

PIN – 10

**Evidence Review** 

# **Regional and City Productivity Debates**

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#### About PIN

The Productivity Insights Network was established in January 2018 and is funded by the Economic and Social Research Council. As a multi-disciplinary network of social science researchers engaged with public, private, and third sector partners, our aim is to change the tone of the productivity debate in theory and practice. It is led by the University of Sheffield, with co-investigators at Cambridge Econometrics, Cardiff University, Durham University, Glasgow Caledonian University, SQW, University of Cambridge, University of Essex, University of Glasgow and the University of Leeds. The support of the funder is acknowledged. The views expressed in this report are those of the author and do not necessarily represent those of the funders.



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# Background and purpose

- This note presents a preliminary analysis of work undertaken by Cambridge Econometrics (CE) which links to the activities of the Productivity Insights Network, which is an ESRC-funded network of institutions seeking to improve understanding about UK productivity performance and its drivers.
- The note summarises projects in which CE have been (or are currently) involved that deal with understanding the drivers of productivity, describing the purpose, methods used, and conclusions drawn.
- The note only focuses on work where a link to productivity has been established or is a part of the work projects which simply focus on a potential driver (e.g. skills or transport) are not covered.
- As well as reporting on the purpose of the work and main findings, there is also some discussion of any gaps in the analysis or issues and questions that remain unresolved, i.e. what remains unknown/unresolved/part of on-going debate.

## Performance gap analysis

### Project (Client and Date of Work)

Northern Powerhouse Independent Economic Review (Transport for the North, 2015-16)<sup>1</sup>

#### Description

This project, undertaken mainly by SQW and CE with a supporting panel of academic experts, provided economic analysis and projections to underpin Transport for the North's development of a transport infrastructure plan to be funded under the Chancellor's Northern Powerhouse initiative. The work comprised: analysis of the prosperity and productivity gaps in the North, and the potential contribution role of different drivers in closing these; analysis of the economies of the 11 Local Enterprise Partnership areas, including an assessment of local productivity performance and causes, sectoral specialisms, capabilities, and assets, and major investments planned/underway to address the causes of the performance gaps and realise sector opportunities; analysis of distinctive competitive advantage and sectoral strengths, capabilities, and potentials of pan-Northern significance; modelling future growth scenarios for the North, including a transformational scenario in which investments intended to address the drivers of the North's prosperity and productivity gaps is undertaken; development of an overall Strategic Growth Narrative, including the role of transport (and other critical factors) in delivering the ambition; development of proposals for an Independent Panel to maintain and development the narrative and underpinning analysis.

CE's work focussed mostly on analysis of performance gaps and on transport scenario modelling, the former of which is described below.

#### Main findings

The analysis identified a persistent prosperity gap between the Northern regions and the rest of the UK, which was mostly driven by a performance gap rather than an employment gap. See summary figures below, with updated data to add years following the report publication.

<sup>&</sup>lt;sup>1</sup> See <u>https://www.transportforthenorth.com/wp-content/uploads/Northern-Powerhouse-Independent-Economic-Review-Executive-Summary.pdf</u>













Figure 3: Employment rate gap



The most probable causes of the productivity gap (skills gaps, innovation performance, agglomeration, entrepreneurship, governance, and lower connectivity) were examined by collecting data and looking for similar patterns in behaviour. The analysis found that the gap in skills (as proxied by highly-qualified workers) was the indicator which mirrored the performance gap most closely, while measures of investment, agglomeration, and research-innovation also show persistent gaps between the North and its comparators.

#### Gaps in analysis

The analysis did not attempt to quantify the different effects within a modelling framework – it was more based on association and visualisation of trends.

## **Transport infrastructure**

#### Project (Client and Date of Work)

MISTRAL (EPSRC, 2016-2020)

Norther Powerhouse Independent Economic Review (ibid)

#### Description

The aim of MISTRAL is to develop and demonstrate a highly integrated analytics capability to inform strategic infrastructure decision making across scales, from local to global. MISTRAL will thereby radically extend infrastructure systems analysis capability. MISTRAL is run by the UK Infrastructure Transitions Research Consortium (ITRC), a consortium of seven UK universities, led by the University of Oxford, which has developed unique capability in infrastructure systems analysis, modelling and decision making. CE's role is to provide economic analysis and modelling in support of Challenge 4: to combine engineering systems models with empirical evidence and new economic thinking to quantify the relationships between infrastructure



investment and regional/national economic growth and to use this understanding to enable rigorous appraisal of the benefits and risks of infrastructure investment.

#### Main findings

The MISTRAL work is ongoing but is seeking to model labour productivity at UK local area level and to assess the impact of changes in connectivity to performance, both cross-sectionally and across time. A range of conditioning factors are being established so as to isolate the effect of both transport (air, road and rail) and ICT connections.

Within the Northern Powerhouse work, the role of transport in explaining the performance gap was hard to gauge directly, due to the difficulty in measuring connectivity and the importance of considering the stock, and not just the flow, of investment. However, there is evidence from the literature that suggests improved connectivity can assist employment and skills (through better matching of workers with jobs) and by increasing the density of employment and so realising agglomeration gains.

When assessing the impact of transport links (with cities and city-regions as the hubs to be

connected) there are arguably four different types to consider namely links:

- Within cities (intra-city transport)
- Between cities within the same region (inter-city regional transport)
- Between cities within the same country (inter-city national transport)
- Between cities in different countries (international transport).

Each of these types of transport is important, but each will affect employment and productivity in different ways. Many of the arguments for the Northern economy acting as a single region focus on the inter-city regional linkages, such as the proposed east-west rail link (HS3), while the employment benefits of better matching of employee skills and available jobs also brings intra-city and inter-city linkages into play. Meanwhile, better linkages to London and beyond should allow improved access to finance and global transport hubs which can help to create new market opportunities.

#### Gaps in analysis

While it is clear that improved transport connectivity can play an enabling role in rebalancing the economy and closing the performance gap between the North and the rest of England, it is impossible to put a figure on this and say 'X £m of transport spending will close the performance gap by Y%'. The interplay between different factors (e.g. transport infrastructure, skills, agglomeration, governance, innovation, etc.) is too complex to capture and separate out within an empirical modelling framework.

## Importance of sectoral structure

#### **Project (Client and Date of Work)**

Paper by Ron Martin, Peter Sunley, Ben Gardiner, Emil Evenhuis and Peter Tyler funded by ESRC project (ES/N006135/1) into Structural Transformation, Adaptability and City Economic Evolutions, as part of its Structural Transformations Programme. Entitled "The City Dimension of the Productivity Growth Puzzle: The Role of Structural Change and Within-Sector Slowdown". A version of this paper was later as:



Martin, R., Sunley, P., Gardiner, B., and Evenhuis, E., and Peter Tyler, 2018, "The City Dimension of the Productivity Problem: The Relative Role of Structural Change and Within-Sector Slowdown", *Journal of Economic Geography*, 18.3, 539-570).

#### Description

The paper examines the differing productivity growth paths of some 85 British cities since the beginning of the 1970s and explores how far these paths reflect differences across cities in the pace and nature of structural change (through changes in their sectoral composition using applications from Kruger (2006, 2008)).

#### Main findings

The research finds that while northern cities led productivity growth over 1971-91 southern cities then led after 1991. However, at the same time, the rate of productivity growth slowed across almost all cities between these two periods. There is evidence of considerable structural convergence across cities and a general tendency for the degree of specialisation to fall. This then leads to a decomposition analysis which identifies the relative contribution of between-sector (structural change) and within-sector effects to city productivity growth.

The analysis reveals that that structural change – and especially the shift from manufacturing to services - has had a negative impact on productivity growth across all cities, but that within-sector productivity developments while positive and outweighing structural change effects, have also declined over the past forty-five years, as well as varying across cities.

#### Gaps in analysis

These findings point to the need for further research on the causes of this slowdown in 'withinsector 'productivity growth and why those causes appear to differ from city to city. They also point to the need for a 'place-based' dimension to policies aimed at improving national productivity performance.

## Skills and labour market analysis

#### Project (Client and Date of Work)

Rebalancing the economy sectorally and spatially: An evidence review (UK Commission for Employment and Skills, 2011)

#### Description

Cambridge Econometrics, in collaboration with SQW, the Centre for Urban and Regional development Studies (CURDS), and the Institute for Employment Research (IER), were commissioned by the UK Commission for Employment and Skills (UKCES) to undertake research on 'rebalancing the economy sectorally and spatially'. The study reviewed existing national and international evidence regarding the rationale for government intervention in the structure of the economy with the intention of building a strong and sustainable economy, balanced geographically and sectorally. In addition to contributing to the review of data and literature, CE used its regional multisectoral economic model, MDM-E3, to project the likely economic feasibility and consequences of policies designed to alter the balance of the UK economy; the analysis highlighted what would need to be done to achieve better macroeconomic and sectoral balance, and the remaining spatial challenges that would need to be addressed. The study provided conceptual, empirical, and policy perspectives on the rebalancing issue, along with guidance on what might assist in rebalancing the UK economy, with a particular focus on skills and employment policy.



#### Main findings

The challenges of imbalance and 'rebalancing' are widely experienced by the UK's competitors, and economies more generally worldwide. Whilst the UK's 'rebalancing' challenges are significant, they are not unusual internationally. Differences in productivity growth have also played a major role in the widening imbalances in economic performance, and skills disparities are a key factor in explaining national and regional productivity differences. Whilst the label may be new, the issue of 'rebalancing' is not unique to the UK, and one in which skills and employment issues in particular are key elements. This provides a strong general argument for interventions designed to assist 'rebalancing'.

Shifts in balance take time to achieve and that there can be tensions between macroeconomic, sectoral and spatial balance.

Even if significant shifts in macro and sectoral balance can be achieved, the impact on spatial balance will tend to be smaller because of the existing nature of balance in the UK. London and the South East already account for one-third of UK output; in order to 'catch up', the other nations and regions would need to achieve considerably faster than average growth sustained over a long period of time. Moreover, favourable shifts in macroeconomic and sectoral balance can exacerbate existing spatial disparities. For example, the forecast cuts in public sector employment (to reduce the public deficit) will hit regions and nations with relatively high concentrations of public services, some of which are already less prosperous areas.

If policies to promote the UK's sectors of comparative advantage are successfully pursued, these will likely benefit macroeconomic balance, but potentially exacerbate sectoral and spatial disparities. Successful regions tend to have a larger than average share of the comparative advantage sectors and so boosting growth in these sectors will tend to further widen spatial disparities. Several comparative advantage sectors (such as financial services, advanced manufacturing) comprise relatively large proportions of professional and skilled occupations but they also have relatively high productivity and so their higher output growth does not create many jobs.

#### Gaps in analysis

In terms of 'new' research, there are three areas where future work would be helpful,

both to fill evidence gaps and to build understanding of 'rebalancing' the economy:

- Since the study's conclusion (i) reinforces the view that spatial imbalances are likely to remain, even where macroeconomic balance is restored and sectoral imbalances have been reduced and (ii) the arguments that such spatial imbalances need to be addressed are accepted (not by redistribution interventions, but by actions that strengthen the underutilised resource bases of places), then more evidence is needed on how this can be accomplished both effectively and cost-effectively. Linked to this, the research on the role, for example, of transport, housing and utilities planning (e.g. water, energy, waste) in bringing about 'rebalancing' in a UK context is not well developed, so that these considerations do not always enter into decision making about investments in infrastructure.
- In terms of sectors, in a 'rebalancing' context some clearly matter more than others because of the innovation they can lever elsewhere in the economy. Research on this is, again, relatively limited and less than conclusive. Further research would be helpful to better understand the relative importance of growth sectors in this respect, and their ability to lever innovation through the wider economy.
- This study has found that skills and human capital interventions have an important role to play in the success of certain 'rebalancing' interventions. There is limited evidence



from the literature reviewed about the specific skills implications of 'rebalancing' activity. Relating to the two points above, further research into how skills interventions can support spatial 'rebalancing', especially linked to investments in infrastructure, and also how skills interventions can support the development of sectors which are important for 'rebalancing' would be valuable.

#### Project (Client and Date of Work)

Components of Growth Study (Insight East, at the East of England Development Agency, 2010)

#### Description

This project was commissioned to assess the contribution of the labour market to economic output and growth in the East of England. A growth accounting approach was developed and applied to estimate the contribution that employment growth made to the recent growth of gross value added output (GVA) in the East of England.

#### Main findings

We estimate that over 2002-08, in both the East of England and the UK, the growth of employment accounted just less than one-third of GVA growth. Labour therefore makes a relatively small contribution to growth with a considerable part of growth coming from elsewhere, namely the utilisation of capital and also total factor productivity.

What our analysis does show is that the utilisation of higher-skilled labour has made a larger contribution to growth in the East of England than has that of lower-skilled labour: employment growth in the higher-level occupations (managers & senior officials, professionals, associate professional & technical occupations) and of workers with higher-level qualifications made a relatively large contribution to GVA growth. This is because much of the increase in employment in the region has been in higher-skilled jobs, typically in higher value-added activities that are rewarded with higher earnings.

#### Gaps in analysis

Skills can be measured in various different ways, none of which are perfect. The *occupation* that an individual undertakes and the formal *qualifications* that they hold are often used as proxies for skills development and formation because data for these measures are most readily available; this study makes use of *occupation* and *qualification* to measure skills.

When it comes to explaining GVA growth it is clear that labour and skills tell only part of the story; there are many other important drivers of and constraints to growth that have not been quantified in this study. Our quantification of the contribution from labour and skills fails to take account of the role played by management and leadership skills. The effectiveness with which capital and labour are utilised together to deliver growth will depend upon the quality of management and leadership skills, of investment decisions made and business strategies implemented.

## **Resource efficiency**

#### Project (Client and Date of Work)

Environmental impacts of the collaborative economy (European Commission, DG Environment, 2016-17)



#### Description

The main objective of this study was to assess the environmental impact and potential of the collaborative economy and to identify the conditions under which the collaborative economy will contribute to sustainable development. The analysis considered how a move to a collaborative, sharing-based economy could improve both productivity through more efficient use of resources by business, and also welfare through the sharing of durable household items.

CE's E3ME model<sup>2</sup> was linked to a life-cycle analysis to provide environmental and macroeconomic impacts of a collaborative economy. Changes were made to the model's inputoutput coefficients to represent the shift towards a collaborative economy. Different scenarios were tested, covering three key sectors (vehicles, accommodation and household durable goods), with different levels of ambition in each scenario. The stakeholders in the project included some of the largest incumbent and new companies in the three sectors.

#### Main findings

The study found that there are likely to be significant changes within the three sectors in the coming decades. Accommodation is already well advanced, through platforms such as AirBnB, and transport could become so (especially if autonomous vehicles take off). Consumer durables is less advanced but has significant potential.

Crucially, the impacts are not just on consumers. Businesses are also beginning to use the services to improve their productivity and enhance profitability. They are likely to help to drive future changes.

The macro-level impacts are positive in terms of faster potential GDP growth and the potential for new jobs to be created. However, in terms of resource use there was little net benefit due to rebound effects; essentially the financial resources that were saved through the sharing economy were instead used to buy other products.

#### Gaps in analysis

Predicting future technological change is impossible so the scenarios were designed based on the views of the stakeholders involved. Sensitivity analysis could provide a broader assessment of future impacts of the collaborative economy, possibly testing a wider range of sectors.

## Agglomeration

#### **Project (Client and Date of Work)**

Gardiner, B., Martin, R., and Tyler, P., 2010, "Does Spatial Agglomeration Increase National Growth?", *Journal of Economic Geography*, 2010, 11.6, 979-1006

#### Description

The article examined the evidence for a link between growth in productivity and the degree of spatial agglomeration across the nations of Europe. In doing so it considered how spatial agglomeration should be measured and how the relationship between agglomeration and the growth of productivity should be modelled.

Alternative measures of agglomeration (Herfindahl, Ellison-Glaeser, Geographical Concentration Index) were considered as ways of representing the degree of concentration of regional activity across countries. Then a basic Sala-i-Martin style productivity growth model

<sup>&</sup>lt;sup>2</sup> See <u>https://www.camecon.com/how/e3me-model/</u> for more information.



was estimated with the explanatory variables as the starting level of productivity, an agglomeration measure, and other starting period indicators of interest. 14 Member States were covered over the period 1981-2007, with sub-periods of up-swing and down-swing identified to provide additional observations for a panel regression model. The preferred agglomeration measure (Adjusted Measure of Geographical Concentration) was also calculated for different regional spatial levels (NUTS1-3).

#### Main findings

The findings on a trade-off between the rate of growth experienced and the degree of agglomeration are rather mixed. The precise results obtained depend on the measure of agglomeration adopted and the spatial scale at which the analysis is conducted.

Rather than derive predictions of the impact of spatial agglomeration on national growth using a highly simplified abstract model it would perhaps be better to try to measure empirically what the effect of spatial agglomeration/regional inequality are on growth, and then build a model that captures the mechanisms involved, reflecting the spirit of the original Krugman (1991) method of deriving NEG models (in which he drew on the observed historical agglomeration of economic activity in the US manufacturing belt). It is perhaps also worth noting how in his most recent work (Krugman, 2009, 2011) he has suggested that perhaps in the advanced economies agglomeration may no longer a primary source of growth enhancing increasing returns that it once was. Recent studies by economic geographers tend to support this view, in that there is evidence that agglomeration economies may go through a 'life cycle' in terms of the benefits they provide for spatial concentrated industries (Potter and Watts, 2010). In the meantime policy makers should be cautious in basing any policy on assumptions of a trade-off between national growth and regional inequality.

#### Gaps in analysis

The spatial units for which economic data reflect administrative convenience rather than being configured to capture localization effects (i.e. relying on functional area definitions). There is also a lack of a definite and generally agreed and accepted model of national growth to which agglomeration measures can be added.

## **R&D / Innovation**

#### Project (Client and Date of Work)

MONROE - Modelling and evaluating the socio-economic impacts of research and innovation with the suite of macro- and regional-economic models (MONROE)

#### Description

The objective of MONROE is to assess medium and long-term impacts of R&I policies and programmes on economic growth, job creation, competitiveness, social inequality and sustainability at various geographical levels ranging from word-wide to European, country and regional levels and for various economic sectors.

MONROE uses a set of existing advanced macroeconomic models (GEM-E3-RD, PACE, E3ME and RHOMOLO) and develops them further to address various issues related to impacts of R&I and R&I policies. In particular the existing models will incorporate the knowledge spillovers (between sectors, regions and countries), explicit knowledge production functions, distinction between public and private R&I and the role of human capital in knowledge creation and dispersion. The models will further make a distinction between product and process innovations as well as between different types of R&I in terms of quality.



Cambridge Econometrics' model E3ME uses measures of endogenous technological progress. The measures are based on cumulative gross investment, quality adjusted by using data on R&D expenditures, to adopt a measure of technological progress. They cover both process and product innovation and thus affect both price and non-price competitiveness in a sector, featuring for example in econometric equations for prices, international trade and industrial employment. The main difficulties with this approach is the diversity of R&D levels across sectors and accounting for knowledge spillovers. As part of the MONROE project, Cambridge Econometrics is improving the measures of technological progress, and the link between R&D and productivity growth in particular. This is done by bringing R&D spillovers, patents citations and indicators of human capital into the measures of technological progress (technology indices).

#### Main findings

The work so far in Monroe has confirmed the important link between innovation and long-run productivity growth, which is represented in the E3ME model by the equations for economic capacity. The linkages between R&D expenditure and innovation are also confirmed, and the project has found key spillover effects, both between sectors and countries. Other work in the project has shown the importance of human capital in driving innovation and productivity growth and also the importance of maintaining a high degree of competition in driving future productivity change.

#### Gaps in analysis

The work is ongoing, so it is too early to report on gaps in analysis.

## Conclusions

Observed productivity as the outcome of a complex process. It can be analysed from many directions, for example: accumulation of capital, investment in skills, infrastructure, enterprise, R&D and innovation, sectoral specialisation, occupational specialisation, exposure to international trade, exposure to FDI, firm demographics, population structure, geographical differences.

The difficulty in appropriating a direction of causality with productivity and performance is that any one of these indicators may just be observing the outcome, rather than a key driver. If a country/locality is seen to be deficient in any one or more of these factors, the question is why? For example, is a failure to invest in skills the reason why productivity is low, or did firms and individuals choose not to invest in skills because of other factors? Are a region's firms less productive because they do not engage much in international trade, or do they not engage in international trade because they have chosen to specialise in something else (because of other factors). Is the UK's productivity low because high productivity in London is blocked from spreading out, or do we observe that geographical pattern because of something else (for example, the nature of international financial services that cluster in one location, purchase other specialised services locally, and bid up wages and rents)?

The production function approach to productivity, which is known to be deficient, doesn't explain *why* different places or firms have chosen to invest more or less. When Adam Smith sought to explain differences in the prosperity of nations, his answer wasn't 'some countries have more capital, and more highly-skilled labour', it was 'the economies made possible by the division of labour create the conditions favourable for skill specialisation and investment'.

An alternative 'interdisciplinary' approach would bring together people with expertise in the different entry points for studying differences in productivity, and ideally it would try to distinguish



more fundamental factors (especially those amenable to policy intervention) from those that are more like consequences (such as, the sectoral, occupational or product/market specialisation of firms in a country/region). And it means recognising the complexity (so there won't be a simple answer like 'the division of labour'), but nevertheless trying to pull out a number of candidate more fundamental explanations.



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