

Core Cities UK

The Economic Performance and Resilience of the UK's Core Cities



Final Report

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Executive Summary

Study objectives

The objective of the study commissioned by the Core Cities Group was to analyse the economic performance of the Core Cities over the past few decades, including how sectoral structure has changed and contributed to this performance over this period. In addition, the resilience of the core cities was investigated with particular application on how Brexit may affect them. Finally, policy implications (from national to local) were considered in this context.

Specifically, the study analysed the patterns and drivers of change in employment, output (GVA), and labour productivity by sector to assess the overall economic performance of Core Cities in the UK over the last 40 years, as well as how resilient these Core Cities have been to four recent recessions during this period. The study focuses its analysis on the 11 Core Cities across the UK, as defined by Core Cities UK: Belfast, Birmingham, Bristol, Cardiff, Glasgow, Leeds, Liverpool, Manchester, Newcastle, Nottingham and Sheffield.

Key messages

The key messages from the study are as follows:

Divergent performance but generally falling behind London on output and productivity

The study found that the growth paths of the Core Cities have been distinctly divergent over the past 50 years.

Following a period of rapid deindustrialisation in the 1970s and 1980s and the early-1990s recession, London bounced back to experience one of the fastest rates of employment growth in the UK and outperformed the Core Cities in terms of employment growth. By 2015 London had turned a cumulative negative growth gap in output of -10 percentage points in 1990 into a positive position of plus 10 percentage points. In output terms, London's economy grew especially rapidly from 1996 onwards and was barely affected by the financial crisis and associated 2007-2010 recession.

Specialisation and diversification

In terms of specialisation and diversification, the UK economy has experienced a gradual shift of activity from industry to services since the 1970s, a trend mirrored across all the Core Cities. London is something of an exception, having increased its specialisation in finance and related services.

All the Core Cities have experienced a decline in its share of manufacturing output and an increase in its share of Knowledge-Intensive Business Services (KIBS), while the importance of the public sector across the Cities has broadly remained the same. Since the 1990s, the pattern of trend decline has moderated somewhat.

Focusing on productivity, the study found that the Cities have generally shifted from high productivity growth sectors to low productivity growth sectors, and the main determinant of city productivity growth has come from improvements in performance within individual sectors rather than from shifts in city economic structure.

Resilience, recession and recovery

Observing how the Core Cities have recovered from the recessions of 1974-76, 1979-82, 1990-92 and 2008-2010, the analysis shows that the average performance of the Core Cities is typically one of lower resistance and recovery than the national average in most of the recession-recovery cycles.

In contrast, while London has not improved its resistance to shock, its ability to recover has improved with each shock it has faced.

Looking forward to the potential impact of Brexit, the study found (unsurprisingly) that the more severe the type of Brexit, the greater the negative impact will be on all the Core Cities.

*Policy
implications*

Together, the Core Cities account for 25 percent of national output, slightly more than London (24 percent). If the Core Cities had grown at the same rate as London between 1992-2015, they would have contributed at least an additional £120bn to the national economy. There is an incontrovertible argument, therefore, that national policy initiatives, whether infrastructural investment, industrial support, technology spending, or other measures, should be explicitly targeted far more on the Core Cities' economies. These areas are major centres of economic activity and need to be factored far more prominently into national policy-making. Unless and until there is a significant degree of decentralisation of the political and institutional structures underpinning the national economy, the scope for 'catch-up' by the Core Cities is likely to be restricted.

At the city level, there is a question whether cities should seek to develop particular new specialisms as the basis for a new phase of growth, or whether diversification is most conducive to growth. In reality, it is likely that cities should adopt policies that promote a mix of specialisation and diversification activities, focusing on innovation and technology-led growth, allowing a city to be adaptable and dynamic in the future. In addition, enhancing a city's physical and strategic connection with neighbouring Core Cities, is likely to foster joint development visions that can have major economic gains.

1 Introduction

1.1 Introduction

Cambridge Econometrics (CE) and Professor Ron Martin (University of Cambridge) have been commissioned by the Core Cities UK to undertake a study analysing the economic performance of 11 Core Cities¹ over the last 40 years and their resilience to major shocks.

This work is based on CE's local area database, which provides economic timeseries data by detailed sector for all unitary authorities and local authority districts (UALAD) in Great Britain.

1.2 Objectives

There are two main objectives of the study:

- (i) Trend performance analysis

To analyse the economic performance of the Core Cities, defined as trends in employment, output (GVA), and labour productivity, in aggregate and by detailed sectors, as well as discussing some of the possible causes of this performance.

- (ii) Resilience analysis

An investigation of how resilient the Core City Regions are against major shocks. By resilience here is meant both how well the Core City Regions resist major shocks, and how well (how fast and the extent to which) they recover from them. Four major shocks will be analysed and compared, namely the recessions of 1974-76, 1979-82, 1990-92 and 2008-2010. In addition, the study will look forward to how Brexit may impact on the Core Cities, as the next major shock on the horizon.

The findings will be benchmarked where appropriate against London and the National (Great Britain) economy.

1.3 Report structure

This report describes the methodology and results of the Core City economic performance and resilience analysis. Chapter **Error! Reference source not found.** provides an overview of the methodology used and the analysis at the aggregate Core City-level, with a sectoral analysis provided in Chapter **Error! Reference source not found.**. Chapter 4 presents the findings from the investigation of how resilient the Core Cities are against major shocks, and Chapter 5 provides a summary of the key findings of the study and its implications on policy, followed by references (Chapter 6).

¹ The definitions of the Core Cities are based on the definitions provided by the CCG (see **Error! Reference source not found.** for the definitions in terms of local authorities).

2 The Evolving Economic Performance of the Core Cities, 1971-2015

2.1 Introduction

This chapter reviews the aggregate economic performance of the Core Cities over the 1971-2015 period across a range of metrics, principally output (GVA), employment, and labour productivity. Comparisons are also made against a national average while London is also included as a benchmark.

2.2 Methodology and definitions

Employment, GVA and labour productivity

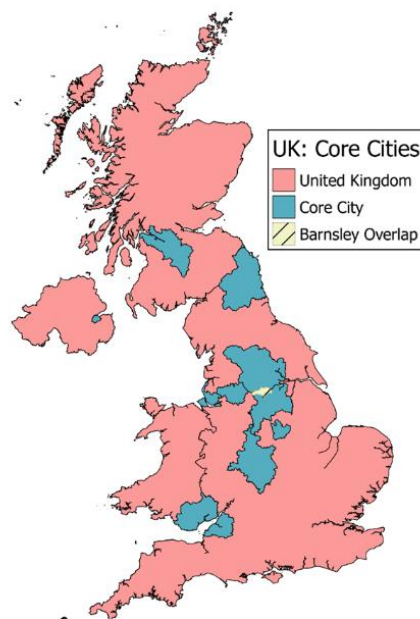
The data used for the Core City calculations are based on Cambridge Econometrics' local authority district (LAD) database. Appendix A provides more details on the database origins, but in summary it is based upon ONS regional data, alongside information from the Business Registry and Employment Survey (BRES) and Annual Business Inquiry (ABI). The exception is Belfast, where an alternative method (also described in Appendix A) was required because the CE data only covers Great Britain.

Employment is defined as workplace-based jobs, which include full-time, part-time and self-employed. GVA is defined in constant (£2013) prices to allow for inflation adjustment. Productivity is the ratio of the two, i.e. constant price output per workplace job.

Core City definitions

The definition of the Core City areas has been provided by Core Cities UK and is made up from aggregating LADs from the aforementioned CE database – the definitions are listed in Appendix B – Figure 2.1 provides a UK perspective, showing the overlap between Sheffield and Leeds definitions (which both share the Barnsley LAD).

Figure 2.1: Core cities within the UK



Source: Core Cities UK, CE Calculations

Maps of the Core Cities and comparisons with other definitions (LEPs, PUAs, possible TTWAs) are also provided in Appendix B.

Growth Paths

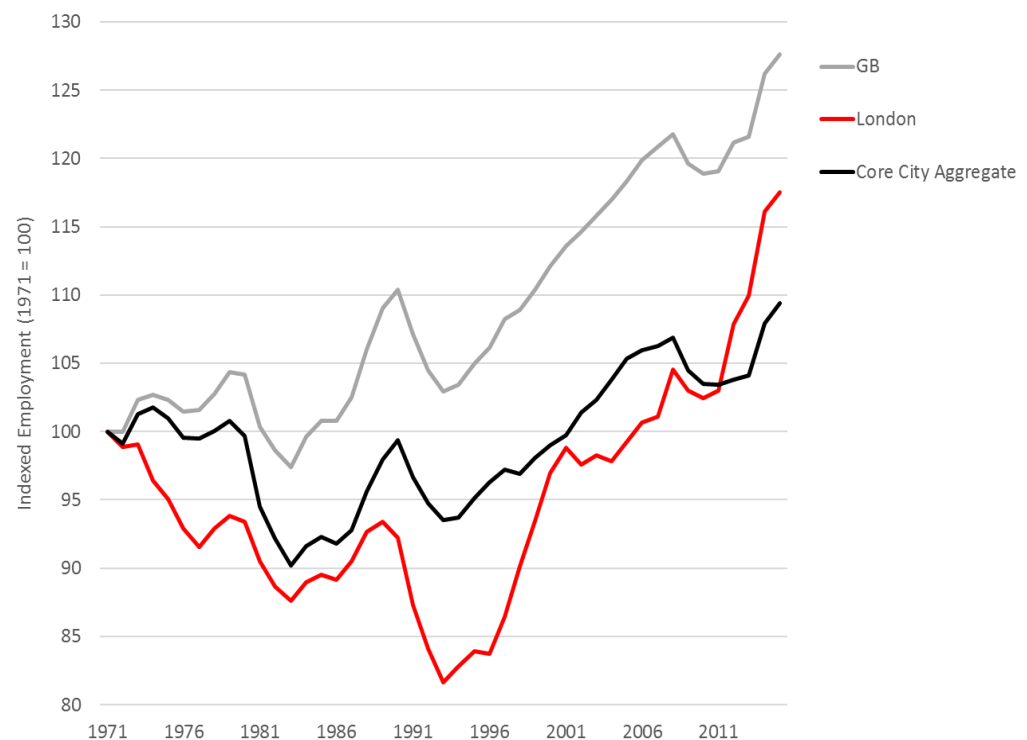
The original method used to analyse the Core Cities used cumulative deviations to mark the divergence of individual Core Cities from the national average. At an aggregate level it is simpler to analyse the growth path for the Core City average in the form of indexed variables of interest.

2.3 Results

Total employment

Figure 2.2 provides an aggregate picture of the Core City performance relative to London and Great Britain. On average, the Core Cities out-performed London, though not the country as a whole, up until the financial crisis, following which London's recovery has pushed it above the Core City performance.

Figure 2.2: Employment Growth Paths (1971-2015)



Note: Belfast added from 1990

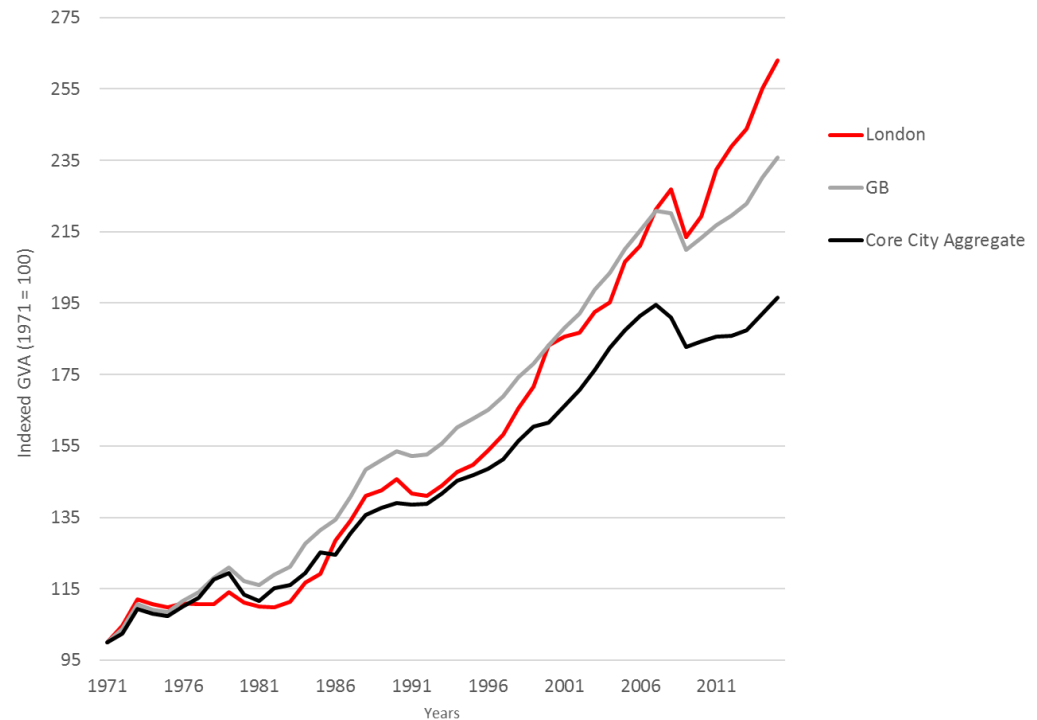
Source: Core Cities UK, CE Calculations

- During the 1970s and 1980s, London followed the same pattern of slower than average employment growth as the major northern Core City Aggregate. Given that historically it had contained the single largest concentration of manufacturing activity, it too underwent rapid deindustrialisation during those decades. Since the recession of the early-1990s, however, it has registered one of the fastest rates of employment growth in the UK, so that it has reversed much of the large employment growth gap that had opened up in the 1970 and 1980s. Over the past two decades or so, London has outperformed the Core City Aggregate in terms of employment growth.
- Turning to the period since 1990, the strong turnaround in London's employment growth performance becomes more evident.

Total output (GVA)

Figure 2.3 provides an aggregate picture of the Core City performance relative to London and Great Britain. On average, the Core Cities roughly matched London, though not the country as a whole, up until 1996, the relaxation of financial regulation that followed, caused London's economy to grow at a faster rate than the Core City aggregate.

Figure 2.3: Output Growth Paths (1971-2015)



Note: Belfast added from 1990

Source: Core Cities UK, CE Calculations

- As in the case of employment, London's turnaround from the early-1990s onwards is clearly evident. In output terms, London's economy grew especially rapidly from 1996 onwards and was barely affected by the financial crisis and associated recession on 2007-2010.

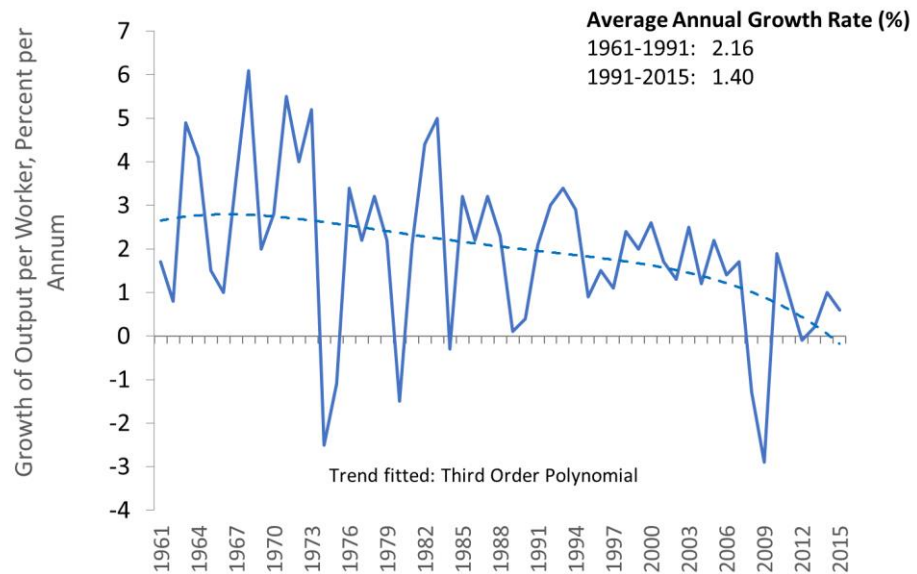
Labour productivity

In recent years, the disappointing growth in national productivity has been a key Government concern, and indeed one of the main motivations behind the Government's announcement of a new Industrial Strategy². In fact, although productivity growth has stalled since the onset of the financial crisis in 2007-2008, productivity advance has been on a downward path nationally for a longer period, arguably since the mid-1970s (see Figure 2.4). This downward trend in productivity growth is not confined to the UK, but is a common feature of almost all OECD economies. Labour productivity growth (as measured by output per employed worker) is the difference between the rate of growth of output (GVA) and rate of growth of employment, and thus can vary over time because of different movements in both output and employment. Thus, overall labour productivity growth can rise if employment falls without any change in

² <https://www.gov.uk/government/topical-events/the-uks-industrial-strategy>.

output; or, again, it can fall if the rate of growth of employment exceeds that of output.

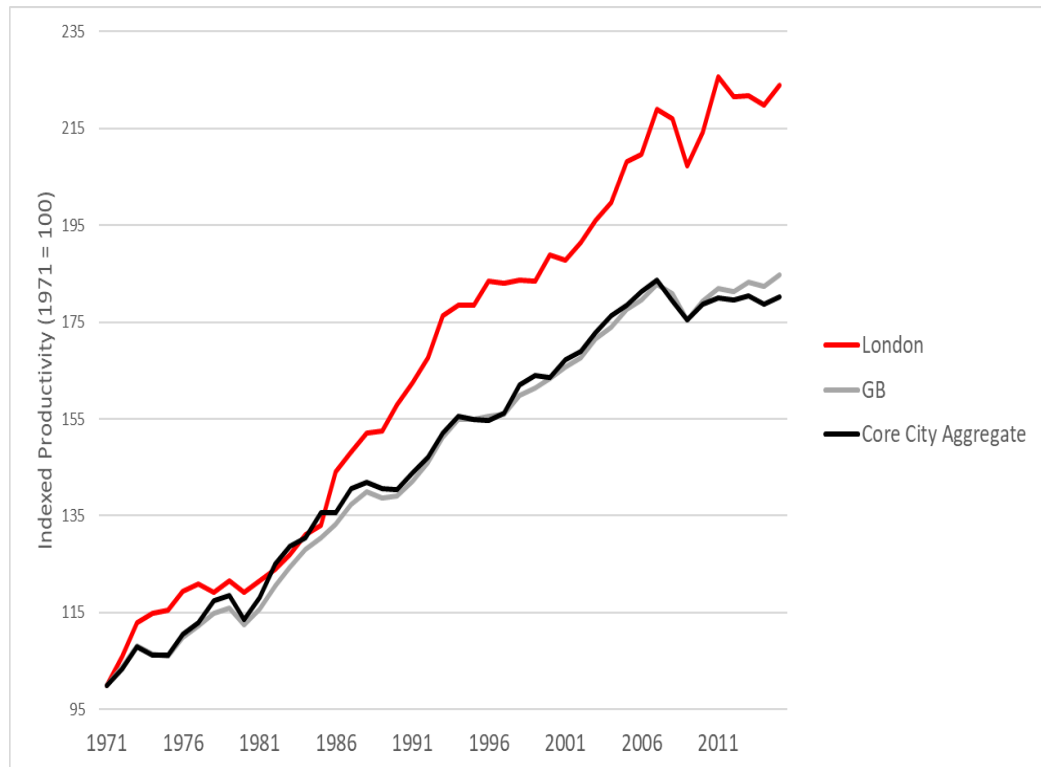
Figure 2.4: Labour Productivity Growth, UK Economy, 1961-2015



Source: Office for National Statistics data, CE Calculations

Recent research has shown that the slowdown in productivity growth in the UK has been a geographically uneven process, in that over the period 1971-1991, northern cities led national productivity, but since then it has been southern cities that have experienced the fastest growth, though at rates lower than those achieved by northern cities in the preceding period (Martin et al. 2018), thus lowering the overall national rate of productivity growth.

Figure 2.5 provides an aggregate picture of the Core City performance relative to London and Great Britain. On average, the Core Cities roughly matched London, though not the country as a whole, up until 1996, the relaxation of financial regulation that followed, caused London's economy to grow at a faster rate than the Core City average.

Figure 2.5: Productivity Growth Paths (1971-2015)

Note: Belfast added from 1990

Source: Core Cities UK, CE Calculations

- As in the case of both output and employment growth, London underwent a dramatic turnaround in relative performance in the late-1980s. While its productivity growth performance in the 1970s and much of the 1980s was inferior to the Core City average, from around 1986 onwards it experienced a marked improvement, separating itself from the Core City average and national average significantly. London's marked relative improvement dates from the deregulation of its financial sector and its increasing importance as a global financial centre.
- One can observe that whilst London's labour productivity has steadily been increasing over time, the Core City Average has remained fairly constant, although it has started to decrease relative to the average since the financial crisis (Table 2.1).

Table 2.1: Labour Productivity Relative to GB Average (=100), Selected Years

Core City	1971	1981	1991	2001	2008	2015
London	116.5	122.3	133.2	132.0	139.9	141.2
Core City Average	89.2	91.0	90.4	90.0	88.5	87.0

2.4 Conclusions

The definitions of the various Core Cities, in some cases, differ significantly from the LEP, TTWA and PUA definition of the city. Whilst this can lead to a change in the magnitude of numbers being examined, relative measures still provide us with a similar insight to preceding research.

When looking at Indexed Employment, one can observe that the Core City Aggregate outperformed London prior to the mid-90s, since then London has achieved a marked turnaround, achieving very high employment growth rates. London was able to surpass the Core City Aggregate in the early 2010s as a result of this growth.

Indexed GVA demonstrates a slightly different trend to that of Employment. Whilst an uplift is noticeable for London in the mid-1990s, the preceding underperformance that was seen in the Employment data, is not present. This results in London significantly outperforming the Core City Aggregate and the rest of GB over the entire study period.

With regards to productivity, the Core City Aggregate has mostly been outperformed for the whole study period by London.

3 Economic Structure and Core City Growth

3.1 Introduction

This chapter goes below the aggregate performance of the Core Cities to examine some features of growth which reflect sectoral disaggregation of employment and GVA. The same period of time (1971-2015) is analysed, but employment and output are split across 82 sectors (see Appendix A for definitions)³.

3.2 Sectoral specialisation

The debate on specialisation vs diversification

There has long been a debate over the role that sectoral structure plays in city and regional growth. On the one hand some argue that specialization is the motor of local economic growth, as it gives rise to so-called Marshall-Arrow-Solow economies associated with the local attraction of a skilled labour pool, specialist suppliers and local knowledge flows and transfers among the firms involved in a given industry, all of which promote innovation and productivity. On the other hand are those who contend that local sectoral diversity is more conducive to growth, as it maximizes scope for local input-output relationships, creates market niches for new activities, fosters both competition and collaboration, promotes knowledge flows, attracts a variety of types of labour. These so-called Jacobsian economies are believed to stimulate growth as well as greater resilience in the face of economic shocks. Highly specialised economies, by contrast, have less of a buffer against such shocks. The evidence for these two different views are mixed on both sides.

Certainly, some of the fastest growing cities and regions in economic history have been specialised. However, equally, economic landscapes are littered with historical examples of localities that once enjoyed success and prosperity on the basis of a particular specialism, but which have since lost that dynamism because of the decline of their specialisms, and a resulting difficulty in finding a new economic role.

Related variety

Given this debate over specialization versus diversification, recent research has sought middle-ground concepts such as 'related variety', the idea that it is the degree of relatedness among a city's or region's industries – as captured, for example, by input-output linkages, or by similar types of product, technology or knowledge – that matters for economic growth. The evidence for this view is thus far equivocal. And then others argue that what matters in today's globalized economy is not sectoral structure, but the functions and tasks that a city or region performs, including its position and role in various supply chains and productions networks (Baldwin, 2016). The data on these sorts of activity are however difficult to assemble and are not readily available for the British system of cities.

Defining specialisation

Here we use our 82-sector disaggregation of city economies to examine the degree of sectoral specialization of the Core Cities, and how this has changed over the 1971-2015 period. There are many measures of specialization

³ Belfast is only available at a 19 sector disaggregation.

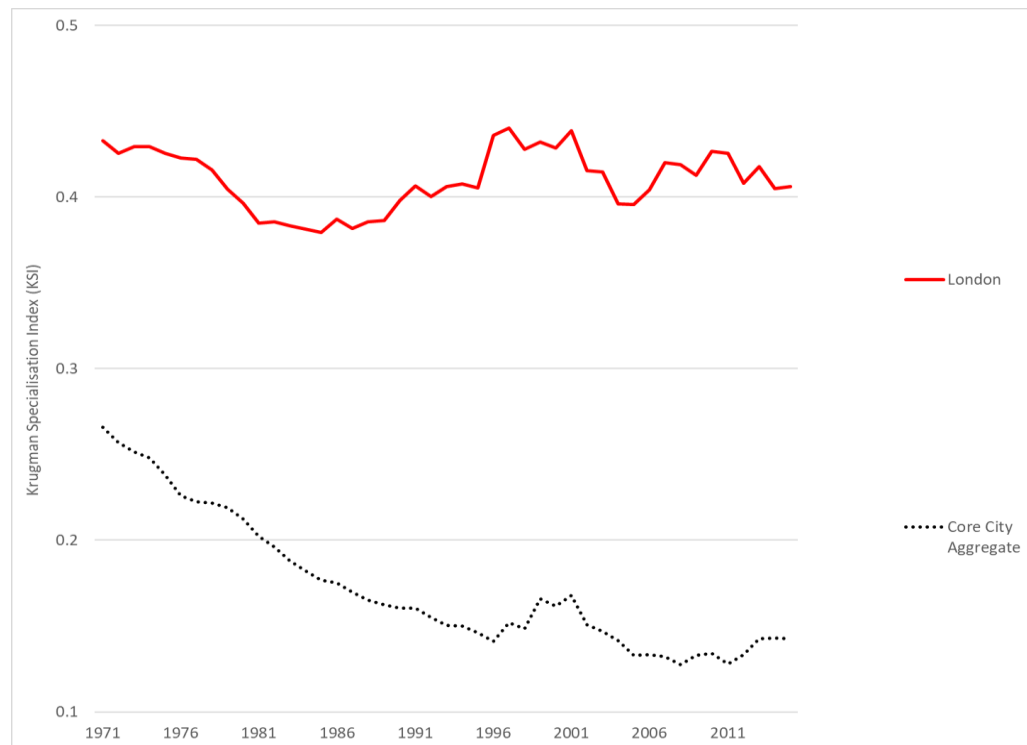
(diversity). The measure of specialization used here is the so-called Krugman Specialisation Index, KSI, defined as

$$KSI_t^i = \frac{1}{82} \sum_{j=1}^{82} |s_{j,t}^i - s_{j,t}^{GB}|$$

where, for a given year t , the index is the sum of the absolute differences between the employment share of each sector j in city i and the corresponding employment share of that sector j in the national (GB) economy. The index ranges from a value of 0 where the city's economic structure is the same as the national structure, to a maximum of 2, where the city has a completely different structure. The higher value of the index, the more specialized is the city (compared to the national economy), i.e. the KSI is a measure of *relative* specialisation.

Figures 3.1 and 3.2 show the evolution of the KSI calculated at 82 sector detail.

Figure 3.1: Krugman Specialisation Index – 82 sector detail (1971-2015)



Note: Belfast added from 1990 onwards.

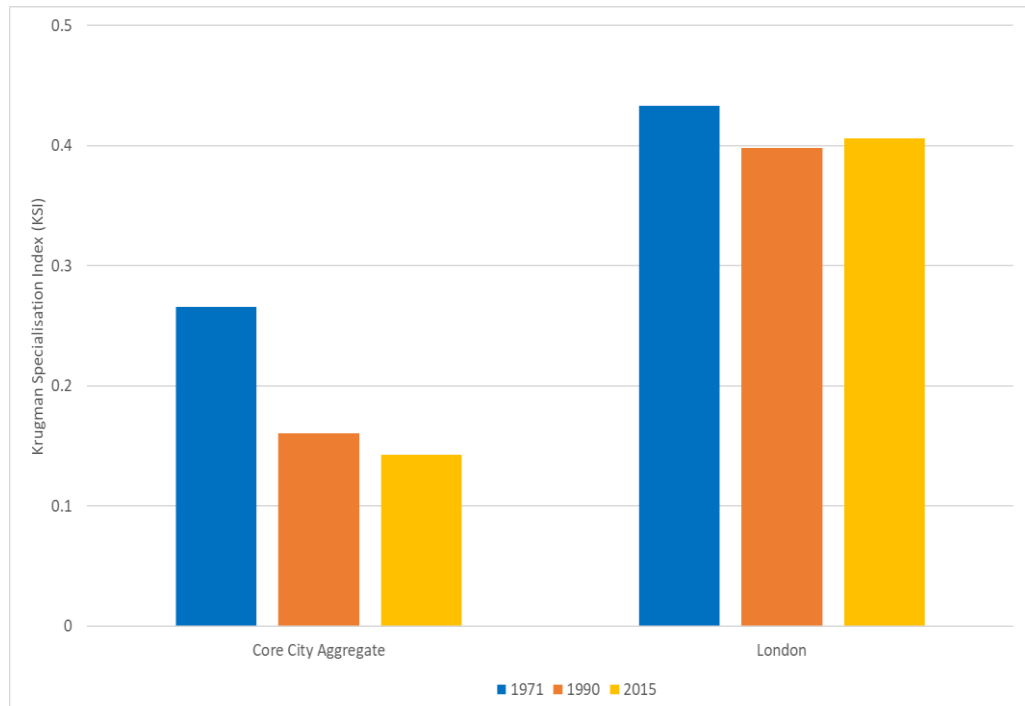
Source: CE Calculations

Some stylised facts emerge from this visualisation:

- London has maintained a relatively high level of specialisation when compared to the Core City average. It dips slightly in the 80s when it transitions from an industrial manufacturing hub to a financial services centre, however it maintains a high level of specialisation after this point.
- The Core City Average sees a trend decline over time, this is due to the high levels of inner-city manufacturing reducing due to international

competition as markets were liberalised. In recent years the trends have started to stabilise with the KSI maintaining at around 0.15.

Figure 3.2: Krugman Specialisation Index – 82 sector detail (1971, 1990 and 2015)



Source: CE Calculations

- The Core City Average is consistently lower in every period, a key question is whether, and to what extent, London's higher productivity (Table 2.1) can be attributed to its maintenance of a higher degree of relative specialisation (Figure 3.1 & Figure 3.2).

3.3 Industrial structure

Broad sector shares

The reasons underpinning the changes in relative specialisation shown in Figures 3.1 – 3.2 can be seen in Table 3.1 below, which reports the changing shares of output across broad sectors (manufacturing, Knowledge-Intensive Business Services (KIBS)⁴, and the public sector). While a detailed sector analysis gives more nuance, the basic story is one of:

- A declining share of manufacturing across the nation, i.e. deindustrialisation.
- The rise of KIBS.
- The average public sector importance maintains its level across the Core Cities on average, which is slightly higher than the UK as a whole, however the importance of the public sector to London has decreased dramatically in recent years.

⁴ KIBS is defined as: Computer Programming and Consultancy, Information Service activities, Legal and Accounting activities, Head offices and management Consultancies, Architectural and engineering activities, Scientific research and development, Advertising and market research, and Other professional, scientific and technical activities.

Table 3.1: Core City Output Shares

Core City	Manufacturing			KIBS			Public Sector		
	1971	1990	2015	1971	1990	2015	1971	1990	2015
London	12%	7%	3%	3%	10%	19%	22%	19%	14%
Core City Average	26%	20%	12%	3%	6%	11%	24%	24%	25%
GB total	21%	16%	10%	4%	7%	14%	19%	22%	20%

Note: Belfast added to Core City average from 1990 onwards.

Source: CE Calculations.

Productivity decomposition

The findings on sector growth discussed above provides evidence of considerable structural convergence across cities and a general tendency for the degree of specialisation to fall. Using a well-established decomposition analysis, we can identify the relative contribution of between-sector (structural change) and within-sector effects to city-level productivity growth.

Following Kruger (2006, 2008), we can decompose a city's productivity growth rate over a given period t to $t+k$ into three components:

$$\frac{\Delta Y_{jt+k}}{Y_{jt}} = \frac{\sum_{i=1}^n s_{ijt} \Delta y_{ijt+k}}{Y_{jt}} + \frac{\sum_{i=1}^n \Delta s_{ijt+k} (y_{ijt} - Y_{jt})}{Y_{jt}} + \frac{\sum_{i=1}^n \Delta s_{ijt+k} \Delta y_{ijt+k}}{Y_{jt}}$$

where Y_{jt} and y_{ijt} refer, to total and sector-specific labour productivity levels (real GVA per employed worker) in city j at time t .

The first term on the right-hand side of the decomposition is interpreted as the 'within-sector' effect, which is the share-weighted average productivity growth of the individual industries in city j (the sectoral shares are held constant at their values at time t). The second term represents the contribution of shifts in sectoral structure, holding initial sectoral productivity differentials constant (as measured by differences from the city average productivity level). The third term measures the combined effect of structural change and sectoral productivity growth rates over the period. The second and third terms in the equation together represent the role of 'structural change' or 'between-sector' shifts in city productivity growth.

The findings from the decomposition analysis are shown in Table 3.2. This finding is in line with other decomposition studies (e.g. Martin et al, 2017) and indicates that the main determinant of city productivity growth has come from improvements in performance *within* individual sectors of activity rather than from shifts in city economic structure.

Table 3.2: Decomposition of Core City Productivity Growth

Core City	1971-2015			1971-1990			1990-2015		
	Total	Within	Between	Total	Within	Between	Total	Within	Between
London	123.8	172.2	-48.4	57.9	53.6	4.4	41.7	75.0	-33.3
Core City Average	79.9	103.9	-23.9	39.9	45.0	-5.1	28.6	37.3	-8.7

Note: Belfast added to Core City average from 1990 onwards.

Source: CE Calculations

The 'between-sector' or structural-change contribution is not only generally less important, but moreover in most cases is negative, indicating that cities have shifted structurally from higher productivity growth sectors into lower growth ones.

3.4 Export intensity

Importance of a city's tradeable base

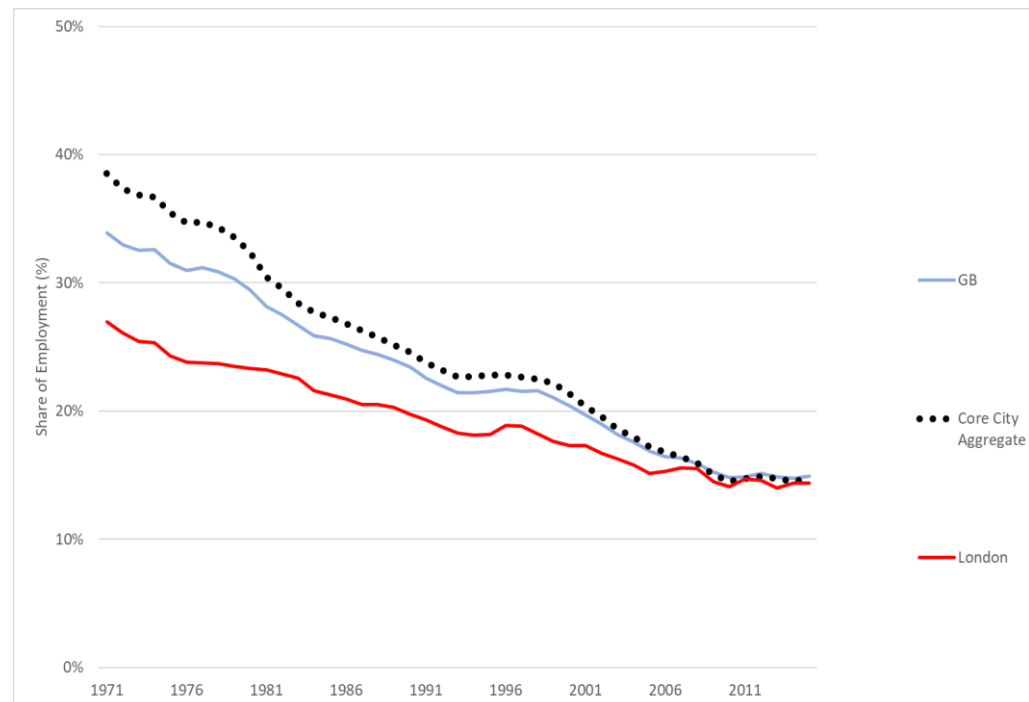
The importance of the tradable base of a regional (or city) economy in underpinning economic performance figures prominently in most economic theory. For example, it is at the centre of Kaldor's model of increasing-returns driven cumulative causation (Kaldor, 1981) whereby the more competitive a region's (or city's) exports (in terms of productivity), the greater the demand for that region's (or city's) tradable products and services, the more this stimulates output (and employment), which in turn stimulates productivity-enhancing innovation and investment, which in its turn increases productivity, and so on, in a circular and cumulative manner. More recently, van Dijk (2014) also agrees that 'the tradable sector is the backbone of a regional economy'.

Obtaining a city-based measure of export intensity

Trade data are not available below aggregate (NUTS1) regional level in the UK, however, meaning that an alternative method is required if some stylised facts are to be obtained on city-level performance. Our approach, therefore, is necessarily an indirect and approximate one. We first identified those sectors which at the UK national level are 'export intensive'. A threshold of 'export intensity' was used, defined as those sectors exporting at least 50 percent of their output or services overseas (the sectors are listed in Appendix D).

Figure 3.4 shows the evolution of export intensity across the Core Cities, defined as the share of employment within export-intensive sectors.

Figure 3.4: Core City Export Intensity



Source: CE Calculations

This shows a trend decline in export-intensity, which mirrors the decline in manufacturing sectors during the UK's deindustrialisation period. The trends

seem to have flattened off in the past decade, as the growth of tradeable services within KIBS has offset manufacturing, but there seems little prospect of getting back to levels of intensity seen during the 1990s.

3.5 Conclusions

A source of debate amongst economists is determining the key drivers behind growth in a region has been whether it should aim for specialisation or diversity in economic activity. History provides multiple examples of specialised economies that have generated growth through specialisation, but also demonstrates that this specialisation can lead an economic downfall, if this specialisation becomes obsolete. This chapter focused on the effects that specialisation has had on the Core Cities, by using the metrics below.

The KSI indicator for the Core City Average reduces over time as cities have converged towards the national average sectoral make-up. London maintains a high degree of specialisation relative to the Core City average, which is explained by London's increasing specialisation in financial services, in the process of becoming a global hub for finance.

The productivity decomposition matches the findings of previous studies. Cities have generally shifted from high productivity growth sectors to low productivity growth sectors. The main determinant of city productivity growth comes from improvements in performance within each sector, rather than shifts between them.

Export Intensity falls for the Core City average and mirrors the decline observed in the manufacturing sector,

4 The Resilience of the Core Cities to Economic Shocks

4.1 Introduction

This chapter investigates how resilient the Core Cities are against major shocks, in particular looking at how well (how fast and the extent to which) they recover from them. Four major shocks are analysed and compared, namely the recessions of 1974-76, 1979-82, 1990-92 and 2008-2010.

4.2 Measuring resilience

Defining resilience

Although there is a growing literature on regional and city resilience, there remains no generally agreed methodology for how it should be measured. The notion of resilience necessarily involves the specification of a counterfactual or expected position, that is some reference point against which to measure a city's resistance to and recoverability from a shock, such a major recession. There are several possible approaches to this issue (see Martin and Sunley, 2015), but given that a major national recession is an economy-wide event, a logical counterfactual or expectation is that each city should react in the same way as the national economy, which can thus be taken as the benchmark against which cities can be compared. Differences from this benchmark are therefore an indicator of each city's (or region's) relative resilience.

Measuring resilience

More specifically, our two measures of resilience for a given city, c , are:

$$RESIS_t^c = \frac{\Delta Y_c^{Contraction} - \Delta E(Y_c^{Contraction})}{|\Delta E(Y_c^{Contraction})|}$$

$$RECOV_c = \frac{\Delta Y_c^{Expansion} - \Delta E(Y_c^{Expansion})}{\Delta E(Y_c^{Expansion})}$$

where $\Delta E(Y_c)$ is the 'expected' rate of change of output in city c during a recession or recovery of length k years, given as:

$$\Delta E(Y_c^{t,t-k}) = \left(\frac{Y_{GB}^t - Y_{GB}^{t-k}}{Y_{GB}^{t-k}} \right) * Y_c^{t-k}$$

and Y_{GB}^t is the national (Great Britain) level of output in year t .

By definition, both measures are centred on zero, in which case a city would have the same resistance and recoverability as the national economy. This permits a 2x2 diagrammatic, as show below, for both classifying city resilience

and for tracking how a city's resilience changes over time from one shock to another.

Figure 4.1: Characterising a City's Relative Economic Resilience

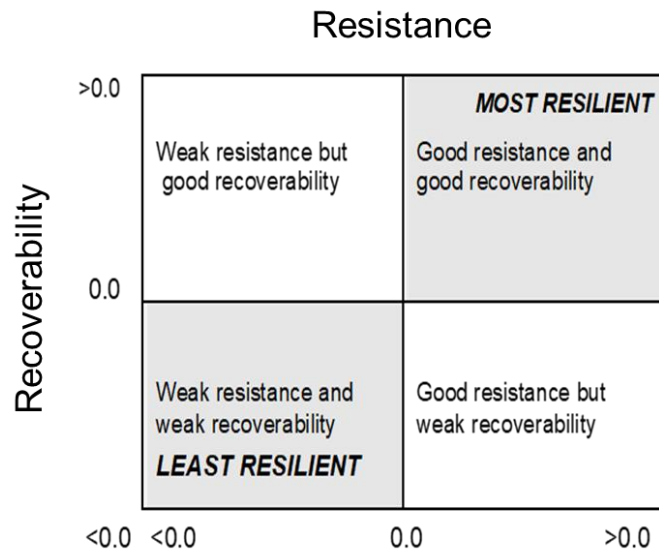


Table 4.1 shows the relative resistance and recovery indices for each of the joint-recession-recovery periods over the 1971-2015 period, using GVA as the underlying indicator. A negative (or below-national average) performance is coloured red for clarity.

Table 4.1: Core City Resistance and Recovery Indices

Core City	1973-75		1975-79		1979-81		1981-90		1990-91		1991-07		2007-09		2009-15	
	Resistance	Recovery	Resistance	Recovery	Resistance	Recovery	Resistance	Recovery	Resistance	Recovery	Resistance	Recovery	Resistance	Recovery	Resistance	Recovery
Core City Av.	-0.03	0.03	-0.70	-0.20	-0.17	-0.09	0.24	-0.37								
London	-0.20	-0.67	0.11	0.02	-0.76	0.20	-0.33	0.81								

Note: Belfast only available, and added to Core City average, from 1990 onwards.

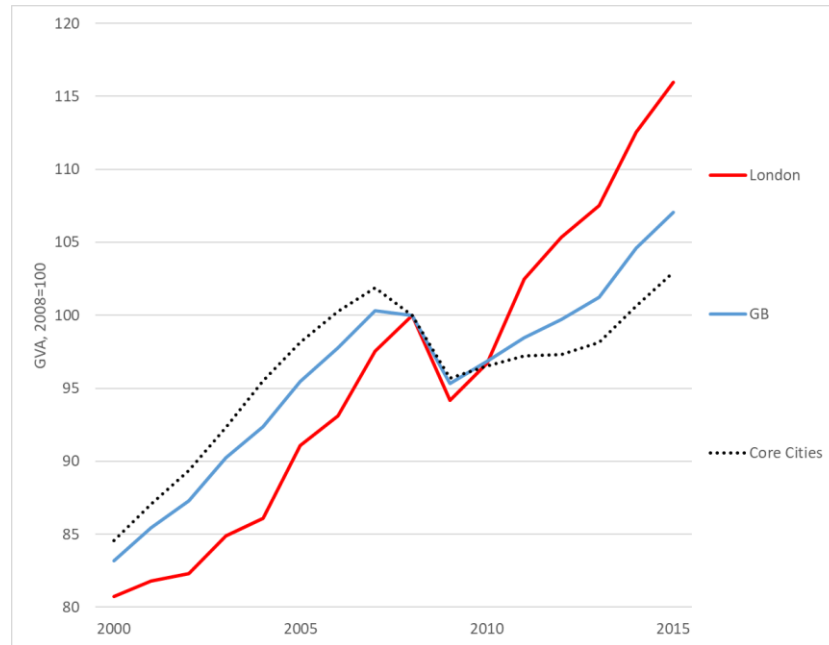
Source: CE Calculations

A key finding is that the average performance of the Core Cities is typically one of lower resistance and recovery than the national average in most of the recession-recovery cycles. In contrast, while London has not improved its resistance to shock, its ability to recover has improved with each shock it has faced.

Recovery trends post-Great Recession

Focussing on the most recent (Great) recession, Figure 4.2 shows how the recovery path (again, based on GVA) of the Core Cities average compare with London and the GB average.

What becomes clear is London's rapid recovery from the recession stands apart from the Core City Average. On average, the recovery trend of the Core City average is also slower than the one it had pre-recession.

Figure 4.2: Core Cities and the 2008-10 Recession

Source: CE Calculations

4.3 Brexit-related analysis

Uncertainty and modelling Brexit

The link between resilience and Brexit are strong, as the latter represents, on current political direction, a forthcoming shock to the UK economy which will affect cities and regions differently, according to their sector and functional specialisations. However, estimating the impact of Brexit on Britain's cities is fraught with difficulties – even predicting the national impact of Brexit has itself proved contentious. Not only do we not know what the precise Brexit will look like ('hard', 'soft', Canada-type, Norway-type, etc), studies of the national impact differ in what potential effects they incorporate (on trade, migration productivity, regulation, wages, financial markets, and the like), as well as in the types of models used (macro-economic, general equilibrium, partial equilibrium, gravity models, and so on).

Identifying sub-national effects

The problems escalate when it comes to estimating the possible impacts on Britain's regions and cities. Predictions of the impact on the country's regions and cities have varied (see, among others, for example, Springford, 2015; McCombie and Spreafico, 2017; Chen et al, 2017; Dhingra et al, 2017). Such variation is not in fact surprising. As in the national case, the predictions of the severity of the impact depend on the plausibility of the assumptions and models used, on the type of Brexit deal eventually secured, and on the data used. One key issue is that the potential adverse effect of Brexit on Britain's cities and regions is not just a question of the proportion of exports of a city or region that goes to the European Union. It also involves their supply chains and production networks, and the extent to which these are located in other cities and regions. There are important industries, such as motor vehicles and aerospace, that not only have localised spatial distributions within the UK, but also complex supply chains of intermediate inputs that criss-cross the EU border (HM Treasury, 2016). Then there are the likely spatially differential implications of restrictions on the migration of labour from the EU into the UK. Further, the long-run impact across cities and regions will depend on how far and in what ways local firms

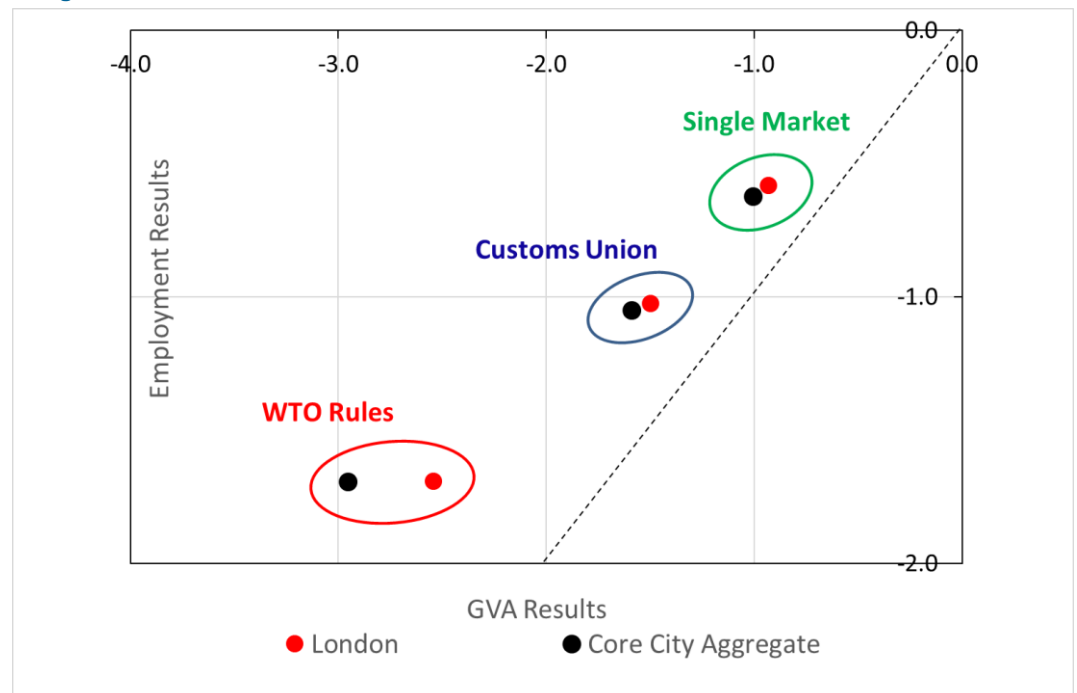
are able to reconfigure their exports away from Europe to other markets, as well as under what trade arrangements. And we cannot know whether and to what extent UK-based firms (both manufacturing and services) would relocate their activities to other EU member states in the case of a 'hard' Brexit. To further compound the problem, the sort of data required to generate estimates at the city level (on trade and so on) are simply not available and have to be proxied in some way.

*Cambridge
Econometrics
study*

In January 2018 Cambridge Econometrics concluded a study for the Greater London Authority (Preparing for Brexit)⁵, which prepared several different scenarios (Single Market, Customs Union, WTO rules) and produced UK-sector results using their E3ME global macro-econometric model⁶, based on assumptions for trade prices (tariff and non-tariff barriers), migration and investment.

Using the detailed sector output and employment results from this study, we have prepared an effective Core City effect by weighting the UK-sector results by each city's output and employment shares in 2015. The results are shown in Figure 4.3. As expected, the general finding of 'the harder the version of Brexit, the worse the impact' holds true for the Core City average and London, but there is a spread of effects within each grouping.

Figure 4.3: Core Cities Brexit Scenarios



Source: CE Calculations

4.4 Conclusions

Measuring resilience inherently requires a comparison between an actual and expected outcome following a shock. Following Martin and Sunley (2017), the national economy is used as the benchmark, against which to compare Core

⁵ See https://www.london.gov.uk/sites/default/files/preparing_for_brexit_final_report.pdf for the final published report.

⁶ See <https://www.camecon.com/how/e3me-model/> for more information.

City performance. The overall concept of resilience is then split into two sub-indices covering the resistance to the shock, and the post-shock recovery.

The results from the resilience indices show that, on average, the Core Cities resist the shock of the most recent (Great) recession better than the whole economy benchmark, but did not recover as quickly. This is the reverse of the situation in London. The growth trends following the Great Recession shown in Figure 4.2 display an increasing divergence in economic performance between London and the Core City average. The Core City Average only surpassed its pre-crisis peak in 2015, this can be explained by a lower need for restructuring the economy in London relative to the Core Cities.

Identifying the way that Brexit will affect the UK economy is difficult at the national level due to the uncertainty around what form the final deal will take, and this difficulty increases at a subnational level as data availability precludes analysis of trade flows and supply chains. However, using CE's E3ME global econometric-model and apportioning sector results to obtain an effective (weighted) city-level effect shows that (unsurprisingly) a harder Brexit will lead to worse impact on the Core Cities. Regardless of the form of the final Brexit deal, all of the Core Cities will experience a relative fall in GVA and employment.

5 Conclusions and Policy Implications

5.1 Main findings

A number of key findings emerge from the above analyses.

1. Considered as a group, since the beginning of the 1970s the Core Cities have tended to lag behind the national economy in terms of growth of output, and employment, and have fallen progressively behind (Figures 2.2 and 2.3).
2. In terms of productivity growth, as a group the Core Cities have more or less kept pace with the national aggregate (Figure 2.5), but have fallen progressively behind London: between 1971-2015, productivity in the Core City group grew 45 percentage points slower than in London. And among the Core Cities themselves productivity differences widened over this period.
3. Comparisons with London are in fact very illuminating. Until the late-1980s, London's economic performance also lagged the national average. Following 'Big Bang' in the mid-1980s, which opened up the nation's financial markets and institutions, London's economy underwent a major favourable 'turnaround', powered by the city's dominance in finance and its role in the global financial system. This has been particularly evident in terms of output and productivity growth (Figures 2.3, and 2.5). In effect, London 'reinvented' itself. The Core Cities were not so well placed, however, and have since struggled to re-orientate their economies to the extent needed to overcome the effects of deindustrialisation.
4. The average Core City has experienced a decline in specialisation (Figures 3.1 – 3.2). This was particularly rapid over the 1970s and 1980s and first half of the 1990s – reflecting in part the deindustrialisation process – since when it has slowed somewhat. The Core Cities have become both more diversified and more similar in terms of sectoral structure. In fact, our other research has shown this to be a feature of almost all British cities (Martin et al, 2018). The notable exception is London, which has maintained more or less the same degree of specialisation since the 1970s, though the nature of that specialisation has changed, away from manufacturing towards financial and other knowledge-intensive business services.
5. One consequence of the shift away from manufacturing has been a decline in employment within export-intensive sectors across all of the Core Cities. The trends seem to have flattened off in the past decade, as the growth of tradeable services within KIBS has to some extent offset manufacturing, but there seems little prospect of getting back to levels of employment 'export intensity' seen in the 1970s and 1980s.
6. A further, and worrying, issue is the impact that the shift from manufacturing to services has had on productivity growth, given that the former tends to have greater scope for productivity advance than many types of the latter. Thus, a decomposition analysis shows that structural change has had a negative impact on productivity growth for the average

Core City. It also shows that the main source of productivity growth has come from within-sector improvements.

7. Of particular interest (and a neglected issue in most studies of city economic performance) is the resilience of the Core Cities to major shocks. This is particularly relevant because the impending exit of the UK from the European Union has the potential to be one of the most disruptive economic shocks of the post-War period.
8. Estimating the possible impact of Brexit across the Core Cities (and indeed across any local areas of the UK) is fraught with difficulty: as the adage says, the only thing predictable about prediction is that it is invariably wrong. Not only is the nature of the eventual precise exit deal still unknown, the detailed data needed to construct an accurate estimate of its impact on individual cities are not available and have to be approximated or proxied in some way. Our own estimates are generated using the estimates of the national sectoral impacts of Brexit from the E3ME macro-economic global trade model developed by Cambridge Econometrics, and applying these to the sectoral mix of each Core City. This exercise shows, unsurprisingly, that the most severe negative impact (on both output and employment) would be associated with a 'hard' Brexit, that is no trade deal with the European Union and a reversion to WTO trade rules (Figure 4.3). As stressed above, these (and indeed other estimates for localities and regions across the UK) have to be treated with due caution, and may well understate what could be the outcome, given that we do not have detailed information on what may be the likely impacts on, and possible decisions of, individual firms in each Core City. Also, given that we have found that sectoral structure as such may only play a small role in shaping the economic performance of the Core Cities, and that within sector effects are more important, estimating Brexit impacts on a sectoral basis may not be the most relevant approach.

5.2 Policy implications

While it is not within the remit of this report to set out specific policies for the Core Cities, jointly or individually, the analyses above, supplemented by more detailed work we have undertaken on the economic performance of the UK's cities and regions (Martin, 2015; Martin, Pike, Tyler and Gardiner, 2015; Martin and Gardiner, 2018; Martin, Sunley, Gardiner, Evenhuis and Tyler, 2018) suggest the following brief comments on policy. These can be broadly described under 'national' and 'city' levels.

National level policies

National-level policies to achieve a more spatially balanced economy date back 90 years to the Industrial Transference Scheme introduced in 1928, followed by the Special Areas Act in 1934. The problem facing national policy-makers then was the structural decline of northern industrial towns, cities and areas, on the one hand, and the concentration of the emerging 'new economy' of mass consumer goods industries in and around Greater London, on the other (Scott, 2007). Even though some narrowing of regional and local economic disparities occurred over the post-war years, London remained the most prosperous part of the UK. And as our analysis has shown, even though London's growth slowed in the 1970s and 1980s as it suffered deindustrialisation, over the past three decades it has rebounded once more,

again as the leading centre of another 'new economy', this time based on global finance and high-level knowledge-intensive business services. A key point for policy is that nine decades of regional and urban policies designed to promote growth in northern cities and regions and enable them to 'catch up' with London have had minimal success. Put another way, the gap in economic performance between the Core Cities and London is not some new development, but a long-standing, systemic one. This is a key conclusion suggested by our analysis.

It is systemic in the sense that London's economic lead and its capacity to repeatedly 'reinvent' itself have much to do with the fact that the key levers of the UK economy - government, policy-making, financial institutions and much of corporate decision-making – are concentrated in London and its hinterland. The UK is one of the most spatially centralised of OECD economies. Much national policy, although ostensibly non-spatial, in practice is both influenced by conditions and imperatives in, and ends up favouring, the London metropolis. Unless and until there is a significant degree of decentralisation of the political and institutional structures underpinning the national economy, the scope for 'catch-up' by northern cities and regions is likely to be restricted (Martin, Pike, Tyler and Gardiner, 2015; Martin and Gardiner, 2018).

Recent policy developments and pan-city programmes

In this context, recent national level policy developments would appear to be useful steps in the right direction. These include: the declaration of a commitment to boost the major cities making up what George Osborne, as Chancellor of the Exchequer, called the 'Northern Powerhouse' (Manchester, Liverpool, Leeds, Sheffield, Newcastle), and similarly the Midlands Engine and Great Western Cities; the decision to construct a new High Speed Two rail link (HS2) from London to Birmingham, Manchester and Leeds; the granting of certain devolved fiscal and other powers to a limited number of major cities and combined authorities, with their own new 'metro-mayors'; a number of City Deals intended to support economic growth and job creation; a National Infrastructure Commission to advise central Government to undertake a nation-wide infrastructure assessment; and the introduction of a new, 'place-based' National Industrial Strategy. These are all welcome, and could potentially provide some of the building blocks for a much-needed policy programme to spatially rebalance the national economy.

However, these various initiatives are not coordinated, operationally or spatially, nor based on any coherent strategy specifically focused on the Core Cities. The Government's commitment to promoting a 'Northern Powerhouse' to "rival that of London" seems to have lost momentum, and arguably has fallen victim to the demand of securing a satisfactory Brexit outcome.

Much has been written on the benefits to the Midlands and northern regions of the proposed HS2, the argument being that a faster rail connection of Midlands and northern Core Cities with London will help drive economic growth in the former. The challenge is to ensure that smaller cities will benefit by being properly connected and integrated with HS2. The evidence from France, which has a high-speed rail system for some time, is relevant here. The effects of high-speed rail investment in France is mixed, with Paris and the largest regional cities such as Lyon benefiting, but smaller regional centres seeing an outflow of businesses. What is also needed, therefore, are substantial investments to improve the rail and road networks and connectivity among and between the Core Cities. The HS3 rail system championed by the

National Infrastructure Commission, which would link Liverpool in the west to Newcastle and Hull in the east would bring key benefits to northern cities. Upgrading and improving the rail and road network among and between the major Northern Powerhouse cities and between these and their surrounding commuter cities would enable this broad northern metropolitan area to *function as a multi-regional agglomeration of inter-linked labour markets and supply-chain networks*. Based on this logic, the same would therefore be the case for other clusters of cities e.g. the Midlands Engine and Great Western Cities areas.

Yet again, while devolution is certainly necessary for powering the economies of the Core Cities, and other areas outside London, of itself it is not sufficient. Much will depend on the scale of financial resources and powers actually devolved (an issue that had been raised by Lord Heseltine in his report 'No Stone Unturned', 2012). And despite its claim to be 'place-based', the new Industrial Strategy merely regards place as one (and the last) of 10 key pillars of a national policy. As the leading North American urbanist, Jane Jacobs (1984), famously argued, it is impossible to understand the 'national' economy without explicit reference to the performance and developmental needs of the cities and city regions of which it is composed. It is in cities that the bulk of a nation's wealth is created, its exports are produced, its jobs are located, and its incomes are spent. 'Place' is not some separate 'pillar' of industrial policy, a simple 'add-on' dimension, but should be the central foundation on which to base and spatially configure key national policies on innovation, technology, skills, infrastructure, and so on.

There is also an issue of how far the above positive policy initiatives may in practice be undermined or weakened by other policies that could work to reinforce London's and the south's advantages. The most obvious concerns the geographical allocation of Governmental infrastructural spending. In recent years, this has by far favoured London and the South East, while regions like the North West and North East have received much lower per capita spending. Future infrastructural spending plans do not appear to entail any major shift towards northern cities. Likewise, plans to curtail central Government grants to local authorities, which will have to rely much more on local business rates, could well work against the less prosperous cities, and again benefit London most. And the new focus on promoting a high-technology corridor from Cambridge to Milton Keynes to Oxford will further boost the regional agglomeration centred on London.

Together, the Core Cities account for 25 percent of national output, slightly more than London (24 percent). Between 1992-2015, London's output grew by 87 percent in real terms; that of the Core Cities collectively by 38 percent. If the Core Cities had grown at the same rate as London, they would have contributed at least an additional £120bn to the national economy. There is an incontrovertible argument, therefore, that national policy initiatives, whether infrastructural investment, industrial support, technology spending, or other measures, should be explicitly targeted far more on the economies of the Core Cities. The latter are major centres of economic activity and need to be factored far more prominently into national policy-making.

City-level policies

Several features revealed by the analyses in this report raise policy issues at the city level.

All of the Core Cities have lost, albeit to different degrees, their former role as centres of manufacturing, and as a consequence much of the former manufacturing tradable base. A particular challenge that they have faced over recent decades has been that of re-orientating and reconfiguring their economies; or to put it another way, of finding or reinventing their economic role. As mentioned above, London has been able to achieve this, but largely because of its special status as the capital, and its inherited nexus of political, economic, and financial advantages.

*Specialisation
and
diversification
policy*

A key question in this regard is whether cities should seek to develop particular new specialisms as the basis for a new phase of growth. The evidence suggests that in fact the Core Cities, and indeed the overwhelming majority of British cities, have become less specialised over recent decades (Martin and Gardiner, 2018). London seems the major exception, in maintaining roughly the same degree of specialisation since the 1970s, though now in finance and certain business services rather than in manufacturing. This might suggest that the Core Cities should aim to develop new specialisms. However, there has long been a debate in academia over whether specialisation or diversification is most conducive to growth. Specialisation may well promote rapid growth for a while but carries with it potential problems of sectoral and technological 'lock-in' and vulnerability to the rise of competitors and to sector specific shocks. Several policy recommendations are to be found in the literature as alternatives to the 'specialisation versus diversification' debate:

- Related Variety – develop and build on activities that share similar or complementary knowledge, technology or inputs. Related variety (or related complexity) is also claimed to facilitate 'branching' into new activities over time, thus promoting adaptability.
- Smart specialisation – currently vogue in the European Commission⁷. Identify a region/city's particular strengths and comparative assets, and prioritise research and innovation investment in those assets and activities, and develop a shared vision for innovation led growth. Essentially the idea of dynamic comparative advantage revisited.
- Clustered diversity – recognises the advantages of clusters of specialised activities but based on a strategy of developing a variety of such clusters, and hence gaining the advantages of both specialisation and diversity. London, for example, has a variety of clusters, from finance, to law, to fashion, and so on. The nature of the clusters selected for policy support will, to a large extent, involve identifying a city's existing and potential strengths.
- Adaptive industrial ecosystem – fostering a dense local system of dynamic firms, skilled labour, innovation networks, local supply chains, and supportive institutions, possibly around a number of key high-productivity firms. Recent research, for example by the Bank of England, suggests that dynamic regions have a higher proportion of high productivity firms and a shorter tail of low productivity firms than less prosperous regions. Productivity leaders can have valuable demonstration effects on other local firms. Another key ingredient of a

⁷ See <http://s3platform.jrc.ec.europa.eu/what-is-smart-specialisation-> for more detail.

dynamic and adaptive local industrial ecosystem is the attraction and retention of a well-educated and skilled workforce. In the USA, for example, this factor appears to be a central driver of local economic success.

- There is little doubt that connectivity is a significant factor in local economic growth and development. It plays a key role in the economic dynamism of the London-Greater South East economy. Over recent years, major infrastructural investments have added to and reinforced the connectivity within this area. By comparison, investment in new transport infrastructure among and between northern cities has lagged. Arguably, substantial improvements to connectivity between the Core Cities in northern Britain would have greater economic benefit than HS2. Present-day rail connections between cities such as Liverpool, Manchester and Leeds are slow compared to comparable journeys made by commuters across Greater London. The proposed Northern Powerhouse Rail project (HS3) could help solve the problem of public transport journey times between the major cities in the North of England. According to analysis by TfN, currently fewer than 10,000 people in the North can access four or more of the north's largest economic centres within 60 minutes. This could rise to around 1.3 million if a Northern Powerhouse Rail were built. It would help create a more integrated 'metropolitan region' ('Northern Powerhouse'), which potentially could develop agglomeration economies on a scale to rival those of Greater London'.

Greater collaboration

Related to physical connectivity, an enhanced level of strategic collaboration could benefit neighbouring Core Cities. Fostering joint and collaborative development visions can have major economic gains. This is what is happening in the London-Greater South East, with the collaboration of several local authorities to form the London-Stansted-Cambridge Innovation Corridor, and what appears to a similar initiative emerging among local authorities along a Cambridge-Milton Keynes-Oxford innovation corridor. Both of these involve integrated development strategies covering housing, skills, infrastructure and innovation and business support. What scope exists for similar collaborative policy programmes among the northern Core Cities is surely a pertinent issue.

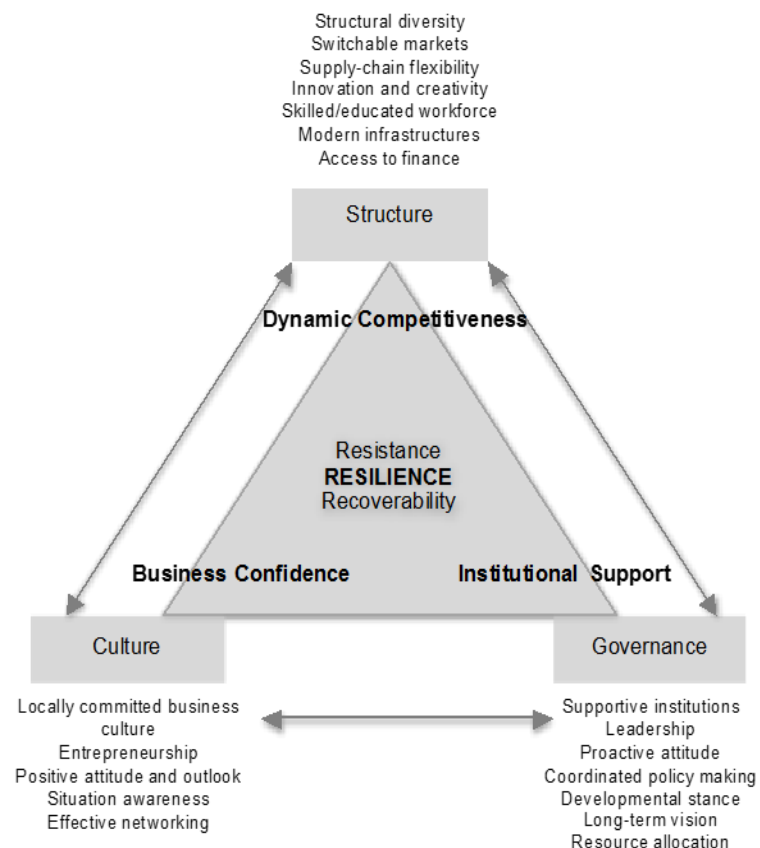
Building in resilience

Underpinning these and other such policy initiatives should be the aim of building economic resilience, of promoting a city economy that is both more resistant to the shocks that inevitably occur from time to time, and more able to recover quickly from them. This is not just an aggregate city economy issue, however. It also has distributional dimensions, in the sense that a city with a high level of income and job inequality is not only likely to be less resistant to shocks, but to experience hysteretic effects in that unskilled and unemployed workers are less likely to benefit from the economic upturn when that occurs. There is mounting evidence that countries, regions and cities that are less resilient to shocks also tend to have lower growth rates over the long term.

Building economic resilience for sustained growth will entail focusing policy simultaneously on several inter-related aspects of an integrated strategy involving at least three main aspects of a city's economy (Figure 5.1). The various elements and fundamentals (the industrial 'ecosystem') that promote local dynamic competitiveness; a local environment and culture that inspires

business confidence and commitment; and an local institutional system of support and leadership, with a collective vision for the city's development

Figure 5.1: Potential Policy Foci for Building City Adaptive Resilience



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Appendices

The appendices include:

- Appendix A: Description of CE LAD database and construction of Belfast data.
- Appendix B: Definition of the Core Cities as provided by Core Cities UK.
- Appendix C: Definition of 82 sectors (from ESRC work).
- Appendix D: Definition of export-intensive sectors (using 50% threshold).

Appendix A Database Construction

Cambridge Econometrics maintains a 45-sector LAD database which was extended backwards (to 1971) and also disaggregated further (to 82 sectors) as part of work for the ESRC-funded project ES/N006135/1 - Structural Transformation, Adaptability and City Economic Evolutions - led by Prof Ron Martin. The following information provides details of how this was achieved.

(i) Cambridge Econometrics LAD database (1981-2015, 45 sectors)

CE maintains a disaggregated database of employment⁸ and (constant price) GVA data by industry (45 detailed sectors) from 1981 for all unitary authorities and local authority districts in Great Britain.

This database is formed from a UK-level 86-sector database, which is based on raw data from the ONS and CE's own estimates. Regional (NUTS1) data are constructed at the 45-sector level, which are scaled and made consistent with the UK sectoral data. These data (back to 1992 for employees and 1996 for self-employed) are based on the quarterly workforce jobs data from the ONS as the main dataset which provides data by 19 industries by region, type (full-time, part-time and self-employed) and gender. To move from the 19 industries to 45 sectors, data from the Business Registry and Employment Survey (BRES) and Annual Business Inquiry (ABI), based on SIC07, were used to generate industry shares by each region

The GVA data are consistent with sectoral data at NUTS 2 level from the ONS Regional Accounts.

(ii) Extending the time period back to 1971

To extrapolate the dataset back to 1971, the growth rates of CE's existing historical dataset are used, which are themselves based on older ONS data from the Census of Employment and ABI. These older datasets were converted to the latest standard industrial classification (SIC07) to maintain consistency with the more recent data. Historical boundary changes for regions and local authorities were also adjusted for, as part of this process to ensure consistency.

(iii) Increasing disaggregation to 82 sectors

At local area level, employment data are the most readily available from the ONS (through NOMIS⁹), and these data were the first to be collected and processed. The latest available data (BRES data based on SIC 2007) were obtained, with older vintages of data (from BRES¹⁰, ABI and the Census of Employment¹¹) being used to construct consistent historical growth rates which were then applied to the latest levels to give a consistent back series for

⁸ The measure of employment is workplace based jobs, which include full-time, part-time and self-employed.

⁹ <https://www.nomisweb.co.uk/>

¹⁰ BRES is an ONS business survey which (from 2010 onwards) replaced the Annual Business Inquiry (ABI).

¹¹ Also obtained from NOMIS.

each sector and local authority district. Table 2 below provides a summary of sources.

Table A1: Datasets used for detailed sector disaggregation

Dataset	Time period	Sectors
BRES	2009-2014	86 (effectively 82*) ¹²
BRES	2008-2009	86 (effectively 82*)
Annual Business Inquiry - Employee Analysis	1998-2008	60 (split to 82)
Annual Business Employment - Survey Employee Analysis	1991-1998	60 (split to 82)
Census of employment – Employee Analysis	1975-1981	183 (aggregated to 82)
Census of employment – Employee Analysis	1971-1974	183 (aggregated to 82)

The GVA data were then constructed by applying NUTS2-level productivity data (as provided by the ONS) to the employment data. This required the mapping of NUTS2 regions to districts and the mapping of the detailed sectors to the fewer sectors for which sub-national productivity data is available from the ONS.

Finally, LAD-level population data were collected from the ONS mid-year population estimates and presented alongside the employment and GVA data.

(iv) Data for Belfast

Data for Belfast are not part of the LAD database constructed for the ESRC project as this only covered Great Britain. To construct data for Belfast, two main sources were used:

- CE's earlier Working Futures study for the former UK Commission for Employment and Skills (based on data from the Northern Ireland Census of Employment, the Agricultural Census and CE's UK regional data).
- Data from Belfast City Council.

The district (Belfast) employment data developed as part of Working Futures were updated to include the latest data from the Agricultural Census and to be consistent with CE's UK regional data used to construct the other Core Cities data. The Working Futures method is summarised below:

- Employment data by district and sector from the Northern Ireland Census of Employment are combined with agricultural employment data from the Agricultural Census from 2001 onwards.
- The data are extended back to 1990 using the average growth rate over 6 years.
- Estimates of self-employment by sector are generated under the assumption that the ratios of self-employed to employees at local level, by

¹² The 86 sectors mentioned in the table did not map well to the 45 sectors. As a result, the number of sectors were aggregated to map 82 sectors to the 45.

sector are the same as those at the corresponding regional level.

Agricultural self-employment data are taken from the Agricultural Census.

- The district data is scaled to be consistent with CE's regional (Northern Ireland) data, which is based on estimates of jobs at a regional level (quarterly workforce jobs, June figures) published by ONS. CE's regional data is in turn consistent with its UK data.
- Estimates of GVA by sector are based on employment by sector and productivity growth in the same sector in Northern Ireland as a whole. GVA will be constructed in 2013 prices for this Core Cities study.

Appendix B Core Cities Definitions

Table B1: Core City LAD Definitions

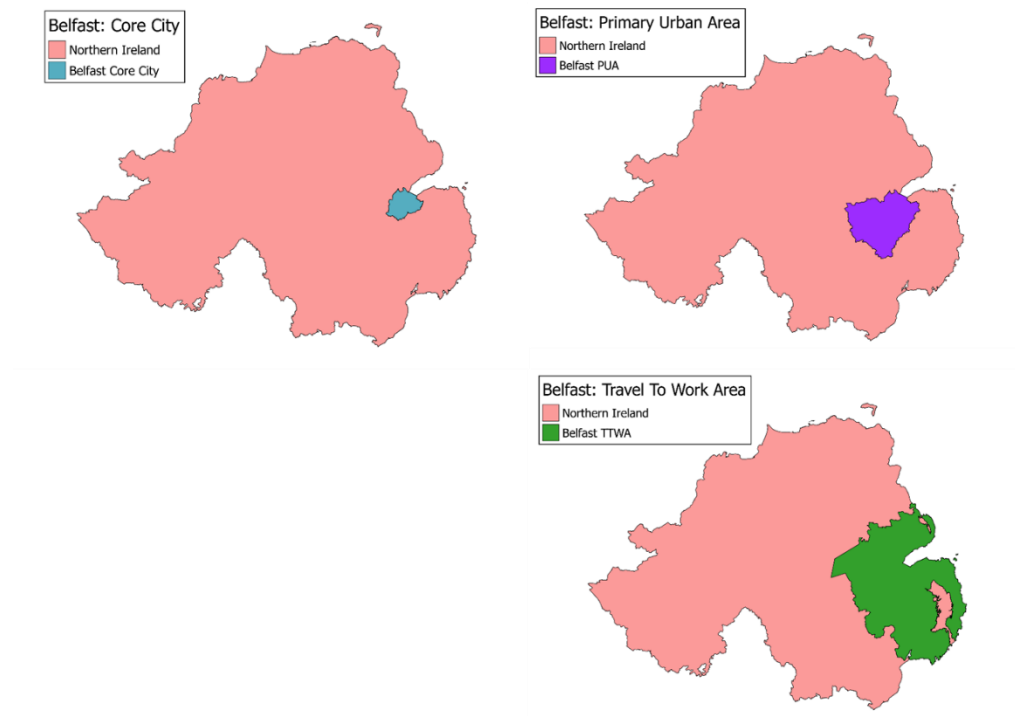
Core City	Local Authority Definition
Birmingham City Region	Birmingham Solihull Dudley Sandwell Walsall Wolverhampton Coventry Warwick District Council Stratford-on-Avon District Council Rugby Borough Council Nuneaton & Bedworth Council North Warwickshire Borough Council Hinckley & Bosworth Borough Council Cannock Chase Lichfield Tamworth East Staffordshire Redditch Bromsgrove Wyre Forest
Bristol City Region	Bristol, City of Bath and North East Somerset South Gloucestershire North Somerset
Cardiff City Region	Cardiff Vale of Glamorgan Bridgend Rhondda Cynon Taf Caerphilly Merthyr Tydfil Blaenau Gwent Torfaen Monmouthshire Newport
Glasgow City Region	Glasgow East Dunbartonshire East Renfrewshire Inverclyde North Lanarkshire Renfrewshire South Lanarkshire West Dunbartonshire
Leeds City Region	Barnsley Bradford

Core City	Local Authority Definition
	Calderdale Craven Harrogate Kirklees Leeds Selby Wakefield York
Liverpool City Region	Halton Knowsley Liverpool Sefton St. Helens Wirral
Manchester City Region	Bolton Bury Manchester Oldham Rochdale Salford Stockport Tameside Trafford Wigan
Newcastle (North Tyne)	Newcastle upon Tyne North Tyneside Northumberland
Nottingham City Region	Broxtowe Gedling Rushcliffe Nottingham
Sheffield City Region	Barnsley Bassetlaw Bolsover Chesterfield Derbyshire Dales Doncaster North East Derbyshire Rotherham Sheffield
Belfast	Belfast

Source: Core Cities UK.

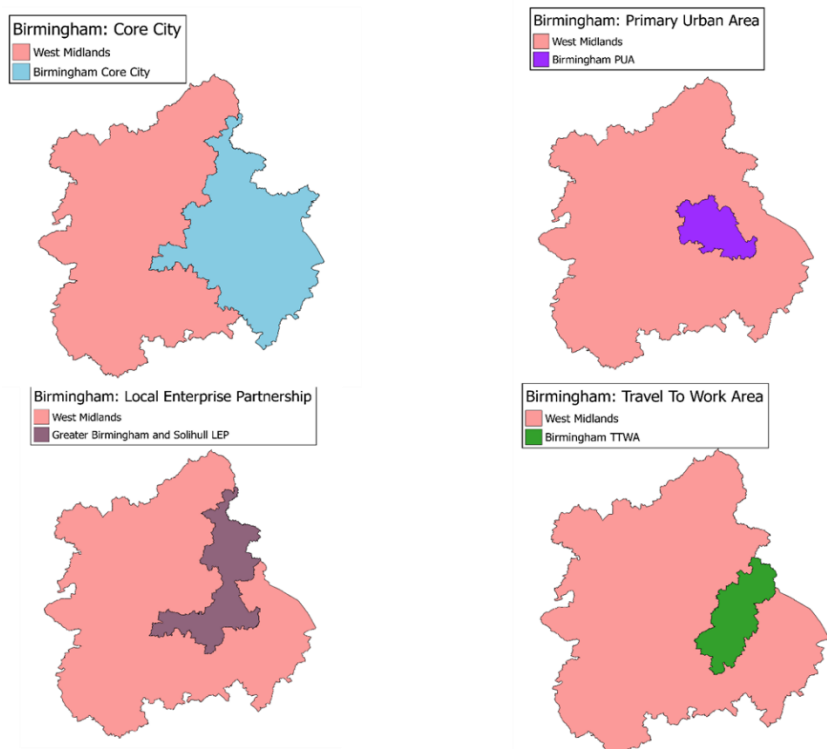
The maps for the core cities, comparing (where applicable) the core city definition, primary urban area, LEP, and TTWA, are provided in the figures below.

Figure B1: Belfast Core City Area Comparison



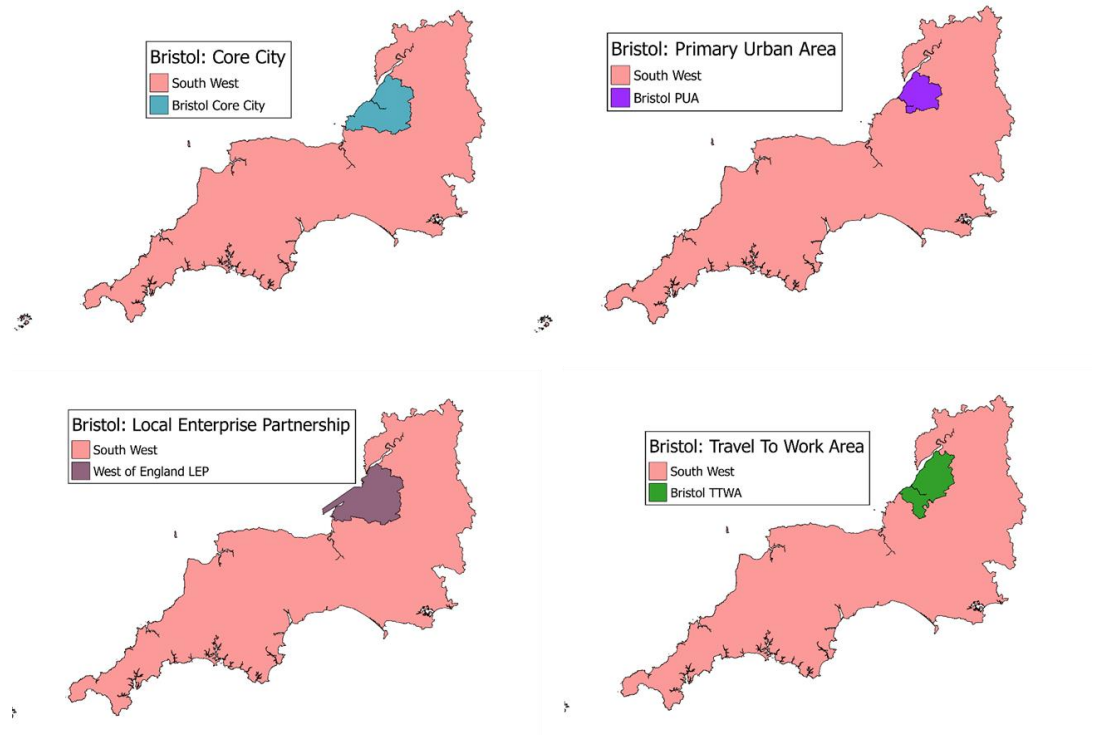
Source: Core Cities UK, CE Calculations

Figure B2: Birmingham Core City Area Comparison



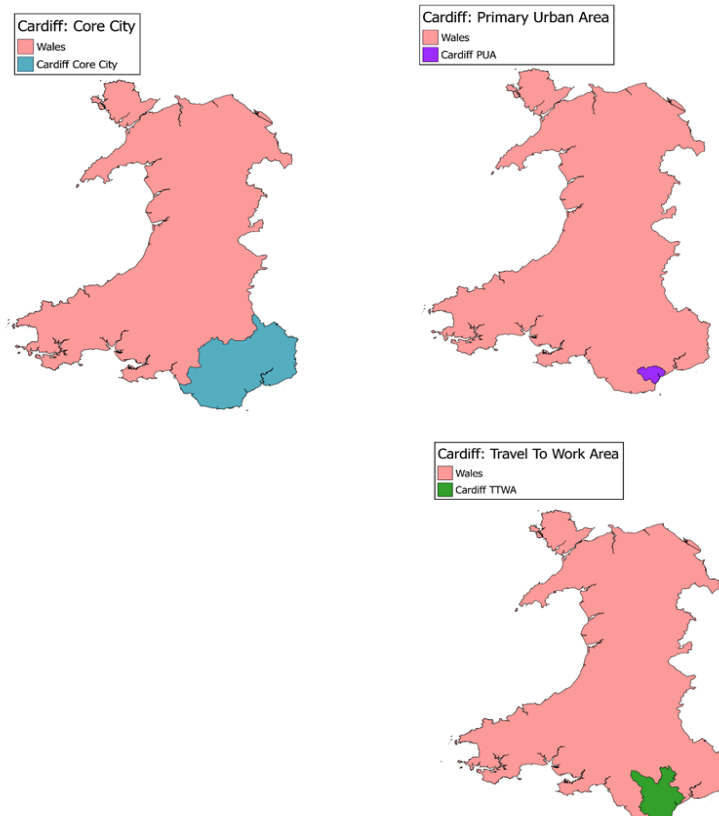
Source: Core Cities UK, CE Calculations

Figure B3: Bristol Core City Area Comparison



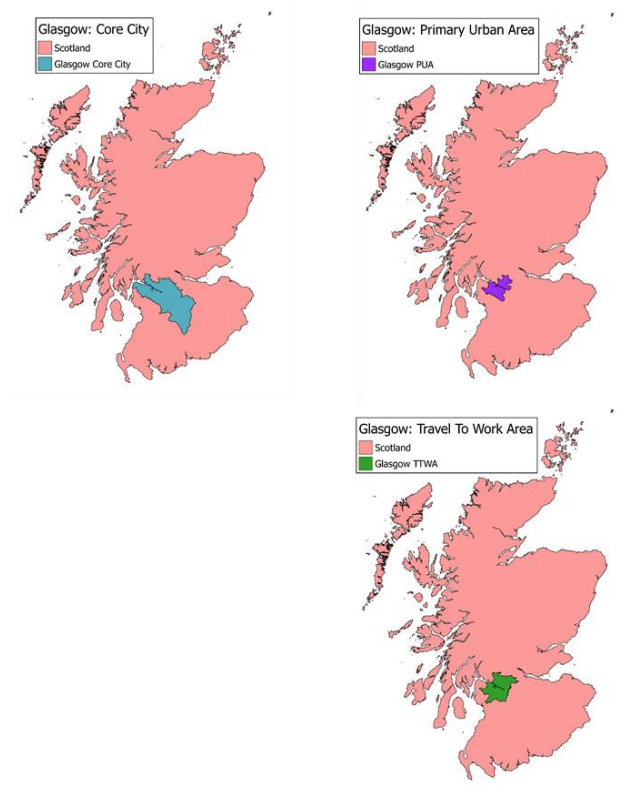
Source: Core Cities UK, CE Calculations

Figure B4: Cardiff Core City Area Comparison



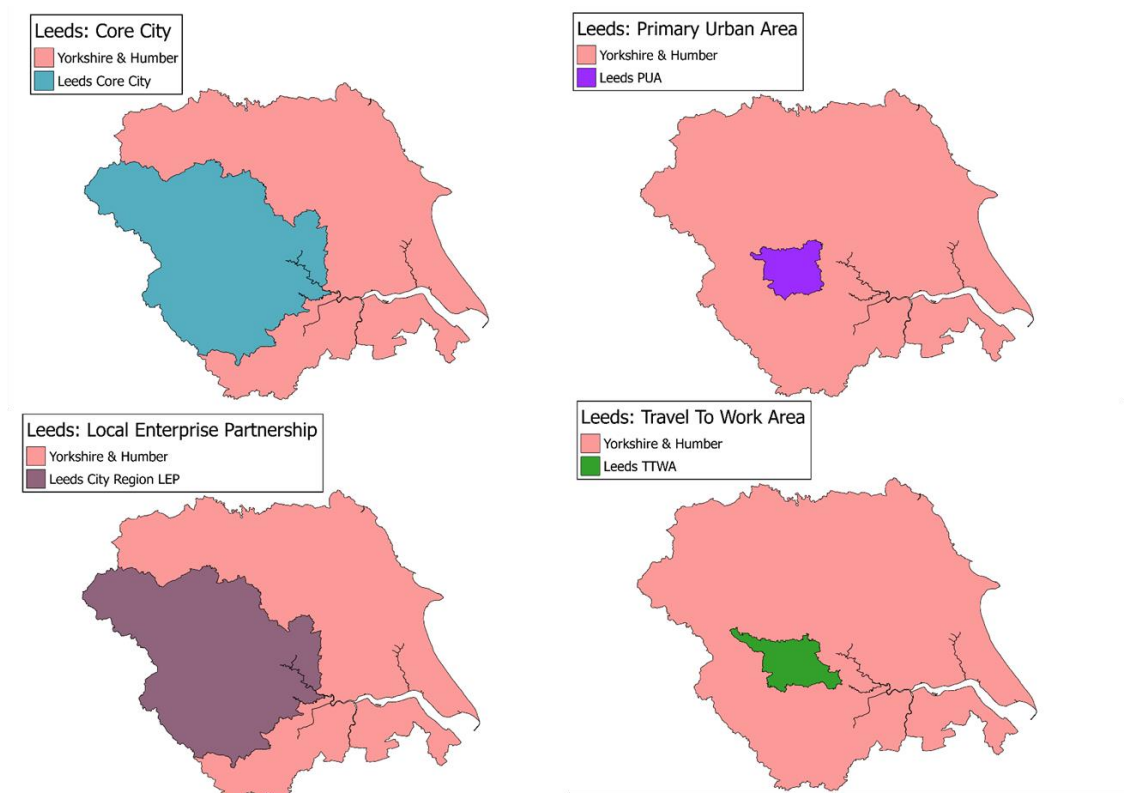
Source: Core Cities UK, CE Calculations

Figure B5: Glasgow Core City Area Comparison



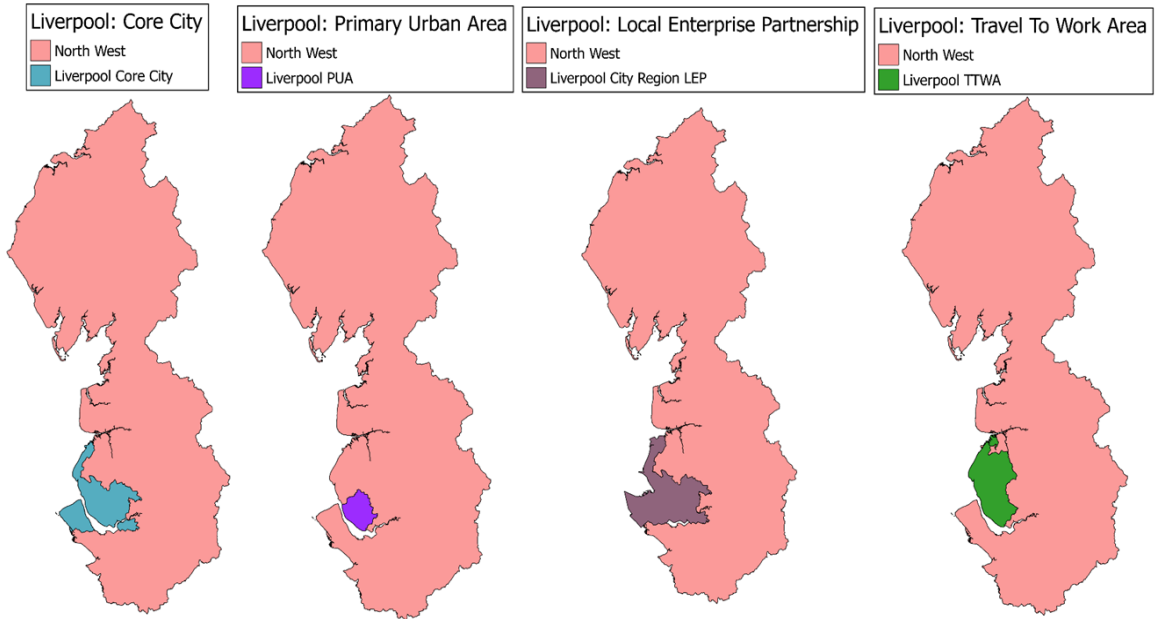
Source: Core Cities UK, CE Calculations

Figure B6: Leeds Core City Area Comparison



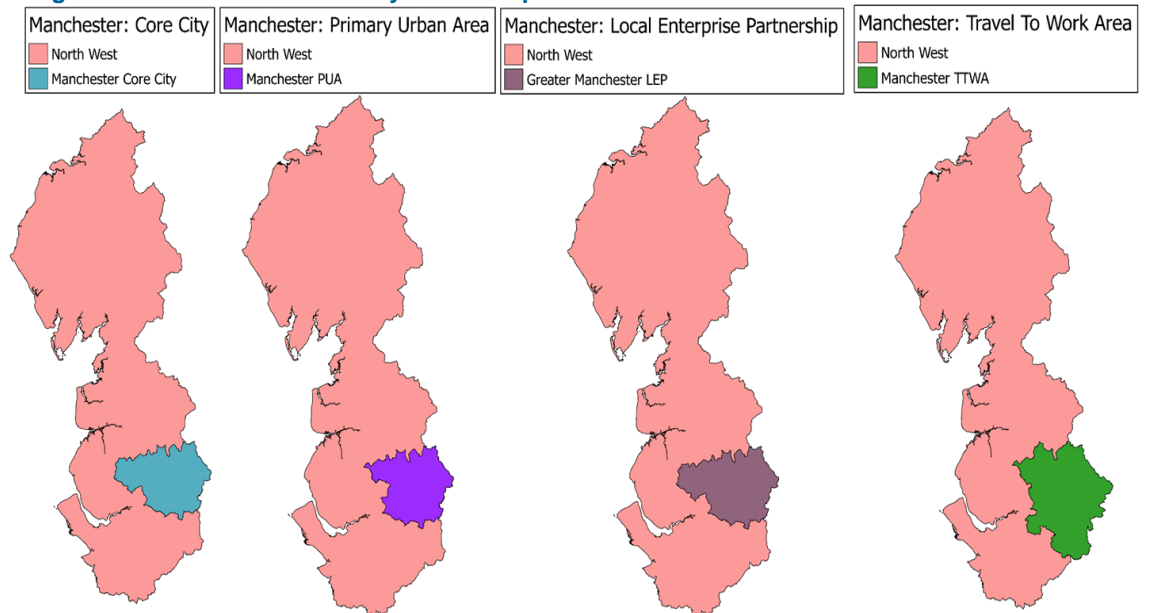
Source: Core Cities UK, CE Calculations

Figure B7: Liverpool Core City Area Comparison



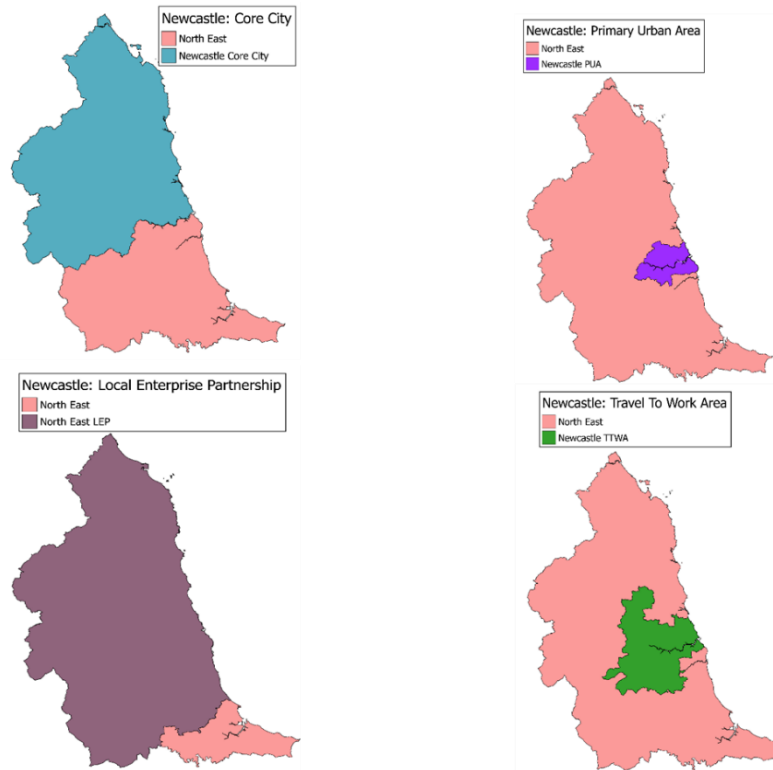
Source: Core Cities UK, CE Calculations

Figure B8: Manchester Core City Area Comparison



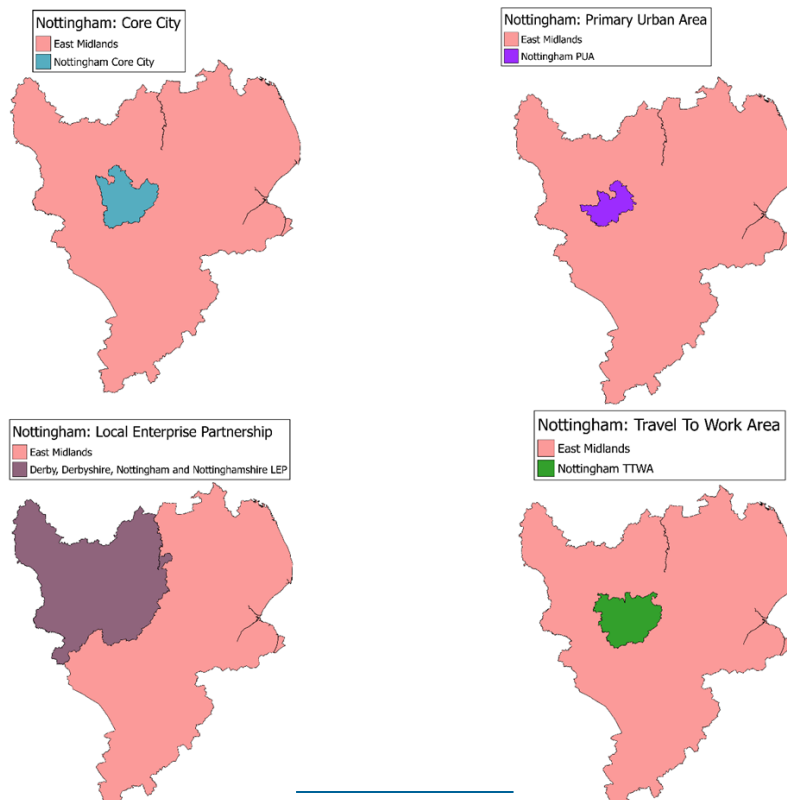
Source: Core Cities UK, CE Calculations

Figure B9: Newcastle Core City Area Comparison

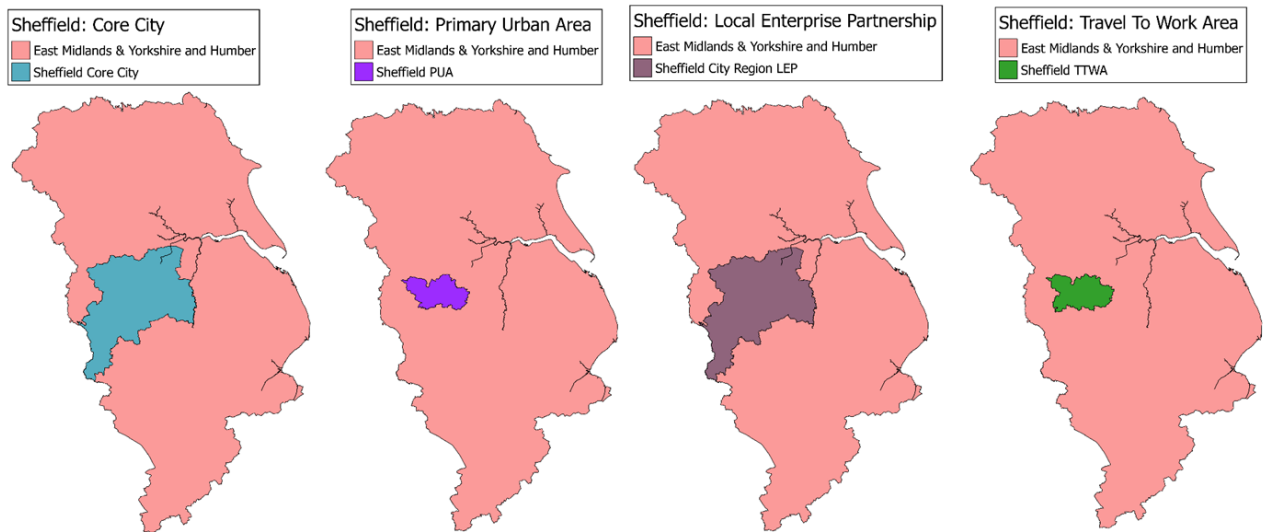


Source: Core Cities UK, CE Calculations

Figure B10: Nottingham Core City Area Comparison



Source: Core Cities UK, CE Calculations



Source: Core Cities UK, CE Calculations

Appendix C 82-Sector Definition

Sector Name	SIC 2007 codes
Crop and animal production, hunting and related service activities	1
Forestry and logging	2
Fishing and aquaculture	3
Mining of coal and lignite	5
Extraction of crude petroleum and natural gas	6
Mining of metal ores	7
Other mining and quarrying	8
Mining support service activities	9
Manufacture of food products	10
Manufacture of beverages	11
Manufacture of tobacco products	12
Manufacture of textiles	13
Manufacture of wearing apparel	14
Manufacture of leather and related products	15
Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	16
Manufacture of paper and paper products	17
Printing and reproduction of recorded media	18
Manufacture of coke and refined petroleum products	19
Manufacture of chemicals and chemical products	20
Manufacture of basic pharmaceutical products and pharmaceutical preparations	21
Manufacture of rubber and plastic products	22
Manufacture of other non-metallic mineral products	23
Manufacture of basic metals	24
Manufacture of fabricated metal products, except machinery and equipment	25
Manufacture of computer, electronic and optical products	26
Manufacture of electrical equipment	27
Manufacture of machinery and equipment n.e.c.	28
Manufacture of motor vehicles, trailers and semi-trailers	29
Manufacture of other transport equipment	30
Manufacture of furniture	31
Other manufacturing; Repair and installation of machinery and equipment	32, 33
Electricity, gas, steam and air conditioning supply	35
Water collection, treatment and supply	36
Sewerage	37
Waste collection, treatment and disposal activities; materials recovery	38
Remediation activities and other waste management services. This division includes the provision of remediation services, i.e. the cleanup of contaminated buildings and sites, soil, surface or ground water.	39
Construction of buildings, Civil engineering, Specialised construction activities	41,42,43

Sector Name	SIC 2007 codes
Wholesale and retail trade and repair of motor vehicles and motorcycles	45
Wholesale trade, except of motor vehicles and motorcycles	46
Retail trade, except of motor vehicles and motorcycles	47
Land transport and transport via pipelines	49
Water transport	50
Air transport	51
Warehousing and support activities for transportation	52
Postal and courier activities	53
Accommodation	55
Food and beverage service activities	56
Publishing activities	58
Motion picture, video and television programme production, sound recording and music publishing activities	59
Programming and broadcasting activities	60
Telecommunications	61
Computer programming, consultancy and related activities	62
Information service activities	63
Financial service activities, except insurance and pension funding	64
Insurance, reinsurance and pension funding, except compulsory social security	65
Activities auxiliary to financial services and insurance activities	66
Real estate activities	68
Legal and accounting activities	69
Activities of head offices; management consultancy activities	70
Architectural and engineering activities; technical testing and analysis	71
Scientific research and development	72
Advertising and market research	73
Other professional, scientific and technical activities	74
Veterinary activities	75
Rental and leasing activities	77
Employment activities	78
Travel agency, tour operator and other reservation service and related activities	79
Security and investigation activities	80
Services to buildings and landscape activities	81
Office administrative, office support and other business support activities	82
Public administration and defence; compulsory social security	84
Education	85
Human health activities	86
Residential care activities	87
Social work activities without accommodation	88
Creative, arts and entertainment activities	90
Libraries, archives, museums and other cultural activities	91
Gambling and betting activities	92
Sports activities and amusement and recreation activities	93
Activities of membership organisations	94

Sector Name	SIC 2007 codes
Repair of computers and personal and household goods	95
Other personal service activities	96

Appendix D Export-Intensive Sectors

National Sectors exporting 50 percent or more of output:

Coke & petroleum
Chemicals etc
Motor vehicles etc
Textiles etc
Electronics
Machinery etc
Electrical equipment
Other transport & equipment
Water transport
Pharmaceuticals
Metals & metal products
Other manufacturing & repair
Food, drink & tobacco
Non-metallic mineral products
Mining & quarrying
Air transport
Other professional services
Arts
Financial & insurance
Wood & paper
Hotels