requires expensive infrastructure investment, as at Daresbury, or MediaCityUK.

However, there is some evidence that MCR productivity is lower than might be expected given its size. Skills seem to play a large part in explaining the productivity gap with the Southeast. This finding confirms the MIER report on employment and skills: there is a real challenge here for Manchester.

The available level of skills can be raised either by addressing the skills of those already resident or by attracting highly-skilled people from elsewhere. The former is a difficult long-term challenge, centrally involving the education system. However, it is essential to tackle this issue, not least in order to ensure that all areas and all people in MCR benefit from higher growth and productivity.

Attracting the highly skilled from elsewhere depends to a large degree on the housing offer. There is clear evidence in the LSE report of strains and mismatch in MCR's housing market.

A second kind of mismatch in the property market concerns commercial premises. The report rightly notes that high value businesses tend to prefer locations in the south of the City Region, where it is difficult to get planning permission, whereas it is fanciful to think that the presence of premises in itself will be enough to get these types of business to locate well away from where their skilled employees want to live.

We agree with the conclusion in the report that planning policy needs to be more responsive to market signals. Co-ordinated planning policies are important to achieve desirable outcomes in terms of the vitality of different types of area and also environmental impacts, but nevertheless policies which do not respond to individuals' and firms' preferences are doomed to fail. This is likely to be unwelcome news for those parts of MCR where supply generally exceeds demand, and between hopes and reality.

Access to transport networks is not as important a factor as might have been thought in explaining the MCR productivity gap with London and the Southeast, although the transport network might provide part of the explanation for MCR's higher productivity with respect to locations elsewhere in the Northwest region. This research is not a direct assessment of the role of transport within the city region, but it does summarise evidence from elsewhere that this latter element – in contrast to transport between cities – is a very important issue for Manchester's economy. There are economic gains to be won from improved transport within MCR.

In sum, the potential exists for growth in Manchester to increase long-term, to the benefit of its residents. The effect on specific places within the city region will be more mixed. In particular, the impact on economic and social deprivation – which was addressed directly in the MIER report by Amion Consulting – will depend on how growth is achieved.

MCR's ability to deliver on its potential for higher productivity and growth, and better livelihoods for its residents, will require it to address a number of very difficult strategic issues. These are taken up in the context of all the reports which form the MIER, in the overarching Reviewers' Report.

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EXECUTIVE SUMMARY

Economic activity in the UK is very unevenly distributed across space. It is inconceivable that this marked unevenness can be explained by appealing purely to inherent differences in physical geography.

Instead, it must be that, over time, the workings of the economic system amplify and reinforce initial differences to generate historically persistent patterns of spatial disparity. For this to happen there must be self-reinforcing benefits from the spatial concentration of activity.

These benefits, often referred to as agglomeration economies (or externalities) may arise in many different ways. A range of costs work to offset these benefits. As economic activity concentrates, the prices of scarce resources, such as land, increase; firms face more competition; roads and public transport become more congested; pollution increases.

In a modern economy, such as the UK, it is the trade-off between these costs and benefits that determines which areas are rich and which are poor; which grow fast and which grow slowly.

This report is concerned with analysing these agglomeration benefits and their policy implications. It explains how they arise and why they matter so much for explaining the geographical distribution of economic activity across areas within countries.

The report:

- (i) reviews the existing literature;
- (ii) presents evidence on the role of agglomeration economics in explaining spatial differences in productivity in Great Britain;
- (iii) assesses the relative position of the Manchester City Region (MCR); and
- (iv) considers the implications for policy.

Further supporting detail for this reportⁱ is available to download:
www.manchester-review.org.uk

Looking at the analysis, we find that:

- with the exception of London, firms in regions and city regions outside of the Southeast tend, on average, to have lower productivity than firms located within the Southeast;
- the city region with the highest productivity outside of London is Bristol. In the North, a group of three city regions (Leeds-Bradford, Liverpool and Manchester) have higher productivity than other Northern locations;

ⁱ Report prepared for the Manchester Independent Economic Review. This work contains statistical data from DNS which is Crown copyright and reproduced with the permission of the controller of HMSO and Queen's Printer for Scotland. The use of the DNS statistical data in this work does not imply the endorsement of the DNS in relation to the interpretation or analysis of the statistical data. This work uses research datasets which may not exactly reproduce National Statistics aggregates.

- firms in the Manchester and Liverpool City Regions have higher productivity than firms elsewhere in the Northwest;
- access to economic mass, to skills and to transport all have a role to play in explaining productivity differences at the firm level. For differences between regions and city regions, variation in the access to economic mass and to skills are much more important than variations in access to the transport network. Better access to economic mass increases productivity because it allows firms and workers to benefit from agglomeration economies;
- agglomeration economies are important for understanding why firms in MCR have higher productivity than firms elsewhere in the Northwest region. Despite this, there is some evidence that MCR productivity is lower than might be expected given its size;
- skills are important for understanding a large part of the productivity gap with the Southeast. This conclusion holds generally, although MCR's skills gap is less than for some other Northern cities;
- a small part of the productivity gap with the Southeast can be explained by access to transport networks, but this is not an important factor in explaining the productivity gap between MCR and the Southeast. Access to the transport network might provide a small part of the explanation of MCR's higher productivity with respect to locations elsewhere in the Northwest region. We do not directly assess the role of transport within the City Region, but there is evidence that this is a very important issue for MCR's economy; and
- at the aggregate level, we find no evidence that the clustering of specific industries improves productivity. Clustering can bring positive productivity benefits for individual sectors, although the effect is nearly always outweighed by the importance of being in a large urban environment.

The literature and our evidence on productivity differences and their determinants suggest the following:

Agglomeration effects and spatial policy

High productivity in a particular place tends to be offset by high costs of living and producing. As a result, productivity differences, including those arising from agglomeration economies, do not alone make the case for focusing on one location over another. The efficiency arguments for policy to divert activity to more productive places rely on 'non-linearities' in the way *net* benefits (productivity advantages minus offsetting costs) change with city size.

Such non-linearities raise the possibility that the free movement of people and businesses between cities does not result in an efficient allocation. In this case, policy that helps move people and businesses from one place to another can raise efficiency, because the increase in *aggregate* net benefits in places that gain, more than offsets the aggregate losses in the places that lose out. Unfortunately, there is essentially no evidence available on the net benefits, or on such non-linearities.

Because productivity benefits of big cities tend to be offset by the costs of living in big cities, equity arguments for focusing on specific places rely on individuals being unable to respond to differences across places in the real standard of living. Even then, many economists think policies focussed on individuals rather than places better address the resulting disparities.

All else being equal, reducing the *cost* of living and producing in high productivity locations is the best spatial policy for creating agglomeration and realising its benefits. This should increase overall efficiency as firms and households relocate to higher productivity locations.

The equity effects are more complicated although, on average, this should increase real standards of living across locations. These gains are most obvious for households currently prevented from moving to high productivity locations by high living costs. Reducing commuting costs in and out of high productivity locations also has beneficial impacts on average, and may be particularly important at smaller spatial scales.

MCR and the UK economy

London and the Southeast have a large and significant productivity advantage relative to the rest of Great Britain. *If* policy wants to achieve a more “balanced” spatial structure it is working against strong market forces pulling in the other direction.

Given this, and what we know from the literature about agglomeration effects and spatial policy (discussed above), there is no evidence to suggest that growth in the North (including MCR) at the *expense* of growth in London and the Southeast would be good for the UK economy.

MCR and growth in the North

There are several northern city regions, MCR included, whose productivity disadvantage relative to the Southeast and London is (i) less than that for other Northern city regions; (ii) less than that of their wider region.

This suggests that policy interventions focussed on those relatively productive city regions will have less work to do to counter the strong market forces pulling towards London and the Southeast.

As with the UK economy as a whole, the evidence base, on average, suggests that the effects on individuals are likely to be positive, if such growth came about as a result of reductions in the costs of living or producing in MCR. The effect on specific places will be more mixed.

Overall, there is some evidence that growth in MCR (as well as a small number of other city regions) is the most realistic way to raise overall economic growth in the North and, depending on how this was achieved, that such growth would be good for the UK economy.

Growth in MCR and economic and social deprivation

Recent growth in MCR has reduced worklessness in all local authority districts. The effect has been more mixed at the neighbourhood level. However, this should be a second order concern relative to the direct impact on individual levels of worklessness.

The impact of future growth on economic and social deprivation will depend how it is achieved. The most direct impact will come from policies that specifically target the most deprived individuals. In contrast, policies that achieve MCR growth through attracting or retaining increasing numbers of skilled workers may have some indirect benefits, but they will also generate other costs in terms of, for example, rising housing costs.

If MCR wishes to attract more skilled workers it has demand and supply side options. On the demand side it can (i) try to encourage relocation of (quasi-) public sector jobs (although there may be a displacement issue because of public sector pay premiums); (ii) make sure the planning system provides suitable business premises in a timely fashion; (iii) deal with infrastructure bottlenecks that may particularly affect high tech firms; (iv) address issues of project financing (although the evidence is mixed on whether this is a genuine problem).

On the supply side policy could (i) try to provide amenities favoured by the high skilled (although systematic evidence for the impacts of this is limited, suggesting that the public good aspects of these amenities should remain the main focus for decision making); (ii) effectively address skilled workers' housing and transport demands. Policy should *not* (i) give emphasis to SMEs; (ii) support particular sectors.

In the area of land use planning, MCR needs to ensure that housing and commercial land supply respond in an appropriate and timely manner to changing demand patterns to ensure that costs do not rise too fast as MCR economy expands. To do this it needs to confront a number of strategic issues: (i) planning decisions on dwelling types and location do not appear to be sufficiently responsive to demand; (ii) some elements of national planning strategy (e.g. mixed communities, Section 106 funded regeneration) may not fit well with MCR's aspirations.

In the area of transport, MCR needs to ensure that its transport investments respond in an appropriate and timely manner to changing demand. To do this it should (i) focus on transport investments that can be justified on the basis of reasonable assumptions about future demand; (ii) figure out how to deliver congestion charging; (iii) focus first on transport objectives and meeting demand, only then on other objectives; (iv) carefully consider whether transport policy actually has a role to play in addressing social deprivation.

Addressing these strategic issues with respect to housing and transport plans is critical. Given its productivity disadvantage MCR needs to attract people based on its quality of life appeal. Current plans may not achieve this.

Policy should *not* be directly concerned with the sectoral composition of MCR. The benefits of clusters and the likely impact of policy are greatly overstated. In some circumstances, involving substantial fixed costs and upfront investment, there may be a coordinating role for policy by helping fund this investment. Overall, however, there is no evidence that skills, innovation, housing or transport policy benefit from having a strong sectoral focus.

In conclusion, there are a number of reasons to think that a limited number of city regions (including MCR) may offer the best possibility for achieving government objectives with regard to narrowing the gap in growth rates between the North and South of England.

On average, however, the effects on individuals are likely to be positive if this growth came about as a result of reductions in the costs of living or producing in MCR.

The effect on specific places will be more mixed. The impact on economic and social deprivation within MCR will depend on how growth is achieved. MCR's ability to deliver on this growth will require it to address a number of very difficult strategic issues.

1.0 INTRODUCTION

Economic activity in Britain is unevenly distributed across space.



In 2005, at the top, West Inner London's employment-adjusted Gross Value Added (GVA)¹ per employee was £44,000, which is 43% above the GB average of £30,850. For the next richest (NUTS3) region, Berkshire, the figure was £39,850, lower than London's but still 29% above the GB average.

In the same year the lowest ranking regions, Liverpool, Blackpool and the Central Valleys of Wales had employment adjusted GVA per employee of £19,800, £21,050 and £21,250, respectively. These lowest values are 31 to 36% below the GB average.

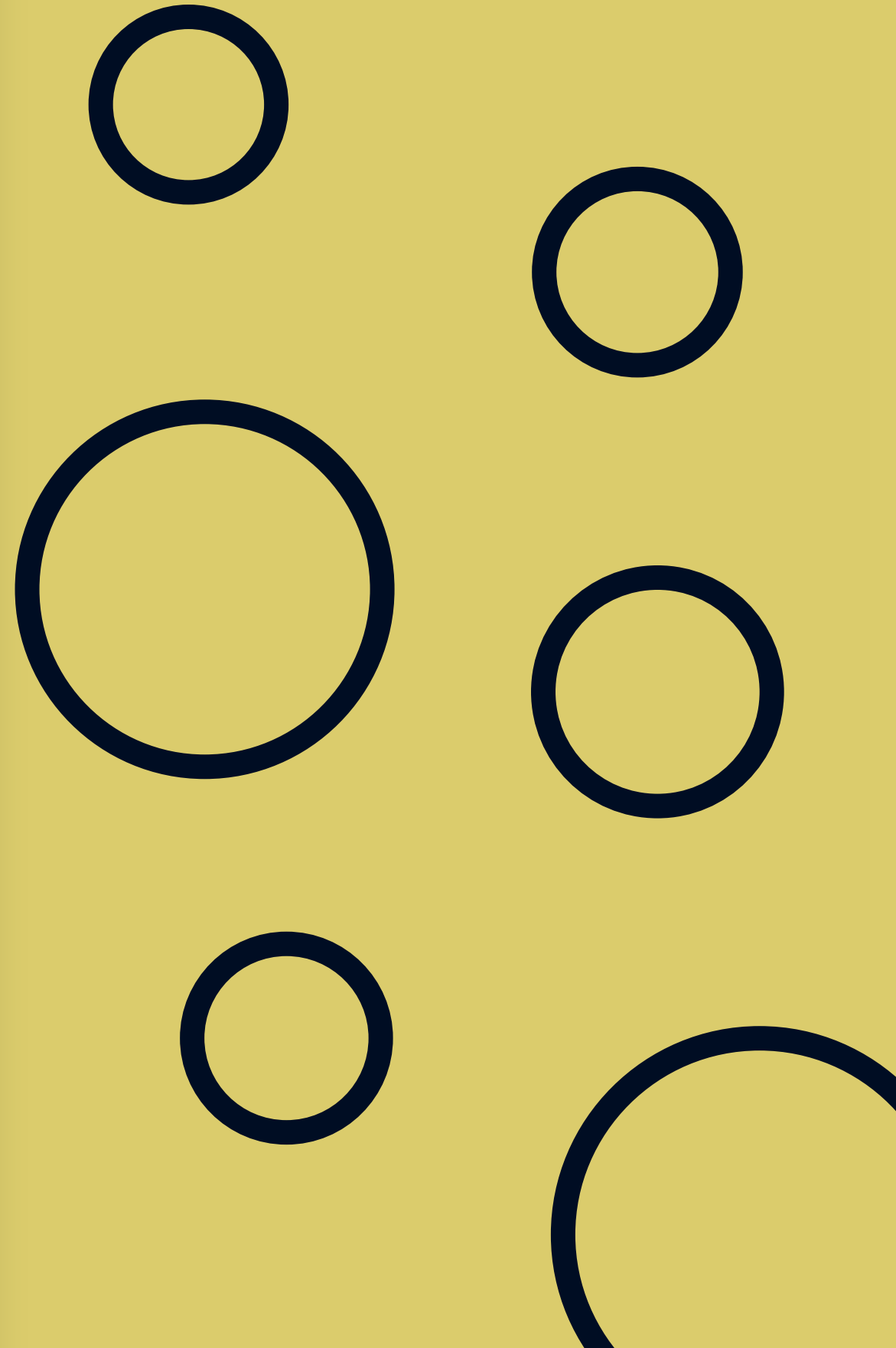
The Northwest region as a whole ranks 8th out of the 11 NUTS1 regions, with a GVA per head of £26,200, but there is substantial sub-regional variation: GVA per head in Cheshire (£32,550) is more than 60% higher than that in Liverpool. Both South and North Manchester are similar to the Northwest as a whole, and below the national average, with figures of £26,550 and £25,750 respectively.

Some of this spatial variation comes from a combination of personal characteristics – particularly skills – and the decisions people make about where to live. This is especially true if we move down spatial scales to consider smaller neighbourhoods, where the differences in GVA would become even more striking.

¹ We estimate Gross Value Added (GVA) per employee at NUTS 3 level by dividing Gross Value Added by workplace-based employment. We then multiply GVA per employee by the working-age employment rate amongst residents in each NUTS 3 area.

Employment-adjusted GVA per employee is thus indicative of the expected GVA from a working age resident in a NUTS 3 area, assuming they could work in the same jobs as existing employees in the NUTS 3 area and have the same employment probability as existing NUTS 3 residents.

The employment numbers come from the Annual Business Inquiry via nomis (nomisweb.co.uk). GVA come from the ONS Sub-regional GVA release (ONS 2008). We present GVA figures rounded to the nearest £50.



1. INTRODUCTION

However, at the city, sub-region and regional levels, differences in the productivity of firms and organisations will have a bigger influence on unevenness in economic activity and it is at these larger scales that policy has a clearer potential role to play in addressing spatial differences in economic performance.

It is inconceivable that this marked spatial unevenness can be explained by appealing purely to inherent differences in physical geography (e.g. climate or natural resources). Instead, it must be that, over time, the workings of the economic system amplify and reinforce initial differences to generate historically persistent patterns of spatial disparity. For this to happen there must be self-reinforcing benefits from the spatial concentration of activity.

These benefits, often referred to as agglomeration economies (or externalities) may arise in many different ways. A range of costs work to offset these benefits. As economic activity concentrates, the prices of scarce resources, such as land, increase; firms face more competition; roads and public transport become more congested; pollution increases.

In a modern economy, such as the UK, it is the trade-off between these costs and benefits that determines which areas are rich and which are poor; which grow fast and which grow slowly. Technological change, globalisation, government policy and a whole host of other factors change these costs and benefits and hence the nature of this trade-off, with fundamental implications for the economic geography of the UK. Of course, the response to these changes is not instantaneous, instead playing out over long periods as people and organisations slowly adjust to the different forces at work.

This report is concerned with analysing these agglomeration benefits. It explains how they arise and why they matter so much for explaining the geographical distribution of economic activity across areas within countries. The report presents evidence on the extent of agglomeration economies in Great Britain and considers the implications for the Manchester City Region.

The report is structured as follows:

- section 2, we review the literature on agglomeration economies and provide an introduction to the basic theoretical concepts as well as an overview of the existing empirical evidence;
- section 3, presents new evidence on agglomeration economies and MCR;
- section 4, presents new evidence on spatial productivity differences in Great Britain; and
- section 5, draws on this work, on the wider literature, and on the findings of other projects undertaken as part of the Manchester Independent Economic Review (MIER) to address policy issues.

2.0 AGGLOMERATION ECONOMIES

At their broadest level, agglomeration economies occur when individuals and firms benefit from being near to others. This report focuses on agglomeration economies that arise in production.

2.1 What are agglomeration economies?

It is important to remember, however, that there may be other benefits of agglomeration, for example in terms of consumption. Indeed, some authors have argued that such consumption economies may be becoming increasingly important². We will touch on these issues in the policy section, but our analysis is focused on the traditional question of agglomeration economies in production.

With this narrower focus, agglomeration economies arise because of the production benefits of physical proximity. Physical proximity to other firms, workers and consumers, may help firms in the day-to-day business of producing goods and services. This implies that the productivity of individual firms will rise with the overall amount of activity in other nearby firms, or with the number of nearby workers or consumers.

Physical proximity may also facilitate the flow of ideas and knowledge, leading firms to be more creative and innovative. The extent to which this shows up in individual firm productivity will depend on the type of innovation taking place, but any such effects will clearly be important in understanding the growth of cities.

The literature traditionally emphasises three sources of agglomeration economies: linkages between intermediate and final goods suppliers, labour market interactions, and knowledge spillovers. Input-output linkages occur because savings on transaction costs means firms benefit from locating close to their suppliers and customers.

Larger labour markets may, for example, allow for a finer division of labour or provide greater incentives for workers to invest in skills.

Finally, knowledge or human capital spillovers arise when spatially concentrated firms or workers are more easily able to learn from one another than if they were spread out over space³.

² See Glaeser, Kolkó, Saiz, 2001; Florida 2003; Glaeser and Gottlieb, 2006.

³ These three examples come from Marshall, 1890.



Unfortunately, despite wide usage, this taxonomy alone is not particularly useful because it is focussed on the channels through which we observe the effects of agglomeration, rather than the underlying mechanisms that drive the effects. For example, firms in big cities may learn from other firms because they have a direct supplier/customer relationship with that firm, because they hire workers from that firm or because they observe what other firms are doing and copy them.

To increase our understanding and formulate policy, we need, first, to understand why firms benefit (e.g. *learning*) and then to understand the channels through which this happens and whether policy can influence them. Unfortunately, the traditional taxonomy's focus on the channels is not very useful for structuring thinking about the mechanisms. For this reason, we will focus on the mechanisms – *sharing*, *matching* and *learning*, through which agglomeration economies can occur⁴.

Agglomeration through sharing occurs when large numbers of firms or workers benefit by drawing on a common pool of resources when organising their activities. We will discuss the benefits that arise in three cases: sharing of public goods and infrastructure; when firms share a pool of intermediate goods suppliers; and when multiple firms employ from the same pool of workers (and these workers share a common pool of firms).

Perhaps the simplest example of agglomeration through sharing relates to the existence of indivisibilities in the provision of goods or facilities – particularly public goods and infrastructure. Examples include transport facilities, such as ports or airports (traditionally a very important factor driving the economy of some cities) and educational facilities such as universities. These facilities may not directly affect production (e.g. a museum) but may still benefit firms indirectly because they can pay lower wages to attract workers from other locations which do not have these facilities.

A second way in which agglomeration economies may arise through sharing occurs when firms are able to share the gains from access to a greater variety of intermediate inputs. In some sectors the intermediate goods (inputs) that firms use are not perfect substitutes and the total number of inputs used may be variable and dependent on supply.

In such cases, access to a wider variety of inputs will make firms more productive through increasing returns to scale. Moreover, the number of producers of these intermediate goods, and hence the variety of inputs available, may depend on the total local supply of workers. Therefore, productivity in the sector depends on the local supply of workers via the number and variety of intermediate goods available, generating agglomeration economies.

⁴ This classification is due to Duranton and Puga, 2004.

An illustrative example is PC manufacture, where expansion of the range of disk-drives, processors, memory chips and other components will lead to higher 'output' (more and better features). As the number of workers involved in producing components grows, the number and variety of producers of components increases and the productivity of PC manufacture rises too.

Another source of economies of scale and agglomeration economies that is related to sharing arises if firms or workers are better able to specialise in larger cities. Conceptually, the gains from variety described above come because of expansion of the number of intermediate goods – access to a larger number of workers leads to an increased number and variety of intermediate goods.

However, specialisation – which is the corner-stone of traditional economies of scale in production without fixed costs (from Adam Smith onwards) – involves increases in productivity when there are a fixed number of intermediate inputs, but workers become more productive when they specialise on a single task.

The text book examples include furniture makers, who, with more employees can assign workers to do specific, routine jobs (making legs, doors, handles etc.) in which they become expert. Similar arguments apply at the aggregate level. In larger labour markets, workers are better able to specialise on a narrower set of tasks. This shows up as increased productivity for firms that gain from sharing increasingly specialised workers or suppliers.

A final source of agglomeration economies from sharing arises if firms are better able to pool risks in larger cities. When firms experience a positive productivity shock, they want to expand employment and vice-versa. However, changes in the firms' employment affect local wages and the effect is greater the more isolated the firm is from other firms in the same sector, or using similar workers.

For an isolated, 'monopsonistic', employer wages rise sharply when the firm expands production in response to a positive shock and fall sharply when it wants to contract production in response to a negative shock. This stabilises employment but limits the firm's ability to adapt its output level to good and bad times and so reduces its average profitability over time.

Unlike the other agglomeration economies discussed so far, however, this benefit will not show up as increased productivity for particular firms in a given period of time. Instead, the area's employment weighted average of productivity (i.e. aggregate productivity) should be higher. This is because when their productivity is high, firms benefiting from risk sharing will have larger shares in area employment than if they were not benefiting from risk sharing (and vice-versa).

We turn now to the next mechanism that can lead to agglomeration economies – *matching*. We will discuss this in terms of search and matching frictions in the labour market, but a similar story could be applied to intermediate goods suppliers.

One way of thinking about the labour market is that it matches different types of workers and firms: the better the match, the higher the benefits to both. Larger cities make it easier for different types of worker and firms to find each other⁵. That is, they help improve matching so that firms and workers are less likely to settle for unproductive matches. Urban and labour economists think of this as improving the quality of the match.

Larger cities can also facilitate the chances of matching. If this is the case, workers will spend less time looking for suitable jobs and unemployment spells will be shorter. Reductions in these frictional costs can feed through into lower labour costs or more output. Reduction in search frictions in a labour market with homogenous labour, amounts to an increase in labour supply (or a flattening of the labour supply curve). In a matching framework with heterogeneous skills, if physical proximity leads to better quality matches, this will act like a labour-augmenting productivity increase, giving rise to both labour and total factor productivity increases.

A final matching benefit arises because hold-up problems are mitigated in markets with a large number of potential partners. Hold-up problems occur when individuals need to make a relationship specific investment (e.g. in skills) but contracts are incomplete so that the person that benefits from the investment (e.g. a firm) cannot credibly commit to reward the individual for their investment. A large number of potential beneficiaries helps mitigate this problem.

We now turn to the final mechanism that can lead to agglomeration economies – *learning*. Even with modern communication technologies distance acts as a barrier to learning. Large cities provide more opportunities for people and firms to learn from each other and from the environment around them. In particular, there are more opportunities for face-to-face contact, which tends to facilitate knowledge exchange.

Workers may also find it easier to switch jobs, taking valuable knowledge with them or firms may be able to learn more easily from their suppliers and customers. In some ways, this more fluid exchange of knowledge is a form of sharing. However, learning is distinct from sharing in that both the generation of knowledge and its *diffusion* benefit from these interactions. A similar argument can be made for the accumulation of skills through learning.

⁵ If the focus is on households instead of workers then matching can also explain why "power couples" (households with two high skilled workers benefit from being in cities.



In terms of the generation of knowledge, diverse environments can help the process of search and experimentation that underly much innovation⁶. These benefits may arise directly during the process of innovation, but may also occur as firms figure out the best way to produce new products or to take them to market. Once innovation occurs and firms have resolved production problems, the production of goods may then take place in smaller, more specialised environments where firms benefit from some of the agglomeration economies we have already discussed above.

Physical proximity can also help with the diffusion of skills. For example, young, unskilled workers may become skilled as a result of face-to-face interactions with older, more skilled workers. These high-skill older workers tend to be found in large cities. In formal models of the diffusion of skills this spatial concentration occurs because of the skill transfer mechanism itself.

Informally, this concentration may occur because, for example, agglomeration benefits favour and attract high-skill workers, or because high-skill workers have tastes and incomes that allow them to benefit most from the consumption opportunities in large cities. As a result of the diffusion of skills and the concentration of older skilled workers, living in large, high-skill cities when young can be viewed as investment in human capital. This investment is risky, however, large cities are more costly and while it is more likely that young people living there will increase their own skills, it is not a certainty.

Young workers who are successful in obtaining skills may then stay in larger more skilled cities to pass on their skills to the next generation – assuming, of course, that they can find some way to be paid for this. Workers who are unsuccessful have no incentives to stay in larger cities with their high living costs and so move away. What is interesting in both of these examples, is that while learning externalities potentially occur anywhere they may be much more important in some (diverse, highly-skilled) environments than others.

There are other ways in which physical proximity can help diffuse information or knowledge. For example, some tacit (hard to formalise) knowledge may best be communicated face-to-face. Alternatively, diffusion may depend on random meetings that are more frequent or useful in places with more people. Formal theoretical modelling of these ideas is in its infancy, but there is a long tradition that points to the important role these effects may have in understanding spatial patterns of development.

⁶ Jacobs, 1969.



Finally, physical proximity can benefit knowledge accumulation over time and thus the sum total of knowledge. There are two ways in which this may occur. One is that knowledge accumulation requires the investment of resources. If proximity increases productivity (through agglomeration), then this increases the resources available for the generation of new knowledge and hence increases the overall amount of accumulated knowledge.

In this way, so-called *static* benefits of proximity (increased productivity today) have *dynamic effects* in the form of more knowledge accumulated for tomorrow. Alternatively, proximity can have direct *dynamic* benefits, if any given investment in accumulating knowledge actually generates faster knowledge growth if it takes place in proximity to other high-skilled workers. The actual mechanisms through which this might occur have not yet been the subject of much research.

In summary, there are many ways in which physical proximity may facilitate sharing, matching or learning and thus lead to agglomeration economies. In our empirical analysis we cannot distinguish between these mechanisms and will instead focus on the overall impact on productivity.

This has the advantage of allowing us to consider policy issues without getting bogged down in the technicalities of separating out the different sources of agglomeration economies (an issue with which the academic literature is only just beginning to grapple – with limited success). But these distinctions between sharing, matching and learning, may sometimes be important when we use the wider literature and other MIER reports to think about policy issues.

2.2 Evidence on the nature and scale of agglomeration economies

We now turn to the empirical evidence on how important these effects are. The literature has made considerable progress in quantifying agglomeration economies⁷. Table 1 summarises results from a number of studies. It shows estimates of the elasticity of productivity with respect to city size varying from around 0.02 to 0.20. Most values are under 0.10 which means that, at most, a doubling of city size is associated with an increase in productivity of 10%.

For the UK, Rice, Venables and Patacchini (2006) estimate an elasticity of just under 0.05 (in the middle of the range reported in the table). Using this elasticity, doubling the size of a UK city would increase productivity by 3.5%. This is not a particularly large effect. Further, recent research for France suggests that once we correct for two important sources of endogeneity (or reverse causality) estimates of the elasticity tend to be towards the bottom of the range reported here⁸.

These broad findings hold an important lesson for policy. According to the MIER business baseline report 'GVA per employment in the Northwest (£29,400) currently stands at 90 percent of the UK average (£32,800)' while 'productivity' in MCR workplaces (expressed as GVA per employment), currently stands at £30,600, also falling some way behind the UK average of £32,800'.

Using the figures from Rice et al (2006) doubling the size of MCR would increase GVA per worker by only £1,070, which would roughly halve this gap. We should therefore not expect too much from agglomeration economies in closing the overall productivity gap between MCR and the UK.

⁷ See Rosenthal and Strange, 2004, for a very useful review.

⁸ See Combes, Duranton and Gobillon, 2008. The two sources of endogeneity reflect the fact that places with high labour productivity will attract labour (so causality runs from productivity to size) and that high skilled workers will move to more productive places (so productivity will be higher regardless of size).

Table 1: Estimates of agglomeration economies from production function analyses.

AUTHOR	UNITS OF ANALYSIS	DEPENDENT VARIABLE	INDEPENDENT VARIABLE	ELASTICITY
Aaberg (1973)	Swedish Cities	productivity	city size (population)	0.02
Shefer (1973)	US MSAs	productivity	RTS at MSA aggregation	0.20
Sveikauskas (1975)	US MSAs	productivity	city size (population)	0.06
Kawashima (1975)	US MSAs	productivity	city size (population)	0.20
Fogarty and Garofalo (1978)	US MSAs	productivity	city size (population)	0.10
Moomaw (1981)	US MSAs	productivity	city size (population)	0.03
Moomaw (1985)	US MSAs	productivity	city size (population)	0.07
Nakamura (1985)	Japanese Cities	productivity	city size (population)	0.03 ^a
Tabuchi (1986)	Japanese Cities	productivity	city size (population)	0.04
Louri (1988)	Greek Regions	productivity	city size (population)	0.05
Sveikauskas et al (1988)	US MSAs	productivity	city size (population)	0.01 ^b

Notes: a – mean value for 14 industries, b – mean value from 5 model specifications.
Source: Table 1, Graham (2008).

To discuss policy issues it would be helpful to be able to draw on a detailed understanding of the industrial, geographical and temporal scope of agglomeration economies. Unfortunately, research addressing these questions is limited in both the UK and wider contexts.

On industrial scope, the literature has focussed on the question of whether agglomeration economies arise from 'urbanisation' or 'localisation'. That is, the extent to which agglomeration benefits extend across all industries and so depend on overall size (urbanisation economies) or instead only occur within narrowly defined industries (localisation economies).

The former help explain large, diversified cities, the latter smaller specialised cities and the clustering of particular sectors. The discussion above, and the figures reported in Table 1 concern urbanisation externalities. Table 2 reports evidence from selected studies on localisation externalities.

For policy purposes it could also be important to know about the geographical scope of agglomeration economies. That is, over what distance do firms benefit from being closer to a greater number of people or other firms? Does an increase in the number of workers living 50km away improve productivity or are the benefits confined to workers living within 5km? What role does travel time play? Do firms benefit from an increase in the number of suppliers in their immediate surroundings, or from an increase in the number of suppliers in the entire city or region?

Table 2: Estimates of localisation economies

AUTHOR	UNITS OF ANALYSIS	DEPENDENT VARIABLE	INDEPENDENT VARIABLE	ELASTICITY
Nakamura (1985)	Japanese Cities	productivity	industry size (employment)	0.05
Henderson (1986)	Brazilian Cities	productivity	industry size (employment)	0.11 ^c
Henderson (1986)	US MSAs	productivity	industry size (employment)	0.19 ^d
Henderson (2003)	US MSAs	plant output	industry size (no. of plants)	0.03 ^e

Notes: c – mean value for ten industries, d – mean value for 9 industries, e – mean value for 4 model specifications. Source: Table 1, Graham (2008)

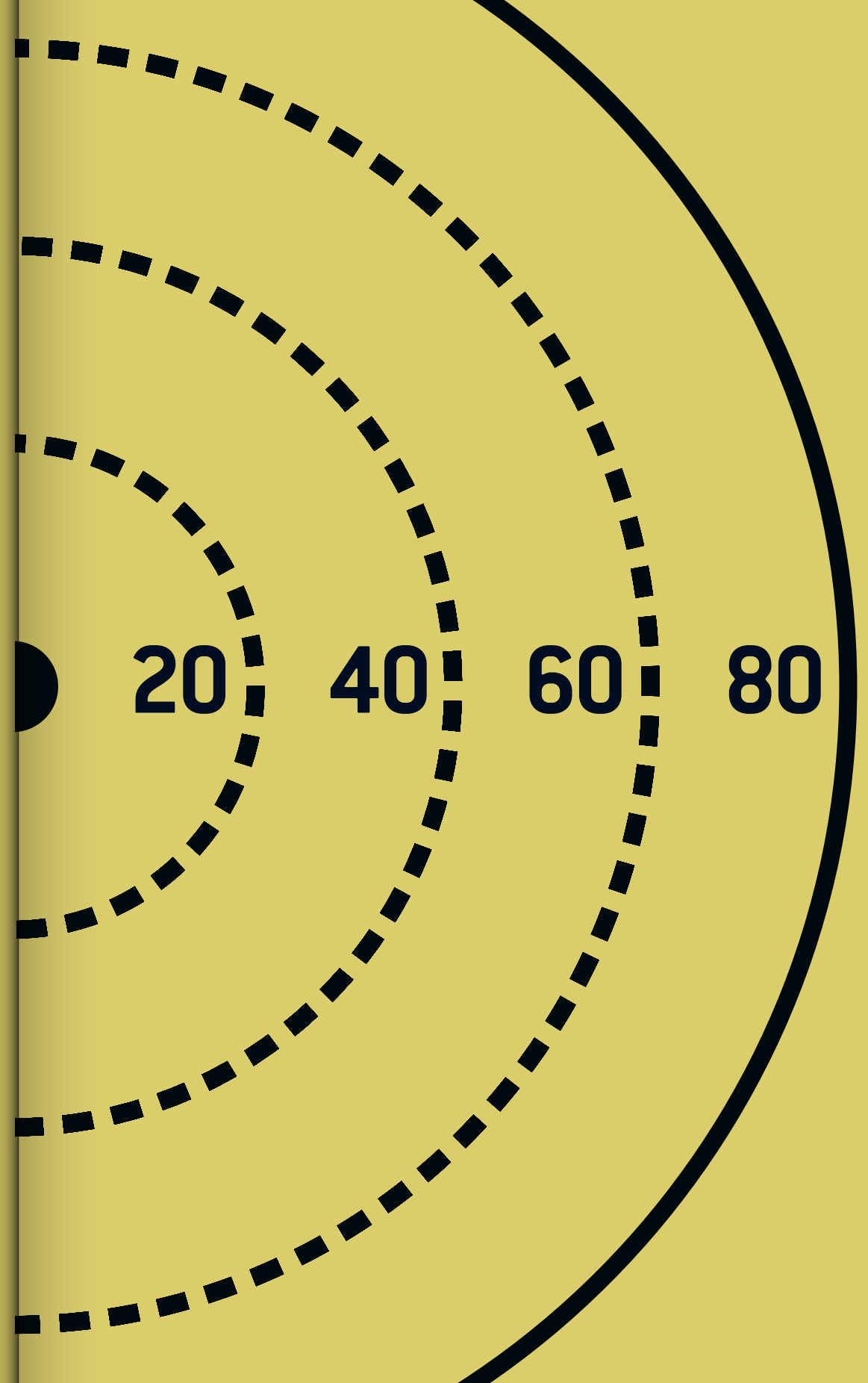
Clearly the answer to these questions will depend on the precise mechanisms through which agglomeration economies operate and on the sector in question. Agglomeration economies based on labour markets seem likely to depend on the number of workers within commuting distance. The geographical scope of agglomeration economies that arise from market access, or access to intermediate goods, will most likely depend on the transportability of the goods or services involved.

The literature on these issues is underdeveloped, and most of the estimates that are available are based on assumptions about the geographical extent of these effects, rather than on any empirical foundations. Most commonly, these assumptions are driven by data availability because researchers use geographical units defined by political or administrative boundaries.

Some studies, instead employ measures based on ‘effective density’ or employment potential that treat space as continuous and aggregate up the employment counts in a circular region centred on each individual firm, with higher weights applied to employment that is located at a closer distance⁹. However, this approach requires assumptions about the specific weights to give to rings located at different distances.

A similar, but more flexible, way to tackle the problem is to look at the effects of employment within several preset distance or travel time bands. For example, Rosenthal and Strange (2003) find for the US that it is own-industry employment located within 1 mile that is the strongest attractor of new firms, with effects diminishing rapidly with distance (although still significant at 15 miles). For England, Rice et al (2006) use travel-time bands and find that most of the productivity benefits of agglomeration are related to population within 80 minutes travel time.

⁹ See, for example, Graham, 2006, 2008.



The final issue, which has received slightly more attention in the literature, concerns the question of whether agglomeration economies are dynamic or static in nature. That is, is the main benefit in the form of faster growth and thus higher income in the future (dynamic externalities) or increased productivity and income today (static externalities).

The literature that considers this issue is also concerned with the sectoral scope of these externalities (i.e. whether they are of the localisation or urbanisation kind)¹⁰. It would be fair to say that subsequent literature has not fully resolved these problems and a consensus on both the temporal and sectoral scope of agglomeration economies is yet to emerge¹¹.

In addition to the issues of the industrial, geographical and temporal scope of agglomeration there is also the question as to the specific mechanisms through which agglomeration benefits arise. Unfortunately, it turns out that we know very little about the relative importance of the different mechanisms and efforts to distinguish between agglomeration mechanisms that are still in their infancy¹².

As Rosenthal and Strange (2004) say in their recent survey “In sum, the many excellent studies of productivity have told us about the existence of agglomeration economies and also about their scope across industries, locations, and time. They have not, however, had much to say about the sources of agglomeration economies.”

Our empirical work focuses on the first-order relationship between access to economic mass and firm productivity, on the links to skills, transport and finally on sectoral scope. The reason for this focus is that we need to keep the analysis tractable and centred on implications for productivity in MCR and other city regions, and not because we see more detailed empirical work on the mechanisms, or geographical and temporal scope as uninteresting.

2.3 Why do agglomeration economies matter?

Before turning to our evidence, it is useful to take a step back and ask – do agglomeration economies matter and should they be of concern to policy makers? The answer is, we argue, yes; however, as we explain below, it is probably more sensible to think about agglomeration economies as a channel for increased aggregate productivity, output, income and welfare – i.e. efficiency – than as a mechanism for dealing with economic inequalities.

The underlying reason to look hard at agglomeration economies in production is that if agglomeration increases productivity (the amount of output we are able to produce with a given amount of inputs) then it can potentially increase earnings, income and standards of living. As Krugman (2005) explains, when we consider countries, a 5% difference in productivity will translate into (roughly) a 5% difference in living standards.

Presumably, people would like to move to take advantage of the higher living standards in the place with higher productivity. This does not happen internationally because countries restrict the ability of people to move freely across international borders¹³.

However, within most countries no such legal restrictions exist to stop people from moving to take advantage of the higher productivity delivered by agglomeration economies. But this in-country migration increases the amount of activity in the higher productivity place and, through agglomeration economies, this increases productivity even further thus attracting more migration, etc.

¹⁰ Glaeser, Kallal, Sheinkman and Schleifer (1992) were the first to consider this issue by regressing local employment growth on initial economic characteristics. Henderson, Kuncoro and Turner (1995) apply a similar methodology. Results for the US are not consistent across the two studies. Glaeser et al. (1992) find that local growth is positively influenced by diversity and negatively by plant size and specialisation.

In contrast, localization economies are at work in all five industries studied in Henderson et al. (1995), while urbanization ones are observed in the high-technology sectors only. These discrepancies might be explained by appealing to data (different time periods and coverage of sectors), estimation methods or problems with the overall methodology. See Combes (2000) and Cheshire and Magrini (2009) for further discussion.

¹¹ See Rosenthal and Strange (2004), Combes and Overman (2004) for literature reviews and further discussion.

¹² Work by Holmes (1999) offers perhaps the best evidence in favour of a role for input sharing. A line of literature following Jaffe, Trajtenberg and Henderson (1993) uses patent citations to provide direct evidence that knowledge spillovers have a geographical dimension in the production of knowledge (although this literature does not make a link from that effect to productivity benefits).

Another strand of literature builds on Audretsch and Feldman (1992) to show that spatial concentration of an industry may play some role in facilitating innovation (but again there is no direct link to productivity). There is growing evidence, surveyed in Moretti (2004) that wages are higher in US cities with lots of college educated workers. Some suggest that these effects most likely work through knowledge spillovers, although there is no direct evidence that this is the mechanism at work. Work by Overman and Puga (2008) suggests some, albeit limited, role for the sharing of risk.

Finally, works by Rosenthal and Strange (2004) and by Ellison, Glaeser and Kerr (2008) use industry location patterns to look at the relative importance of each factor. Both studies suggest that input sharing, knowledge spillovers and labour market pooling all have a role to play in explaining agglomeration benefits.

¹³ Of course, the EU provides a notable exception.

So, at the sub-national level, differences in productivity are reinforced by the fact that firms and workers can move to more productive places. Thus places with higher productivity will tend to see employment and income grow while places with low productivity will tend to see employment and income falling.

What happens to put a break on this process? After all, we do not all live in London or the Southeast of England (which, as we shall see are the two areas with highest productivity in Great Britain). The answer is that the price of scarce resources, in particular land, rise to offset the higher wages that firms are able to pay as a result of their higher productivity.

It is useful to think whether the resulting pattern of economic activity is efficient. As usual, if markets function well, there is a very strong case for simply following these productivity signals. But this is not the case when it comes to spatial policy for the simple reason that individual decisions on where to live and produce impose externalities on other individuals.

For example, traffic congestion tends to increase with city size. Could these negative externalities be sufficient to offset positive productivity differences so that we should be shifting the balance of economic activity towards lower productivity areas to improve our overall standard of living?

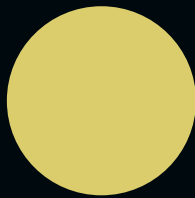
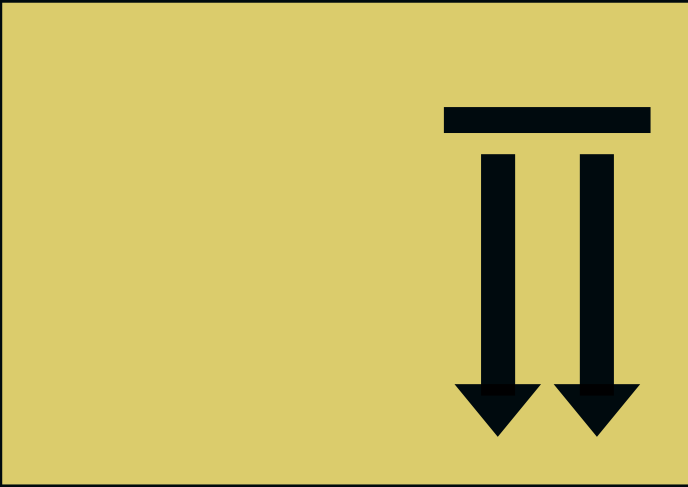
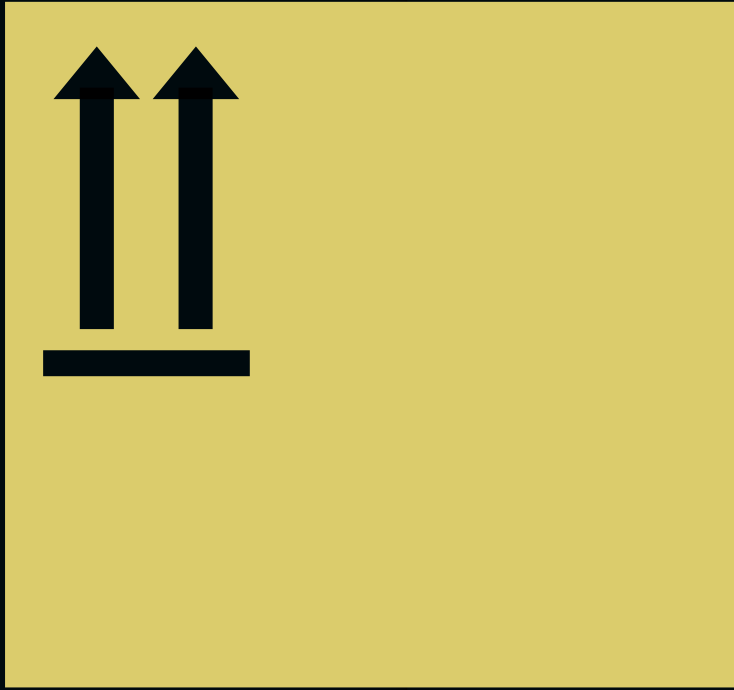
This is an incredibly difficult question to answer. There are clearly a range of negative externalities that occur as activity concentrates. But often these negative externalities will also occur in lower productivity places if policy attempts to redistribute activity to those locations. In addition, this ignores the fact that there are also positive agglomeration externalities that firms and households ignore when they locate in the more productive location.

For example, because knowledge spills over, my R&D benefits other firms located close to me. Of course, I ignore that benefit when deciding both how much to invest in R&D and where to locate my research lab. Thus there is a potential role for policy to either increase my R&D investment or to locate near other firms who could benefit from my R&D investment¹⁴.

Negative externalities, such as congestion, also imply a role for government. In this case, to make sure that I “internalise” the costs of congestion to others when I make decisions about whether to drive my car or build a new house in an already crowded area. If we cannot tackle these externalities directly, then there may be a case for using the blunter policy tool of changing overall location patterns to help deal with them.

For externalities to provide a clear justification for intervening directly, to redistribute from high productivity to low productivity locations, we would need to know how these positive and negative externalities balance out in practice. Unfortunately the evidence on whether positive or negative externalities dominate is far from conclusive.

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Another way to think about this is to consider how the net benefits (productivity minus offsetting costs) change with city size. High productivity in a particular place tends to be offset by high costs of living and producing. As a result, productivity differences, including those arising from agglomeration economies, do not alone make the case for focusing on one location over another.

The efficiency arguments for policy to divert activity to more productive places rely on 'non-linearities' in the way *net* benefits (productivity advantages minus offsetting costs) change with city size. Such non-linearities raise the possibility that the free movement of people and businesses between cities does not result in an efficient allocation and distribution of city sizes.

In this case, individual agents might see no gain from moving from low productivity to high productivity places, because the costs more than offset the benefits. But, policy that helps move people and businesses from one place to another can raise efficiency in the economy as a whole, because the increase in *aggregate* net benefits in places that gain, more than offsets the aggregate losses in the places that lose out.

However, there is little evidence available on the costs (congestion, transport, infrastructure etc.) that offset productivity advantages in big cities, therefore we do not know much about the net benefits, and we know nothing about whether they are non-linear. Therefore, it is unwise to look at productivity advantages alone as a justification for policy intervention.

So far, we have been talking about the productivity effects of shifting around economic activity, while ignoring policies that address costs. For the things we should care about, i.e. real standards of living, these offsetting costs should figure as much in our thinking as differences in productivity.

In the absence of extensive and convincing evidence on the balance of negative and positive externalities and on the non-linearity of net benefits, lowering the costs of living in (or commuting to) high productivity locations is the best way to try to take advantage of spatial differences in productivity. This observation will play an important part in the policy conclusions that we reach.

However, beyond efficiency arguments, what about equity arguments? Unfortunately, these are far from simple and as a result this remains one of the most poorly understood issues in popular discussion of spatial policy.

As we discussed above, places with high productivity will tend to see employment and income grow while places with low productivity will tend to see employment and income falling. Does this mean that people in big cities are better off than those in small cities or those living outside cities?

Almost certainly not, because living costs rise to offset the higher wages that firms pay as a result of higher productivity. Thus real incomes, standards of living and wellbeing may not be so different between high and low productivity places.

Consider the simplest case in which people care about disposable income, net of housing costs, and are free to relocate. If they choose not to do so, it must be that the income advantages from locating in high productivity places are roughly offset by increases in the cost of living.

¹⁵ See Glaeser (2008).

No one can improve their *disposable* income by relocating to a different city; everyone is at least as well off staying where they are as they would be from relocating. In this setting, the economy is in what urban economists call 'spatial equilibrium'¹⁵. People could move, but they choose not to, because moving would not actually make them any better off in real terms. An analogous story could be told about firm profits and location, but we keep things simple by focussing on workers.

It is of course arguable to what extent this description of spatial equilibrium characterises the UK economy. But, the concept is a powerful tool for thinking about agglomeration economies and analysing the potential consequences of policy.

As set out so far, this discussion abstracts from the fact that places may also differ in the quality of the amenities they offer (e.g. nice countryside, or museums). It also abstracts from the fact that people are likely to be different in terms of the productivity gains of relocating from one place to another.

The discussion also abstracts from the fact that people differ in their preferences for the amenities that different places offer: some people prefer countryside to city, some Manchester to London, irrespective of any income differences. But the idea of spatial equilibrium can be extended to account for these factors.

We expect to see the benefits of amenities roughly offset by either lower wages or higher housing costs leaving people indifferent between living in different places. People who are more productive in big cities or have stronger preferences for the amenities found there will be willing to pay more than others to live in those cities. Hence, it is these people that will end up living and working in big cities.

If these issues are considered carefully, it becomes clear that spatial differences in agglomeration and productivity may not have much to do with equality, judged in terms of differences in the real standard of living for people living in different places.

Consider the extreme case in which income advantages of big cities are completely offset by housing costs, such that income net of housing costs is equalised across all places. This distribution is already 'equitable', and policy that redistributes activity away from big cities cannot make it more so. On the other hand, this redistribution could lower aggregate output, by diluting the benefits of agglomeration.

More realistically, suppose that workers with a comparative advantage or preference for big cities live there, and vice-versa for workers with a comparative advantage or preference for small cities. Starting from spatial equilibrium, policy to relocate activity from big cities to small cities is likely to make both types of worker worse off in real terms, while having an ambiguous impact on real disparities between workers in big and small cities.

A further issue is that this policy is likely to have its intended effects only in the short run, because any spatially focussed benefits will tend to disperse as the economy adjusts and people migrate in response to the policy.

This is not meant to be an exhaustive list of scenarios, but simply serves to illustrate our argument that the equity implications of spatial policy are not at all clear-cut. Taking account of agglomeration economies can, however, be very important in formulating policies that improve efficiency and make everyone better off, at least in the sense that the winners could more than compensate the losers.

The problem for policy is that (i) we don't know how particular agglomeration economies work and (ii) we don't know much about the offsetting costs and net benefits and so (iii) we don't know whether the existence of agglomeration economies means policy should be trying to encourage more or less spatial concentration of economic activity.

Finally, in addition to these questions about the efficiency role of policy it is also valid to ask about the implications of uneven development for people who are very immobile. When we were discussing "spatial equilibrium" we ignored the consequences for this group. We will consider this issue in more detail.

In the next section we focus on providing some evidence to help answer the second of these questions. To do this we begin by examining differences in productivity across Great Britain. We then seek to answer the simple question – to what extent do agglomeration economies and other factors explain the productivity of MCR firms? Finally, we use our own findings and those of the other MIER reports to consider what are the implications for policy.

3.0 EVIDENCE ON AGGLOMERATION ECONOMIES

Our primary research, set out in this section of the report, aims to answer a simple question – to what extent is the productivity of MCR firms greater or lower than that of firms elsewhere in Great Britain and what might explain these differences?



3.1 Measuring productivity

Although the question is simple, answering it is not straightforward. We focus, in particular, on the role of agglomeration economies, the local availability of skills and ease of access to transport.

To undertake our analysis we need to obtain estimates of productivity for firms, together with information on where these firms are located and measures of agglomeration, skills and transport at each of these locations. We then look at how productivity differs across locations, before considering the extent to which differences in agglomeration, skills and transport can explain this.

To look for evidence of production agglomeration economies we will examine whether firms located in places with high 'economic mass' (i.e. close proximity to high levels of economic activity) have higher productivity. We will examine the role of skills and transport similarly, by constructing measures of access to skills or particular types of transport. We provide more details on all these measures.

We first need to decide how we will measure productivity. Total factor productivity (TFP) provides the most theoretically consistent measure of productivity (see Box 1) and is the measure that we use here. From now on, when we talk about productivity, we mean TFP.

Box 1: Measuring productivity

What do economists mean by productivity? This is not as straightforward a question as it might seem. A generic definition is output per unit of input (i.e. total output/total inputs) but this definition begs the question of how to define outputs and inputs.

There are two widely used measures of productivity – labour productivity and total factor productivity – that answer this question in different ways. Labour productivity measures the amount of value added per worker, or per hour of labour, or per job (this is the definition used by the Office for National Statistics (ONS) for aggregate productivity).

At both the micro level (firms) and the macro level (e.g. regions or countries) labour productivity is relatively easy to calculate. Unfortunately, labour productivity may be a misleading measure if other inputs can be substituted for labour inputs.

For example, a firm's labour productivity might look high because it uses more capital per worker or because it buys in intermediate inputs rather than using labour to produce them in-house. This can be a particularly important issue when using productivity to capture agglomeration externalities, because we expect firms to outsource differently in different sized locations.

Economists' preferred productivity measure is one that compares a firm's output with an index of all its production factors. That is, a measure that captures the efficiency with which all inputs combined produce output. Such a measure is referred to as total factor productivity. The Appendices provide more detail on the definition and measurement of productivity.

Our analysis of productivity and its determinants is based on the production function method outlined in the Appendices (1). Put simply, we assume the value added of firms (the value of their output minus their inputs) is determined by the labour (i.e. workers) and capital employed by the firm as well as the characteristics of the location (economic mass, skills, transport) where the firm produces. There are some technical problems with doing something as “simple” as this.

For example, high productivity firms should employ more labour and capital (i.e. inputs are endogenous) so we may end up underestimating the productivity advantage of the most productive firms if we don’t correct for this. In early work on the project we experimented with two corrections for this particular problem without fundamentally changing our overall conclusions, so we implement the simpler approach here¹⁶.

Of more concern, perhaps, is the worry that places that are productive for some unobserved reason attract highly productive firms. This increases economic mass which makes it look like economic mass (and hence agglomeration) drive productivity when actually the effect runs the other way. We discuss this issue further later on.

3.2 Data

For the UK, we can use data from the Annual Respondents Database (ARD) to estimate these production functions. The ARD provides exhaustive establishment level data which underlies the Annual Census of Production in the UK. The data set is collected by the ONS and covers all UK establishments¹⁷.

The dataset does not cover the self employed. Before 1997, sectoral coverage was mostly confined to manufacturing. This coverage was expanded significantly in 1997. Table 3, shows the broad sectoral coverage available from that point. Given the expansion in sectoral coverage, we focus on 1997 onwards. Data is available from the ARD until 2004, giving us an overall time period of 1997 to 2004.

The data necessary to estimate impacts on productivity are only available if a firm is sampled (‘selected’ in ARD terminology)¹⁸. In turn, whether a firm is sampled depends on the size of the firm. For example, from 1998, the ARD samples 25% of firms with less than 10 employees; 50% of firms with 10 to 99 employees; 100% or 50% of firms with 100 to 249 employees (varies by industry) and 100% of firms with more than 250 employees.

There are additional rules on how frequently smaller firms can be sampled. The detailed sampling frame varies across time and sectors and can be found in Griffiths (1999) or Robjohns (2006).

Tables 4 and 5 provide some descriptive statistics on the number of observations (i.e. firms) used to estimate our basic production functions (where output only depends on inputs available to the firm). Table 4 gives the breakdown of the number of observations by the final industry sector classification used by the MIER baseline, while Table 5 gives the breakdown by size class¹⁹.

¹⁶ We tried methods due to Olley and Pakes (1996) and Levinson and Petrin (2003).

¹⁷ See Griffith, 1999, for a detailed description of this data.

¹⁸ In fact, to calculate TFP firms need to have been sampled in more than one year to allow the construction of capital stocks. This is why it is easier to calculate labour productivity where no data on capital stock is needed and so one year of data is sufficient to provide an estimate. See the Appendices for more details.

¹⁹ Table A.1 in the appendix shows the number of firms on which we base our estimations. As reported there, we have non-missing data on all the variables for 67 percent of the selected firms.

²⁰ See the Appendices for more details on two digit SIC coverage.

Table 3: Sectoral coverage of the Annual Respondents Database

SECTOR	SIC CODES COVERED (SIC 92)
Catering	55101 to 55520
Construction	45110 to 45500
Motor trade	50101 to 50500
Production	1410 to 41000
Property	70110 to 70320
Retail	52111 to 52740
Services	60101 to 93050
Wholesale	51110 to 51700

Source: Robjohns (2006), table 3.

From Table 4 it is clear that while the coverage varies by industry, sample sizes are generally reasonable. Two caveats: firstly, we have no data on the public sector; secondly, the ARD does not provide full coverage of Financial Services. The relatively large sample for “Financial and Professional Services” are mostly engaged in “Other Financial Services” (UK SIC 74)²⁰.

We will return to this issue when we consider individual sectors but we don’t think it distorts our findings. From Table 5, the under-representation of small firms is apparent. However, because the size distribution of firms is similar across locations this should not significantly affect our results.

3.3 Defining city regions

The next decision to make is the geography to use when we want to compare the productivity of firms in different places. Our starting point was a list of city regions provided by the MIER and constructed by Regeneris for their MIER project on skilled workers. Details of how these were constructed are provided in Box 2. The list provided gave city region definitions for Manchester, Birmingham, Bristol, Glasgow, Leeds and London.

For our regression exercise we supplemented this list by applying the same criteria for travel to work movements to a set of additional core employment areas (defined as all Local Authorities with employment greater than 150,000 according to census data in 2001). This gave us the following additional city regions: Aberdeen, Cardiff, Edinburgh, Leicester, Liverpool, Newcastle, Nottingham and Sheffield.

Table 4: Number of observations by industry

FINAL SINGLE INDUSTRY	FREQUENCY
Agriculture, Forestry and Fishing	462
Automotive	873
Aviation	758
Construction	23,601
Creative / Digital / New Media	12,192
Education	5,405
Energy	2,230
Engineering	27,961
Environmental Technologies	1,021
Financial & Professional Services	28,139
Hospitality and Tourism	20,212
ICT Digital / Communications	11,470
Life Sciences – Biotechnology / Pharma	562
Life Sciences – Health	4,473
Logistics	10,804
Manufacturing	29,832
Mining	706
Other	4,722
Other Business Services	12,083
Retail	44,445
Social Work	4,670
Sport	2,876
Textiles	5,870
Wholesale	30,547
Total	285,914

Source: Author's own calculations from the ARD.

Table 5: Number of observations by size band

FINAL SINGLE INDUSTRY	FREQUENCY
0 to 9 employees	80,207
10 to 24	62,387
25 to 49	37,609
50 to 99	33,801
100 to 249	34,175
250+	37,735
Total	285,914

Source: Author's own calculations from the ARD.

Box 2: Defining city regions

The geographical definitions of the city regions used in this report are an important issue. Following guidance from the MIER team and recognising the need to use a set of definitions which are largely consistent, the following approach has been adopted:

- the travel to work patterns of people in higher managerial and professional occupations are used as the basis for defining the city regions;
- for each city, a core employment area has been identified. This is the local authority district, or combination of districts, which can reasonably be regarded as the central employment area; and

- census data showing the travel to work movements of higher managerial residents of districts to the core employment area determine the boundaries of the city region. A 15% threshold is set for inclusion, so any local authority district which sends 15% or more of its residents to the core employment area is defined as being within the city region. This is one method among several which are commonly used to define city regions.

In consultation with MIER we made a minor adjustment to the boundary of MCR (specifically dropping Rossendale and adding Congleton) to reflect strategic definitions. The detailed composition of the resulting city regions are reported in the Appendices. To keep things manageable, when we discuss our finding we ignore results for the three smallest city regions (Aberdeen, Leicester and Nottingham).

Once we have this list of city regions we need to decide an appropriate reference group. Sometimes it is useful to compare firms in city regions to firms outside city regions. When this is the case, the reference group “Rest of GB” is defined as all firms outside of a city region. On other occasions it can be more helpful to get an idea of where city regions stand with respect to their broader region and where their broader region stands with respect to the Southeast of England.

Then, the reference group “Southeast” is simply defined as all firms in the NUTS 1 region Southeast that are outside of the London City Region. Broader regions are also defined using NUTS 1 regions so the “Northwest” accounts for all firms located in the NUTS 1 region Northwest that are not part of a city region. There is a complication concerning the treatment of multi-plant firms, when plants are in different locations, that is discussed further in the Appendices.

3.4 Spatial determinants of productivity

We turn now to the factors that we think should explain the productivity differences we observe across locations.

To capture the role of agglomeration economies we construct a measure of the ‘economic mass’ at each location. As we are interested in understanding whether sectors are subject to localisation or urbanisation agglomeration economies we need a measure of the size of ‘own activity’ (localisation) and ‘all activity’ (urbanisation) at each location. From the literature, this can be based on different measures – plant counts, employment and output being the most common. Given the available data we use employment.

One possible measure would then be employment in some geographical unit surrounding each location. For example, we could use total employment at the Travel to Work Area to measure urbanisation. While such a measure has the advantage of being simple it suffers from the problem that the choice of boundaries is rather arbitrary. In addition, clearly, firms do not stop interacting with other firms just because they are located on either side of Travel to Work Area boundaries drawn on a map.

To get around this we construct a measure of economic mass which is high when a firm is close to other locations that have lots of employment and is low when a firm is relatively isolated and surrounded by locations with low employment. Rather than doing this for every firm, we allocate firms to their postcode sector (obtained by deleting the last two characters from the postcode) and then calculate what is known as a distance weighted sum of employment for that postcode sector. Box 3 gives more details.

While economic mass is one source of agglomeration economies, the literature also places strong emphasis on the potential role of skilled workers. We would like to be able to assess whether the agglomeration of skilled workers has an effect over and above overall economic mass. To do this, we construct two measures of access to skills in a manner parallel to that of our measure of economic mass described above.

Specifically, we want the measure of skills to be high when firms are close to locations where lots of skilled workers live. However, because we want this measure to capture the possible effect of access to skilled workers over and above overall economic mass we base our measure on the share of population at different locations who have qualifications equivalent to National Vocational Qualification level 4+ (which includes HNDs, First Degrees, Higher Degrees and similar qualifications) and NVQ level 3+ (includes 2 or more A levels, advanced GNVQ). Box 4 gives more details on how the skills variables are constructed.

Box 3: Economic mass as a measure of potential agglomeration benefits

The index of urbanisation used in the empirical analysis is identical to the effective density index used by Graham (2006) (although we prefer to refer to it as a measure of *economic mass*).

To construct this, we first calculate total employment in each postcode sector from the Business Structure Database (known also as the IDBR), that records the address, employment, and turnover of all VAT or PAYE registered businesses in the UK.

A postcode sector is the geographical unit obtained by deleting the last two characters from the full postcode. The economic mass for a given postcode sector i in a given year is calculated by adding up contemporaneous employment in neighbouring postcode sectors within 100km of postcode sector i , using inverse-distance weighting.

This inverse-distance weighting applies a weight of d_{ij}^{-1} to the employment in postcode sector j , where d_{ij} is the straight-line distance between the centroids of i and j . Therefore, a postcode sector is assigned an aggregate of employment in neighbouring postcode sectors, with

employment in more distant places contributing less than employment close by. The equation for the economic mass measure is thus:

$$A_i = \sum_{j \in D} emp_j \times d_{ij}^{-1}$$

where D is the set of postcode sectors within 100km of postcode sector i .

To allow employment in postcode sector i to contribute to its own urbanisation index, we set $d_{ii} = 0.5 \times d_{i1}$ where d_{i1} is the distance to the nearest postcode sector centroid. A plant (local unit) in the ARD is assigned the urbanisation index value of the postcode sector in which it is located.

The localisation index is constructed in a similar fashion, but separately for each 3 digit industrial sector to give industry-specific indices. A plant (local unit) in the ARD is assigned the industry-specific localisation index of the postcode sector in which it is located. Appendix A1 gives more detail on the treatment of multi-plant firms that have plants in more than one location.

Box 4: Skills variables

Skills variables are derived from the Labour Force Survey, aggregated to local authority district level according to place of survey respondents residence.

We use the proportion of the working age population with NVQ Level 4+, or Level 3+ qualifications (or equivalent). To obtain skills measures that vary by postcode-sector level, we use a similar procedure to that described above for urbanisation.

The effective skilled share at Level 4+ for a given postcode, sector i , in a given year, is calculated by averaging the contemporaneous skilled share in nearby local authorities, using an inverse-distance weighting sequence.

This sequence applies a weight of

$$d_{ij}^{-1} \sum_j d_{ij}^{-1}$$

to the skilled share in local authority j , where d_{ij} is the distance between the centroids of postcode sector i and local authority j .

Note that these weights sum to 1. Postcode sector i is therefore assigned a weighted *average* of the skilled share in neighbouring local authorities, with nearest LAs receiving higher weights than those further away.

The equation for the Level 4+ skilled share is thus:

$$S_i = \sum_{j \in D} (Lshare_j \times d_{ij}^{-1} \times \sum_{j \in D} d_{ij}^{-1})$$

where D is the set of local authorities within 20km of postcode sector i . The Level 3+ skilled share is constructed similarly. A plant (local unit) in the ARD is assigned skilled shares for the postcode sector in which it is located. Again, the Appendices detail the treatment of multi-plant firms.

Finally, a potentially important source of agglomeration economies is the extent to which firms are able to share the fixed costs of large public goods. This is likely to be particularly important with respect to transport.

A complete analysis would require information on the accessibility of the places in which firms are located, incorporating the full costs of reaching other firms and workers within the same city and the costs of reaching other cities, regions and countries. These costs would need to take into account travel times along transport networks, the reliability and efficiency of public transportation systems, feasibility of driving and parking, congestion issues, in addition to the distance to physical infrastructure and transport nodes.

Such an analysis is beyond the scope of this study and we settle for a severely stripped-down representation of transport costs, based on proximity to transport infrastructure nodes. For this purpose, we construct four transport variables measuring the distance to airports, motorway junctions, rail stations and sea ports.

Of course, these variables provide only an approximate and partial picture, but we expect more fully-specified transport cost measures to be very highly correlated with the sparseness of transport represented by these distance variables²¹.

The set of transport infrastructure nodes were derived from various sources: postcodes of passenger airports with international links obtained from www.ukairportguide.co.uk/; full access motorway junctions extracted from Ordnance Survey Strategic mapping data; rail station postcodes provided by the Department of Transport; sea port postcodes from UK Major Ports Group (www.ukmajorports.org.uk/).

All these transport nodes were converted to point features in GIS software (ArcGIS), and straight line distances computed from each postcode sector to the nearest of each type of transport node feature (airport, motorway junction, rail station, port). Figure 1 shows the locations of these transport nodes for each type of transport. These transport variables best capture the ease of access to the transport links between, rather than within, locations.

²¹ See, for instance, Combes and Lafourcade 2005 on the high correlation between inter-place distances and generalised transport costs.

Figure 1: Transport infrastructure nodes – International airports



Transport infrastructure nodes –
Full access motorway junctions



Transport infrastructure nodes –
Rail stations



3. EVIDENCE ON AGGLOMERATION ECONOMIES

Transport infrastructure nodes –
UK Major Ports Group ports



4.0 SPATIAL DIFFERENCES IN PRODUCTIVITY IN GREAT BRITAIN

We start here by examining spatial differences in (total factor) productivity across the City Regions and regions of Great Britain.

4.1 Approach

For the moment, we pool all industries together and consider how places compare to the Southeast. Technically, we do this by including a set of location dummies. We allow for the fact that different industries will use different combinations of labour and capital to produce output (so “automotive” firms use more capital, while “other services” firms use more labour).

We also allow industries to differ in terms of their average productivity. Technically we do this by including industrial dummy variables, both in levels, and interacted with our measures of labour and capital²². Because our data cover the period 1997 to 2004 we also need to allow for the fact that productivity changes over time. We do this by including year dummies.

Finally, because the same firm can appear in the sample more than once, we need to correct for the fact that this can distort our findings relative to a completely random sample. We do this by imposing a statistical correction known as “clustering the errors” at the firm level. Results of the regression of productivity on location dummies are reported in the first column of Table 6, where we suppress the industry dummies and interactions for presentational purposes.

To understand what the coefficients on the location dummies tell us we need to note several things. For any variable, the top number in the row gives the *coefficient*, while the bottom number gives the *standard error*. Ignore the standard error for the moment and instead focus on the coefficient.

We see that MCR has a negative coefficient of -0.115 while the Northwest (excluding MCR and Liverpool) has a coefficient of -0.153. The fact that these numbers are negative tells us that firms in both MCR and the Northwest have lower productivity than firms in the comparison region. Looking carefully at the table we see that results for one region – Southeast – are not reported.

²² An industrial dummy variable is a binary 1-0 variable, encoded 1 when an observation is in industry *j* and zero otherwise.

So, as mentioned earlier, the comparison group for this regression are firms in the NUTS 1 region Southeast that are *outside* the London City Region. Thus the coefficient of -0.115 for MCR tells us that firms in MCR have lower productivity than firms located in the Southeast.

The coefficient of -0.153 tells us that the same is true of firms in the Northwest (once again – excluding firms in MCR and Liverpool; from now on we will assume that this definition of “region” is understood). That is, negative coefficients tell us that firms in an area have lower productivity than firms in the Southeast, positive coefficients (only observed for London) tell us that firms in the location have higher productivity.

Because of the nature of our measure of productivity, the magnitude itself, e.g. -0.115 for MCR is a little hard to interpret. Instead, we tend to focus on the ranking of locations and on whether or not there is evidence that locations differ significantly in terms of their productivity. Box 5 explains the basics of statistical significance in this context.

Every time we want to make comparisons between places, to be confident that differences are more real than random, we should go through the calculations described in Box 5 (or get the econometric software to do them for us). This will be very important to bear in mind when we start to rank places by the size of their coefficients. When we see differences between the coefficients that are small relative to the size of our uncertainty – as measured by the standard errors – we need to be cautious about any conclusions that we draw on the relative productivity of the two places.

Box 5: Statistical significance of city region differences in productivity

In Table 6, does the fact that the Northwest coefficient, -0.153, is more negative than that for MCR, -0.115, imply that firms in the Northwest are less productive than firms in MCR? It certainly suggests this, but we have to be very careful in drawing this kind of conclusion from a simple comparison of coefficients alone.

The problem is that we only have an estimate of the productivity advantages and disadvantages conferred by different locations. This estimate is based on a sample of firms currently in-situ, which is not really the population of interest to us or policy makers.

If we went and picked another random sample of firms or surveyed the same or different firms at a different time, we would expect to get a slightly different answer. Even if we had data on all firms, we would still expect random things to be happening to particular firms at the time when they are surveyed. Perhaps a small firm saw a key worker get sick, while a larger firm happened to pick up an unusually large order from an overseas customer.

Firms have to adjust to these temporary shocks so their measured productivity will tend to move around. The data would be different if we had collected it some other time. Assuming the samples are random and that these shocks to specific firms are also random, then the estimated MCR coefficient should be somewhere around -0.115 and the Northwest coefficient somewhere around -0.153 but there will be some variation.

The crucial point is that, because of sampling and these random events we cannot be certain that the true average effect for MCR actually is -0.115 and that for the Northwest actually is -0.153. We just know that the true values should be somewhere “close” to those values. The crucial question then becomes how close?

This is what the standard errors on the coefficients are designed to tell us. Roughly speaking, assuming our regression model is set up right we can be pretty confident that the true value for MCR lies within plus or minus two standard deviations of -0.115.

As the standard error on MCR coefficient is 0.00944 this means that we can be fairly confident that the true value for MCR is somewhere between -0.133 and -0.096. “Fairly confident” here means that there is only about 1 chance in 20 (or 5%) that the true value lies outside that range.

Similarly, the standard error on the Northwest coefficient is 0.0101, which means we can be fairly confident that the true value for the Northwest is somewhere between -0.132 and -0.173. There is a tiny overlap between those two ranges, which means we can be fairly confident that firms in the Northwest do, on average, have lower productivity than firms in MCR.

There is one specific set of comparisons that are very easy to make because of the way the table is set up. The stars next to the coefficients tell us how certain we can be that the productivity of the place is different from that of the comparison region – in this case the Southeast.

Just like with Michelin rankings of restaurants: the more stars there are, the more certain we can be that firms in the region in question have different productivity from those in the Southeast. In contrast to restaurants, of course, our stars can be attached to coefficients that indicate a region is worse as well as better. With this explanation out of the way, let’s consider what we can learn about spatial productivity differences from the results presented in column 1.

Several key results emerge. First, with the exception of London, firms in all locations have lower productivity than firms in the Southeast. These differences are statistically significant (notice all those stars). To some of us, these results are not particularly surprising, but they do serve to remind us that the desire to locate in London and the Southeast is a perfectly rational one from the individual firm’s perspective.

Of course, because these productivity benefits attract firms and workers the price of scarce resources, such as land, will be higher in London and the Southeast. These costs will tend to offset the productivity benefits. Self-evidently, if firms can relocate and they choose not to, this means that they are at least as profitable in their current location as they would be elsewhere.

Similarly, if workers are mobile but choose not to move, then they must be at least as well off where they currently live as they would be elsewhere. Comparable firms and comparable workers will tend to be indifferent between locating in London and the Southeast versus elsewhere. As discussed above, this effect makes it hard to think through the equity effects, if any, of regional policy that encourages firms to move out of London and the Southeast.

Our results also highlight the fact that the efficiency arguments for such a policy are not as simple as if firms were behaving irrationally when they locate in London and the Southeast. Productivity is higher in London and the Southeast so we would expect a regional policy that redistributes activity away from that area to have a potentially negative effect on overall UK productivity.

The second set of results to emerge from this basic analysis comes from looking at the rankings of the coefficients on the location dummies. It is easiest to see the overall picture in Figure 2 which ranks locations in decreasing order of their coefficients.

We would highlight several points. First, of the English City Regions outside London, Bristol is the only one that comes close to the productivity levels of the Southeast. Even then, firms have significantly lower productivity in Bristol than they do in London and the Southeast.

Turning next to the English City Regions outside of the “South” we find evidence that firms in Manchester, Liverpool and Leeds-Bradford have productivity advantages relative to firms in the other major City Regions of Birmingham, Newcastle and Sheffield. Remember, we need to be careful with these comparisons to check that the standard errors are small enough that we can be confident that differences in rankings are genuine rather than spurious.

Table 6: Productivity regressions

VARIABLE	(1)	(2)	(3)	(4)
Urbanisation		0.0894 0.00226***	0.0730 0.00237***	0.0679 0.00305***
Skills (NVQ3)			4.442 2.265***	6.433 2.301***
Skills (NVQ4)			10.76242 2.154***	9.278 2.164***
Airport				-0.00688 0.00299**
Motorway				-0.00452 0.00198**
Station				0.00818 0.00184***
Port				-0.0126 0.00250***
Northeast region	-0.174 0.0143***	-0.145 0.0143***	-0.0635 0.0152***	-0.0882 0.0152***
Northwest region	-0.153 0.0101***	-0.128 0.0101***	-0.0754 0.0105***	-0.0947 0.0106***
Yorkshire region	-0.185 0.0110***	-0.136 0.0111***	-0.0686 0.0119***	-0.0909 0.0120***
East Midlands region	-0.148 0.00964***	-0.123 0.00963***	-0.0702 0.0104***	-0.0671 0.0107***
West Midlands region	-0.145 0.00948***	-0.135 0.00946***	-0.084 0.0102***	-0.0843 0.0106***
East of England region	-0.11 0.00937***	-0.0448 0.00943***	-0.00201 0.0104	-0.00641 0.0105
Southwest region	-0.141 0.00851***	-0.0605 0.00867***	-0.0489 0.00875***	-0.0589 0.00881***
Wales	-0.23 0.00978***	-0.118 0.0101***	-0.0731 0.0110***	-0.088 0.0110***
Scotland	-0.212 0.0112***	-0.0412 0.0120***	-0.0674 0.0122***	-0.0746 0.0124***
Birmingham	-0.158 0.00988***	-0.218 0.0100***	-0.137 0.0114***	-0.128 0.0125***
Bristol	-0.0578 0.0149***	-0.08 0.0149***	-0.05 0.0150***	-0.0651 0.0152***
Cardiff	-0.179 0.0129***	-0.175 0.0129***	-0.122 0.0136***	-0.137 0.0139***

Table 6: Productivity regressions (continued)

VARIABLE	(1)	(2)	(3)	(4)
Edinburgh	-0.107 0.0111***	-0.0813 0.0110***	-0.0848 0.0112***	-0.111 0.0119***
Glasgow	-0.104 0.0102***	-0.123 0.0102***	-0.0983 0.0104***	-0.117 0.0109***
London	0.127 0.00749***	0.00699 0.00782	0.0137 0.00856	0.00357 0.00862
Leeds-Bradford	-0.133 0.00957***	-0.167 0.00957***	-0.0917 0.0105***	-0.101 0.0108***
Liverpool	-0.113 0.0171***	-0.159 0.0170***	-0.0976 0.0174***	-0.116 0.0177***
Manchester	-0.115 0.00944***	-0.165 0.00951***	-0.102 0.0101***	-0.112 0.0104***
Newcastle	-0.159 0.0147***	-0.164 0.0146***	-0.0792 0.0156***	-0.0952 0.0159***
Sheffield	-0.224 0.0145***	-0.267 0.0146***	-0.168 0.0160***	-0.16 0.0162***
Observations	285809	285809	285809	285809
R-squared	0.897	0.898	0.899	0.899

Notes: Dependent variable is \ln value added. Results not reported for year dummies, industrial dummies in levels and interacted with \ln labour and \ln capital. Errors clustered at the reporting unit level; * denotes significant at 10%, ** significant at 5%, *** significant at 1%. Reference location is Southeast Region. Aberdeen, Nottingham and Leicester coefficients are not reported.

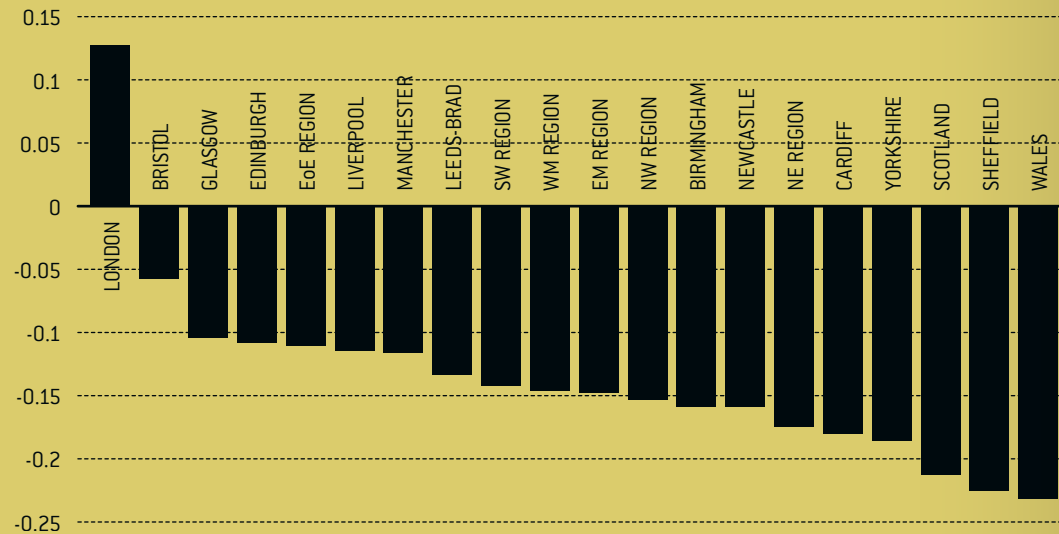
We can be fairly confident that firms in Manchester, Liverpool and Leeds-Bradford have higher productivity than firms in Sheffield. We need to be more careful in comparisons of Liverpool and Leeds-Bradford to Birmingham and Newcastle.

Leeds-Bradford's lower coefficient means that we cannot be so confident that the productivity of firms there is different from firms in Birmingham and Newcastle. For Liverpool, despite the fact that it has a fractionally higher coefficient, we are actually less certain about its precise value and thus less confident that firms there are significantly more productive than they are in Birmingham and Newcastle.

For MCR we can be fairly confident that firms there are more productive than those in both Birmingham and Newcastle. At a pinch, we might also be fairly confident that firms in Manchester have higher productivity than those in both the West and East Midlands (it depends on how certain we want to be about this statement).

Finally, we see that, with the exception of Birmingham and Sheffield, city regions tend to do better than the region in which they are situated (although these differences are not always significant). In the particular case of MCR and the Northwest, as we discussed at some length earlier, this difference is statistically significant. We now turn to the role agglomeration economies play in helping us understand these differences.

Figure 2: Productivity differences



Notes: Figure shows the productivity of firms in different regions relative to firms in the Southeast (i.e. it reports coefficients on location dummies from regression 1 in Table 6 ranked in descending order)

Box 6: Endogeneity and agglomeration

Our regression shows that higher economic mass is associated with higher productivity. But this does not necessarily mean that higher economic mass causes productivity to increase. An alternative explanation is that places with higher productivity for some reason other than size (e.g. a well functioning transport system) attract lots of firms and households.

Given this current position, the difficulty in disentangling the two effects and the fact that the policy discussion, generally, does not need us to be able to distinguish between the two mechanisms, we don't address this issue in our empirical work. In the text, we make it clear when this inability to distinguish cause and effect might make a difference to policy.

That is high productivity causes increased economic mass. Urban economists spend a large amount of time and effort trying to solve this chicken and egg problem. A fair summary of the current state of academic research is that both effects are at work.

The second column in Table 6 tells us that agglomeration economies appear to play an important role in 'explaining' differences in productivity across space. Although, we should keep in the back of our minds that we cannot be certain about the direction of causality (see Box 6).

The coefficient is highly statistically significant (i.e. we are very confident it is not zero) and tells us that a 1% increase in the measure of economic mass results in a 0.09% increase in productivity. That is consistent with, although at the higher end of, estimates found in the literature, partly reflecting the fact that we do not try to correct for endogeneity (again, see Box 6).

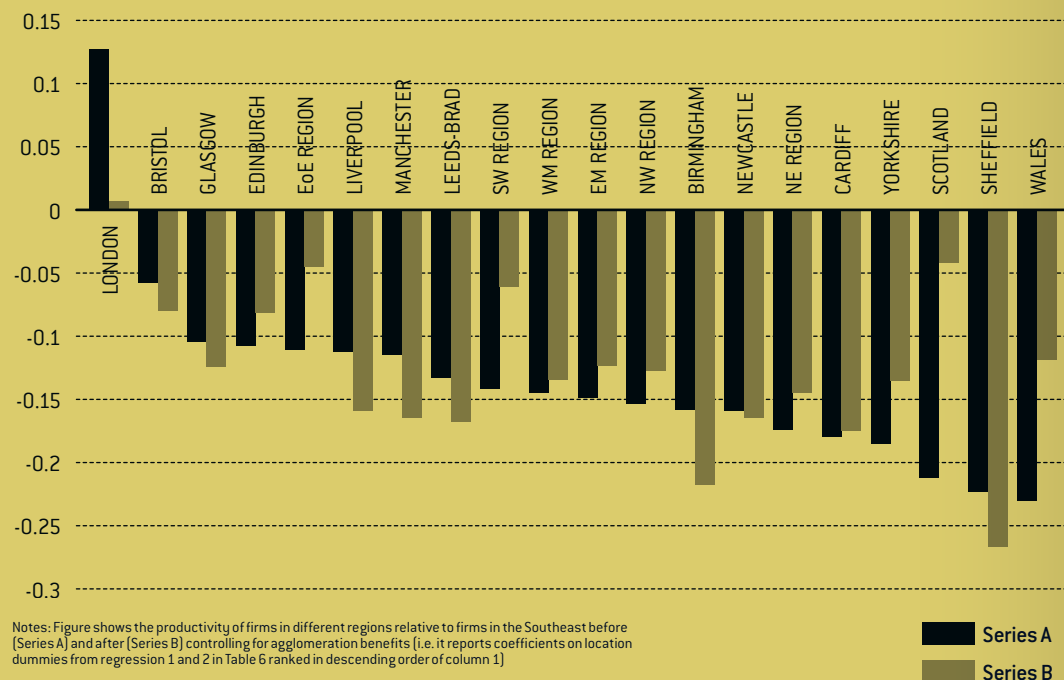
Agglomeration also explains some of the productivity effects attributed to specific places. The relative performance of regions outside the Southeast improves somewhat. This makes sense because the Southeast region benefits most from agglomeration economies, so some of its productivity advantage comes from that.

Notice, however, that all regions continue to have negative significant coefficients. Agglomeration explains some, but not all, of the productivity advantage of the Southeast. What about the City Regions? There the effect works in the opposite direction as city regions are places that tend to benefit from agglomeration economies.

PRODUCTIVITY

ECONOMIC MASS

Figure 3: Productivity differences after controlling for agglomeration



We see that London’s productivity advantage relative to the Southeast region is essentially explained by agglomeration (we cannot now detect a significant difference between London and the Southeast region). Comparing MCR with the rest of the Northwest we see that agglomeration benefits explain all of MCR’s advantage.

In fact, once we control for the fact that MCR benefits more from agglomeration economies (i.e. we discount its advantages from being big), firms in the Northwest perform better than firms in MCR. Of course, firms do not think about how productive they will be *ignoring* any benefits that come from agglomeration, so this is just a thought experiment to demonstrate the importance of agglomeration economies in explaining productivity differences across place.

This thought experiment of ignoring any benefits from agglomeration can also serve another useful purpose. Imagine two cities that have roughly similar levels of productivity. When we run the first regression, these two cities will have roughly the same values for their productivity relative to the Southeast.

Now assume that one of these cities has a higher level of economic mass and so should benefit more from agglomeration economies. When we run the second regression controlling for agglomeration economies, the larger cities productivity will look worse than the smaller cities. This will show up in larger changes to the large cities coefficient and possibly a change in rankings.

Given that we are introducing an additional factor, it’s rather difficult to be sure how confident we can be about these differences. But the results are still indicative. To take a concrete example when we compared productivity between Newcastle City Region and MCR we could be fairly confident that firms in MCR had higher productivity.

Now compare the results reported in column 2 of Table 6. The coefficient on MCR has fallen to -0.165. Newcastle’s coefficient has also fallen, but not by very much to -0.164. This tells us that MCR’s advantage relative to Newcastle comes from the fact that its economic mass is higher.

Once again, remember that firms do not think about how productive they will be *ignoring* any benefits that come from agglomeration so this is just a useful thought experiment. But it does raise the interesting issue as to why productivity in Newcastle is higher than we might expect relative to MCR. Of course, there are plenty of factors that might differ between locations (including MCR and Newcastle) so we would not want to jump to the conclusion that there must be a policy explanation for these relative movements.

Before we turn to consider some of these alternative explanations its useful to have a way of keeping track of what is happening as we move across the specifications in Table 6. The only formal way to do this is to look at the coefficients and standard errors and to perform the kind of comparison we have done above.

But two informal representations will help draw out the economic messages. Figure 3 is the first of these. It keeps the rankings of cities the same as in Figure 2 and shows what happens to their relative performance (as measured by the coefficient reported in Table 6) as we consider additional explanations for differences in productivity. The shifts we have described earlier are fairly easy to see in the move from the Series A to the Series B bars.

Table 7 is the second method we use to draw out the economic messages. It simply reports the location and its relative performance. This just replicates the information reported in Table 6, but here we ignore issues of statistical significance and we rank regions in each column according to their relative productivity.

Again, comparing columns 1 and 2 it is fairly easy to see the changes in the relative rankings of regions and city regions that we talked about earlier.

Clearly, productivity for firms in MCR is lower than we might expect given the overall size of the MCR economy. Three issues that have been consistently proposed as explanations of MCR’s weaker economic performance may be particularly important for productivity, given what we know about agglomeration economies.

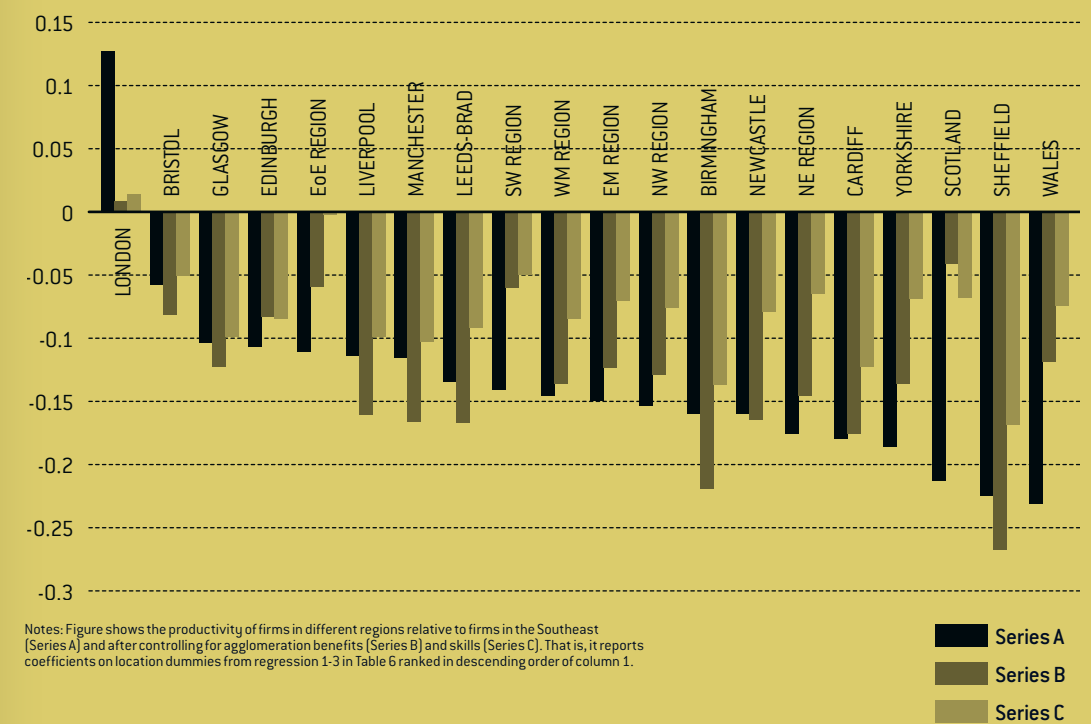
Specifically, (i) the labour market for skilled workers may be too thin; (ii) poor transport links may mean the access to economic mass is lower than it could be; (iii) the overall size of specific sectors may be too small. We address each of these in turn.

Table 7: Rankings of locations

NO CONTROLS		URBANISATION		URBANISATION AND SKILLS		URBANISATION, SKILLS AND TRANSPORT	
PLACE	COEFF	PLACE	COEFF	PLACE	COEFF	PLACE	COEFF
London	0.127	London	0.00699	London	0.0137	London	0.00357
Bristol	-0.0578	Scotland	-0.0412	Scotland	-0.0674	EoE region	-0.00641
Glasgow	-0.104	EoE region	-0.0448	EoE region	-0.00201	SW region	-0.0589
Edinburgh	-0.107	SW region	-0.0605	SW region	-0.0489	Bristol	-0.0651
EoE region	-0.11	Bristol	-0.08	Bristol	-0.05	EM region	-0.0671
Liverpool	-0.113	Edinburgh	-0.0813	Edinburgh	-0.0848	Scotland	-0.0746
Manchester	-0.115	Wales	-0.118	Wales	-0.0731	WM region	-0.0843
Leeds-Brad	-0.133	Glasgow	-0.123	Glasgow	-0.0983	Wales	-0.088
SW region	-0.141	EM region	-0.123	EM region	-0.0702	NE region	-0.0882
WM region	-0.145	NW region	-0.128	NW region	-0.0754	Yorkshire	-0.0909
EM region	-0.148	WM region	-0.135	WM region	-0.084	NW region	-0.0947
NW region	-0.153	Yorkshire	-0.136	Yorkshire	-0.0686	Newcastle	-0.0952
Birmingham	-0.158	NE region	-0.145	NE region	-0.0635	Leeds-Brad	-0.101
Newcastle	-0.159	Liverpool	-0.159	Liverpool	-0.0976	Edinburgh	-0.111
NE region	-0.174	Newcastle	-0.164	Newcastle	-0.0792	Manchester	-0.112
Cardiff	-0.179	Manchester	-0.165	Manchester	-0.102	Liverpool	-0.116
Yorkshire	-0.185	Leeds-Brad	-0.167	Leeds-Brad	-0.0917	Glasgow	-0.117
Scotland	-0.212	Cardiff	-0.175	Cardiff	-0.122	Birmingham	-0.128
Sheffield	-0.224	Birmingham	-0.218	Birmingham	-0.137	Cardiff	-0.137
Wales	-0.23	Sheffield	-0.267	Sheffield	-0.168	Sheffield	-0.16

Notes: Table shows the productivity of firms in different regions relative to firms in the Southeast (first ranking) and after controlling for agglomeration economies (second ranking), skills (third ranking) and transport (fourth ranking). That is, it reports coefficients on location dummies from regression 1-4 in table 6 ranked in descending order.

Figure 4: Productivity differences after controlling for agglomeration and skills



Notes: Figure shows the productivity of firms in different regions relative to firms in the Southeast (Series A) and after controlling for agglomeration benefits (Series B) and skills (Series C). That is, it reports coefficients on location dummies from regression 1-3 in Table 6 ranked in descending order of column 1.

Series A
Series B
Series C

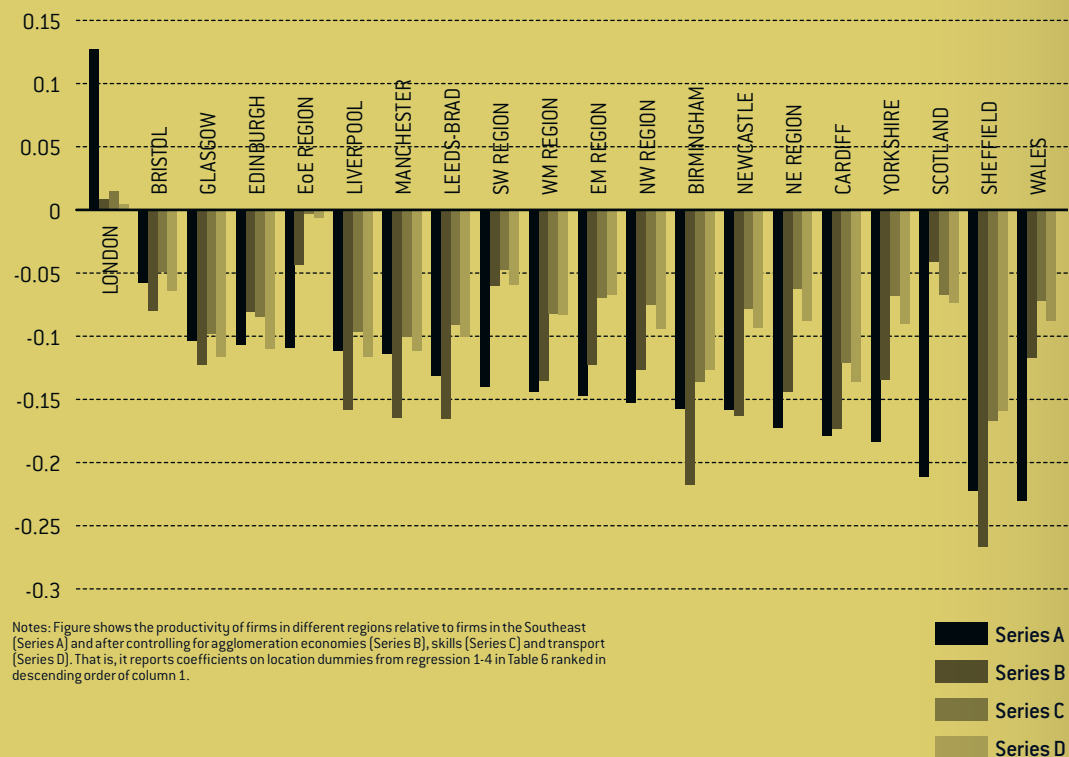
To control for skills we can introduce the measure of skills which we described above. As a reminder we have measures for NVQ level 3 and 4 (and their equivalents). Level 4 Qualifications include HNDs, First Degrees, Higher Degrees and similar qualifications. Level 3 qualifications include 2 or more A levels, advanced GNVQ, NVQ 3, and equivalent. Column 3 of Table 6 shows that good access to workers with both of these levels of skills raises productivity.

There are two reasons why having good access to workers with higher skills could raise firm productivity. First, higher skilled workers are intrinsically more productive. Second, agglomeration economies might benefit higher skilled workers more. Because the ARD provides no information on the skill composition of individual firms we cannot control for the former effect directly.

This means that our measure of higher skilled workers captures both the direct (composition) and agglomeration benefit to firms. All we can say from the positive coefficients on the skills variables is that at least one of these effects is important for understanding spatial differences in productivity.

In addition, although the effects of the two skills variables themselves are directly comparable (so we can say with some certainty that NVQ4 skills are more important for productivity than NVQ3) the fact that they are constructed from shares of workers with particular skills means that they are not directly comparable to the economic mass measure.

Figure 5: Productivity differences after controlling for agglomeration, skills and transport



Notes: Figure shows the productivity of firms in different regions relative to firms in the Southeast (Series A) and after controlling for agglomeration economies (Series B), skills (Series C) and transport (Series D). That is, it reports coefficients on location dummies from regression 1-4 in Table 6 ranked in descending order of column 1.

Figure 4 works the same way as Figure 3 and shows what happens to the relative productivity of different locations as we introduce our skills measures. For every region (with the exception of Scotland) lower skills account for a big part of the productivity disadvantage relative to the Southeast.

It's a particularly important part of the explanation of the relatively poor productivity of firms in some places (e.g. Sheffield and Newcastle). The effects on MCR and Liverpool are actually the smallest of the Northern cities. Again, it is probably useful to remember not to read too much in to these relative movements. The big picture here is the importance of skills in explaining a large part of the productivity gap with the Southeast of England.

We turn next to the possible role of transport in explaining the remaining differences. As a reminder we have four measures of access to transport – distance to the nearest airport, motorway junction, station and port. Because these measures of transport increase the further you are from a particular type, negative coefficients indicate a positive effect of transport access on productivity and vice-versa.

The results in Table 8, column 4 present a mixed picture. Access to airports, motorways and railways is beneficial for productivity while being close to a rail station has a negative effect. Looking back at the maps in Figure 1 it is clear that there are some fairly remote rail stations, which might explain the negative impact on productivity.

Figure 5 shows that the overall effect of transport links in explaining spatial differences in productivity is limited. This is in line with the observation made in the Eddington Report that the regions and city regions of the UK are actually reasonably well served by the transport network. Of course, our measures of transport access are fairly crude – we do not, for example, control for the quality of the transport link to which a node gives access.

There is also no doubt that careful cost benefit analysis could well identify projects which have large social returns (although surprisingly little is known about the productivity impacts of transport)²³. Indeed, this appears to be the case for a number of schemes for which evidence is already available.

These findings are, however, consistent with the idea that large, low productivity places tend to be relatively over supplied with transport rather than under supplied, particularly if they are declining from some historically more productive time as with many of the UK's city regions²⁴.

Finally, what does the productivity data tell us about the third argument for MCR's relatively weaker productivity – the lack of "clusters" of critical mass in particularly important sectors? It should be noted that many authors – ourselves included – are very sceptical about the recent infatuation with policy support to "clusters" as a way of achieving increased productivity. We discuss this issue further later, but the evidence that we are about to present certainly supports this scepticism.

Remember, the literature distinguishes two broad categories of agglomeration economies: *urbanisation* the benefits of co-location with workers and firms in all sectors; and *localisation* – the benefits of co-location with workers and firms in the same industrial sector. The concept of localisation relates quite closely to the idea of industrial "clusters" (from Silicon Valley, to Soho, to science parks).

We construct our measure of "localisation" – a measure of the employment presence of firms in the same sector – in the same way as we construct our measure of urbanisation. But now, instead of considering the *total* amount of employment close to a firm we only consider employment in the *same* industry.

To make our results easier to interpret we then reconstruct our measure of urbanisation for each firm using total employment in nearby firms but ignoring those that are in the same industry. That way, our localisation measure captures the effect on productivity of increasing the number of nearby firms doing the same kind of activity, while our urbanisation measure captures the effect of increasing the number of firms doing something else.

If stories about the importance of the critical mass of particular sectors in MCR (and elsewhere) are true we are looking for a positive effect of localisation. Of course, this does not rule out a positive effect from overall urbanisation as well. In theory both effects could certainly be positive and as we shall see, this sometimes happens for individual sectors.

Table 8 shows what happens to our results when we include these two alternative measures of urbanisation and localisation. The table presents results for our original urbanisation measure (urban I) and then for localisation and the revised urbanisation measure (urban II) for each of the three specifications discussed above. That is, we first introduce the measures on their own, then add skills and finally add the transport variables.

23 See Gibbons and Overman 2008.

24 See, for example, Glaeser and Gottlieb (2008).

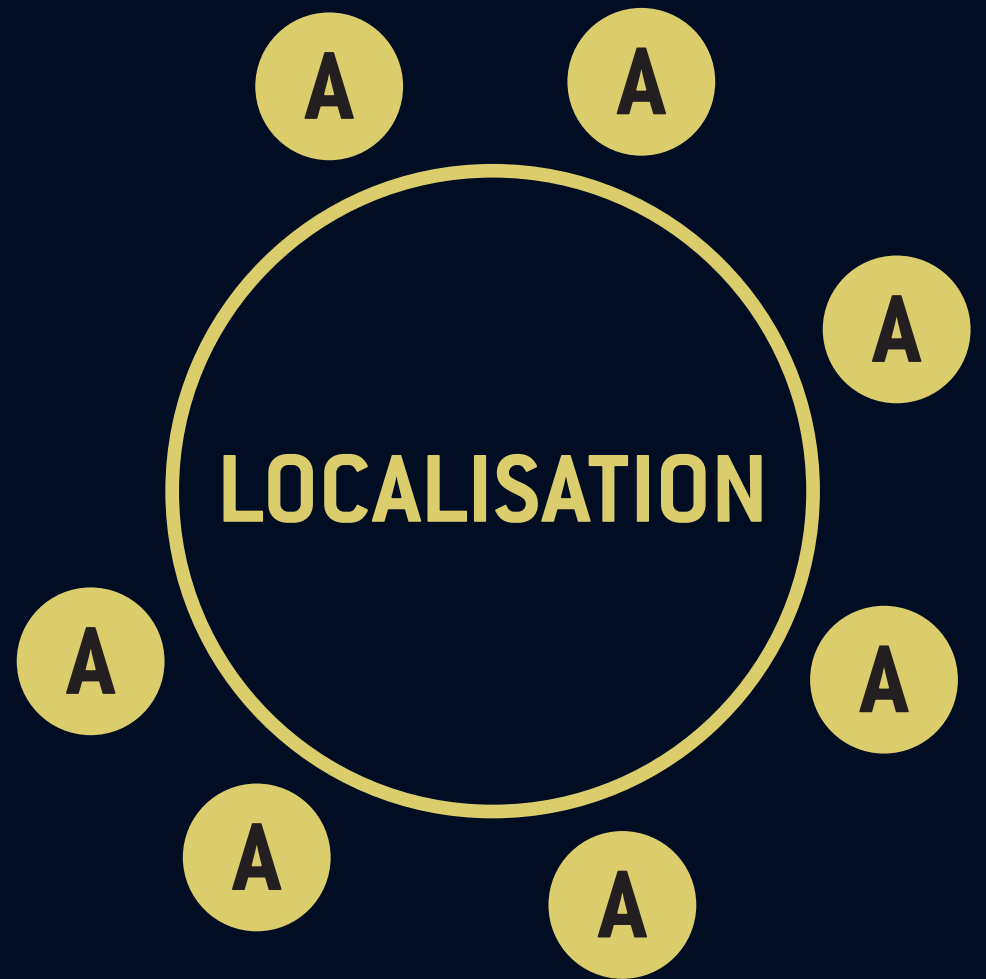
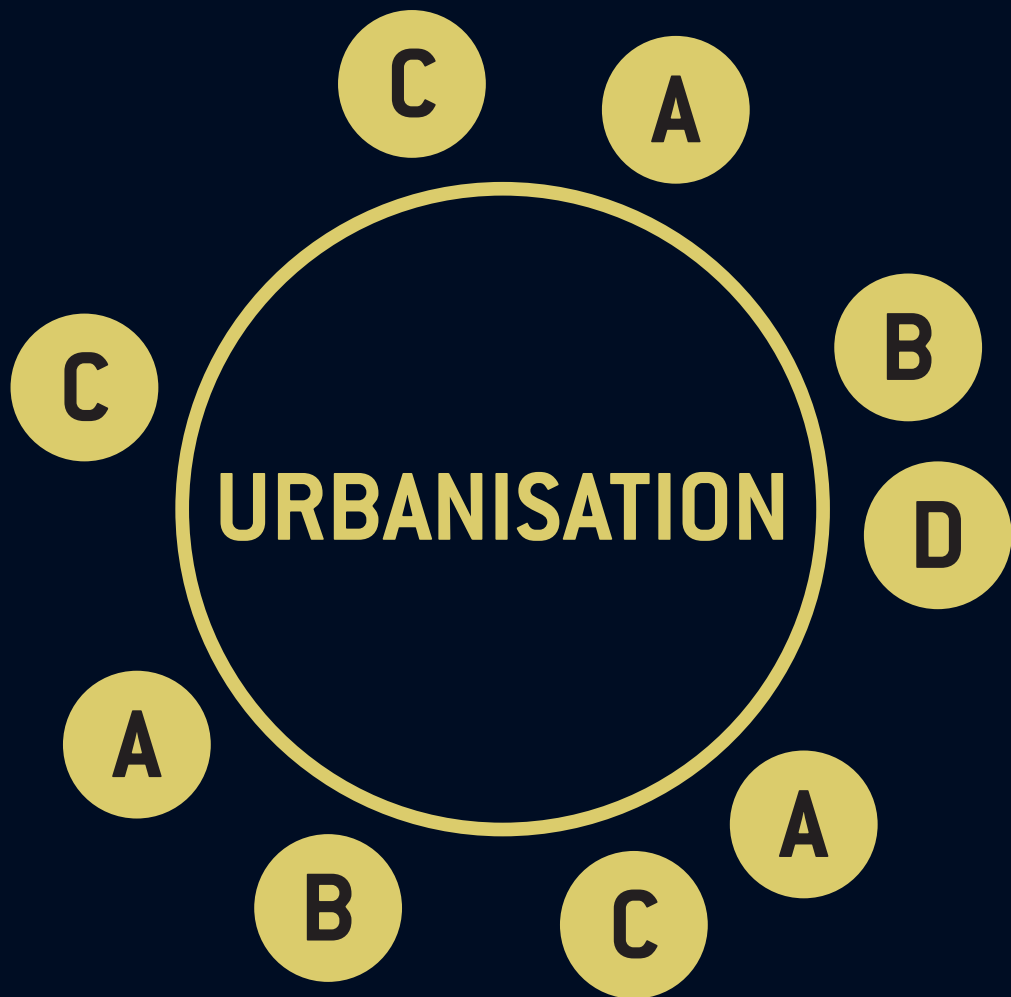


Table 8: Results differentiating between localisation and urbanisation

VARIABLE	(2)		(3)		(4)	
Urban I	0.0894 0.00226***		0.073 0.00237***		0.0679 0.00305***	
Urban II	0.117 0.00290***		0.101 0.00296***		0.0957 0.00352***	
Localisation	-0.0272 0.00184***		-0.0282 0.00184***		-0.0281 0.00184***	
Skills (NVQ3)		4.442 2.265**	3.91 2.263*	6.434 2.301***	6.218 2.299***	
Skills (NVQ4)		10.76 2.154***	11.62 2.153***	9.278 2.164***	9.91 2.162***	
Airport				-0.00688 0.00299**	-0.00557 0.00299*	
Motorway				-0.00452 0.00198**	-0.0038 0.00198*	
Station				0.00818 0.00184***	0.00721 0.00183***	
Port				-0.0126 0.00250***	-0.0134 0.00250***	
NE region	-0.145 0.0143***	-0.147 0.0143***	-0.0635 0.0152***	-0.0643 0.0152***	-0.0882 0.0152***	-0.0807 0.0153***
NW region	-0.128 0.0101***	-0.127 0.0101***	-0.0754 0.0105***	-0.0736 0.0105***	-0.0947 0.0106***	-0.084 0.0106***
Yorkshire	-0.136 0.0111***	-0.136 0.0110***	-0.0686 0.0119***	-0.0673 0.0119***	-0.0909 0.0120***	-0.0823 0.0120***
EM region	-0.123 0.00963***	-0.123 0.00964***	-0.0702 0.0104***	-0.0699 0.0104***	-0.0671 0.0107***	-0.0616 0.0107***
WM region	-0.135 0.00946***	-0.136 0.00945***	-0.084 0.0102***	-0.084 0.0102***	-0.0843 0.0106***	-0.0736 0.0106***
EoE region	-0.0448 0.00943***	-0.045 0.00942***	-0.00201 0.0104	-0.00208 0.0104	-0.00641 0.0105	-0.00519 0.0105
SW region	-0.0605 0.00867***	-0.0595 0.00866***	-0.0489 0.00875***	-0.0479 0.00875***	-0.0589 0.00881***	-0.0537 0.00884***
Wales	-0.118 0.0101***	-0.116 0.0101***	-0.0731 0.0110***	-0.071 0.0110***	-0.088 0.0110***	-0.0759 0.0110***
Scotland	-0.0412 0.0120***	-0.0384 0.0120***	-0.0674 0.0122***	-0.0646 0.0122***	-0.0746 0.0124***	-0.0673 0.0123***
Birmingham	-0.218 0.0100***	-0.218 0.0100***	-0.137 0.0114***	-0.136 0.0114***	-0.128 0.0125***	-0.119 0.0124***
Bristol	-0.08 0.0149***	-0.0827 0.0149***	-0.05 0.0150***	-0.0523 0.0150***	-0.0651 0.0152***	-0.0713 0.0152***
Cardiff	-0.175 0.0129***	-0.175 0.0129***	-0.122 0.0136***	-0.121 0.0136***	-0.137 0.0139***	-0.142 0.0139***

Table 8: Results differentiating between localisation and urbanisation (continued)

VARIABLE	(2)		(3)		(4)	
Edinburgh	-0.0813 0.0110***	-0.0846 0.0110***	-0.0848 0.0112***	-0.0877 0.0112***	-0.111 0.0119***	-0.114 0.0118***
Glasgow	-0.123 0.0102***	-0.127 0.0102***	-0.0983 0.0104***	-0.101 0.0104***	-0.117 0.0109***	-0.122 0.0109***
London	0.00699 0.00782	0.00481 0.00782	0.0137 0.00856	0.0107 0.00855	0.00357 0.00862	0.00534 0.00861
Leeds-Brad	-0.167 0.00957***	-0.169 0.00957***	-0.0917 0.0105***	-0.0916 0.0105***	-0.101 0.0108***	-0.0887 0.0108***
Liverpool	-0.159 0.0170***	-0.16 0.0170***	-0.0976 0.0174***	-0.0976 0.0174***	-0.116 0.0177***	-0.119 0.0177***
Manchester	-0.165 0.00951***	-0.168 0.00950***	-0.102 0.0101***	-0.103 0.0101***	-0.112 0.0104***	-0.103 0.0103***
Newcastle	-0.164 0.0146***	-0.168 0.0146***	-0.0792 0.0156***	-0.0817 0.0156***	-0.0952 0.0159***	-0.0863 0.0159***
Sheffield	-0.267 0.0146***	-0.268 0.0145***	-0.168 0.0160***	-0.167 0.0159***	-0.16 0.0162***	-0.157 0.0161***
Observations	285809	285775	285809	285775	285809	285775
R-squared	0.898	0.898	0.899	0.898	0.899	0.899

Notes: Dependent variable is \ln value added. Results not reported for year dummies, industrial dummies in levels and interacted with \ln labour and \ln capital. Errors clustered at the reporting unit level; * denotes significant at 10%, ** significant at 5%, *** significant at 1%. Reference location is Southeast Region. Aberdeen, Nottingham and Leicester coefficients are not reported.

The results are striking. Across all the specifications localisation always has a negative effect on productivity, urbanisation a positive effect. In line with our previous comments, this is clear evidence, at least at the aggregate level, that the size of particular industries is not a major concern in terms of explaining spatial productivity differences.

Turning to the location dummies, we see that introducing localisation does nothing to explain the initial ranking of regions (compare columns 1 and 2). We reach a similar conclusion for the specifications including skills and transport.

It probably makes more sense to discuss this issue in depth once we turn to the analysis of individual sectors. Our findings there suggest that, while localisation may have some positive impact for individual sectors, urbanisation is much more important for understanding productivity differences.

4.2 Sectors

We now turn to these results for the individual industries. We are able to report results for 24 out of 25 industries. The omitted industry is the public sector for which ARD contains no data. Also, remember that the coverage of Financial and Professional Services is somewhat partial. Once again, to keep things manageable, we do not report results for Aberdeen, Leicester and Nottingham (although we do include dummies for these City Regions).

The Appendices (A2) provide three sets of detailed results. The first set replicates our basic specification where we just include location dummies to look at the average productivity in different places (Table A2.4). The second set introduces our measure of urbanisation to capture agglomeration economies (Table A2.5).

The third set includes our measure of localisation (i.e. based on own employment) and our alternative measure of urbanisation (calculated excluding own employment) along with the skills and transport variables (Table A2.6). For a reminder of the distinction between the different measures of urbanisation and localisation, refer back to the text above Table 8.

We start by considering the position of MCR relative to the Southeast (remember this is the excluded, or comparison, region). On the basis of the available data, productivity in MCR firms appears to be lower²⁵ than the Southeast in 18 out of 24 sectors and higher in 6. It does significantly worse in Engineering, Environmental Tech, Tourism, ICT Digital/Comms, Logistics, Manufacturing, Other, Other Business Services, Retail, Textiles and Wholesale.

As a reminder, significance here indicates the degree of certainty that we have about the differences that we are reporting. So we are only reasonably confident about the negative results for the 11 sectors just listed. For the other 7 we cannot be sure that MCR is actually doing worse or whether we have just observed some chance differences. See Box 5 for more on this.

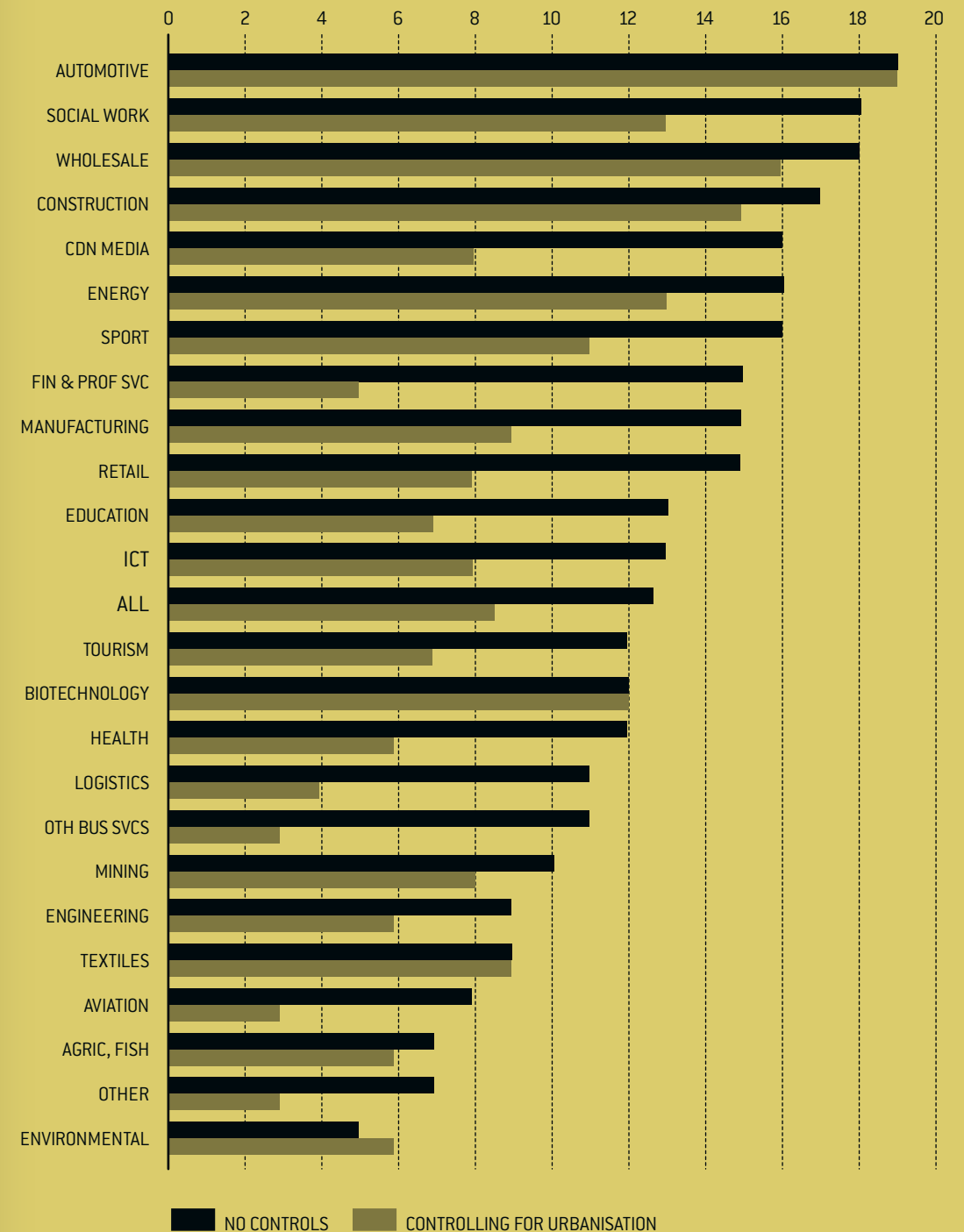
Results are insignificant for all of the industries for which MCR has a positive coefficient relative to the Southeast. That is, we cannot be confident that MCR has a true advantage in these industries (Automotive, Education, Energy, Financial and Professional Services, Life Sciences – Biotech, Social Work). Putting this more positively, it does not appear to have a significant disadvantage in these six industries either.

In conclusion, in our aggregate results we found that, overall, MCR had a productivity disadvantage relative to the Southeast. Our individual sector results suggest that this carries over to most individual industries, with some interesting exceptions.

As with the aggregate results, it is also interesting to figure out a locations' relative rankings in terms of productivity. We have 24 sectors by 20 regions (ignoring the Southeast region which is our benchmark) so reporting rankings for all locations quickly becomes overwhelming. Instead, for each industry, Figure 6 simply shows MCR's ranking relative to the other 19 regions, excluding the Southeast, Nottingham, Leicester and Aberdeen.

²⁵ One of the problems with such a broad industry classification is that one can certainly question the extent to which activities within the same sector are truly comparable across space. For example, some locations may focus on high tech manmade fibres while others focus on cotton shirts.

Figure 6: MCR's regional ranking for each industry sector



Note: rankings are 1, lowest, to 20, highest. Industries ordered left to right by highest MCR ranking without controls for urbanisation. Figures are based on point estimates from regressions, and not all rankings or differences in rankings are statistically significant. Bar marked 'All' shows MCR's average rank.

A high number indicates a high ranking relative to other regions, so a tall bar indicates that sector has high productivity in MCR relative to other regions. MCR's average ranking on this scale is 13, which means it is 8th out of our 20 regions. In the overall rankings MCR was 7th out of 20 regions. The minor difference reflects the fact that some industries are more important than others and that, roughly speaking, MCR's overall ranking comes from weighting the ranking in individual sectors (by the number of firms).

Looking at Table A2.4 again, it is clear that very few of the differences between similarly ranked locations are statistically significant. For example, in Aviation, we can be pretty confident that London ranks first but we cannot be so confident that second ranked Bristol truly has an advantage relative to 13th ranked MCR.

This example holds more generally and is the first example of a point that we will make throughout this section: it is very difficult to be confident about any given location's relative productivity in any given sector. This urges considerable caution of the advisability of sector based strategies.

Because sectoral policies are a firm favourite with policy makers the usual response to this is to appeal to "local knowledge" as a way of resolving this uncertainty and justifying the decision to concentrate on particular sectors. But even with the very detailed data that we have on firms across a whole range of locations it is very difficult to identify any particular sector where a city region, or region, has an advantage.

It is hard to see how "local knowledge" solves this problem because, setting aside the issue of whether it actually provides better information about local firms (not necessarily the case) it only tells policy makers about what is going on in their own location. It is also important to recognise that local firms have incentives to lobby for policy that will not necessarily be beneficial for the area as a whole. We will revisit these issues in some detail below.

What about the position of MCR relative to the Northwest? As we discussed above, the overall position is clear. We can be fairly confident that firms in MCR have a productivity advantage relative to firms in the Northwest (excluding Liverpool City Region).

We see this overall pattern repeated when we look at individual sectors. Productivity of firms in MCR is on average higher than firms in the Northwest in 18 out of 24 sectors, although the differences are small for a number of sectors. Perhaps unsurprisingly, firms in the Northwest do better in Agriculture, Forestry and Fishing and in Mining as well as having tiny differences for four other sectors.

These differences tend to make sense, but once again we stress the fact that, while we can be confident about the overall result (that across sectors, firms in MCR tend on average to be more productive) it is very difficult to be certain about the magnitude of any specific industry differences just from comparing firms in MCR and the Northwest.

The second set of columns in Figure 6 shows what happens to the MCR's ranking, by industry, when we control for urbanisation in the regressions, i.e. we discount the potential agglomeration advantages that MCR has from being big.

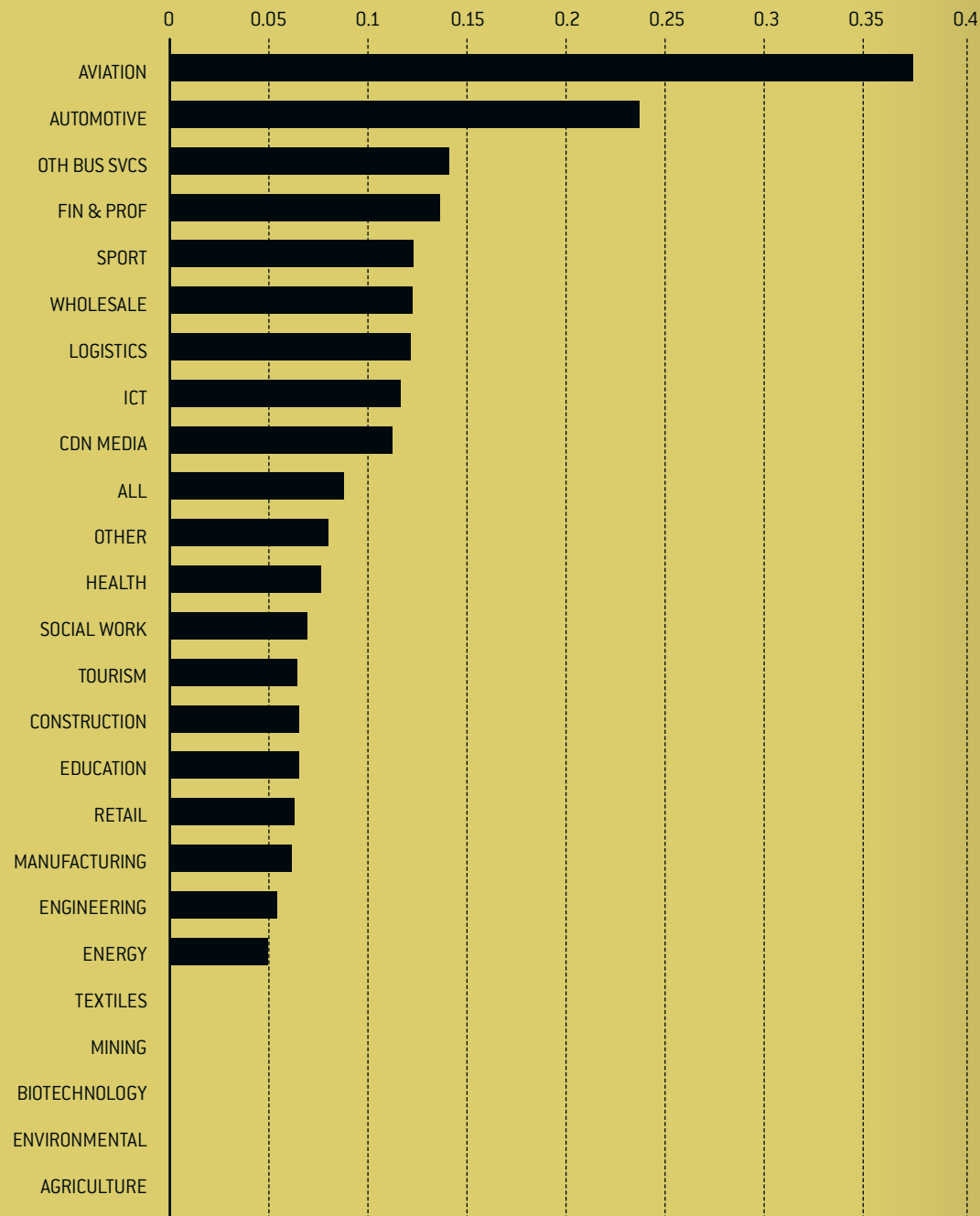
As we saw in the results for all sectors together (Figure 3), this can change the region's relative position: many sectors are re-ordered in terms of MCR's ranking.

Again this reinforces the point that apparent sectoral performance is a very poor indicator on which to base policy decisions, because judgements about which sectors are performing well depends a lot on how the comparison is made. Moreover, the statistical uncertainty remains, and many of the differences are not significant.

A different way of looking at this issue is to ask the question whether a given industry tends to benefit disproportionately from being in urban locations. As city regions are obviously more urban than the region in which they are located, sectors that benefit a lot from agglomeration economies will tend to have higher productivity when firms in those sectors locate in a city region as opposed to elsewhere in the wider region.

LOCALISATION

Figure 7: Industries ranked by size of agglomeration economies



Notes: Coefficients from regression of productivity on urbanisation (time dummies, industry dummies, capital and labour). Insignificant coefficients set equal to zero.

Table A2.5 in the appendix, reports results for sector specific agglomeration economies. We find positive benefits for 19 out of 24 sectors. As the results can be a little overwhelming, Figure 7 ranks industries by the size of their agglomeration economies. The five industries at the end are those where we find no evidence of significant benefits.

The bar marked “All” plots the measured agglomeration benefits when we pool all sectors together, so provides a useful benchmark for thinking about which sectors have above average, versus below average, agglomeration economies.

You would tend to expect city regions to have significantly higher productivity than their surrounding regions in the industries with highest agglomeration economies. One could make a similar statement about firms in London and the Southeast relative to those located elsewhere.

Remember that these are average values for firms in the sector looking across all locations. These results, and the specific comparison between MCR and the Northwest, tend to tell the same story. For example, Agriculture, Forestry and Fishery and Mining (two of the sectors for which firms in the Northwest appeared to have higher productivity than firms in MCR) do not benefit from agglomeration economies, while the largest difference occurs for Automotive, which benefits from the second highest agglomeration economies.

But the mapping between these results and those comparing MCR to other places is not one-to-one. For example, MCR does well relative to the Northwest in Biotechnology, despite the fact that we do not find any agglomeration economies for that sector.

Again, it is much easier to make the general comparison for sectors looking across lots of locations than it is to make *specific* comparisons between only a couple of locations. “Local knowledge” could be of more help with the latter, however, because it only requires the policy maker to be familiar with firm performance across a smaller number of places.

So, for example, Regional Development Agencies may have information on why these effects do not play out in particular places within their region. If one wanted to get a more detailed understanding of where the differences between MCR and the Northwest come from, this suggests taking the sectoral results as a benchmark and using local knowledge to figure out why these might not map into actual productivity differences.

To emphasise, however, we can be much more confident about general results than sector-location specificities. Even if local knowledge can improve the situation, sector based policy making will still face very large gaps in the underlying evidence base.

This message is further reinforced by turning to the issue of whether we can identify clear differences in the way that firms in different sectors respond to urbanisation versus localisation economies and to the availability of skills and transport infrastructure.

Appendix Table A2.6 (see Appendices) reports the results for regressions including all of these variables (we include city region and region dummies, but suppress the results to keep things manageable). The broad findings can be summarised as follows: separating out the relative importance of different transport infrastructure for the productivity of firms in specific sectors is difficult; however, the balance of significant positive versus negative effects does line up with the aggregate effects.

URBANISATION

We reach a similar conclusion for skills. In line with the overall results, share of NVQ4 skills tend to have a bigger positive effect on productivity than share of NVQ3 skills (the average coefficient for NVQ4 is larger). Likewise, taken together NVQ3 and NVQ4 skills increase productivity (the sum of the coefficients is positive) in nearly all sectors.

Once again, even with the wealth of new evidence that we are able to provide here, we are a long way from being able to characterise the productivity determinants of sectors in the kind of detail that would be needed for detailed sector-based policy.

Finally, we turn to the question of localisation versus urbanisation. Again, this is an area where policy initiatives are very popular but systematic evidence to underpin those initiatives is weak.

Our results suggest that few sectors are likely to benefit from the clustering of activity outside of more urban environments. Wholesale, Sport, Energy, Automotive and (the catch all category) Other are the only sectors where we find positive localisation economies in the absence of urbanisation economies. Of course, the sectoral classification used by MIER is quite aggregate, so we should be careful about pushing these results too far.

Offset against this is the fact that problems of endogeneity (productive places attract firms) get more serious for finer sectoral disaggregations. In five sectors – Aviation, Creative/Digital/New Media, Engineering, Financial and Professional Services, ICT Digital Communications – we find evidence of both localisation and urbanisation economies.

These sectors benefit from clustering of their specific activity *with* lots of other activity. In nine sectors, localisation actually has a negative impact on productivity. In most cases (seven out of nine) these sectors *do* benefit from urbanisation economies. Environmental Technologies and Textiles have negative localisation effects without any corresponding urbanisation effect.

Four other sectors benefit from urbanisation, but not localisation effects. Overall, the picture is nuanced and the case for clustering in the absence of wider urbanisation economies appears weak.

To summarise, results on specific sectors are in line with our overall findings. However, our understanding of what drives spatial productivity differences in different sectors is in its infancy. We find relatively little evidence that there are strong localisation economies in the absence of urbanisation economies, but strong evidence for urbanisation economies across a wide range of industries. In line with findings from several other MIER projects, this urges caution in the pursuit of sector-based policies. We now summarise our results before turning to questions of policy.

4.3 Summary of results

Our results suggest that:

- with the exception of London, firms in regions and city regions outside of the Southeast tend, on average to have lower productivity than firms located within it;
- the City Region with the highest productivity outside of London is Bristol. In the North, a group of three City Regions – Leeds-Bradford, Liverpool and Manchester – have higher productivity than other Northern locations;
- firms in the Manchester and Liverpool City Regions have higher productivity than firms elsewhere in the Northwest;
- access to economic mass, to skills and to transport all have a role to play in explaining productivity differences at the firm level. For differences between regions and city regions, variation in the access to economic mass and to skills are much more important than variations in access to the transport network. Better access to economic mass increases productivity because it allows firms and workers to benefit from agglomeration economies;
- agglomeration economies are important for understanding why firms in MCR have higher productivity than firms elsewhere in the Northwest. Despite this, there is some evidence that MCR productivity is lower than might be expected given its size;
- skills are important for understanding a large part of the productivity gap with the Southeast. This conclusion holds generally, although MCR's skills gap is less than for some other Northern cities;
- a small part of the productivity gap with the Southeast can be explained by access to transport networks, but this is not an important factor in explaining the productivity gap between MCR and the Southeast. Access to the transport network might provide a small part of the explanation of MCR's higher productivity with respect to locations elsewhere in the Northwest. We do not directly assess the role of transport within the City Region, but there is evidence that this is a very important issue for the MCR economy; and
- at the aggregate level, we find no evidence that the clustering of specific industries improves productivity. Clustering can bring positive productivity benefits for individual sectors although the effect is nearly always outweighed by the importance of being in a large urban environment.

5.0 IMPLICATIONS FOR POLICY

In this section we consider these issues drawing on the existing literature, our own evidence reported above and the results from other projects that form part of the MIER.

5.1 Terms of reference

According to its terms of reference, the purpose of the MIER is to provide a detailed and rigorous assessment of the MCR economy, which aims to:

- understand the potential for a higher long-term growth rate for the MCR, including the relevant policy levers;
- analyse the potential role of the MCR economy in the context of the extreme regional imbalance of growth in the UK;
- analyse the links between the MCR economy and the economy of the Northwest as a whole; and
- establish the means by which MCR growth can be shared as widely as possible within the City Region, and beyond, thereby help address stubborn areas of economic and social deprivation.

We start here with questions about the implications of higher growth in MCR for the national, regional and local economies before turning to questions about how this growth might be achieved. Of course, this is a somewhat artificial separation, but considering the “spatial reach” of MCR growth first, allows us to set out general issues which will help guide some of the discussion around policy levers.

5.2 MCR and the national economy²⁶

Much has been made about the potential role of MCR in rebalancing the uneven location of economic activity in England. One can characterise two versions of this proposition. The milder version is that growth in MCR is the most realistic way to raise overall economic growth in the North and that this would be good for the UK economy. The more extreme proposition is that this would be good for the overall growth of the UK economy, even if (or especially if) it came at the expense of growth in the South.

There is little evidence in favour of the extreme form of this proposition. Some cross country studies do suggest a negative relationship between national income and spatial inequalities (at least for more developed countries) but it is unclear whether the causality runs from income to spatial inequality or vice versa. Some recent growth, such as in China, is clearly associated with high and widening spatial inequalities. Indeed, until recently, the UK’s growth compared favourably to a number of our EU neighbours who, in general, have lower spatial inequalities.

More concretely, our analysis summarised in Figure 2 provides clear evidence that firms in London and the Southeast have a significant productivity advantage. Thus, the most likely effect of a regional policy that redistributes activity away from that area is a negative effect on overall UK productivity.

One might be tempted to argue that this purely reflects the overall size of the South, or its skill composition, or transport connectivity. However, as Figures 3 to 5 show, these factors do not fully explain the productivity advantage of firms in London and the Southeast. Of course, we could keep adding additional factors to explain more of the relative productivity advantage of firms in London and the Southeast.

Even if policy then evened out differences in all these factors it is very unlikely to eliminate this productivity advantage completely for the simple reason that being close to our largest trading partners confers an advantage on London and the Southeast that is impossible to replicate in the North of England.

This locational advantage means London and the Southeast will, on average, always have higher productivity. As we explained earlier, this higher productivity will tend to attract firms and workers, increasing agglomeration and thus reinforcing the initial productivity gap that comes from having a locational advantage.

As discussed earlier, when markets function well there is a very strong case for simply following these productivity signals. Remember, this is not the case when it comes to spatial policy because individual decisions on where to live impose externalities on others.

Could the negative externalities of concentration in London and the Southeast offset the productivity differences that we have identified in our analysis so that we should be shifting the balance of economic activity towards the North to improve our overall standard of living?

²⁶ The next three sub-sections draw extensively on Overman and Rice (2008).

We have already made it clear that this is an incredibly difficult question to answer. A useful way to start thinking about this is to recognise that, because the supply of land is very restricted by the planning system, spatial differences in productivity translate into spatial differences in the price of commercial and residential land.

As Figure 8 indicates for commercial land, these prices show an incredible amount of variation across space. In some circumstances, land prices will be high because of the existence of an unexpandable natural local amenity, for example, a sea view or beautiful countryside, which makes an area desirable. These local amenities will explain some of the high land prices in rural areas that are visible in Figure 8.

But across urban areas, spatial variations in prices of land tend to reflect spatial differences in productivity (or man made amenities) rather than natural amenities. So, consistent with our analysis commercial land prices are highest in London and the Southeast. We would reach a similar conclusion if we considered residential land, although the picture is complicated by natural amenities and peoples' commuting patterns.

Externality arguments in favour of redistribution away from London and the Southeast rely on social costs, in terms of increased congestion, pollution, the amenity value of undeveloped land etc, more than outweighing the private benefits that lead to land prices there being so much higher.

Starting with undeveloped land, what evidence there is, points to quite high social benefits from urban parks but not from undeveloped "greenbelt" land at the urban fringe²⁷. The most important traffic congestion externalities, in London at least, are already partly factored in to land prices as a result of the congestion charge. But they are not completely factored in so they could provide some justifications for ignoring the very strong positive land price signals. Offset against this, congestion also isn't priced in urban areas, such as MCR, which we are talking about redistributing growth towards.

Pollution externalities are even trickier. There are clearly some localised pollution externalities that would argue against further development in the South, but considerations relating to carbon could well work in the opposite direction.

London has high public transport use and significant rail based commuting and the average distance between people would decrease if population expanded in the South. Evidence from the US suggests that carbon emissions per person are lower in dense places²⁸.

Finally, all of this ignores the fact that there are also positive agglomeration externalities that firms and households ignore when they make their land decisions. This means that land price differences will tend to understate the efficiency advantages of allowing further development.

It should be clear that the current evidence base allows no conclusions on whether positive or negative externalities of city size dominate and thus whether their net impact offsets or reinforces the positive productivity advantage in London and the Southeast.

²⁷ See, for example, Cheshire (2008), Barker (2006) and CLG (2001).

²⁸ Glaeser 2009.

Figure 8: Spatial variations in land prices



Put another way, there is clear evidence supporting the existence of positive productivity advantages in London and the Southeast and *no* concrete evidence on the overall net impact of other positive and negative externalities.

In summary, we are not in a position to know whether spatial policy should encourage or discourage further spatial dispersion. In the circumstances, policy efforts need to focus on directly quantifying and pricing these externalities (e.g. through congestion charging and carbon pricing) rather than making arbitrary policy decisions in favour of more or less development in specific locations.

So, to re-emphasise, it is no use talking about the productivity effects of shifting around economic activity, while ignoring the offsetting costs. For the things we should care about, i.e. real standards of living, these offsetting costs should figure as much in our thinking as any changes in productivity.

In the absence of extensive and convincing evidence on the balance of negative and positive externalities, the best way to try to take advantage of spatial differences in productivity is to focus policy on reducing the offsetting costs, for example by congestion pricing and lowering the costs of living in (or commuting to) high productivity locations. Of course, policies to reduce costs are not costless so we need to offset these against benefits when reaching decisions on particular measures.

The discussion so far has focussed on efficiency arguments. What about equity arguments? As we have already discussed at some length spatial differences in agglomeration and productivity may not have much to do with equality, judged in terms of differences in the real standard of living for people living in different places.

Equity arguments in favour of spatial policy in the UK tend to overstate the case because (i) they fail to account for differences in preferences and differences in the composition of the population in different places; (ii) they focus on nominal not real income differences and fail to understand the implications of spatial equilibrium; (iii) they assume that relocating economic activity towards deprived areas is an effective and feasible way of dealing with spatial differences.

We can summarise this discussion as follows: current evidence on productivity differences, agglomeration economies, land prices and externalities suggest that the efficiency arguments for changing the balance of activity between London and the Southeast and elsewhere in the UK, including MCR, are weak.

In fact, on the basis of current evidence such a policy is most likely to have an overall negative effect. Current evidence also suggests that the equity arguments for spatial policy as a useful mechanism for redistribution have been significantly overstated.

5.3 MCR and growth in the North

Our evidence on productivity differences suggested that, when looking at English city regions outside of the South, firms in Manchester, Liverpool and Leeds-Bradford have productivity advantages relative to firms in the other major city regions of Birmingham, Newcastle and Sheffield.

As we discussed at some length earlier, we are confident (in the statistical sense) about our finding that MCR has a productivity advantage over these other city regions.

We can also be fairly confident that firms in Manchester have higher productivity than firms in both the West and East Midlands (it depends on how certain we want to be about this last comparison).

Finally, we saw that, with the exception of Birmingham, city regions tend to do better than the region in which they are situated. In the particular case of MCR and the Northwest we can be quite confident that firms in MCR enjoy a productivity advantage over firms in the Northwest (outside of its two city regions).

For the UK as a whole, we have just considered at some length why shifting the balance of activity from high to low productivity areas is likely to be bad for overall productivity. *Within* the North, however, the same argument means that shifting the balance of economic activity towards city regions (which tend to be productive relative to their region) will tend to increase overall productivity.

As we have just discussed, the evidence for this argument is strongest in the case of MCR. Looking back to Figure 8, it should be clear that, as with London and the Southeast, land price signals also support the evidence from productivity differences. Once again, externalities, both positive and negative, muddy the waters.

But, as before, we lack strong evidence that negative externalities offset the positive productivity differences that we are fairly confident exist. Overall, the evidence suggests that trying to shift the balance of economic activity towards city regions (especially MCR) is likely to improve the productivity of the North.

Of course, this shift in balance does not necessarily need to come from redistributing existing activity but could come instead from allowing faster growth in the city region through the generation of completely new activity.

Focussing on city regions outside of the Southeast has the added advantage that, while policy will inevitably be working against market forces at the national level (otherwise it would not be necessary to intervene to achieve regional growth objectives) it will at least be working with market forces within regions.

Once again, however, assuming that our central focus should be on raising living standards, we need to take into account the fact that costs rise to offset spatial advantages in productivity. As before, in the absence of evidence on whether positive or negative externalities dominate, the policy focus should be on internalising externalities and on expanding the economic activity in MCR by reducing the costs of living in (or commuting to) higher productivity locations in MCR.

All of this discussion raises the natural question: suppose one follows the strategy of focusing on a limited number of city regions and succeeds in improving their economic performance still further, what are the implications for the rest of the region?

The answer starts to shift us from a focus purely on the questions about the efficiency aspects of different policy options towards questions about equity aspects. How will the benefits of such a policy be distributed across people and firms in the region? Are the proponents of this approach correct in their assertion that the benefits will spillover to the surrounding areas?

Unfortunately, this question is difficult to answer, because the evidence on the specific nature of the linkages between places is even more limited than that on the role of cities in regional growth. Economic linkages between places work through three main channels.

First, firms buy and sell goods and services across space. Second, workers can live in one place and commute to another. Third, workers and firms can move between places.

A general analysis of the implications of these channels for the nature of linkages between places is beyond the scope of this report. But it is useful to think through their implications in the specific circumstances where we might encourage growth in a city region located in a region with other urban areas that are not performing as well.

The role of supply and demand linkages between firms has been emphasised by proponents of the New Economic Geography²⁹. If we ignore, for the moment, the possibility that firms and workers can move between locations then expanding the number of firms operating in a city region has two contrasting effects on firms elsewhere. To the extent that these new or expanded firms increase their demand for goods and services from elsewhere this will provide a positive linkage between places.

At the same time, lower production costs and increased competition among firms in the city region may lead to cheaper sources of inputs for firms located in other parts of the region. Again, this effect will provide a positive linkage between places.

However, if these new or expanded firms compete for customers with firms located elsewhere then this will work in the opposite direction and imply a negative linkage between places.

In reality, both the positive and negative linkage will be at work and the impact on firms elsewhere is theoretically ambiguous. We do not know of any literature that has been able to measure the relative strength of these two different effects empirically, although there is evidence that the balance of these two forces helps determine the wages that firms are able to pay in different locations³⁰.

²⁹ See Fujita, Krugman, Venables, 1999.

³⁰ See Redding and Venables 2004.

As economic activity concentrates in a city region, these demand and supply “linkages” change the profits that firms can make in different locations in the region. Other economic forces also come into play. Agglomeration economies working through thick labour markets or knowledge spillovers further increase firm profitability in the city region as the amount of activity there expands.

Offsetting this, increased competition in the markets for their goods and services can decrease the profits of individual firms as the overall number of firms expands. In addition, increased competition for scarce local resources (particularly workers and land) drive up firms’ costs in the city region.

If the combined effects of greater agglomeration economies (better access to suppliers and customers, better labour markets, increased knowledge spillovers) outweigh the effects of increased competition and increased costs of doing business in the expanding city then growth in the city region can be self reinforcing.

What happens to other locations in the region as firms and workers are drawn to the city region? This depends on where these firms and workers are coming from. If they are coming from outside the region then the effect on firms in other cities depends on the balance between the positive demand and supply effects and the increased competition in their own market.



If the city region is expanding by drawing firms and workers from other cities within the region then we must not only take into account these demand and supply effects, but also recognise that other locations within the region are getting smaller as workers and firms move to the expanding area.

According to conventional textbook economic analysis, the increase in the supply of labour to the city region tends to reduce wages and increase house prices and other living costs. Elsewhere in the region, wages increase and house prices are expected to fall as the population declines. The net result is that real wages in the city region fall relative to those in other cities in the region and this reduces the incentives for further migration.

However, if agglomeration economies are sufficiently strong then the impact of migration on wages can be very different. As the population of the city region grows then productivity and hence wages increase still further, while declining population in other cities of the region leads to lower productivity and wages.

Whether or not we regard this as a good thing will depend on whether we look through the prism of people or places. If we focus on places, what we tend to see is population, wages and house prices increasing in the more successful city region and falling in the less successful cities.³¹ This clearly looks pretty bad if you are a policy maker representing the area where wages and house prices are falling (and vice versa for policy makers in the more successful area).

If the outcome is clear from a place perspective, what about from the perspective of the people who live in these different places? The answer to this question is much more nuanced. Within the city region, the increase in wages on average more than offsets the increase in housing (and other living) costs.

Average real wages and hence living standards are higher – if this were not the case then workers would not be moving to the expanding city region. However, this is not to say that everyone is better-off as a result of the changes. Individuals who remain outside the labour market and are dependent on fixed incomes may be worse-off due to rising housing costs.

Rising housing costs may lead to worse outcomes for those workers, like nurses and teachers, whose wages are set nationally and are not responsive to changes in local economic conditions. This effect is partly responsible for the “affordability” issues that face low paid public sector workers who live in expensive cities. In other words, in terms of the people resident in a growing city region, the picture is much more mixed than the aggregate wage and house price data might suggest.

In the cities that are losing firms and population, this story of winners and losers is repeated. Individuals who move to the expanding city are better off because their real wage rises. For those workers who are unable or unwilling to move, wages are lower. Lower housing costs may partially offset the effects of lower wages for some, but the consequences of lower house prices will vary across households depending on whether or not they own their home.

Finally, in the reverse of what happens in the city region, workers outside the labour market or on fixed wages may actually be better off as their costs of living fall. This, in turn, reduces the incentives for these groups to relocate to the growing city region.

As is the case for the majority of significant economic changes, the story is one of gainers and losers. However, it is important to remember that the net result of the increased spatial concentration of economic activity is likely to be higher productivity and higher real income for the region as a whole.

Hence, from the perspective of the region as a whole, the benefits to the gainers should outweigh the costs to the losers. Certain policy decisions will also change this balance, an issue to which we return to later.

An alternative to both people and firms moving to the expanding city region is that firms move, but workers stay put and commute. Commuting, rather than relocating, may dampen the positive effects on wages and house prices in the expanding city region and the negative effects in the less successful cities. It is for this reason that some commentators focus on improving transport networks as a means of “spreading out” the benefits from growth in expanding city regions³².

There are a number of caveats to this conclusion, however.

First, as considered in detail in New Economic Geography models, lower transport costs change the balance between agglomeration and dispersion forces in ways that can often encourage firms to move into the expanding market and serve their customers from there.

Second, encouraging large scale commuting between places may have adverse environmental impacts.

Third if large commuting flows are driven by the fact that housing supply is unresponsive in growing cities (perhaps as a deliberate result of policy) then this will have the effect of making some people living in less successful places worse off – namely those who would have chosen to move in the absence of the restriction on housing supply but now opt to commute.

Restricting housing supply actually restricts the extent that people in other places can benefit from the growing city region, even if it helps protect those places from falling wages and house prices. Clearly this has implications for land use policy with regard to new housing (an issue to which we return later).

Looking longer term, net agglomeration benefits are not infinite, and at some population size, the benefits to firms and workers from further increases in population and economic activity in the expanding city region will be outweighed by the higher costs of scarce resources, particularly land, congestion and pollution etc. From this point, further expansion of economic activity will switch to other areas of the region³³. Indeed, this pattern of development is clearly visible in London and the Southeast.

How much do we know about how all of these different effects play out in practice? The answer is, once again, very little. On balance, the evidence suggests that regional strategies based around city regions are most likely to deliver on regional growth objectives (because, if nothing else, *within* the region they are working with market forces rather than against). Further, it is highly likely that the overall benefits to people who move to, or commute to, the expanding city region will outweigh the losses to people who are unwilling or unable to do so.

But as the discussion in this section makes clear, new evidence will be needed to help quantify the magnitudes of gains and losses to different people in different places. On the basis of what we currently know, however, it is clear that there will be winners and losers, even if the size of any effects remains unknown.

³² See, for example, Lucci and Hildreth, 2008.

³³ Although, once again, on the basis of existing evidence there is no way for policy makers to know when this point has been reached.

³¹ These issues are given a more formal treatment in Overman, Rice, Venables, 2009.

5.4 Growth in MCR and economic and social deprivation

Having considered the role that MCR might play in terms of national and regional economic growth, we now turn to the impact of growth on economically disadvantaged residents within MCR. There are several aspects of this issue that need considering. We address each in turn, before looking at the available evidence for the City Region.

Clearly, the most direct benefits to disadvantaged residents occur when their economic opportunities improve as a result of overall growth in MCR. If our primary concern is economic and social deprivation, then the focus needs to be on maximising the direct benefits to such individuals of increased economic opportunities as the local economy expands.

Available evidence suggests that carefully designed, people-based policies (for example “supply side” policies that focus on addressing individual barriers to work) are much more likely to deliver these direct benefits than place-based policies that target particular areas³⁴.

There are, however, a number of ways in which growth in MCR may have indirect impacts on the economic opportunities of disadvantaged residents. A large theoretical literature argues that attracting high skilled workers to a city has positive spillover effects on the productivity of the lower skilled workforce.

A number of mechanisms have been suggested. The simplest is that low skilled workers learn through interactions with more highly skilled workers. An alternative argument is that greater numbers of highly skilled workers lead to higher levels of investment, and that this also raises the productivity of lower skilled workers.

How important are these effects empirically? As a starting point, it is useful to remind ourselves that even in London, our most economically successful city, the Index of Multiple Deprivation 2007 tells us that there are many deprived areas. This observation would carry over to most other urban areas, particularly in regions outside of the Southeast of England. This doesn’t mean that there are no spillover benefits across urban areas, but it does caution us against expecting too much from these spillovers.

The direct empirical evidence on the extent of these effects is mixed and the literature is certainly not as extensive as the neighbourhood effects literature that we discuss later (it is also mostly based on US data). A recent overview of the literature concludes that, on balance, there is likely to be some beneficial spillover at the level of urban areas, but that it is still too early to be able to draw evidence on the size of any such spillovers³⁵.

³⁴ Glaeser 2008.

³⁵ See Moretti 2004.

³⁶ See Cheshire, Gibbons and Gordon 2008.

At the neighbourhood level, this question of economic and social deprivation is further complicated once we recognise that individuals whose economic prosperity improves may choose to react to this by moving out of their deprived neighbourhoods.

In terms of dispersion in measures of neighbourhood deprivation, this would certainly lead to a worse outcome than if the individuals whose prosperity improves choose to stay put. However, it is the impact on people rather than places that should be the primary concern and evaluation of alternative outcomes should be based on the well-being of the people affected.

In this case, we should assess the direct benefit to the individuals who move (in terms of increased incomes, better neighbourhoods) and compare these to the costs to those individuals who remain.

The literature suggests that the spillover effects due to changing neighbourhood composition are unlikely to be that large, so the focus should be on the direct impact on wages and the cost of living³⁶. Of course, data for individuals can be very hard to come by, and so the evidence that we have available often focuses on neighbourhoods rather than people.

It will thus be very important to keep this discussion in mind when we use this evidence to consider what has happened to economic and social deprivation during the recent period of growth in MCR. It is to this that we now turn.

As is well known, starting from some point in the early 1990s, until very recently, MCR experienced a period of sustained economic growth. What happened to economic and social deprivation during this period?

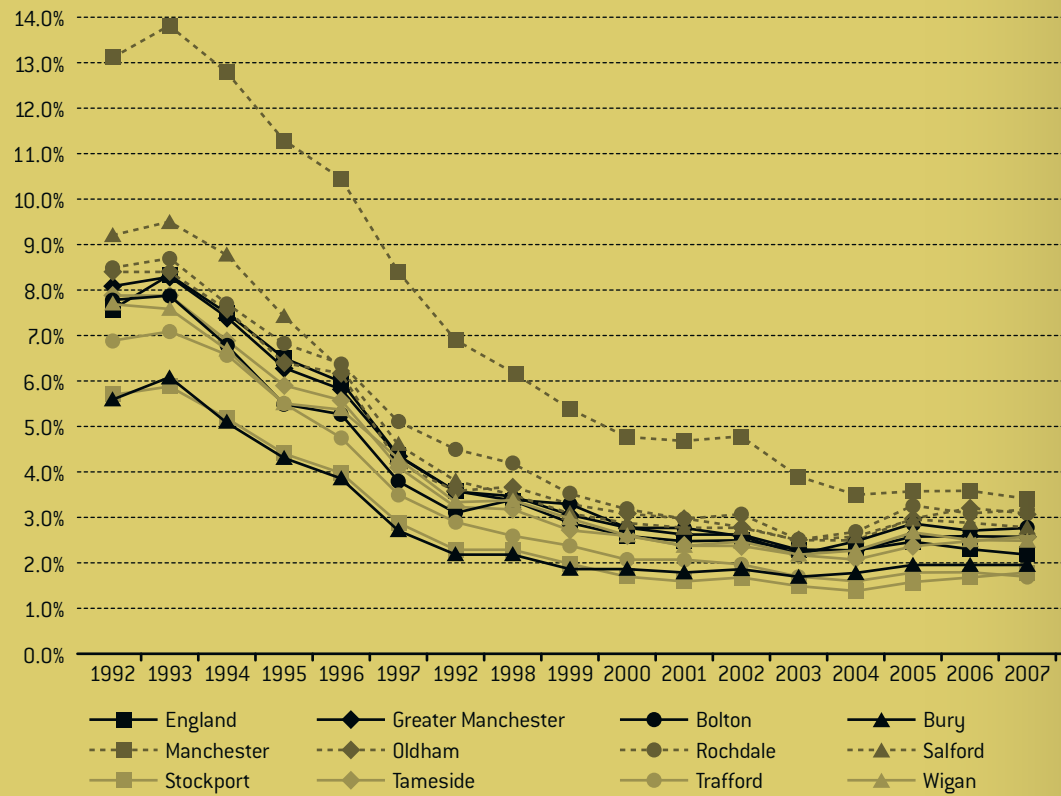
As explained in MIER Sustainable Communities Report, in the absence of other time series data, we can use unemployment, and particularly worklessness as reasonable proxies to try to answer this question. Let us start by taking the longer term view by looking at unemployment rates.

Figure 9 shows what happened to unemployment in Greater Manchester districts between 1992 and 2008. Growth in MCR has been associated with significant improvements in unemployment rates across *all* GM districts, although the decline has levelled off recently. Manchester itself has seen the greatest percentage point decline in unemployment.

Part of this decline reflects changes to Job Seeker Allowance regulations. However, assuming the impact of these changes was roughly equal across districts the finding on relative changes still holds. In addition, as Figure 10 shows, changes in worklessness during the more recent period tell a similar story. Overall worklessness has fallen everywhere in Greater Manchester with Manchester, again, experiencing the largest percentage point fall.

At smaller spatial scales, the picture is more nuanced. Using Local Super Output Areas (average resident population 1,500) to proxy for neighbourhoods, Table 9 shows that the absolute change in worklessness rates tended to be higher for the neighbourhoods that started in the lower deciles, when ranked according to the Index of Multiple Deprivation.

Figure 9: Unemployment rates in Greater Manchester districts 1992 to 2008



Source: Claimant Count, NOMIS, 2008. Figure taken from MIER Sustainable Communities Report.

Despite this positive trend overall, some neighbourhoods did actually see their worklessness rates increase during this period. This problem was more acute in local authorities that saw the smallest overall decrease in worklessness.

So, for example, in Manchester only 8 (3.1%) of the 259 LSOAs had higher worklessness rates in 2006 compared with 1999, while in Bolton, 56 (32%) of 175 LSOAs saw their worklessness rate increase over the same period.

In addition to these absolute declines, the worst ranked neighbourhoods have tended to see smaller percentage point improvements in their worklessness rates relative to the local authority district in which they are situated.

Reaction to this observation depends very much on the extent to which one believes that neighbourhood characteristics play an important role in causing differences in outcomes for otherwise identical individuals.

Figure 10: Worklessness rates in Greater Manchester LADs 2000 to 2008



Source: DWP Benefits, NOMIS, 2008. Figure taken from MIER Sustainable Communities Report.

37 See the CLG Regeneration Framework consultation.

Our reading of the literature, as discussed in Gibbons et al (2008), is that any such effects are generally swamped by the role of individual characteristics in explaining outcomes. So, we think these changes in worklessness rates are probably largely explained by the underlying characteristics of the people living in those neighbourhoods.

This would suggest that the main policy objective needs to be to focus on individual level policies (e.g. raising skills) to help tackle barriers to work. It may be useful to use information on neighbourhoods to help target policies, although this will not be as effective as using information on individuals. This is because some people who benefit from such policies will not be those most in need.

Place based policies that involve expenditure on, for example, the built environment are likely to play a very minor role in improving individual outcomes in terms of worklessness³⁷. They may improve neighbourhood outcomes by changing composition, but it is unclear in what sense this is a desirable outcome in the absence of strong feedback effects from neighbourhood composition to individual outcomes.

Of course, many neighbourhood improvements take the form of public goods and may have direct effects on wellbeing of residents. The benefits of these should be assessed in that context, rather than by making unrealistic assumptions about their role in achieving “transformation” of deprived neighbourhoods. We will return to some of these issues when we discuss housing policy later.

Table 9: Worklessness rates, Greater Manchester, 1999 to 2006

IMD DECILE	1999	2006	ABSOLUTE CHANGE IN RATE
Worst 1	30.4	27.9	-2.5
2	24.1	20.9	-3.1
3	20.7	17.5	-3.2
4	16.8	15.0	-1.7
5	13.4	11.8	-1.6
6	11.8	9.6	-2.2
7	10.4	8.6	-1.8
8	8.8	7.2	-1.6
9	7.7	6.0	-1.7
Best 10	5.5	4.5	-1.0

Source: MIER Sustainable Communities Report.

Overall, growth in MCR has been associated with decreasing worklessness across all the City Region's local authorities. Worklessness still remains a problem, however, and it will be crucial to tackle problems of individual barriers to work to allow individuals to participate in any future growth.

The extent to which an individual's location within the MCR acts as an additional barrier to work over and above their individual barriers to work is unclear. But based on existing evidence any effects are likely to be small³⁸.

There may be specific issues with regard to social housing if this prevents people from moving to more accessible locations when they would otherwise do so. Again, these effects are most appropriately tackled through policies to directly address the problem of social housing allocation.

5.5 Policy levers

Skills

Our evidence shows that skills play an important part in explaining the relative productivity of regions and city regions. As we explained earlier, skills have a direct effect on productivity (skilled workers are more productive) but there may be an additional agglomeration benefit (skilled workers increase the productivity of others). We cannot distinguish between these two effects, although the existing evidence suggests that the former is much more important than the latter.

³⁸ See Ihlantfelt and Sjoquist (1998).



As Figure 3 made clear, a substantial part of the productivity disadvantage of MCR relative to the Southeast comes from the overall composition of its workforce in terms of people with higher qualifications. Clearly, improving the share of MCR's population with higher qualifications will help reduce the productivity gap with the Southeast. One way to do this is to tackle the skills base of current residents. The second is to try to attract skilled workers from elsewhere to MCR.

Attracting skilled workers to MCR will raise productivity because skilled workers are more productive (composition) and because skilled workers may increase the productivity of others (an agglomeration benefit). It is important to remember that the first channel is likely to be far more important than the second in increasing economic productivity.

Firms in MCR already have access to England's second largest Higher Managerial and Professional workforce (see Table 10). That workforce, in turn, has access to the second highest concentration of high skilled employment outside of London (see Table 11). MCR is thus relatively well positioned in terms of the overall size of its skilled labour force.

This is not to say that increasing the size of the skilled labour force will not have additional second round effects as a result of agglomeration. Agglomeration economies arise because of matching, learning and sharing. Matching benefits will mean increasing the number of skilled workers tends to benefit other skilled workers.

Learning benefits are also likely to favour other skilled workers. On the consumption side, a large pool of skilled workers can also share the fixed costs of amenities that cater to the demands of skilled workers.

There is also an increasing body of evidence that places with larger numbers of skilled workers are more resilient, in the sense that they are better able to reinvent themselves in the face of negative shocks to core industries³⁹.

³⁹ Glaeser and Saiz (2004).

For all these reasons as the number of skilled workers increases, a place may become more attractive to skilled workers. Thus, while agglomeration economies may play a modest role in increasing productivity relative to composition effects, they may be important in helping to attract further skilled labour.

Table 10: Potential size of City Region Higher Managerial and Professional labour markets and penetration rates (15% travel to work threshold)

	POTENTIAL HMP LABOUR MARKET IN 15% TTW
Manchester (Manchester LAD core)	112,200
Manchester (Manchester / Salford / Trafford Core)	149,200
Bristol (Bristol LAD core)	63,900
Birmingham (Birmingham LAD core)	104,600
Leeds (Leeds / Bradford LAD's core)	113,300
Leeds (Leeds LAD core)	101,100
Glasgow	95,300
London (Inner London NUTS 2 Area)	912,500

Source: MIER Skills Report

Table 11: Total employees in Knowledge Based Industries; Percentage of total and location quotient compared to Great Britain, 2006

	KBI – ABSOLUTE NUMBERS
MCR	623,000
Leeds CR	465,000
Bristol CR	247,000
Birmingham CR	503,000
London	2,102,000
Northwest	1,265,000

Source: MIER Skills Report

The evidence (albeit somewhat dated due to its reliance on the 2001 census) suggests that some of these forces may be operating in the MCR⁴⁰. MCR's ability to retain workers in high status occupations and 25 to 44 year-olds, the age group that is likely to be most mobile in career terms, compares well with other provincial city regions.

MCR's key regional role, in particular, is highlighted by the fact that a high proportion of both groups remain in the region. All of the provincial city regions, however, compare badly to London and its surrounding area and MCR loses a substantial proportion of its high skilled and mobile young workers to London and the Southeast.

Retention rates for graduates are higher in MCR than in other provincial city regions but substantially lower than in the capital. London and the Southeast are also the most popular first job destinations for Manchester graduates after MCR itself and the Northwest region.

If attracting more skilled workers is considered desirable, what can policy makers do to achieve this? There is considerable debate in the literature on whether high skilled jobs follow high skilled workers or vice-versa⁴¹.

The evidence collected for the MIER cannot hope to resolve this debate. Instead, it seems sensible to think about assessing the feasibility and cost effectiveness of a range of options that might address both the demand and supply side of the market for skills.

Possible options on the demand side include:

- Relocation of (quasi-) public sector employment to MCR. Examples include the BBC move to MediaCityUK in Salford and the expansion of the Daresbury campus. This should increase the overall size of the market for skill. It also generates demand for locally produced, non-traded services.

⁴⁰ These findings come from the MIER project on Skills.

⁴¹ See Scott and Storper (2009).

Set against this is the fact that public sector employment in lower cost locations causes distortions because national public sector pay setting means public-private sector pay differentials can create problems for private sector firms.

The evidence base to quantify these effects is limited. A recent special issue of the Manchester School (volume 75, issue 4) provides convincing evidence that the gap is substantial in a number of countries (including the UK) but is able to say far less about the implications of this for private sector activity.

Work undertaken by Experian on behalf of the Lyons Review of Public Sector Relocation suggested that crowding out is an issue, but that complete crowding out (where public sector jobs just replace private sector jobs one for one) is unlikely.

It appears that the degree of responsiveness in the private-public pay gap is crucial for gauging the extent to which this might occur. Finally, there might be further effects on the private sector via transport and the land markets. We know of no evidence that quantifies this.

- Ensuring the provision of suitable business premises. Case study evidence reported in MIER's employment and skills report suggests that one key driver of the ICT sector in MCR is "the availability of a wide range of business premises in the types of high quality locations (e.g. North Cheshire) that the industry typically favours, within and beyond the urban employment core."

One possible response is the provision of suitable premises through property-based technology-orientated business incubators. However, the available evidence does not support this policy approach. Most careful empirical studies find no evidence that these incubators have positive effects on entrepreneurship, innovation or regional development⁴².

This suggests that policy should, instead, focus on ensuring that the planning system responds quickly and effectively to private developers who wish to provide new business premises in response to demand from firms.

- Addressing infrastructure bottlenecks that may be particularly important for firms that employ high skilled workers (e.g. broadband).
- Addressing issues of project financing. The Northern Way Private Investment Commission is currently examining the question of the availability of private finance to small and medium size businesses in the North.

The interim report expresses some specific concerns about the availability of venture capital outside of the Southeast. This form of financing is likely to be particularly important to some types of businesses that employ skilled workers.

The problem, as always, comes from trying to assess whether the spatial concentration of venture capital in the Southeast purely reflects the fact that there are more suitable investment opportunities there, or whether there is some market failure that prevents suitable investment opportunities in the North from being able to access venture capital. The evidence in favour of the latter is weak⁴³.

There are also a couple of options that the evidence suggests should *not* be considered.

- In seeking to attract new investment, policy support should not be geared disproportionately either towards overseas investors or SMEs, both conventionally considered to be the most important targets for support. Investment by large domestic firms in the region appears to have the biggest impact on both productivity and employment⁴⁴.
- Do not focus on particular sectors or clusters. The evidence suggests that diversity is, and will continue to be, much more important to the MCR than its strength in any particular sector⁴⁵. This issue is so important that we devote a section to it below.

On the supply side, there are several possible options:

- Spend money on amenities that appeal to the high skilled. There are plenty of stories about possible benefits, but almost no systematic evidence. This suggests that decisions on amenities should continue to be made on the basis of their public good aspects not any hypothetical transformational impact in terms of attracting skilled workers.
- Lower the cost of living for skilled workers by tackling transport problems and dealing with problems in MCR's housing market. It is self-evident that the cost of living is an important factor in household location decisions. These issues are sufficiently important that we consider them in separate sections later.

⁴² See, e.g. Tamasy, 2007.

⁴³ See Sunley et al (2005).

⁴⁴ See the evidence and conclusions from the MIER report on Investment.

⁴⁵ See the extensive discussion above on urbanisation versus localisation economies as well as work for the MIER report on Innovation.

What are the implications of a policy aimed at attracting more skilled workers for the wellbeing of lower skilled workers? They may benefit from matching, learning and sharing with skilled workers so attracting more skilled workers may help “raise all boats” in terms of productivity.

Demand from skilled workers for untraded services (e.g. restaurants) may also help with low skilled wages or unemployment. Set against this benefit, is the fact that skilled workers compete with unskilled workers for scarce resources (land, desirable schools etc). These cost of living effects will tend to offset any productivity or employment benefits.

Rather worryingly, evidence for the MIER reports growing affordability problems even in the worst decile of neighbourhoods over the period 2000 to 2008. The current economic downturn will help mitigate these effects, but this does point to serious fallings on the supply side of the MCR market.

Of course, in terms of the benefits to lower skilled workers, this strategy means targeting expenditure at attracting skilled workers that could have been spent on directly helping lower skilled workers. It is not clear whether the indirect effects of the former would be greater than the direct effect of the latter.

Housing

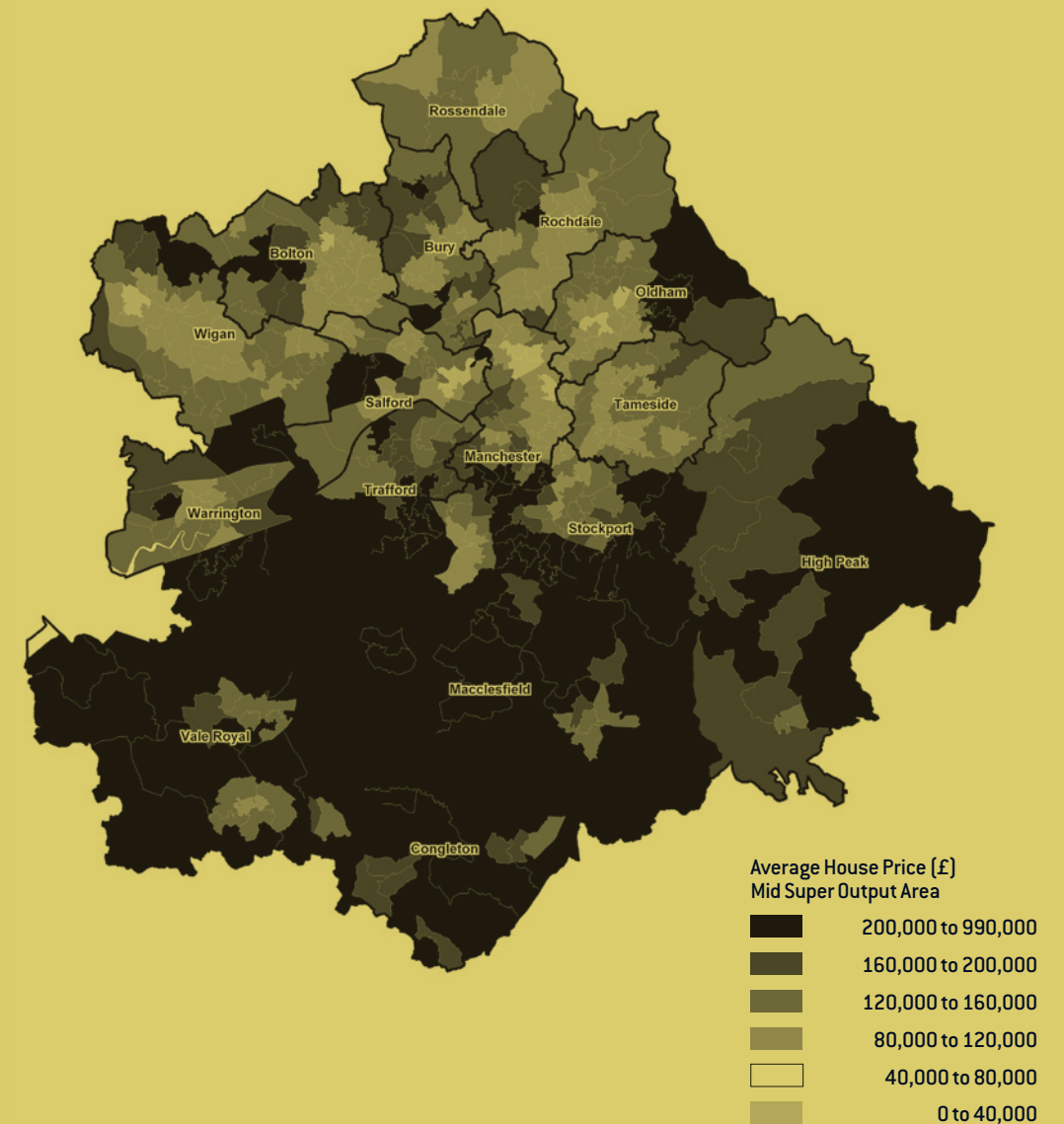
As discussed earlier, a key strategic issue for MCR is how to ensure that housing and commercial land supply respond in an appropriate and timely manner to changing demand patterns to ensure that costs do not rise too fast as MCR’s economy expands. It is not clear that this issue is being adequately addressed within the current land use planning framework.

There have been extensive studies of MCR’s housing market as part of the Making Housing Count programme, the Regional Spatial Strategy for the Northwest and the MCR development programme. MIER projects on Sustainable Communities and Skills have also considered the issue. There seems no point in repeating the very detailed findings from those reports here. We focus instead on raising a number of key strategic questions and challenges.

Figure 11 shows what happened to house prices by 2006 in MCR. As is now clear, a significant part of the overall increase in UK house prices during this period has been driven by historically low interest rates and the availability of credit. But supply constraints played a crucial role in determining the extent to which this increase in demand played out in quantities (more housing) versus prices.

It is clear from Figure 11, and other evidence, that the supply response in MCR was simply inadequate to present steep rises in house prices in even the most deprived neighbourhoods. This is despite the fact that, during this period, MCR expanded its housing stock (number of units built per head) quite rapidly relative to the English average. Why is this and what policy measures have been adopted to ensure that this problem would not be repeated as the MCR economy begins to recover from the current downturn?

Figure 11: Average dwelling prices by super output area, 2006



Source: Make Housing Count – Manchester City Region Housing Market Analysis, ECOTEC for AGMA

One part of the problem may be that this new supply did not properly reflect differences in demand for type and location of housing. For example, MCR housing documents place a strong emphasis on the desirability of mixing neighbourhoods in terms of household and tenure type. This runs contrary to clear evidence that some kinds of mixing are not desirable to any of the groups concerned.

For example, families and students or the elderly and the young⁴⁶. The justification for ignoring these preferences arises from the widespread belief in the policy making community that households gain from being located in “mixed communities”. Unfortunately, several factors question the extent to which this will occur.

The evidence base for neighbourhood effects (one key source of potential benefits from mixed communities) is actually fairly weak⁴⁷. Even if such effects exist, the extent to which communities become mixed as cities grow is limited by the tendency of households to sort themselves into different neighbourhoods.

Policy makers often try to address the sorting issue by encouraging the mixing of communities through the selective provision of different housing types within neighbourhoods. Again there is limited evidence that such policies achieve mixed communities in the long term, as opposed to providing a one-off subsidy to a particular cohort of households. Given all this evidence, why do MCR housing plans continue to place so much emphasis on the importance of mixing?

Moreover, to the extent that such policies achieve their objective, they may make it more difficult for cities to attract those firms and individuals who do not want to locate in such mixed communities.

This raises a specific issue for MCR and other northern city regions that set out to raise the quality of their housing portfolio in order to attract or retain more skilled workers. In short, for a given investment in new housing provision, there is almost certainly a trade-off between the development of mixed communities and a city’s ability to attract and retain more skilled workers.

In the absence of strong and compelling evidence that mixing communities actually generate benefits for more deprived people, we may want to err on the side of caution when drawing up housing strategies, at least in less well performing city regions.

These issues are specific examples of a more general problem – the need to make supply more responsive to market conditions and less “plan-led”. At the moment there is a very strong emphasis in MCR and Northwest strategic plans on delivering large numbers of relatively small dwellings in the conurbation core. Unfortunately, this segment of the market may already be over supplied.

Again, some of this oversupply reflects specific demand conditions, but planning restrictions also play a role here. In circumstances where a particular class of assets (housing) are showing high rates of return and the policy framework only allows substantial investment in one particular type of that asset (small flats in the city centre) then over-investment in that particular type will occur.

This clearly plays a role in explaining problems in the flat segment of MCR’s market. In addition, focusing on small dwellings in the conurbation core does little to address the housing demand pressures that have been causing high price growth in the south of MCR. If MCR is successful in attracting or retaining more skilled workers, these pressures will almost certainly increase in the medium term.

⁴⁶ This problem is explicitly discussed in MCR housing documents but then ignored.

⁴⁷ See Cheshire, Gibbons, Gordon (2008).

A final problem in this area relates to regeneration spending and funding. For over a decade an important part of local government funding for regeneration expenditure has been funded by Section 106 agreements that extract planning gain from developers.

This has been possible because the planning system restricts the overall supply of land so that there are large gains when development is allowed. In addition to the funding generated this system is further able to directly influence the location of development towards regeneration areas by allowing it there and limiting it elsewhere.

Overall, the system has achieved improvements in the built environment in a number of regeneration areas. It should be recognised, however, that by restricting the market response to changing demand these gains have come at considerable costs in terms of general affordability.

It is also becoming increasingly apparent that very high house price rises were central to engaging private developers in these projects. This is going to cause large problems given current housing market conditions as Michael Parkinson’s recent report for CLG documents.

It also raises the problem that continued reliance on this strategy during a future upturn will require house prices to begin to rise rapidly again to ensure private sector gains in regeneration areas offset the attendant risks (these are also, of course, partly offset by government expenditure in regeneration areas).

There is a clear contradiction inherent in a system that restricts the supply of land to raise land and house prices, in turn, to provide revenue through planning gain that is then used to build houses that partly address problems of affordability caused by rising house prices.

Similar concerns relate to the future supply of commercial land. For example, current MCR and Northwest plans appear to favour almost exclusive use of brownfield land despite the evidence that this may not serve the demand for firms.

There appears to be little debate on whether increased take up of green belt land could be justified to meet growing employment and housing demand. This will almost certainly be an issue if MCR’s growth ambitions are to be realised. There also appears to be a tendency to make decisions about commercial land use projects at strategic sites with little regard to likely employment uses and far too much emphasis on “transformative” potential.

In short, there is a significant disconnect between the demand for and supply of buildings by both location and type. Of course because land use planning should help address the externality from land use it should take in to account the overall social cost when making decisions about supply. However, there are reasons to think that the degree of disconnect between supply decisions and the pattern of demand within MCR may not be optimal.

Many of these decisions reflect national policy but if MCR is to achieve its aspirations it does seem important to consider the extent to which these national guidelines are appropriate to its current housing context. The recent experience in MCR’s housing market, questions whether land use plans structured around these guidelines are delivering outcomes that maximise benefits to households and firms.

Transport

As with housing, there is an extensive evidence base on transport in MCR. Once again, there seems no point in repeating the very detailed findings from those reports here. We focus instead on raising a number of key strategic questions and challenges to current thinking.

Our findings on transport and productivity, summarised in Figure 5, suggested that access to the transport network is not a particularly significant issue for MCR, particularly relative to some other city regions. Of course, we have been upfront about the fact that we use a fairly crude characterisation of the transport network in our productivity work. That said, MCR is clearly well served by its international airport, motorway network and frequent train connections to London.

Nothing we have done can resolve, for example, the question of whether high speed rail is important to the development of MCR. Careful cost benefit analysis is the best way to answer such questions.

There is a debate on the extent to which traditional cost benefit analysis captures the impact of major transport schemes. DfT's wider economic impacts work is currently seeking to address this. Our feeling, based on our reading of the literature, is that the "transformative" nature of many infrastructure schemes is often overstated. In the context of MCR this suggests policy focus on schemes where we are confident that benefits exceed costs under reasonable assumptions about future growth in demand.

There are a number of strategic questions relating to intra-MCR transport policies. The first concerns congestion charging. Congestion charging in Manchester was comprehensively rejected by voters in the recent referendum, an outcome which should have been entirely anticipated: congestion charging makes road users pay for a cost that they do not otherwise have to bear – the social cost of their contribution to congestion. Hence, voters are very unlikely to favour it.

But a properly designed congestion charge will increase the attractiveness of the city region and raise aggregate welfare. All the evidence supports the idea that this would bring large overall gains to MCR. The case for congestion charging needs to be reconsidered⁴⁸.

Regardless of what happens with congestion charging one can raise several issues with regard to local transport plans. First, are they sufficiently realistic about changing patterns of demand for travel? It is striking that current policies have not produced the desired shift from private to public transport and yet the Local Transport Plan view car journeys as satisfying *residual* demand.

The issue here is one we have already considered extensively with regard to housing earlier. Transport plans need to try to deal with the externalities that people ignore in their private decision making on modal choice but they also need to be realistic about what people want (i.e. demand *not* need). Transport policies now need to meet so many objectives that they are in danger of failing to meet their most basic – to invest in lowering the cost of getting from A to B in situations where the social benefits of doing so outweigh the costs.

⁴⁸ As identified by a number of cost benefit analysis on the congestion charge proposals.

If we could be confident that all of this was driven by the careful consideration of the underlying externalities then this would not matter – after all demand ignores those externalities and it is right that plans should force people to internalise them.

Unfortunately, it is very unclear that this is the case. Of course this comment applies to most all local transport and housing plans in the UK so the crucial question is whether getting this wrong might matter more for MCR than for other places?

Figure 2 suggests that this may be the case (and more generally for places outside of London and the Southeast). These places have lower productivity and thus pay lower nominal wages. Lower costs of living (broadly defined) help offset this. Bad transport and housing raise these costs. If MCR wishes to increase its population by attracting people from elsewhere in the country this is not a good idea.

A final strategic issue that needs to be addressed is the extent to which transport provision effectively addresses problems of social exclusion. Most transport plans treatment of these issues is overly simplistic. Deprived areas can be poorly served by public transport. Improving these public transport links certainly provides a public good to households living in those areas.

The issue is the extent to which it also offers socio-economic benefits beyond those stemming from that direct public good provision. The evidence is far from clear. Take worklessness, for example. It is true that people who do not work are more likely to live in areas with poor transport links. But this does not mean that poor transport links *cause* worklessness.

It could be that people who do not work choose to live in areas where transport links are bad because these areas generally have lower housing costs, or they accept social housing provision in these neighbourhoods. The academic evidence on spatial mismatch (households living far from jobs) has tried to resolve the direction of causality with little success.

Good transport links are certainly associated with higher housing costs. Once again, however, it is difficult to disentangle cause and effect, because transport links will tend to serve areas where demand for housing is high. In contrast to the link to worklessness, however, the academic literature is clearer that improving transport links raises house prices.

On balance, then, the evidence suggests that improving transport links to deprived neighbourhoods should positively impact house prices while the effect on worklessness is uncertain. These house price effects will benefit owner occupiers in those areas, but hurt renters. What happens next depends on whether the house price changes and the improved access to jobs are sufficient to encourage the workless to move elsewhere, while people who are employed now move in.

Once again, we are reminded that (i) rising house prices in poor neighbourhoods are not necessarily a good thing; (ii) place based policies to tackle issues of social deprivation have unintended consequences that tend to limit their impact on individual deprivation.

In short, transport policy has an important role to play in improving the quality of living in MCR. The extent to which current plans will achieve this is open to question. Transport is also a rather blunt tool for effectively tackling issues of social deprivation.

Clusters

There is extensive policy literature on clusters that uses the existence of agglomeration economies to justify a whole range of policy interventions. Such an approach could be used to develop policy options for MCR.

Policy makers like this approach because it argues for a strong role for active policy and usually involves the introduction of a range of ‘innovative’ policy measures. A significant number of academics like it too, for similar reasons. In contrast, most mainstream economists, and a number of leading economic geographers, are sceptical, if not hostile, to this approach and thus cautious about the policy conclusions that this literature reaches.

We discuss the problems with this approach in this section.

The first, well documented problem, is one of definition. Just what is meant by a cluster?

The literature provides a large number of rather vague answers to this question⁴⁹. Even if this objection could be met by tightening the definition, much more significant problems remain. As noted by Duranton (2008), “the [main] problem with the cluster policy literature is one of a lack of well-articulated theory: what is the ‘problem’ that cluster initiatives are trying to fix?” This problem lies at the heart of economist objections to this approach⁵⁰.

A common answer to the question about the role of cluster policy is that it aims to improve local “competitiveness” or productivity. The problem with this answer is that it does not clearly set out the source of any possible inefficiencies (or inequities) and thus cannot explain how to correct for them. Porter’s famous diamond (see Porter 2000) attempts to map out the underlying sources of competitiveness.

49 Martin and Sunley (2003)

50 These issues are considered in Duranton (2008) on which this section draws heavily. We summarise the arguments and refer the reader to the original paper for more details.

The resulting model appears to be complex with many different elements all feeding into one another. But this complexity is actually rather superficial as all of the different elements feedback positively to other elements.

A complex policy mix is called for, but fortunately, in Porter's model, all policy actions on any component of the diamond will help strengthen the cluster. Of course, in reality this will not be the case because of the presence of negative feedback.

For example, in many cases, reducing barriers to entry in a sector that is already reasonably competitive may hamper the development of new products. This is because firms offset the cost of innovating against the profits that they make once they innovate; entry drives down these profits and reduces incentives to innovate all else equal.

Yet cluster policies often advocate increasing both entry and new product development as mutually reinforcing elements in strengthening a cluster. It would be possible to identify many other examples where carefully specified economic models and available empirical evidence actually point to a negative feedback between different elements of the diamond.

The second problem with the diamond model is that, despite its apparent complexity, it pays no attention to some fundamental drivers. For example, what is being assumed about labour mobility? If firms are mobile, but workers are not, how can one be sure that encouraging larger clusters in a particular place is a good idea? Similarly, what is being assumed about the functioning of the land market? It is quite possible that any surplus generated by increasing the size of the cluster just translates in to higher rents for owners of land.

Models of urban economics show that the answers to such questions are fundamentally important in understanding the functioning of the spatial economy and in assessing the role, if any, for policy. Yet the diamond model is silent on these issues. This is particularly important in the UK context, where planning for housing and commercial land use is one of the key policy levers available at the sub-national level.

Finally, even if there is positive feedback between the different elements of the diamond model, this does not actually provide a justification for policy intervention. Such a justification needs to be based on carefully identifying reasons why the market ignores these positive feedbacks and produces an inefficient outcome. That is, we need to look for market failures and construct policy to address them accordingly.

Unfortunately for the clusters policy approach, simple models that do this, suggest that market failures can lead to clusters being too big as well as too small. In other words, effective cluster policy might actually call for a reduction in the size of clusters.

The simplest way to think about the benefits of clustering is to assume that, because of the existence of agglomeration economies, the productivity of firms and thus the wages that they pay are increasing with cluster size. Offsetting this are rising costs (e.g. increased land prices) as the cluster increases in size.

At small cluster sizes, we might expect increased benefits to outweigh increased costs as the size of the cluster increases. That is, the "competitiveness" of the cluster (as measured by the wages that its firms can pay to workers) is increasing in cluster size. At some size, however, the rate at which costs increase will begin to outweigh the rate at which benefits increase. That is, there is likely to be an optimal cluster size at which the wages that firms can pay are maximized. Encouraging expansion beyond this size will lead firms and workers to be worse off.

In the absence of government intervention would we expect cluster sizes to be above or below this optimal size? The answer depends on the mobility of workers and firms. If firms are reasonably mobile, which is likely to be the case, clusters tend to be too large. This is because when firms enter the cluster they take account of the benefit to them, of being able to pay a higher wage as a result of agglomeration economies, but they ignore the increased costs to all the other firms.

This is an example of a coordination failure. One way to solve this coordination problem is to have some large agent come along and help firms recognise the additional costs that they impose on other firms or else restrict the size of clusters. In other words, in this simple world, government should be working to decrease the size of clusters, not increase them.

Of course, this explanation is too simple, because there are externalities on both the benefit and cost side of cluster formation. Firms ignore both types of externalities when making their decisions. Cluster advocates focus on the unexploited benefits to argue that clusters will be smaller than optimal. In reality, there are cost externalities as well as agglomeration externalities which may make the socially optimal size (the point where net social benefits are largest) for the cluster bigger or smaller than the private optimal size (the point where net private benefits are largest).

However, even if the socially optimal size is bigger than the private optimal size this doesn't necessarily mean government policy needs to expand the size of the cluster because private decisions may have already led to the cluster being too big relative to the private optimum.

In short, as is so often the case, the existence of several un-priced externalities make it very difficult to know what policy should be seeking to do in practice. Cluster advocates essentially only think about one of the three types of externalities present here (agglomeration externalities) while ignoring the other two (cost externalities and coordination failures).

Oddly, when it comes to the overall size of our cities, advocates of strong land use controls do the opposite. They focus only on cost externalities and coordination failures, generally ignoring agglomeration economies, to reach the conclusion that larger cities are too big relative to some optimum. As should be clear by now, both of these approaches only represent a very partial view of even the simplest models of cluster and city size formation. We would argue strongly that this is *not a good basis for policy*.

Of course, these conceptual issues might not matter at all if cluster advocates could point to a large number of cases where carefully designed public policies have had significant effect on both the size of clusters and their competitiveness.

Unfortunately, a recent meta-survey of more than 750 clusters finds evidence that government policy does not do this⁵¹. For example, van der Linde (2003) finds that "Random events or government influence [...] are the least important determinants in competitive clusters, while they play a much more important role in uncompetitive clusters".

51 van der Linde, 2003.

Cluster creation policies perform even worse. For the over 750 clusters that van der Linde (2003) studies, only one competitive cluster has been established as a result of a specific government policy to attract it. In short, even if we wanted to, simplistic implementation of cluster policies appears to do essentially nothing to create or increase the competitiveness of clusters.

Evidence collected for the MIER serves to reinforce these conclusions. As discussed earlier Wholesale, Sport, Energy, Automobiles and (the catch all category), 'Other' are the only sectors where we find evidence of positive localisation economies in the absence of urbanisation economies.

Where we find evidence of both urbanisation and localisation economies the latter are only more important than the former for ICT (and then not significantly). In short, for most sectors, there is little evidence that clustering is a more important source of productivity than urbanisation.

As we highlighted in our detailed discussion earlier, these results question the desirability of policy focus on the lack of "clusters" of critical mass in particularly "important sectors". Of course, we have only focused on productivity differences while one of the frequent arguments advanced in favour of clustering is that it may enhance innovation. The wider academic literature is not particularly supportive of this idea, however.

From Jane Jacobs to the recent work of Duranton and Puga on "nursery cities" it is apparent that diversity is crucial in driving innovation. These findings are echoed in Volterra's work for MIER.

They find that innovations spread more easily in a supply chain than amongst a group of competitors. In contrast, mimicking innovations introduced by competitors is a very poor method for spreading new ideas.

A number of policy implications emerge from this discussion:

- Policy should not be overly concerned with the sectoral composition of the local economy. It is clear from much of the analysis undertaken for MIER that MCR is relatively specialised (compared to the national average) in some parts of Manufacturing and Financial Services. It also may have an emerging specialism in Creative/Digital/New Media Industries as well as ICT and Life Sciences.

This information may sometimes be useful, but it is not central to most policy decisions. This sectoral composition is an outcome of a large number of decisions taken by both firms and workers about where they want to live and what they want to produce.

It is driven by factors that we are only just starting to understand and it will change in the future in ways that are hard to predict. Given our current state of knowledge about the underlying driving factors it makes no sense for policy to focus on trying to achieve a particular sectoral composition.

- Of course, sometimes policy makers need to make decisions about investments with large fixed costs that are likely to favour particular types of activities. The infrastructure investment underpinning MediaCityUK and Daresbury are perhaps two such examples of this.

The crucial point to remember, however, is that these decisions can be very risky given the high degree of uncertainty around the future development path of particular sectors. High fixed costs and long lead times may justify the public sector taking these risks.

However, in the absence of clear and compelling evidence on the benefits of clustering there are many decisions where the risks are not justified by the benefits (if they exist) from sectoral targeting.

- Policy decisions on skills would appear to be an important area where the case for policy changes to focus on specific sectors is not very compelling. According to evidence collected for the MIER, City Region employers have been able to satisfy their skills requirements without much difficulty even during the past period of sustained economic growth.

Many economists would not find this particularly surprising. After all wages and vacancies act as a pretty good incentive for people to react to rising local demand for particularly types of skills. Of course, some of this supply response may reflect the tailoring of training provision towards particular skills as a result of demand from employers. But it suggests that existing mechanisms are adequate to meet employers' specific needs without any further emphasis on particular sectors.

To the extent that the supply response instead reflects in-migration of workers from elsewhere there may be some sense in helping individuals within MCR better focus their training decisions on skills that are required by local sectors. Unfortunately the evidence is unclear on whether this is a better option than attempting to raise general skills so that workers are better able to adapt to changing demands for sector specific skills.

- In the context of skills, it is also important to remember that MCR loses a substantial portion of its high skilled and mobile young workers to the diversified environment of London and the Southeast.
- The evidence suggests a similar conclusion with respect to networking policy designed to enhance innovation rates⁵². Sector-based networks – the conventional policy makers' approach to networking – may not in fact represent a useful route to building innovative capacity. As emphasised by Volterra in their innovation report, cross-sectoral groups are likely to perform better.
- We discussed earlier the limited success of property based investments aimed at particular types of activities. To reiterate, unless large fixed costs are unavoidable then land use decisions relating to the type of business properties need to be demand led not based on predictions of the future sectoral composition of MCR or the hypothetical transformative impact of particular schemes⁵³.

In short, given our current state of knowledge, policy making to support development of MCR is unlikely to benefit from a focus on particular sectors. There may be some exceptions when policy involves the financing of large fixed costs that are likely to benefit firms in a particular sector.

⁵² See the MIER report on innovation.

⁵³ See Glaeser and Gottlieb 2008.

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