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Divergent cities in post-industrial Britain

Future of Cities: Working Paper

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Divergent cities in post-industrial Britain

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Foreword

The Future of Cities project has been informed by working papers commissioned by the [Lead Expert Group](#) and written by authors from academia and industry.

These papers highlight the key challenges and opportunities facing cities in the UK out to 2065. The Expert Group drew upon this evidence base to develop project outputs.

These outputs aim to inform near-term policy making in both local and central government, in order to achieve desirable long-term outcomes for UK cities.

Professor Sir Alan Wilson

Abstract

According to Moretti (2013), deindustrialisation has been responsible for a 'great divergence' between cities that have moved to become centres of innovation and ideas, and those that have continued to produce material goods. Other authors however, place more emphasis on trends in specialisation and differences in productive bases as the driving forces behind urban divergence. Somewhat similarly, Storper (2013) argues that recent divergence been fundamentally been driven by the fact that some cities have become more specialised in knowledge intensive sectors. While most of this interest in urban divergence has been based on US cities, recent European research also reports divergent processes. The aim of this paper is to examine the degree of divergence across UK cities and to analyse how far this has been driven by differences among cities in industrial structure and specialisation , tradable bases, and productivity.

Keywords: *Cities Post-industrialism, Structural change, Tradables Specialisation, City-specific effects*

I. Introduction : deindustrialisation, post-industrialisation and divergent city growth paths

For some years now a dominant interpretation of the consequences of deindustrialization and manufacturing decline for large cities in the Western world has prevailed and, indeed, remained largely unquestioned. In this interpretation, deindustrialization and the unsuitability of city locations for advanced manufacturing operations mean that old industrial cities are faced with decline and only those cities which succeed in shifting their economies to consumption activities, creative industries, and advanced producer services can look forward to a bright economic future. Further, as the story goes, those old cities that, historically, have been dependent on manufacturing and heavy industry are condemned to falling progressively behind their more post-industrial counterparts.

It is not surprising that early influential accounts of deindustrialisation were profoundly pessimistic about the future of large industrial cities. Industrial cities were creatures of the nineteenth century and correspondingly in the twentieth became the principal location of deindustrialization, showing the earliest symptoms of the process (on the USA case see, Bluestone and Harrison, 1982; for the UK, see Martin and Rowthorn, 1986). Many authors concluded that as manufacturing employment declined both absolutely and as a share of total employment, older industrial cities had lost their key economic rationale and would face relentless suburbanisation, a shift of activity out of cities to smaller settlements and more rural areas, and cumulative relative if not absolute economic decline. According to Fothergill et al (1988), for example,

[T]he relative decline of cities as centres of industrial production is an almost inevitable consequence of the process of economic change within an 'advanced' capitalist economy. Just as the unrestrained operation of the market economy led to the development of ever larger cities during the last century, in changed circumstances the market economy is eroding their industrial base (p.69).

Analyses of the viability of industrial cities were haunted by visions of economic decay, exit and disorder.

More recently however, research on city-regions in both the USA and Europe has suggested rather more heterogeneous and varied outcomes. According to recent research, cities have diverged significantly in their performances. While some older industrial cities have been devastated by the decline of manufacturing and have often appeared in the roll call of 'shrinking cities' (Pallagst et al, 2014), others have managed to remain stable and adapt, and yet others have shown evidence of some renaissance, reinvention, and recovery (Glaeser, 2005, Power et al, 2010). The recent economic records of older industrial cities in the United States have been highly divergent (Christopherson, 2009; Hobor, 2012; Moretti, 2013). One well-known reason for this divergence is that some of the largest global cities, which were once dominated by manufacturing, have been able to reinvent themselves as control centres for producer, finance and business services. In addition, other old industrial cities have diversified their economies and developed new service enterprises and cultural activities. However, what is perhaps less widely recognised, is that divergence has also been driven by the way in which some smaller, second-order manufacturing cities have been able to find new productive roles and niches.

According to several recent theses, deindustrialisation has not produced a uniform decline in large cities but has rather triggered a divergence in performance between 'reinvented cities' and those that have been unable to adapt and respond. The latter face a chronic jobs gap and a cumulative spiral of decline.

Explanations of this trend to urban divergence identify a number of plausible underlying causes. However, none of these have, as yet, been intensively tested and scrutinised. According to Moretti (2013), for example, deindustrialisation has been responsible for a 'great divergence' between cities that have moved to become centres of innovation and ideas, and those that have continued to produce material goods. The former enjoy a virtuous spiral based on agglomeration forces in which innovation 'ecosystems' attract highly skilled migrants, and these pools of skilled labour then attract more innovative firms. In contrast, those cities that have not developed new innovation systems face worsening living standards and diverging social qualities (Moretti, op cit). This has produced a widening dispersion in nominal wages between growing and declining urban areas, as both highly skilled and lower skilled service occupations in growth cities are better rewarded. In similar fashion, Berry and Glaeser (2005) see the uneven growth of human capital across cities as leading to variations in growth and to a slowdown in economic convergence. In their view, cities with a high stock of human capital tend to have more entrepreneurial, small-firm economies and, over time, such economies act as magnets for more skilled employees. But while Glaeser (2011), envisages several possible ways to attract creative human talent to cities he remains pessimistic about the fortunes of declining industrial areas.

The path back for declining industrial towns is long and hard. Over decades they must undo the cursed legacy of big factories and heavy industry (Glaeser, 2011, p. 67).

Other authors however, place more emphasis on trends in specialisation and differences in productive bases as the driving forces behind urban divergence. Storper (2013), for example, argues that recent divergence has fundamentally been driven by the fact that some cities have become more specialised in knowledge intensive sectors. These cities have experienced faster growth and higher economic resilience, in contrast to those industrial cities specialised in unskilled and labour intensive manufacturing sectors which have lacked resilience and fallen behind (see also Storper et al, 2015). Somewhat similarly, Markusen and Schrock (2006) identify a deepening specialisation of labour across US cities and emphasise that both large and second-order cities are becoming more specialised both by types of industry and types of occupation. This, they suggest, reflects the fact that while most cities have become more similar in terms of consumption activities, they have diverged in terms of their export-oriented economic bases.¹ Such productive distinctiveness is not related in a simple way to employment change, but is nevertheless key to robust growth, and industrial cities require new forms of distinctiveness. In their words,

becoming more distinctive may be a survival strategy for an older industrial city. It may not increase overall employment, but it might countervail losses in uncompetitive functions (Markusen and Schrock, 2006, p. 1318).

While most of this interest in urban divergence has been based on US cities, recent European research also reports complex patterns and divergent processes. Thus for the study period 1996-2017, Dijkstra et al (2013) find no simple linear relationship between city size and

¹ Doussard and Schrock (2014) also find that while US regions have diverged in terms of their export bases, the types of work each region performs have remained remarkably stable.

economic performance in European cities. While some large capital cities are thriving as global hubs, contemporary growth trends over space also show a mixture of urban to rural shifts, as well as shifts from larger to smaller urban areas. In Western Europe in particular, the second-tier of medium-sized cities is playing an increasing role in economic growth, presumably as general purpose technologies allow these cities to better participate in global flows. This mixed pattern of city growth experiences precludes simple generalisations about city size and growth:

In many countries, large cities can be found among the top and bottom performers. Also the performance of smaller and medium-sized cities is highly varied with some faced with low or even negative growth in population and economic activities (Dijkstra et al, 2013, p 348).

Such research implies that we need to know much more about the extent to which similar sized cities, and old industrial cities in particular, are diverging in terms of their growth performance. The aim of this paper is to examine the degree of divergence across UK cities and to analyse how far this has been driven by differences among cities in industrial structure and specialisation, tradable base, and other city-specific factors.

2. Divergent growth paths of British cities

Over the past three decades or so, British cities have exhibited quite disparate rates of growth, both of output and employment (see Figure 1).² At one extreme Milton Keynes has experienced an annual average growth rate output of 5.0 percent and just over 3.12 percent for employment, while at the other extreme Dundee's output grew at only 0.93 percent per annum and its employment actually declined by 0.6 percent per annum. What is also striking is the broad geography of city growth over the period, with many northern cities growing more slowly than most southern ones.³ Indeed, a number of northern cities have actually shrunk in employment terms. The two northern cities that are notable exceptions to this pattern are Telford and Warrington, both towns that were the focus of planned expansion programmes under the post-war New Town Acts. Equally striking is the very strong correlation between employment and output growth ($R=0.905$): the cities that have grown fastest in employment terms have also been those that have grown fastest in terms of output (here measured as gross value added, in constant 2011 prices).

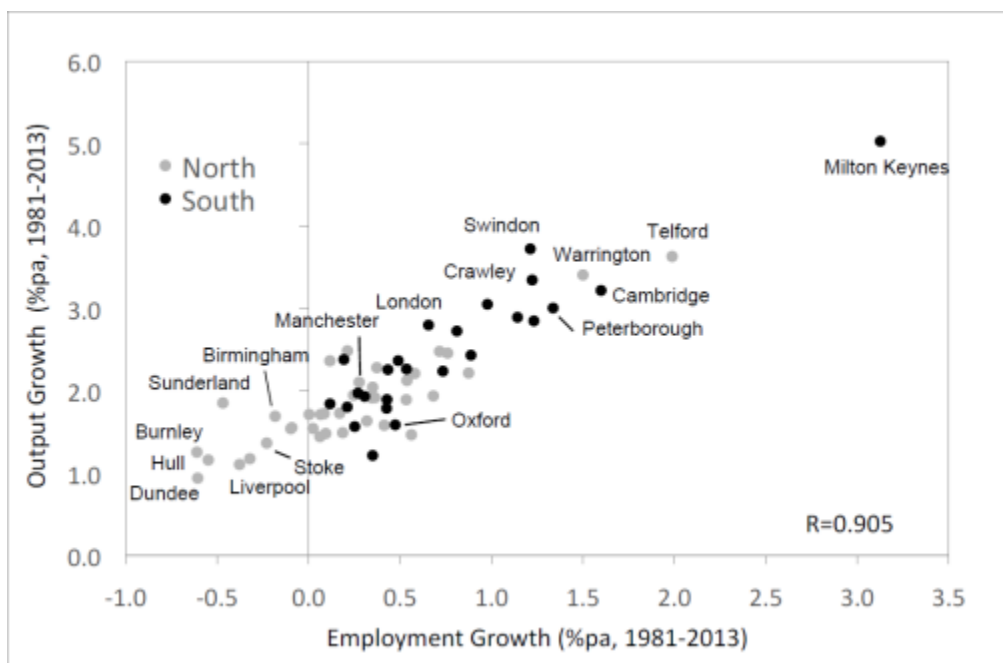


Figure 1: Average growth rates of output and employment across British cities, 1981-2013

Note: For definitions of the broad regional divisions of 'North' and 'South' used to distinguish these two groups of cities, see Footnote 2. The cities used in this paper are the Primary Urban Areas (PUAs) as defined by the Centre for Cities, London.

² The particular cities studied in this paper are those used by the Foresight programme on The Future of Cities, UK Government Office for Science. They are defined in terms of the neighbouring Local Authority Areas that contain the contiguous physical built-up urban area relating to a given city. As such they do not necessarily correspond to travel to work areas (see Martin et al, 2014).

³ Following usual practice, the South comprises the regions of London, the South East, South West, East of England and East Midlands. The North comprises the rest of Great Britain, namely the West Midlands, Yorkshire-Humberside, North West, North East, Wales and Scotland.

When cumulated over time, these disparities in city growth rates chart a marked divergence between the fastest and slowest growing cities (Figures 2 and 3).⁴ In terms of employment, for example, between 1981 and 2013 a cumulative growth gap of around 50-55 percentage points opened up between these two groups.

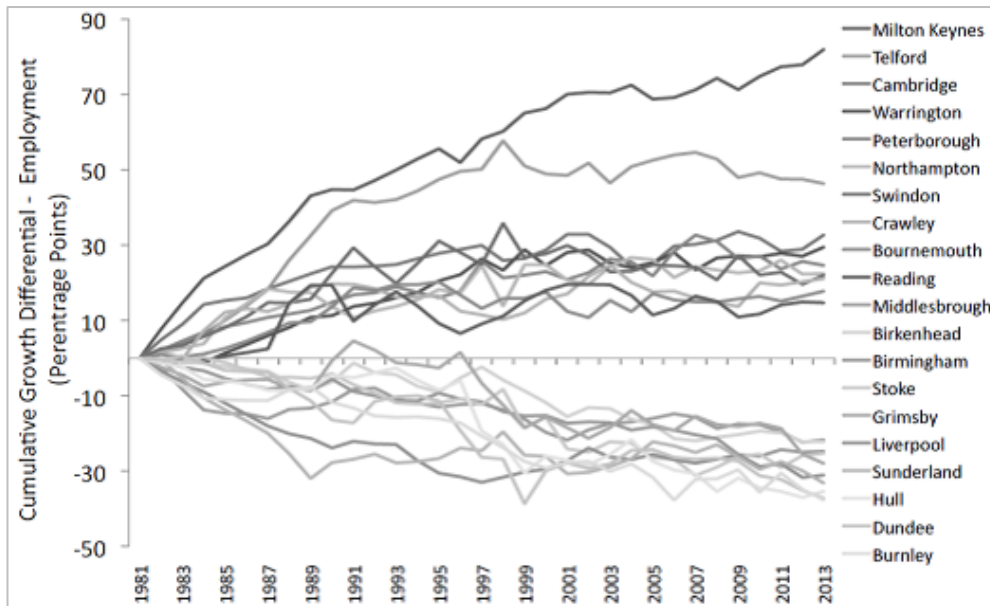


Figure 2: Divergent employment growth paths: Top ten fastest and bottom ten slowest growing cities, 1981-2013

Note: Annual percentage growth differences from the UK national growth rate, cumulated through time.

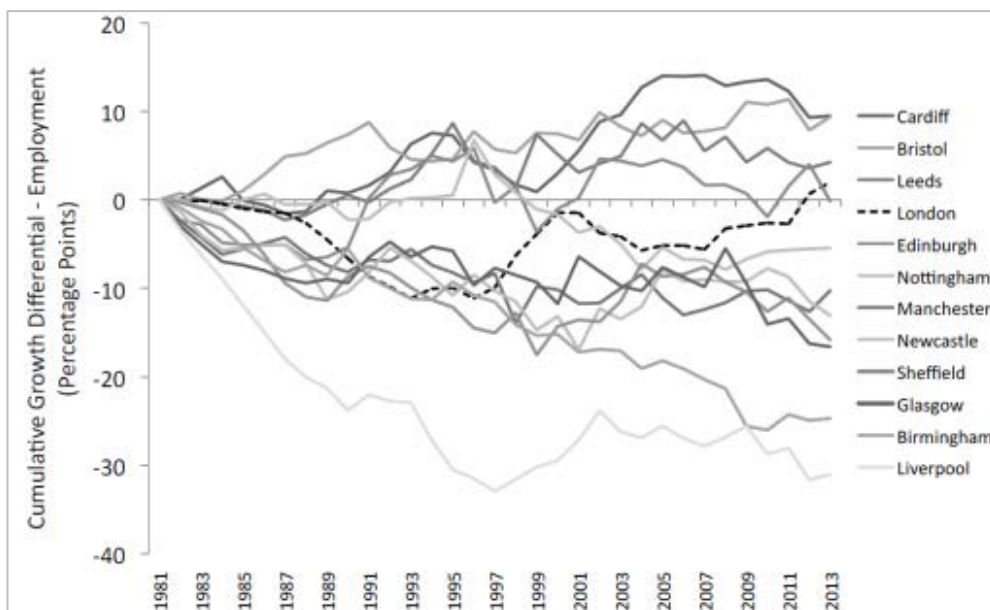


Figure 3: Divergent employment growth paths, core cities, 1981-2013

Note: Annual percentage growth differences from the UK national growth rate, cumulated through time.

⁴ We follow Blanchard and Katz (1992) in using the idea of cumulative differential growth paths to depict long-run comparative growth performance.

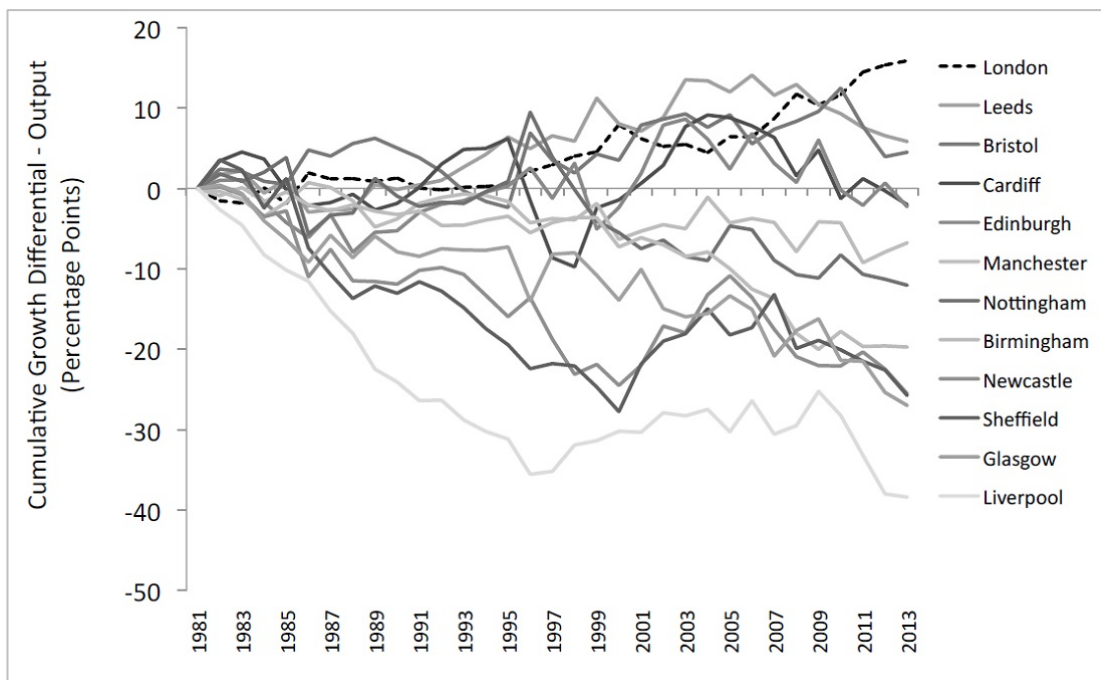


Figure 4: Divergent output growth paths, core cities, 1981-2013

Note: Annual percentage growth differences from the UK national growth rate, cumulated through time.

What is also evident from Figures 1 and 2 is that most of Britain's principal cities have lagged behind smaller cities, especially those in the South. Indeed, the majority of the so-called 'core cities' – most of which are in the North - have not kept pace with the national growth rate, whether of employment or of output (Figures 3 and 4). Only Bristol, Cardiff, Leeds and London have outperformed the national economy over the period, and then by relatively small margins. London's growth path is of particular note, in that it shows the marked 'turnaround' in this city's economy coming out of the recession of the early-1990s, a feature we will return to later in the paper. By contrast, the cities of Newcastle, Sheffield, Birmingham, Glasgow and Liverpool witnessed a dramatic slippage in growth compared to the national average from the beginning of the 1980s to the late-1990s. Only since then has their relative decline slowed somewhat, though not enough to reverse their negative cumulative growth gaps.

What is clear is that economic growth in the UK over the past three decades or so has been varied and divergent across the country's main cities. Many of the former industrial large towns and cities of northern Britain have lagged persistently behind those in the South, many of which were less dependent on manufacturing to begin with. Yet even within both groups of cities, northern and southern, growth trajectories have differed, and likewise between the 'core cities'. The patterns are thus quite complex.

The lower performance of many of the northern cities has itself attracted Government attention in the past few years, as part of its concern to 'spatially rebalance' the national economy in the wake of the 2007-08 financial crisis and the deep recession this triggered. The idea of a 'northern powerhouse' has entered the political lexicon, based on promoting growth in and devolving fiscal powers to a collection of northern cities sufficiently close to each other that, combined, would be a force to rival London and the South East of England (Osborne, 2014). Improving the growth performance in the country's northern cities is seen as a way not only to increase jobs and incomes for the people living there, but also as a way of redressing the so-

called 'North-South Divide' in the national political economy, and as a means of lifting the nation's productivity (HM Treasury, 2015)⁵.

⁵ To cement its new-found interest in cities outside London, the Government has appointed a Minister for the Northern Powerhouse, and even the UK Treasury now regards the promotion of the Powerhouse a key foundation for rebalancing the national economy (HM Treasury, 2015).

3. Deindustrialisation and structural reorientation across British cities

While the rates of employment and output growth of cities depend on a host of factors, following the discussion in the previous section a key question is how far the growth trajectories of British cities reflect differences in the extent to which they have made the transition from industrialism to post-industrialism. The re-orientation of the national aggregate economy over the past 30-40 years has been dramatic. In employment terms, the production sector (manufacturing, extractive, construction and utilities) reached its peak (12.17 million, of which 8.51 million were in manufacturing) in 1965, and by 2011 had shrunk to 5.6 million (3.27 in manufacturing); whereas employment in private services expanded over the same period from 11.21 million to 15.08 million. Up until 1980 production employment still exceeded employment in private services, but since then a yawning gap has opened up between them (Figure 5). A similar shift has occurred in output: over period 1965-2011 the share of total output accounted for by production fell from 40.6 percent to 19.1 percent, (manufacturing from 31.5 percent to 10.7 percent), while that of private service expanded from 55.5 percent to 79.1 percent. What has also been striking is the long-run growth in Government services (both central and local state).

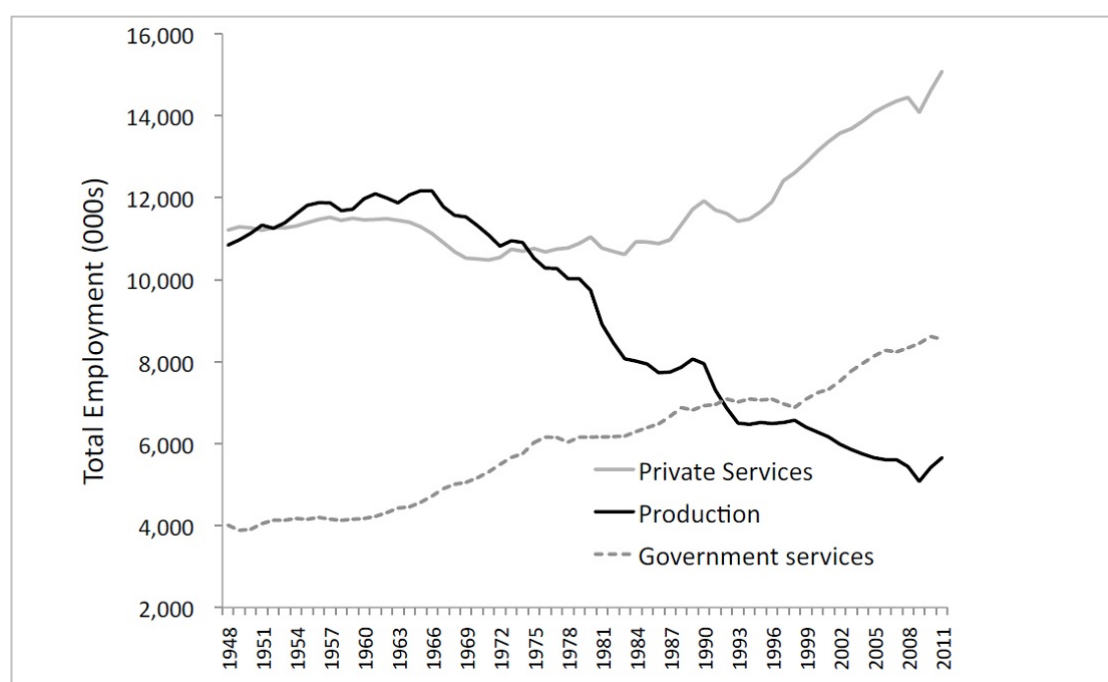


Figure 5: The shift to a 'post-industrial' economy: Employment in production, private services and Government services, Great Britain, 1948-2011

Note: Production refers to Manufacturing, Extractive Industries, Construction and Utilities. Government Services includes both central and local government.

Source of data: GDDC database, University of Groningen (www.rug.nl/research/ggdc/data/10-sector-database)

This process of deindustrialisation and the shift into services is common to almost every other advanced economy, and in this respect the UK is no different from many other such countries. But the decline of manufacturing does appear to have been notably more severe in the UK than elsewhere (see, for example, Rowthorn and Wells, 1987; Critchley, 1995; Rowthorn and Coutts, 2013).

Disaggregating the trends shown in Figure 5 is highly revealing (Figure 6). All but two of the sectors that have grown in employment over the past three decades are service activities (the only production industries being coke and petroleum, and construction – the latter only very marginally). It is striking that electronics and pharmaceuticals, two key production sectors that are often used in reference to the idea of ‘advanced manufacturing’, actually declined in employment over the 1981-2013 period. Only two services declined in employment, namely public administration and defence, and wholesale and distribution. Several of the fastest growing services are sectors that would normally be regarded as ‘knowledge intensive’ or ‘creative’. These are often taken as being emblematic of the ‘post-industrial’ or ‘new’ or ‘knowledge’ economy, although this ascription is not unproblematic. For one thing, there are sections of manufacturing that are advanced, have sizable research and development functions, a significant proportion of knowledge-intensive activity, and which contain ‘creative’ occupations and personnel. Some examples would be some branches of electronics and pharmaceuticals, and possibly also motor vehicles, all also important export sectors. Yet, overall, these industries have experienced some of the largest falls in employment over the period. Likewise, there are occupations and types of employment in the ‘knowledge-intensive’ and ‘creative’ service sectors that are not in fact ‘creative’. Disentangling these occupational and functional effects is difficult using sectoral data, and the level of disaggregation currently available to us is in any case limited to 46 sectors (see Figure 6 and Appendix). Nevertheless, the pattern of sectoral growth rates portrayed in Figure 6 raises the obvious question as to whether and to what extent the divergent city growth paths described earlier reflect differences between cities in their sectoral structures and specialisations, and particularly how far have those cities that were more dependent on manufacturing have managed to re-orientate and adapt their economies (their employment bases) around services, and most especially knowledge-intensive services.

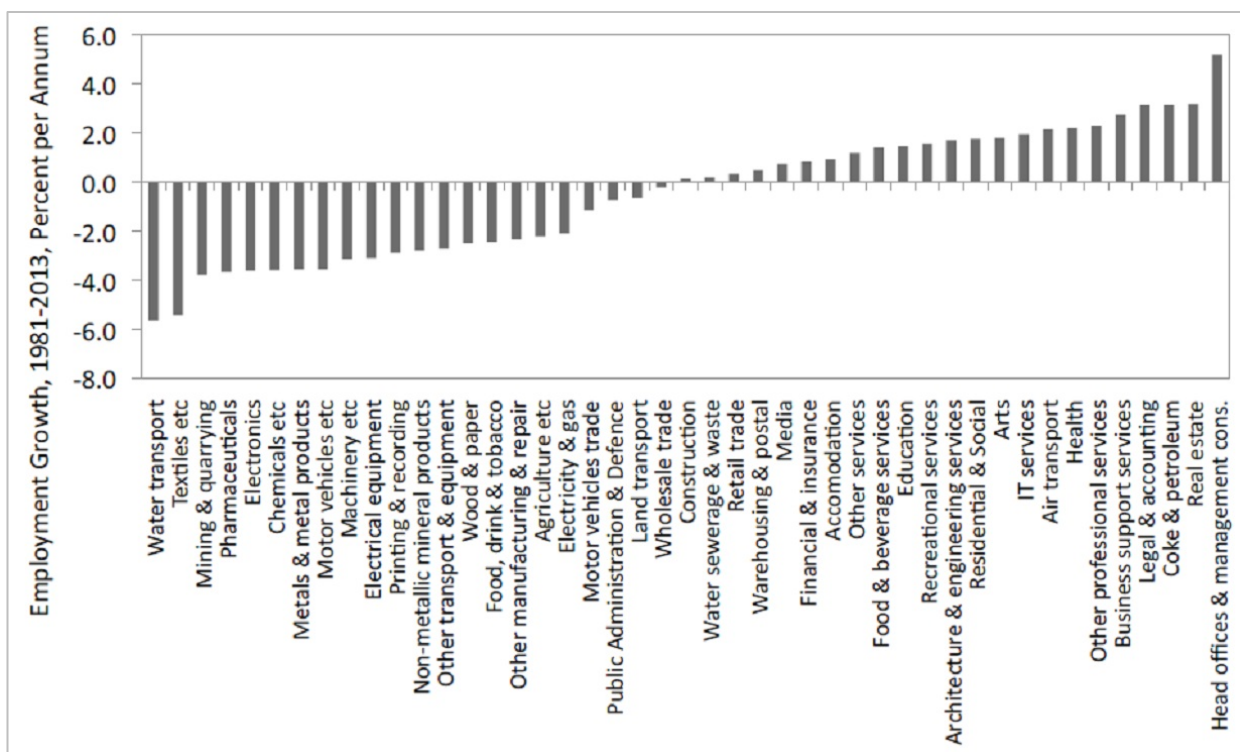


Figure 6: Employment growth by sector, 1981-2013, Great Britain

Source of data: Cambridge Econometrics

The relationship across cities between the loss of manufacturing jobs and the growth of knowledge intensive service sector jobs is shown in Figure 7. Every city bar one – Blackpool –

has benefited from employment growth in knowledge intensive services over the period (Figure 7). But what is equally apparent is the absence across cities of any significant correlation ($R=0.08$) between the pace of deindustrialisation and the growth of such knowledge intensive sectors. Cities that have experienced the same rate of decline of industrial employment exhibit varying rates of growth of jobs in knowledge intensive services (for example, compare Milton Keynes and Hull in Figure 7); or the same rate of employment growth in knowledge intensive services but quite different rates of contraction of manufacturing employment (such as Bournemouth and York). Put another way, cities appear to have varied considerably in their capacity to generate job growth in knowledge intensive services to compensate for the job loss in manufacturing and production industries. British cities, in other words, have varied in their capacity to reorientate and adapt their employment structures around the new, post-industrial economy. This variation may well help to explain the divergent city employment growth paths depicted in Figures 1, 2 and 3. The implication is that shifts in industrial structure may be only a part of the explanation of those divergent city growth paths.

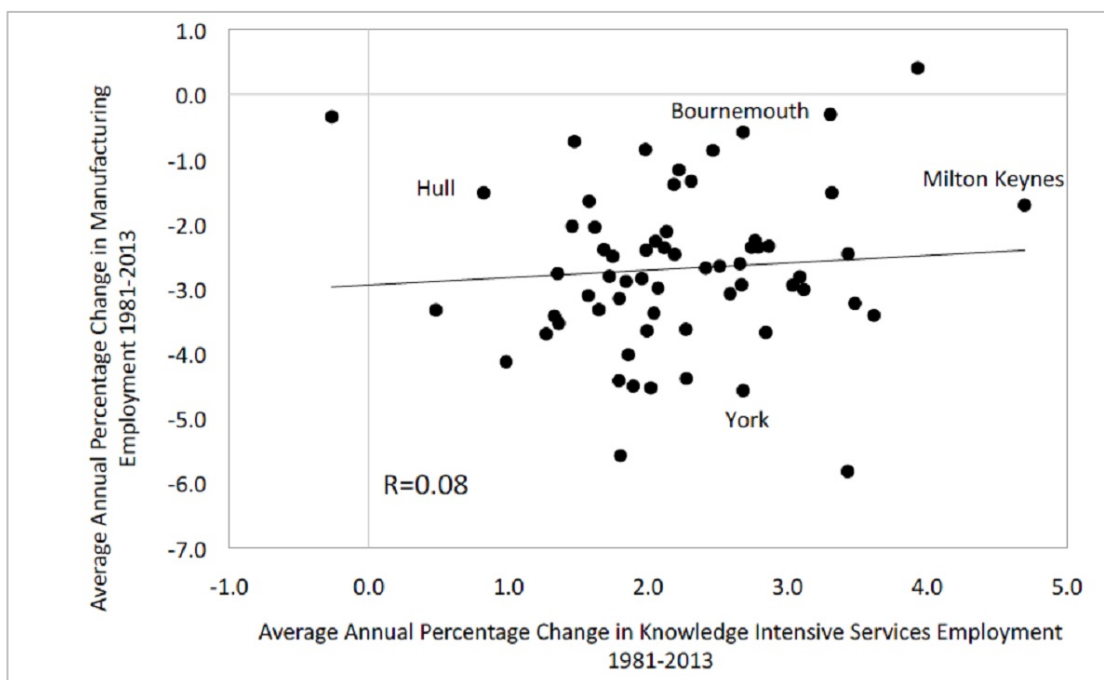


Figure 7: Deindustrialisation and the growth in knowledge intensive services across cities: Percentage change in employment, 1981-2013

What is also evident from Figure 6 is that many of those sectors that, nationally, have declined in employment are what would be considered as 'traditional export' sectors, that is mainly manufacturing. The role of tradables in a region's or city's economic growth performance has long been recognised, and has recently received renewed attention. Thus according to Storper (2013),

The motor of a city-region's economy is the tradable sector; it provides the jobs that come in and anchor labour as well as income to a place, on the basis of which the home market is built. However big the locally serving sector might appear at any given moment in time, it will always shrink if the tradable jobs go away, as cities such as Detroit know all too well (p. 33).

An examination of the impact of tradables on regional (rather than city) economic disparities in employment growth in the UK can be found in Rowthorn (2010). According to Rowthorn (2010), the long-run prosperity of a region is primarily determined by the strength of its export or tradable base. He shows that since the beginning of the 1970s, employment in the tradable or export base in the northern regions of the UK has declined in relation to that in the southern regions.⁶ This in turn, he argues, has had negative multiplier effects on employment more generally in the North, and has been a factor stimulating a net migration drift of population, and especially qualified workers, southwards, at least up to the early-2000s, a drift that has added to the growth momentum in the South.⁷ As Rowthorn sees it, the North of the UK has not replaced its declining old tradables activities with new ones on a sufficient scale, relative to the South, to prevent a widening of the North-South divide in economic prosperity.

The importance of the tradable base of a regional (or city) economy figures prominently of course in traditional regional export base theory. It is also at the centre of Kaldor's model of increasing-returns driven cumulative causation (Kaldor, 1981). 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. His model suggests that regional (or city) growth rate differences are associated with differences in the income elasticities of demand for exports and imports associated with regional (or city) differences in the structure of production and trade, whether regions (or cities) specialise in primary production or manufactured goods or sophisticated tradable services.

A not dissimilar focus on the role of the tradable base is found in Moretti's (2010, 2013) analysis of city growth in the United States. His interest is in estimating the multiplier effect from creating an extra job in the tradables sector of a city, which he defines in terms of manufacturing, on employment in the city's nontradables sector. Using data for three points in time (1980, 1990 and 2000) he estimates that for each additional job in manufacturing in a given city, 1.6 jobs are created in the nontradable sector in the same city. The effect is significantly higher for skilled jobs because these pay higher wages: the creation of an extra skilled job in the tradable sector generates 2.5 jobs in local goods and services. However, van Dijk (2014) shows that these estimates of the tradable on nontradable multiplier are overestimated by Moretti, partly because some key sectors are omitted from the definition of the tradables sector and partly because of technicalities associated with estimation procedures. Nevertheless, although his estimates of the multipliers are lower than those of Moretti, van Dijk agrees that "the tradable sector is the backbone of a regional economy" (p. 22).

In seeking to explore this issue for our British cities, we immediately encounter a basic problem – that of identifying the tradable sectors of each city. Ideally this would be done using data on each city's exports, both to other parts of the UK national economy and to overseas markets. However, no such comprehensive trade data are available at this spatial level. Our approach here, therefore, is necessarily an indirect and approximate one. We first identified those sectors which at the UK national level are 'export intensive'. Two thresholds of 'export intensity' were analysed, defined as those sectors exporting at least 50 percent and at least 25 percent of their output or services overseas. The sectors so identified are listed in the Appendix. These were

⁶ He defines 'tradables' as agriculture, manufacturing, extractive industries, finance and business services, and hotels and restaurants. His definition of North and South is the same as used here in our Figure 1.

⁷ In this respect Rowthorn's model bears a close affinity to that developed by Holland nearly forty years ago, in his *Capital versus the Regions* (1976).

then used to calculate two changes in employment for each city over our study period: employment change in the (nationally-defined) ‘export-intensive’ (or ‘tradable’) sectors present in each city, and the change in employment in the remaining (‘non-tradable’ or ‘local’) sectors. What this approach misses out, of course, is intra-national trade, and the fact that certain sectors may constitute part of the tradable base of a city even though those sectors nationally are not export-orientated. At the same time, we are also assuming that the export intensity of a given sector (the proportion of its output that is exported, and the elasticity of demand for the product or services of that exported sector) is the same in each city where that sector is found. These omissions and assumptions potentially impose important caveats on our analysis, but in the absence of detailed city trade data, are unavoidable.

Using the definitions of ‘tradables’ just described, we follow Moretti (2010) and apply the following simple regression model in order to estimate the size of the city ‘tradables multiplier’:

$$\Delta \log E_{it}^{NT} = \alpha + \beta \Delta \log E_{it}^T + \varepsilon_{it}$$

Where $\Delta \log E_{it}^T$ is the change in employment the export-intensive (‘tradables’) sector in city i over the entire 1981-2013 period, and $\Delta \log E_{it}^{NT}$ is the corresponding change in employment in the remaining (‘nontradables’) part of the city’s economy. The coefficient β gives the elasticity of nontradables employment with respect to a change in employment in tradables. The results are shown in Table 1.

The OLS elasticity is 0.208 for the 50 percent export intensity threshold, and 0.303 for the 25 percent threshold. The latter indicates, for example, that a ten percent increase in the numbers employed in export-intensive ‘tradables’ in a city is associated with a three percent increase in employment in local goods and services (‘nontradables’). Given that, using the 25 percent threshold, nationally there are about three ‘nontradable’ jobs for each tradable job, this elasticity implies that for each additional job in ‘tradables’ in a given city, one job is created in the ‘nontradable’ sector in the same city. This compares with the multiplier of 1.6 in Moretti’s study of US cities.⁸ There is then some evidence to suggest that the faster is employment growth in the tradable base of a city, the faster is the employment growth in local or nontradable goods and services in that city, though our estimate for British cities appears lower than that for US cities. Also, the strength of the relationship varies significantly between cities (as indicated by the low level of fit in Table 1, and the dispersion in Figure 8. Compare for example, Cambridge and Preston: these differ markedly in employment growth in their tradable base, but have similar rates of growth of employment in nontradables). A more disaggregated analysis of the tradable base, focusing for example on advanced high-technology manufacturing or leading knowledge sectors might possibly provide more insight, but together the patterns evident in Figure 7 and Figure 8 suggest that the broad sectoral structures of cities provides only a partial explanation of their different and divergent long-run employment growth paths. But we need to go beyond these broad sectoral divisions and explore the issue in more detail.

⁸ Moretti found an OLS elasticity of 0.554, but when his regression was instrumentalised to remove the effect of exogenous shifts in demand for labour in city tradable activities, this was reduced to 0.334.

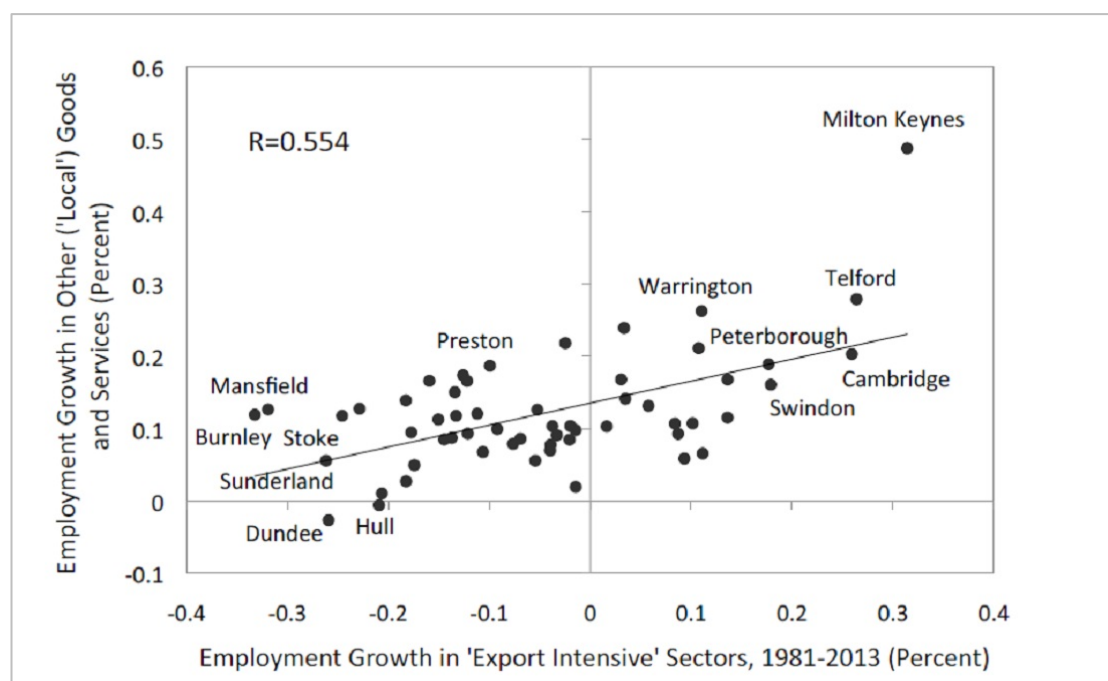


Figure 8: Employment growth across cities in export-intensive sectors ('tradables') and other ('local' or 'nontradable') goods and services, 1981-2013

(Export Intensity defined by a 25% threshold)

Note: 'Export intensive' sectors are defined in the Appendix

Table 1: Local export-intensive (tradable) sector employment multiplier, 63 cities, 1981-2013

	Model	
	50 Percent Export Intensity	25 Percent Export Intensity
Constant	0.20599 (6.55438)	0.13588 (15.57031)
ET(50)	0.28099 (2.79658)	
ET(25)		0.30314 (5.71923)
R-Squared	0.15758	0.30124
Adj R-Squared	0.14672	0.29795
F-Statistic	2.47763	4.10126

Note: Summary of OLS regression estimates of Equation (1). t-statistic in parentheses.

'Export intensive' sectors are defined in the Appendix.

4. Specialisation, industrial structure and city growth

As noted above, some observers argue that cities in the US show signs of becoming more specialised and distinctive in terms of the economic structures. One of the most debated issues in studies of regional and city growth is the relative role of structural specialisation versus diversification. The arguments have been well rehearsed in the literature, and need not be repeated in detail here. But, essentially, the case for specialisation is that it gives rise to particular types of agglomeration externalities and increasing returns effects (so-called Marshall-Arrow-Romer externalities) – especially the attraction of specialised labour, suppliers and intermediaries – that foster a high rate of innovation and knowledge spillover amongst the firms concerned. According to Glaeser et al. (1992) under the Marshall-Arrow-Romer (MAR) view, knowledge is predominantly industry-specific. Knowledge spillovers may therefore arise between firms within the same industry and can only be supported by the concentration of a particular industry within a region or city. These intra-industry spillovers are known as localization or 'specialization' externalities, and are held to drive growth. At the same time, of course, specialization carries potential problems, not least organizational and cognitive 'lock-in' to a particular industrial-technological system that rigidifies and becomes increasingly vulnerable to external shocks (from more efficient or productive competitors, for example). Specialisation, in other words can reduce resilience. Much depends on the particular type(s) of specialization involved. A city or region specialized in heavy, capital-intensive sectors may end up being far less adaptable over time than a city specializing in knowledge intensive, information capital based activities. Nevertheless, according to some scholars, specialisation is *the* driver of city-region growth (Storper, 2013).

The diversification view by contrast is that a diversified economic structure is the most conducive to long-run growth because of the favourable so-called Jacobsian external economies that such diversity confers. A diversified economic structure, it is argued, permits and encourages knowledge spillovers between complementary rather than similar industries as ideas developed by one industry can be applied in other industries. The exchange of complementary knowledge across diverse firms and economic agents facilitates search and experimentation in innovation. Further, a diversified structure offers varied alternative market niches for suppliers and considerable scope for branching into new activities. The varied skill base of workers itself encourages entrepreneurship. Therefore, a diversified local production structure can lead to increasing returns and gives rise to urbanization or 'diversification' externalities. Other things being equal, such a city economy is likely to be more resilient to shocks and more adaptable over time.

Any impartial reading of the extensive literature on whether specialization or diversification is better for regional and city growth would indicate that the matter is still undecided, and confused: one can find examples to support both views (see for example, Duranton and Puga, 1999). One can point to certain present-day cities that owe their economic growth and success to specialization. But one can equally point to cities that formerly enjoyed economic success based on this or that specialization but which are now languishing economically. At the same time, one can point to successful cities that have diversified economic structures. And so the

debate goes on.⁹ Some have sought to resolve the specialization-versus-variety impasse by introducing other concepts, for example ‘diversified specialization’ and ‘related variety’. ‘Diversified specialisation’ refers to the case where a city’s economy is dominated by, say, three or four major sectors of activity (Farhauer and Kröll, 2011). The idea of ‘related variety’ refers to a situation where a number of sectors share complementary knowledges, technologies or inputs (Frenken, Van Oort and Verburg, 2007). However, the logic underpinning these ideas is not unproblematic. Just how many (or how few) dominant sectors are needed to define ‘diversified specialisation’? And in terms of the implications for growth, much surely will depend on precisely what these major sectors are. Likewise, in the case of ‘related variety’ surely it matters what the sectors are that are related – and how they are related. Relatedness among similarly weak, declining or lagging sectors may have quite different consequences from relatedness among a group of dynamic, buoyant activities. In addition, the extent of ‘relatedness’ may be crucial: a certain degree of relatedness may well be advantageous, and permit branching or re-orientation of a city’s firms and industries into complementary activities. But a high degree of ‘relatedness’ across a high proportion of a region’s or city’s industries will reduce the modularity of the city’s economy, and may be a source of low resilience to shocks. And what if a city’s ‘related variety’ is in fact dominated by, or dependent on just a few major producers? This could be growth-inducing or potentially destabilising. The relationship between economic structure and city growth is likely, therefore, to be a complex one, and ultimately is an empirical issue that could well be influenced by city-specific patterns and processes of path dependence in sectoral evolution: the effect of previous industrial structures can linger on long after those industries may have disappeared.

One simple but useful measure of city economic specialisation is that used by Krugman (1993), which essentially measures the degree of structural (dis)similarity between a given city’s economy and that of the nation as a whole. Let s_{ijt} be the employment share of sector j in city i in year t , and s_{Njt} the corresponding employment share of that sector in the national aggregate economy for the same year. Then the index is

$$SS_{it} = \sum_j |s_{ijt} - s_{Njt}|$$

If city i has the same sectoral structure as the national economy the index would be zero. If the city has a completely different, non-overlapping structure from that of the national economy, the index would be 2 (because each sectoral share in the city would be counted in full). Thus the index is a simple way of quantifying differences in city structures, and hence in city *relative* specialisations. It also shows whether city economic structures are diverging or converging, that is whether they are becoming more or less distinctly specialised, over time. Figure 9 shows the index for our 63 cities for 1981 and 2013, the cities being ranked in ascending order of relative structural dissimilarity or specialisation as at 1981. Considerable differences across cities in the degree of specialisation existed at that time, with most northern industrial cities being the more specialised and less industrialised, larger and more southern cities being the least specialised. By 2013, however, almost every city had undergone a reduction in its structural distinctiveness, the most marked falls being among those cities that had been the most relatively specialised at the beginning of the period. Clearly, in line with the shift from industry to services discussed earlier, British cities have all undergone structural change, the general result of which has been

⁹ See Palan (2010) for a useful evaluative survey of the range of different measures that have been used to measure structural specialisation and diversity.

to reduce the degree of sectoral differentiation between them. The overall picture is one of convergence rather than of divergence or increasing distinctiveness of economic structures across the city system.

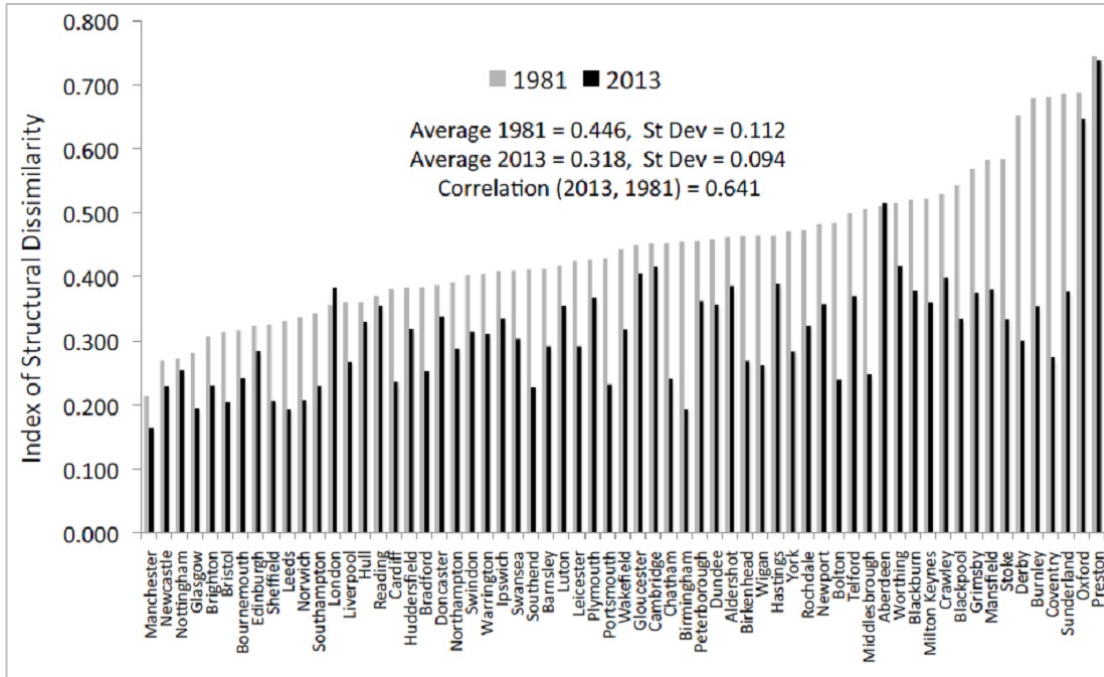


Figure 9: Relative economic specialisation (structural dissimilarity) across British cities, 1981 and 2013

Note: Cities ranked by increasing structural dissimilarity (relative specialisation) in 1981.

A simple measure of structural change is given by the Lilien index (Lilien, 1982; see also Robson, 2009), defined for a given city i at time t as that is, as the square root of the sum

$$Lilien_{it} = \left[\sum_j (E_{ijt} / E_{it}) (\Delta \log E_{ijt} - \Delta \log E_{it})^2 \right]^{1/2}$$

over all sectors j of sectoral-share-weighted deviations of city sectoral employment changes from city total employment change, over the period $t-1$ to t . The all-city average of this index for each year from 1982 to 2013 is shown in Figure 10. It appears that, taking the 63 cities together, the pace of structural change increased steadily during the 1980s and 1990s. This reflected the rapid decline in industrial employment and shift in structure towards services across many of the cities over these two decades. The pace of structural change then appears to have slowed from the late-1990s onwards, until rising again in the Great Recession in 2008-2010. While our analysis may possibly be constrained by the 46-sector disaggregation used, the convergence or reduction in distinctiveness apparent at this level (which seems to run counter to what has been found to typify US cities), does at least again suggest that the divergent city employment growth paths described earlier can only partly be attributed to differences in city economic structures.

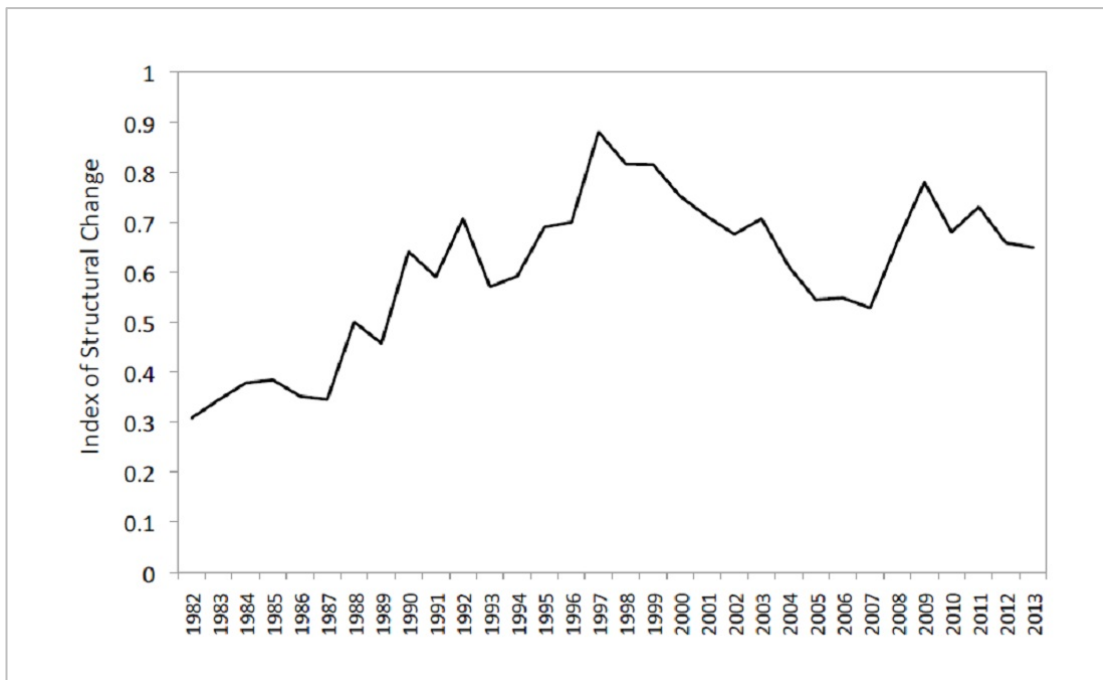


Figure 10: Lilien Index of Structural Change, average across all cities, 1982-2013

One way of investigating this more precisely is by means of shift-share analysis. The shift-share technique has long been used to study regional and city growth patterns and to decompose those patterns into various effects (the literature is extensive, but useful surveys and reviews include Selting and Loveridge, 1990; Selting and Loveridge, 1992). The technique is typically applied to either employment or output, although there are also trade-related applications (e.g. Chern et al, 2002). Conventional shift-share decomposes a city's growth (of employment or output) over a given period into three parts: a 'national share' component, an 'industrial mix' or economic structure component, and a 'city specific' component. The 'national growth' component is that rate of growth that would have occurred over the period in question if a city's economy (employment) had grown at the same rate as the national economy (employment) as a whole. The 'industrial composition' effect or shift is the contribution to the city's (employment) growth that can be attributed to the difference in industrial structure as between the region or city and the national economy; it reflects how far the region's or city's share of nationally faster and slower growing industries and activities differs from the nation as a whole, that is how far a region or city specializes in more and less dynamic industries.

The 'city-specific' component is often deemed the most interesting since it is normally assumed to indicate the extent to which locally-unique factors have caused growth or decline in a city's industries. More specifically, it captures the extent to which a city's industries have grown faster or slower than their national counterparts, and this difference is assumed to point to some local comparative advantage (or disadvantage), such as the availability of particularly skilled labour, greater use of technology, the presence of other sophisticated inputs, such as superior suppliers, or particular occupational advantages (for example associated with the concentration in a city of an industry's higher-order or higher productivity functions). This shift component is sometimes referred to as the city 'competitiveness' component, though it does not identify the causes of that competitive advantage (or disadvantage), and it is assumed (not unproblematically) that greater competitiveness leads to higher employment.

Over the years there have been various elaborations and extensions of the basic shift-share procedure, including dynamic versions and development of shift-share regression models. Here we utilise a dynamic version of the technique. The traditional shift-share procedure essentially assumes that a city's industrial mix (the sectoral distribution of employment or output) in the initial year remains fixed throughout the entire study period, so that growth between that initial year and the end year is then decomposed holding the starting economic structure constant. This opens the method to two main criticisms which have been well-rehearsed in the literature. The first is that an in-built bias is introduced because a city's industrial structure is likely to change over time, and using the initial sectoral shares of employment or output and holding these constant over the entire study period will not take account of this. Such a bias most likely occurs in cities undergoing rapid structural change, and/or where the time period being studied is a long one, since this would allow significant structural change to occur. The second problem is that if the difference between a city's growth rate and the national growth rate itself varies during the study period, the initial fixed weights (which equate to the city's size relative to the national total), will introduce a bias into the national effect.

Dynamic shift-share allows both growth rates and industry structures to vary over time (see Barff and Knight, 1988; Selting and Loveridge, 1990; Chern et al, 2002). This removes the potential for the above types of bias to occur, and also provides additional information on any changes that take place in the relative growth trajectories of cities, which would be concealed by the static version of the method. More specifically, city total growth differentials (from the national average) and their various components were estimated on a year-to-year basis, and these growth rates were cumulated through time. This approach thus provides a direct counterpart to the cumulative city growth differentials shown in Figures 2, 3 and 4, by decomposing those cumulative differential paths into 'structural' and 'city-specific' effects. Further, this method helps to reveal any significant breaks or changes in the contribution of the growth components, rather than simply identifying the direction of the overall net shift of cities between the beginning and end points of the study period. Given the profound shifts in the structure of the UK economy over the past three to four decades and that these shifts have played out differently across the country, a dynamic version of shift-share seems a useful enhancement to the traditional comparative-static version.

The results of this analysis for each of the cities studied here are shown in Figure 11. The cities are ranked by ascending size of their cumulative percentage point differential employment growth, and for each city the contributions to this total differential growth of the 'structural effect' and the 'city-specific' effect. Since these effects are calculated on a year-to-year basis, and cumulated progressively through time, they allow for the changing structural composition of a city's employment, and, correspondingly, changes in 'city-specific' characteristics and influences. Two key features are immediately evident. First, for most of the cities that have negative cumulative percentage point differential employment growth over the period – that is, those that have lagged behind the national rate of employment growth – the structural effect is negative. Similarly, for many of the cities that recorded positive cumulative differential employment growth over the period as a whole the structural effect is positive, although less consistently so. But what is also striking is that for a large number of cities the structural effect is outweighed by the 'city-specific' effect.

5. Beyond structure? Exploring city-specific components of employment paths

The interpretation of the so-called ‘city-specific effect’ in Figure 11 is not straightforward. In the shift-share literature, the ‘regional-specific’ effect is often termed the ‘competitiveness effect’. In many ways, regional or city ‘competitiveness’ is a bit like the ‘dark energy’ and ‘dark matter’ that puzzle astrophysicists and cosmologists: we claim that ‘competitiveness’ is important in shaping the differential growth of cities and regions, but we are unable to observe it directly and instead infer its presence from – the assumption is that it ‘reveals’ itself in terms of – its effect on other more measurable aspects of city or regional economic performance, such as productivity, profitability, market share and the like (Martin, 2006; Martin et al, 2006). Often in fact, productivity – output per worker or per hour – is used as a surrogate for competitiveness, the argument being that productivity growth determines how successfully a firm or city or region competes. Indeed, some hold that it is productivity that is the crucial determinant of an economy’s success, not competitiveness: as Krugman has put it, “productivity isn’t everything, but in the long run it is almost everything. A country’s ability to improve its standard of living over time depends almost entirely on its ability to raise its output per worker” (1994, p.11). And, Krugman argues, it is not so much *what* an economy does (ie whether, and in what, it specialises) but *how well* it does what it does (its productivity). The same might also be said of cities.

The question is, however, what productivity growth implies for employment. There is some debate on this issue. At the micro-economic level, the impact of productivity on employment is ambiguous, and depends on the bias of technological change, on prices of competing goods and services, and on the price elasticity of demand. An individual firm, for example, might be able to secure an increase in productivity (‘competitiveness’), in the short run, by shedding its least productive or less skilled workers, even though not increasing overall output to any significant extent. At a macro-economic level, however, the effect over the long run is often argued to be somewhat different. While a short-run perspective emphasizes the impact of productivity on the number of workers needed to produce a *given* level of output, the long-run perspective emphasizes that an increase in labour productivity lowers prices, expands demand and leads to higher employment (see, for example, Nordhaus, 2005). As the new technological innovations that boost productivity occur, new industries arise, along with the creation of new jobs. The increased demand for labour will tend to boost wages, as firms compete to hire additional workers, and raise total employment. With higher employment and productivity, potential output increases. In the long run, therefore, faster productivity growth should translate into an increase in the overall demand for labour in the economy. This at least is the theory.

However, in the case of British cities over the past three decades or so, while there has been a strong positive relationship between output growth and employment growth, as we saw in Figure 1, there has been no significant relationship across cities between productivity growth and employment growth (the correlation is zero; see Figure 12). Indeed, what is striking is the wide range of employment growth rates across cities for a given productivity growth rate. Together, Figures 1 and 12 indicate that the divergent pattern of employment growth across British cities has been driven by differences in output growth rather than in productivity growth.

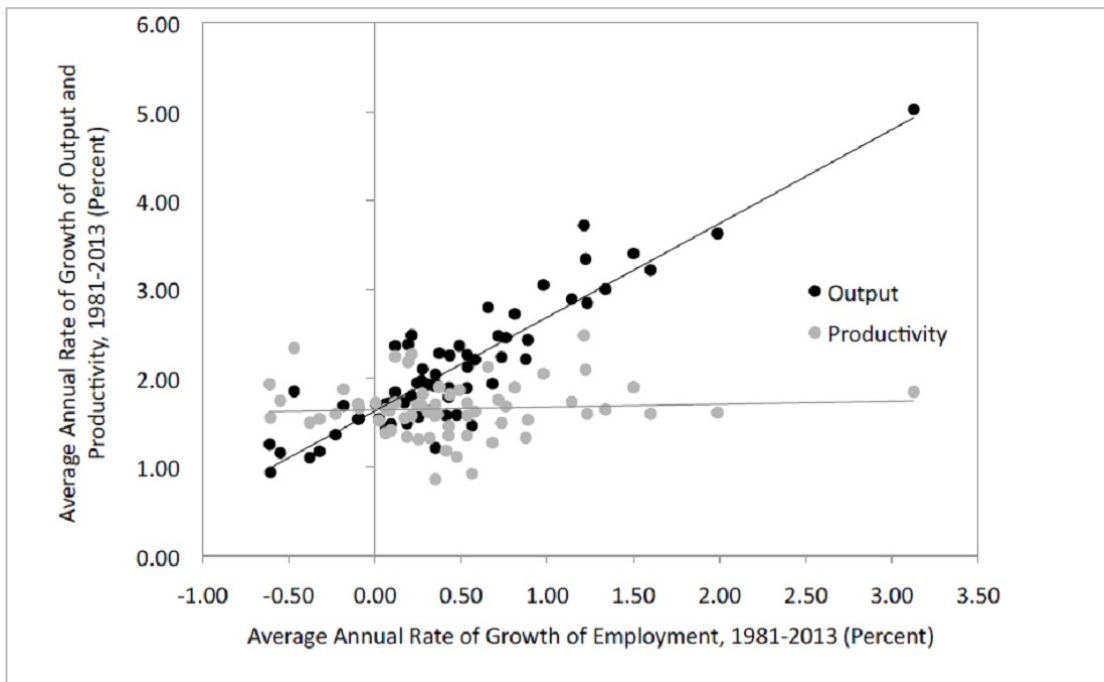


Figure 12: Average annual rate of growth of employment, output and productivity for British cities, 1981-2013

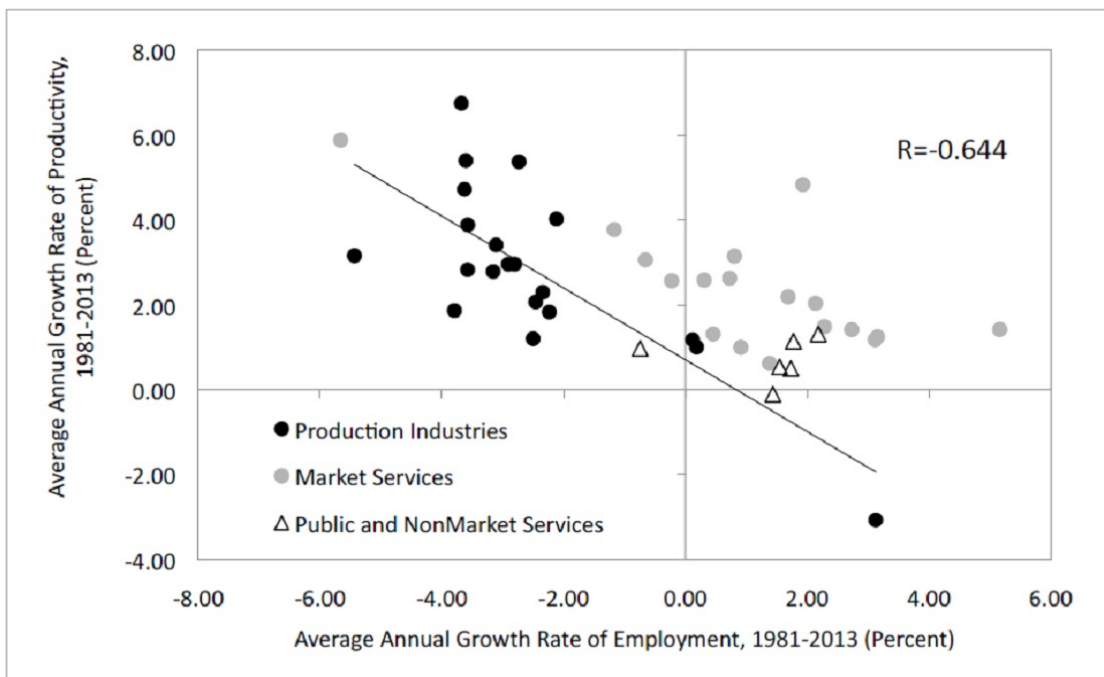


Figure 13: Employment and productivity growth of major sector groups across British cities, 1981-2013

One possible reason for this concerns the effect of the progressive shift from manufacturing to services on productivity growth. Many years ago, authors like Baumol (1967) and Fuchs (1969) argued that productivity improvements in services are much harder to achieve than in goods producing industries. If this is so, the progressive shift of the economy towards an increasing share of services implies a reduction in the overall national rate of productivity improvement: the growth of services has generated large numbers of jobs but a slower rate of productivity

advance than found in manufacturing, where large numbers of jobs have been lost, in part because capital (more technologically advanced machinery) has been substituted for labour, in part because of a shift of production to cheap labour locations elsewhere.

If we look at the relationship between employment growth and productivity growth by broad sectoral groupings across our cities, we do in fact find a significant negative relationship between productivity growth and employment growth (Figure 13). While productivity growth has tended to be highest in production (manufacturing, construction, utilities and extraction), it has been at the cost of major falls in employment, whereas in many private market services employment growth has been strong, but productivity growth broadly slower than in production industries: most services, however, have registered both positive productivity and positive employment growth.

It is of interest to decompose the city-specific effect of the cumulative differential city employment growth derived from the shift-share analysis by broad sector groups. By definition, a 'city-specific' effect would be expected to influence most if not all of a city's activities in the same way, positively or negatively, since that effect is assumed to capture local conditions that cannot be attributed to a city's sectoral mix per se, but which influence the local performance of those sectors relative to their national counterparts. As Figure 14 shows, at each end of the city distribution, for both those cities for which the 'city-specific effect is largest, and those for which it is smallest, the effect does indeed tend to be positive or negative, respectively, for all three broad sector groups, suggesting it does indeed capture something intrinsically 'specific' to those cities.

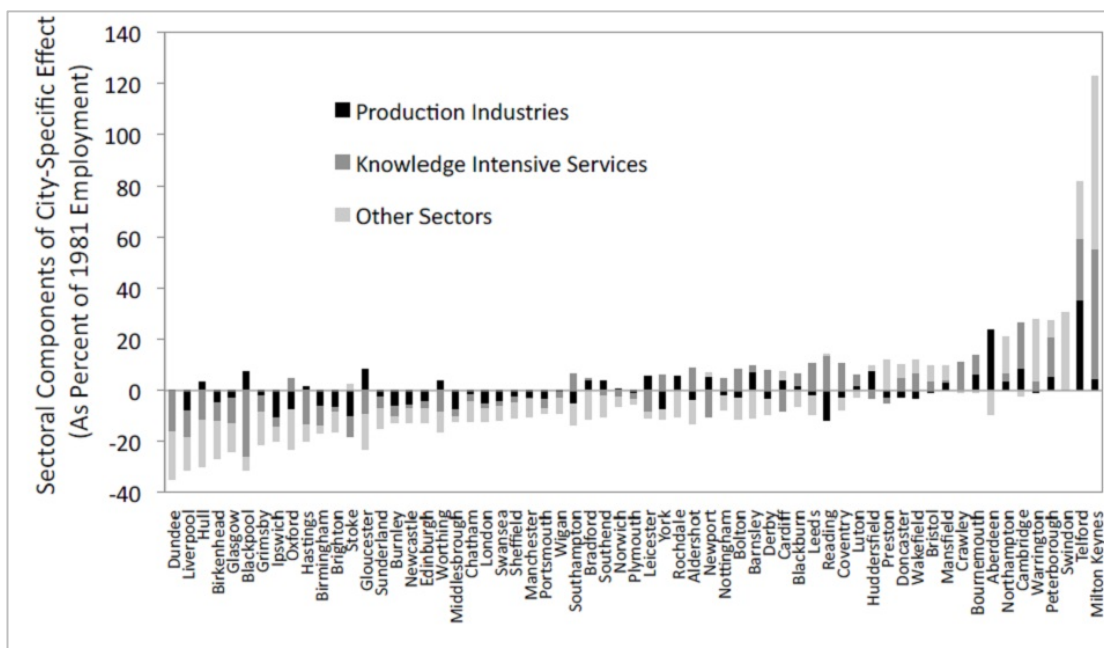


Figure 14: The shift-share 'city-specific' effect by broad sectoral group

Note: Cities ranked by size of their total cumulative 'city-specific' growth effect, expressed as a percentage of 1981 total city employment

But what precisely are the determinants of these 'city-specific' effects? A wide range of factors in addition to industrial structure has been suggested in the literature as potentially influencing city growth, including human capital endowments (skilled and graduate labour), innovative capacity (as proxied, for example, by patent activity), entrepreneurship (as captured, say, by new firm formation), various positive agglomeration externalities (arising from the close

proximity or density of firms and jobs), and the local governance and policy regime (including local tax powers, local financial institutions, and local ‘leadership’). The importance of skills and human capital has repeatedly been emphasised (for example, Glaeser, et al, 1992; Rauch, 1993; Simon and Nardinelli, 1996; Simon, 2004; Moretti, 2012) and often found to be statistically significant when included in regressions. However, as with other factors identified as influencing city growth, skills and human capital endowments are likely to be closely bound up with, and hence possibly difficult to isolate from, a city’s industrial structure, past as well as present. As Simon (2004, p. 127), states, “controlling for industry mix in regressions for city growth should reduce or eliminate the explanatory power of human capital”. The same is likely to apply, at least to some extent, to measures of technological intensity, innovation, firm formation and the like. Thus, given our interest here is explicitly in the determinants of the ‘city-specific’ effect identified from our shift-share analysis, which is that part of city employment growth with both national and local industry effects removed, it is not clear what the contribution of such factors as skills, technology, and so on will be to the city-specific growth component. We estimated various regressions with measures of skills, patents and density, as independent variables, which we report on below. But there is one factor which is worth discussing in some detail, namely purposive urban development policy.

One of the distinctive features of Britain’s urban system as it has evolved over the post-war period has been the New Town and Expanded Town programmes. These programmes – which occurred essentially in three waves, between 1946-1955, 1956-1965 and 1966-1970 – were in large part a result of the Greater London Plan of 1944, the aim of which was to decentralise population and economic activity away from the metropolitan capital of London. Over the three periods some 32 New and Expanded Towns were established across England, Scotland and Wales. Many are within an hour’s travel time from London itself. The idea behind these new settlements was the planned, integrated, and self-contained development of housing and employment, often on ‘greenfield sites’. Both population and jobs were encouraged to move to these new settlements, in part through the use of Industrial Development Certificates that were explicitly intended to constrain the expansion of economic activity in London in an attempt to steer it to the New and Expanded Towns, especially those nearest London. There are three of these New Towns in our city data set (Crawley, Milton Keynes, Telford), and three Expanded Towns (Northampton, Peterborough and Warrington). As Figure 9 shows, all are in the top ten fastest growing cities over our study period, and all have strongly positive ‘city-specific’ effects. None were heavily industrialised settlements prior to designation as a New or Expanded Town, and all have seen high rates of population and employment expansion. They contrast strikingly with the old, previously heavily industrialised cities, most of which are in the North of the country. Many of the latter have laboured under the legacy of dense built forms, old industrial sites and ageing infrastructural assets, in contrast to the lower density, newer and often mixed-use built environments, served by more modern infrastructures that characterise the New and Expanded Towns.

In an attempt to identify the roles of the various factors summarised above, the following cross-section regression was estimated over the 63 cities:

$$\Delta E_i^{CSE} = \alpha + \beta_1 SKILL_i + \beta_2 \log PATENTS_i + \beta_3 \log EMPDEN_i$$

$$+ \beta_4 \log POP_i + \beta_5 NEW_i + \beta_6 EXP_i + \varepsilon_i$$

Where:

ΔE_i^{CSE} = the cumulative sum (over 1981-2013) of the city-specific cumulative shift-share component of employment change as a percentage of the 1981 employment level, for city i ;

$SKILL_i$ = the proportion (percentage) of skilled jobs (NVQ4 and above) in the labour force for city i for 2011;

$PATENTS_i$ = patents per employee in city i for 2011;

$EMPDEN_i$ = employment density (000s per sq km) in city i in 1981;

POP_i = population (000s) in city i in 1981;

NEW_i = new towns dummy (Crawley, Milton Keynes, Peterborough, Telford);

EXP_i = expanded towns dummy (Ipswich, Northampton, Preston, Warrington).

The local shift-share component identifies that component of a city's employment change that cannot be explained by national trends or the city's industrial structure. As such it is assumed to reflect localised conditions of firm and labour market strength or weakness across the sectors being analysed. There is no generally accepted theory to suggest what the determinants of this city-specific effect might be. The possible determinants in Equation (2) include some of those that have variously been hypothesised in the literature: skills and patents (reflecting high-knowledge specialisation and innovation), employment density (designed to capture local city agglomeration effects), and population size (a proxy for 'home market' effects, and also urban agglomeration economies). In addition, we included dummy variables to capture the possible benefits that being a new or expanded urban area might bring.

An immediate issue is that regular, consistent time series data do not exist at the city level for some of the independent variables, specifically skills and patents where the available data are for 2011, and thus towards the end of the sample period. This raises a potential endogeneity issue, whereby the skills and patents indicators may both affect, and be affected by, the local employment effect. Unfortunately, due to data limitations there was no immediate solution to this issue and so we proceeded with the regressions bearing this potential caveat in mind. Glaeser (2005) faced the same problem in his analysis of the impact of skills on the growth of Scottish cities, in which he correlated (population) growth over 1981-2001 with a measure of skills in 2001.¹⁰

The local shift-share effect is a total across the 45 sectors being analysed, and so can be broken down by broad activity group as well as looked at in aggregate. Thus Table 2 gives the OLS results for Equation 2 for all sectors, while Tables 3 and 4 show respectively the corresponding estimates for production industries and knowledge intensive services separately. Although the precise results differ somewhat between these three regressions, a number of key points stand out. First, while the coefficients on $SKILL$ are positive they are not statistically

¹⁰ His correlation of 0.50 turned out to be the same as that which Glaeser and Saiz (2004) obtained in a study of city growth and skills in the USA. In that study, however, city growth over 1980-200 was correlated with initial skills, in 1980. Using skills measured towards or at the end of a study period may possibly be valid if we believe that the relative skill endowments across cities change but slowly over time.

significant. This is consistent with Simon's (2004) point about the expected lack of influence once the effect of economic structure has been allowed for or, as here, removed.

Table 2: Regression of city-specific component of differential employment growth, 1981-2013: All sectors

<i>Variable</i>	<i>Coefficient</i>	<i>Std. Error</i>	<i>t-Statistic</i>	<i>Prob.</i>
Constant	49.06688	35.25491	1.391774	0.1699
SKILLS	0.378334	0.502625	0.752716	0.4550
LOG(PATENTS)	-0.211230	2.007770	-0.105206	0.9166
LOG(EMPDEN)	-8.985055	3.361726	-2.672751	0.0100
LOG(POP)	-1.679628	3.119244	-0.538473	0.5925
NEW	58.50777	9.345125	6.260780	0.0000
EXP	16.78869	8.797494	1.908349	0.0619
R-squared	0.588258		Mean dependent var	-0.584597
Adjusted R-squared	0.540749		S.D. dependent var	24.00001
S.E. of regression	16.26434		Akaike info criterion	8.526821
Sum squared resid	13755.49		Schwarz criterion	8.773309
Log likelihood	-244.5412		Hannan-Quinn criter.	8.623040
F-statistic	12.38211		Durbin-Watson stat	2.397173
Prob(F-statistic)	0.000000			

Note: Variables defined as in text.

Second, the effect of *PATENTS*, as a proxy for technological intensity, differs as between the model for production industries, where it is negative but not statistically significant, and the model for knowledge intensive services where its influence is positive and just significant (at the 10 percent level). The effect of employment density, *EMPDEN*, as our surrogate measure for agglomeration economies, is consistently negative, though only statistically significant for the all-sector model. We suspect that this finding mainly reflects the negative legacies for employment growth of the older, dense built forms and 'brown field' sites in northern industrial cities. The negative coefficient on city size as measured by population, *POP*, in the case of the model for production industries may be capturing a similar effect. The coefficient on the new town dummy, *NEW*, is strongly positive and significant for all three models, and that on expanded towns, *EXP*, is positive and statistically significant for the all-sector and knowledge intensive service regressions, but not in that for production industries.

Table 3: Regression of city-specific component of differential employment growth, 1981-2013: Production industries

<i>Variable</i>	<i>Coefficient</i>	<i>Std. Error</i>	<i>t-Statistic</i>	<i>Prob.</i>
Constant	13.67364	13.07603	1.045703	0.3005
SKILLS	0.004176	0.186423	0.022398	0.9822
LOG(PATENTS)	-1.051301	0.744863	-1.411747	0.1640
LOG(EMPDEN)	-1.653613	1.24863	-1.326219	0.1906
LOG(POP)	-2.273032	1.156926	-1.964716	0.0548
NEW	8.918570	3.466103	2.573083	0.0130
EXP	-2.383355	3.262987	-0.730421	0.4684
R-squared	0.335443		Mean dependent var	-0.210815
Adjusted R-squared	0.258764		S.D. dependent var	7.006714
S.E. of regression	6.032436		Akaike info criterion	6.543173
Sum squared resid	1892.295		Schwarz criterion	6.789661
Log likelihood	-186.0236		Hannan-Quinn criter.	6.639392
F-statistic	4.374608		Durbin-Watson stat	2.183966
Prob(F-statistic)	0.001197			

Table 4: Regression of city-specific component of differential employment growth, 1981-2013: Knowledge intensive services

<i>Variable</i>	<i>Coefficient</i>	<i>Std. Error</i>	<i>t-Statistic</i>	<i>Prob.</i>
Constant	17.37915	17.53502	0.991132	0.3262
SKILLS	0.369919	0.249995	1.479707	0.1450
LOG(PATENTS)	1.681065	0.998621	1.683387	0.0983
LOG(EMPDEN)	-2.617595	1.670249	-1.565501	0.1235
LOG(POP)	0.437563	1.551444	0.282036	0.7790
NEW	25.89945	4.648061	5.572098	0.0000
EXP	2.654031	4.375682	0.606541	0.5468
R-squared	0.483933		Mean dependent var	1.021812
Adjusted R-squared	0.424387		S.D. dependent var	10.66247
S.E. of regression	8.089526		Akaike info criterion	7.130012
Sum squared resid	3402.903		Schwarz criterion	7.376499
Log likelihood	-203.3353		Hannan-Quinn criter.	7.226231
F-statistic	8.127034		Durbin-Watson stat	2.458931
Prob(F-statistic)	0.000003			

Given the limitations of data, and the lack of a theoretically grounded model of the determinants of 'city-specific' effects in city employment growth dynamics, these findings are at best tentative. Much more work needs to be done to identify and assess the relative contribution of the different factors influencing city employment growth, and to determine how far and in what ways such factors might themselves interact with and bear the imprint of a city's economic structure and its evolutionary history. This takes us firmly into the conceptual and empirical territory of 'adaptive growth'.

6. Conclusion and directions for future research

We began this paper by discussing the increasing interest, by academics and policy-makers alike, in the economic performance of cities. Given that cities are widely seen as the ‘engines’ of national economic growth, differences in the output, employment and productivity growth of cities understandably attract attention. This attention takes on particular significance if, as appears to be the case in the USA, in much of Europe, and as we have shown in this paper, also in Britain, city growth disparities are sustained over quite long periods of time. What is discernible in fact is a systematic and sustained pattern of ‘divergent growth’. In the British case, this divergence also has a broad geographical complexion, with most of the fastest growing cities over the past three decades or so being those in the South of the country, and almost all of the slowest growing cities being those in the North. The divergent performance of the nation’s cities is thus a key factor behind the problem of ‘spatially unbalanced growth’ (Gardiner et al, 2013) that has become a central concern of the UK government and its aim of rebalancing the economy by promoting a ‘powerhouse’ of interconnected northern cities which, together, could rival London’s recent success (Osborne, 2014; Martin et al, 2015).

A central question, of course, is why British cities (and those elsewhere) have exhibited divergent growth. In this paper we have explored what in many ways is the most obvious potential explanation, namely the role of economic structure. The role of economic structure in city (and regional) growth has itself become a subject of mounting discussion and debate within economic geography and regional and urban studies. Much of that discussion has centered on the relative advantages and disadvantages of a specialised structure as against a diversified one. Another (not unrelated) issue is that of a city’s tradable base – what its exports are, and how these impact on the rest of its economy. Such structural issues have a special salience given that the past three or four decades have witnessed a major transformation and reorientation of Western economies from an industrial model of economic growth and employment to one dominated by service activities, particularly knowledge intensive services. What matters, one might then assume, is how individual cities have been impacted by and have adjusted and adapted to this ‘great transformation’. In seeking to assess the role of economic structure on city employment growth, therefore, we used a form of shift-share that explicitly allows for continuously ongoing cumulative changes in city industry structure through time. Even using this ‘dynamic’ version of shift-share, however, the evidence for our British cities suggests that (changing) economic structure accounts for only part, and typically only a small part, of the differences in city employment growth rates. It is most important for cities at each end of the growth distribution - for the fastest and slowest growing cities – but even for these, city-specific effects are just as, if not more, important. Furthermore, our data suggest that for the most part, British cities have in any case been converging in economic structure towards a common dependence on private and public services for their employment. And although we do find some evidence of a tradable employment multiplier, which implies that this aspect of structure has some relevance, the effect is not that strong.

The upshot of our analysis, bearing in mind the limitations of the data at our disposal, is that factors other than structure per se explain much of the divergent growth paths of British cities. Explaining this ‘city-specific’ effect – or what in shift-share analysis is sometimes called a ‘competitiveness’ effect – is thus a key research question. It is also a challenging one, however. For one thing, there is no single, generally agreed theoretical framework from which to identify the full range of determinants of ‘city-specific’ effects; instead, the various hypothesised factors

found in the literature often appear somewhat ad hoc. For another, in the British context, severe data limitations constrain any detailed temporal analysis of these various determinants. Our exploratory analysis is thus highly tentative. Nevertheless, it appears that larger cities, and those with high densities of economic activity, do not seem to have been the most conducive for growth, possibly reflecting the legacies of their old industrial past and the limited space for new development. This result at least raises some questions over the normal assumption that large cities necessarily enjoy positive externalities of agglomeration. Likewise, although the regression coefficient on skills is positive, it is not significant, although this might be because the city-specific effect is a residual after allowing for industrial structure (and national growth) effects. What clearly emerges is that the fastest growing cities in Britain over the past thirty years taken as a whole have been those that have been deliberately planned and developed through post-war public policy: the purposive and integrated expansion of population and employment in these centres has set them apart from other cities, with the exception of London. This finding is of more than just academic interest, given recent calls for focusing future population and employment growth on a range of purposively 'expanded' cities spread across England (City Growth Commission, 2014; URBED, 2014).

While the findings presented here are necessarily provisional, they do support a call for much more detailed and in-depth research into the comparative growth patterns of cities, especially in an era of considerable structural, technological and competitive change and reorientation. Perhaps the role of structure would appear stronger using more disaggregated data; perhaps the 'city-specific' effects we identify are themselves related to structure; perhaps better time series data on non-structural factors would allow us to better explain those city-specific effects. And perhaps detailed contrastive comparisons of individual cities would help to reveal the causal stories behind divergent growth patterns. There is, in short, an extensive agenda here for further investigation.

References

- Barff, R.A. and Knight, P. L. (1998) Dynamic Shift Share Analysis, *Growth and Change*, 19, pp. 1-10.
- Baumol, W.J. (1967) Macroeconomics of unbalanced growth: The anatomy of urban crisis, *American Economic Review*, 57, pp. 415-426,
- Berry, C. and Glaeser, E. (2005) The divergence of human capital levels across cities, *Papers in Regional Science* 84, 3, 407-444.
- Bluestone, B. and Harrison, B. (1982) *The Deindustrialization of America*, New York: Basic Books.
- Chern T.S., Ping, T.S., Robinson, E. and Wilson, P. (2002) Assessing Singapore's Export Competitiveness: A Dynamic Shift-Share Analysis, *Occasional Paper 23*, Economic Policy Department, Monetary Authority of Singapore.
- Christopherson, S. (2009) Manufacturing: Up From the Ashes, *Democracy*, 14, (Fall), www.democracyjournal.org/14/6702.php?page=all
- City Growth Commission (2014) *Unleashing Metro Growth*, Final Report of the City Growth Commission, Royal Society of Arts, London.
- Dijkstra, L., Garcilazo, E. and McCann, P. (2013) The economic performance of European cities and city-regions: myths and realities, *European Planning Studies* 21, 3, 334-354.
- Doussard, M. and Schrock, G. (2014) Stability amid industrial change: The geography of US deindustrialisation, Ch 24 in Bryson, J. Clark, J. and Vanchan, V. (Eds) *Handbook of Manufacturing Industries in the World Economy*, Chichester: Edward Elgar, pp. 381-396.
- Duranton, G. and D. Puga (1999) Diversity and specialisation in cities: Why, where and when does it matter?, *Research Papers in Environmental and Spatial Analysis No. 56* (Department of Geography & Environment, London School of Economics).
- Farhauer, O. and Kröll, A. (200) Diversified specialisation: going one step beyond regional economics' specialisation-diversification concept, *Jahrbuch für Regionalwissenschaft*, 32, 1, pp. 63-84.
- Fothergill, S., Gudgin, G., Kitson, M. and Monk, S. (1988) The deindustrialisation of the city, in Massey, D. and Allen, J. (Eds) *Uneven Re-Development: Cities and Regions in Transition*, London: Hodder and Stoughton, pp. 68-86.
- Frenken, K., Van Oort, F.G. and Verburg, T. (2007) Related variety, unrelated variety and regional growth, *Regional Studies*, 41, pp. 685-697.
- Fuchs, V. (1969) *Production and Productivity in the Service Industries*, Washington: National Bureau of Economic Research.

Gardiner, B., Martin, R.L. and Tyler, P. (2013) Spatially unbalanced growth in the British economy, *Journal of Economic Geography*, 13, pp. 889-928.

Glaeser, E. (2005) Reinventing Boston: 1640-2003, *Journal of Economic Geography*, 5, pp. 119-153.

Glaeser, E. (2011) *The Triumph of the City: How Urban Spaces Makes Us Human*, London: Pan Macmillan.

Glaeser E.L., Kallal H.D., Scheinkman J.A., Shleifer A (1992) Growth of Cities. *Journal of Political Economy*, 100, pp. 1126–1152.

Glaeser, E. and Saiz, A. (2004) *The Rise of the Skilled City*, Brookings-Wharton Papers on Urban Affairs,

HM Treasury (2015) *Fixing the Foundations: Creating a More Prosperous Nation*, Cm 9098, London: HM Treasury.

Hobor, G. (2013) Surviving the era of deindustrialization: the new economic geography of the urban rust belt, *Journal of Urban Affairs* 35, 4, 417-43.

Holland, S. (1976) *Capital Versus the Regions*, Basingstoke: Macmillan.

Kaldor, N. (1981) The role of increasing returns, technical progress and cumulative causation in the theory of international trade and economic growth, *Economie Appliquée*, 34, pp. 593-617.

Krugman, P. (1993) Lessons of Massachusetts for EMU, in Torres, F. and Giavazzi, F. (Eds) *Adjustment and Growth in European Monetary Union*, Cambridge: Cambridge University Press, pp. 241-269.

Krugman, P. (1994) *The Age of Diminishing Expectations*, Washington: The Washington Post Company.

Lilien, D.M. (1982) Sectoral shifts and cyclical unemployment, *Journal of Political Economy*, 90, 4, pp. 777-793.

Marksuen, A. and Schrock, G. (2006) The distinctive city: divergent patterns in growth, hierarchy and specialisation, *Urban Studies* 43, pp. 1301-1323.

Martin, R.L. (2006) Economic geography and the new discourse of regional competitiveness, Ch. 8 in Bagchi-Sen. S. and Lawton Smith, H. (Eds) *Past, Present and Future of Economic Geography*, London: Routledge, pp. 159-172.

Martin R. L. and Rowthorn, B. (1986) (Eds.) *The Geography of De-Industrialisation*, Basingstoke: Macmillan.

Martin, R.L. , Kitson, M. and Tyler, P. (Eds) (2006) *Regional Competitiveness*, London: Routledge.

- Martin, R.L., Gardiner, B. and Tyler, P. (2014) *The Evolving Economic Performance of UK Cities: City Growth Patterns, 1981-2011*, Working Paper, Foresight Programme on The Future of Cities, UK Government Office for Science, Department of Business, Innovation and Skills, London.
- Martin, R.L., Pike, A., Tyler, P and Gardiner, B. (2015) Spatially rebalancing the British economy: *Regional Studies*, in press.
- Moretti, E. (2010) Local multipliers, *American Economic Review, Papers and Proceedings*, 100, pp. 1-7
- Moretti, E. (2012) *The New Geography of Jobs*, Boston: Mariner Books.
- Nordhaus, W. (2005) *The Sources of Productivity Rebound and the Manufacturing Employment Puzzle*, NBER Working Paper 11354.
- Oguz, S. and Knight, J. (2010) *Regional Economic Indicators, with a Focus on Sub-Regional Gross Value Added Using Shift-Share Analysis*, Economic and Labour Market Review, Office for National Statistics,
- Osborne, G. (2014) 'We Need a Northern Powerhouse', Speech by the Chancellor of the Exchequer, Speech, Manchester, 23 June.
- Palan, N. (2010) Measurement of specialisation: the choice of indices, *Working Paper 62*, Research Centre for International Economics, Vienna, Austria.
- Pallagst, K., Wiechmann, T. and Martinez-Fernandez, C. (Eds) (2014) *Shrinking Cities: International Perspectives and Policy Implications*, London: Routledge.
- Power, A., Plöger, J. and Winkler, A. (2010) *The Fall and Rise of Great Industrial Cities*, Bristol: The Policy Press.
- Rauch, (1993) Productivity gains from geographic concentration of human capital: Evidence from the cities, *Journal of Urban Economics*, 34, pp. 380–400.
- Robson, M. (2009) Structural change, specialisation and regional labour market performance: evidence for the UK, *Applied Economics*, 41, pp. 275-293.
- Rowthorn, R. E. (2010) Combined and Uneven Development: Reflections on the North-South Divide, *Spatial Economic Analysis* 5, pp.363-388.
- Rowthorn, R.E. and Coutts, K. (2013) Re-industrialisation: a commentary, *Working Paper 454*, Centre for Business Research, Judge Business School, Cambridge.
- Rowthorn and Wells (1987) *Deindustrialisation and Foreign Trade*, Cambridge: Cambridge University Press.
- Selting, A. and Loveridge, S. (1990) *Testing Dynamic Shift-Share*, www.jrap-journal.org/pastvolumes/1990/v24/24-1-2.pdf.

Selting, A.C. and Loveridge, S. (1992) *A Summary of the Literature on Shift-Share Analysis*, Staff Paper P92-13, Department of Agricultural and Applied Economics, University of Minnesota.

Simon, C.J. (2004) Industrial reallocation across US Cities, 1977-1997, *Journal of Urban Economics*, 56, pp. 119-143

Simon, C. J. and Nardinelli, C. (1996) The Talk of the Town: Human Capital, Information, and the Growth of English Cities, 1861 to 1961, *Explorations in Economic History*, 33(3), pp. 384-413.

Storper, M. (2013) *The Keys to the City: How Economics, Institutions, Social Interactions and Policies Shape Development*, Princeton: Princeton University Press.

Storper, M., Kemeny, T., Makarem, N. and Osman, T. (2015) *The Rise and Fall of Urban Economies: Lessons from San Francisco and Los Angeles*, Stanford: University of Stanford Press.

URBED (2014) *Uxchester Garden City*, Wolfson Economics Prize, URBED, Manchester., www.policyexchange.org.uk/images/WolfsonPrize2014/20140827%20rudlin%20stage%202.pdf

Van Dijk, J.J. (2014) Local employment multipliers in US Cities, *Discussion Paper 730*, Department of Economics, University of Oxford.

Appendix

Sectoral disaggregation used in the city employment series

1. Agriculture etc
2. Mining & quarrying
3. Food, drink & tobacco
4. Textiles etc
5. Wood & paper
6. Printing & recording
7. Coke & petroleum
8. Chemicals etc
9. Pharmaceuticals
10. Non-metallic mineral products
11. Metals & metal products
12. Electronics
13. Electrical equipment
14. Machinery etc
15. Motor vehicles etc
16. Other transport & equipment
17. Other manufacturing & repair
18. Electricity & gas
19. Water sewerage & waste
20. Construction
21. Motor vehicles trade
22. Wholesale trade
23. Retail trade
24. Land transport
25. Water transport
26. Air transport
27. Warehousing & postal
28. Hotels
29. Food & beverage services
30. Media
31. IT services
32. Financial & insurance
33. Real estate
34. Legal & accounting
35. Head offices & management cons.
36. Architecture & engineering services
37. Other professional services
38. Business support services

- 39. Public Administration and Defence
- 40. Education
- 41. Health
- 42. Residential & Social
- 43. Arts
- 44. Recreational services
- 45. Other services
- 46. Other non-specified

Definition of 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

National Sectors exporting 25 percent or more of output

The above, plus:

Business support services
Media
Agriculture
Head offices and management consultancies
Architecture and engineering services

Definition of knowledge-intensive services

Media

IT Services

Finance and Insurance

Real Estate

Legal and Accounting

Head Offices and Management Cons

Architecture and Engineering Services

Business Support Services

Other professional Services

Arts

Education (50%)

Health (50%)



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