**Economic Complexity and Levelling up**

**Executive Summary**

Cities offer a number of inherent benefits to more knowledge-based forms of economic activity. The most successful ones offer access to large numbers of high-skilled workers, and they provide greater opportunity to create and share knowledge face-to-face.

Economic complexity is an analytical approach that attempts to measure how sophisticated an economy is. It has been widely used to compare countries, but to date has been less commonly applied at the subnational level, especially in the UK.

Using this approach shows that because of the inherent advantages that cities have, they are more complex. The UK’s most knowledge-based activities tend to cluster within its urban areas.

Cities’ size plays a role in its complexity levels. Larger cities tend to be more complex than its smaller peers. That said, high complexity in large cities outside the South of England still does not reflect into higher productivity levels. This suggests those cities are the ones with the largest ‘productivity gap’, as shown in previous Centre for Cities’ briefing on levelling up. Moreover, UK’s largest cities – with the exception of London – currently lag its’ French and German competitors, which highlights the need of continuing improving its economic structure.

This static picture hides what has been an improving picture for the big cities over the last 40 years. Applying the economic complexity approach for the first time to historical data in the UK, this briefing shows that the big cities have started to close the gap between their actual and potential performance. In 1981, the largest cities outside the South of England had complexity levels below average. But since then, some of these places were able to break out of its ‘low knowledge’ trap to attract in more knowledge-based activities.

Some argue that this turnaround has been policy driven, with a bias shown towards big cities at the cost to other parts of the UK. Looking back at the whole range of policy interventions since then, it is difficult to see any favouring through policy. Instead, as the UK economy has specialised in more knowledge-based activities over this period as a result of increasing globalisation, big cities have been best placed to take advantage of this change as such activities looked for particular things from their location of choice.

But clearly there is work to be done. Despite their improvement, the continued underperformance of the UK’s large cities creates a cost to the UK economy that the Centre for Cities estimates is at least £47 billion per year. In order for the UK economy to get the most out of what is has, there needs to be greater focus on the performance of large cities, particularly if the Government wants to level up the economy.

This research also offers a note of caution for those who urge areas to ‘play to their strengths’ when attempting to improve their economies. Those cities that have continued to specialise in similar types of activities such as Blackpool in aero spatial activities, are the ones that have become less complex in recent years. This suggests that in many struggling places, it is not what a place has that should be the only question asked, but rather what a place doesn’t have. Many places in North and Midlands won’t see a turnaround in the coming years if they continue to focus on what they already have, particularly in manufacturing. They need to focus on addressing the barriers that stop more complex activities from investing in their areas.

**Introduction**

* The government has announced levelling up the country has an objective and CfC has recently defined levelling-up in i) standards of living ii) help places each its productivity potential.
* On the productivity front, UK’s productivity is below France and Germany but there is a geography to it. Previous CfC research shows that the national productivity lag is mostly driven by large cities located outside the South East as they do not outperform non-urban areas as we would expect.
* Economic complexity helps us understand better the underlying economic capacities of each city. This allows identifying which places are lagging the most, when compared with their productivity potential.
* A comparative analysis between today and 1981 provides guidance on what work and what doesn’t in terms of changing the economic fortunes of a city.

**This paper attempts to understand the productive capabilities of each British cities and it is divided as follows:**

* What is economic complexity and how it looks today in UK urban areas
* How urban complexity changed in the last four decades
* What does this mean for levelling up?

**What is economic complexity and how it looks today in UK urban areas**

**Complex and productive sectors tend to be in urban areas due to their underlying features**

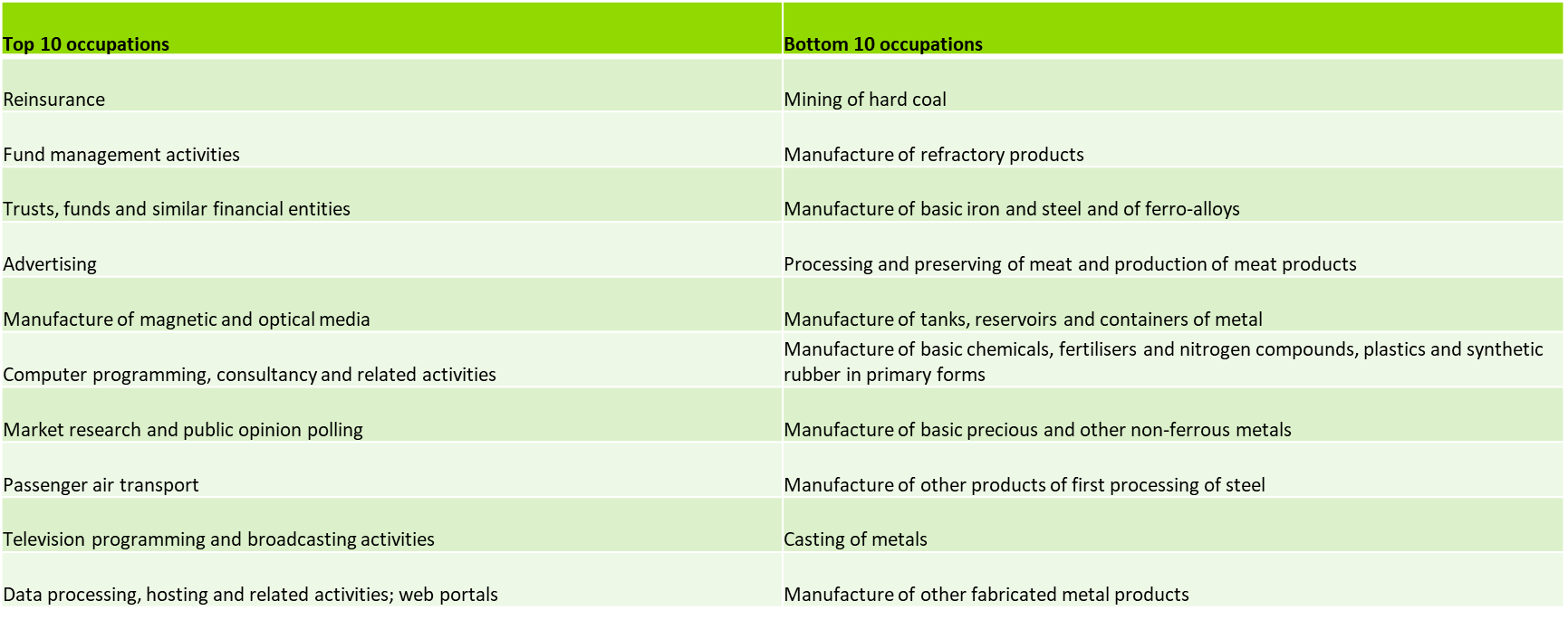
* Economic complexity is a concept that infers the economic sophistication of a place, based on its’ comparative advantage and inherent knowledge levels. This process is done by analysing the mix of activities a place can make (more details see box 1). As individuals are limited in what they can know and produce, improving collective knowledge in an economy – and therefore, economic complexity – requires people and firms to interact and share its knowledge.
* Complex economies tend to have larger levels of collective knowledge, which allow them to specialised in knowledge-intensive sectors and innovate over time. Meanwhile, economies with lower levels of complexity are mostly associated with activities that require a smaller base of knowledge that do not need vast web of knowledge interactions in the economy.
* Urban areas, due to its inherent benefits promoted through densification are in the best position to generate knowledge spillovers and increase the complexity of the overall economy, when compared with non-urban areas. This is supported by UK’s data that shows **urban areas being more complex than non-urban areas (Figure 1),** because cities present inherent benefits (e.g. large labour pools, sharing of inputs like roads, etc.), which attract knowledge-related sectors, making them the UK’s engine of growth.

**Figure 1: Urban areas are more likely to be complex than non-urban areas.**

Source: BRES, 2019. Centre for Cities’ own calculations. Weighted-average of economic complexity scores at the Local Authority level; the higher the score, the more complex the economy is. The most complex Local Authority is the City of London, followed by Tower Hamlets, while Dumfries and Galloway ranks last. Note that complexity scores are relative to other local authorities, meaning that there will always be local authorities with negative scores.

* Today’s most complex exporting activities are typically knowledge intensive services like Finance, Advertising and programming; while the least complex occupations are associated with the production or extraction of goods (e.g. mining and manufacturing). Previous research from the Centre for Cities shows that services’ exports – more likely to be complex – tend to locate in cities, particularly in city centres that allow them benefit from agglomeration.[[1]](#footnote-1) Exporters of goods (lower complexity) are most likely to locate in suburbs or non-urban areas as land and premises are cheaper.

**Table 1:** Exporting occupations by complexity (2019)



Source: BRES, 2019. Centre for Cities’ own calculations.

* + Box 1: with overall complexity developed by Hidalgo and Hausman, definition and formula. Rare products are not necessarily complex. State the authors argue it is a predictive force of future economic growth

**Differences in intra-urban complexity are substantial**

* Even though cities are more complex and UK’s engine of growth, **urban areas are not equally complex and some even perform below the average non-urban areas**. Figure 2 show a clear relationship between productivity and complexity in UK’s cities. This supports the view that productivity differences across regions are mainly result of differences between their exporting structure, rather than underperformance of existing businesses or lack of exporting jobs.[[2]](#footnote-2)
* Most of cities and large town that present both high complexity and productivity levels are mostly located in the Greater South East. Research has shown that high-skilled exporters are more prevalent in urban areas in the Greater South East because they have been able to offer a large number of skilled workers and networks of highly-skilled businesses.[[3]](#footnote-3) The most productive and complex firms and sectors are willing to pay a premium – in form of more expensive commercial space – to access such advantages.
* Almost all cities with lower complexity also present below average productivity levels below the urban average. These cities generally located in the North and Midlands where its competitive advantages are highly associated with cheap labour and land, attracting low complexity (also low productivity) activities as distribution and storage.

**Figure 2:** Complexity and productivity are highly correlated

**Urban average**

Source: ONS 2018; BRES, 2019. Centre for Cities’ own calculations. **Note that complexity scores are relative to other cities, meaning that there will always be cities with negative scores**

**Large cities in particular punch below their weight**

* There is a strong relationship between city size and its economic complexity as Table 3 shows. As the economy shifted towards knowledge-intensive sectors, l**arger cities are more likely to attract complex activities due to its inherent features, such as large pools of workers and networks of businesses.**

**Figure 3:** Agglomeration effects from larger cities promote a knowledge-based economy

Source: ONS, Business Register and Employment Survey (BRES); ONS, Census 2011. Centre for Cities’ own calculations.

* That said, most of UK’s largest cities – like Glasgow, Manchester and Leeds – simultaneously present **low productivity levels and higher economic complexity (see Figure 2)**. This suggests that such places are the ones with the largest ‘productivity gap’ to be closed. As previous Centre for Cities research shows, it represents at least £47 billion per year for the British economy.[[4]](#footnote-4)

**Largest cities’ complex base is relatively small, making them lag their international competitions**

* The current underperformance of large cities is partially explained by the relatively small size of their complex sectors. Currently, most large cities present some comparative advantages in complex sectors. However, those activities still employ a comparatively low level of workers, when compared with other complex economies as Figure 4 shows. As consequence, complex activities are not large enough to drive productivity significantly upwards.

* For example, Glasgow and Brighton have comparative advantages (more employment than average) in several complex activities but the employment share in those activities is substantially different. Brighton, a city with higher productivity, have 54 per cent of its exporting jobs in the five most complex sectors of its economy. Meanwhile, in Glasgow – which has productivity below national average – only 13 per cent of its exporting jobs are associated with its most complex activities.

**Figure 4:** Complex cities with low productivity levels lack a large complex export base

Source: ONS 2018; BRES, 2019. Centre for Cities’ own calculations.

* British cities lag their French and German international competitors in terms of complexity, which is particularly relevant for UK’s largest cities. Despite presenting comparatively high levels of complexity at the national level, *Figure 5* shows that large cities significantly underperform their French and German peers, comparable to French smaller cities. From the 18 French and German large cities analysed, all present complexity above average, while the same does not hold for the UK: only three (Bristol, Leeds and Manchester) out of the nine largest cities in the UK (excluding London) had complexity slightly above average. Consequently, large cities need to increase the size of its complex sectors in order to close the existing productivity gap.

**Figure 5:** Large British cities significantly lag their German and French competitors

Source: Eurostat, xxx. Most complex cities are London and Paris, respectively. Explain methodology here and cities collected.

**The last four decades of economic complexity (1981-2019)**

**Urban areas and large cities in particular have been diverging**

Analysing the last four decades helps understand the reasons behind the current “productivity gap” in several British cities. As the economy has been moving from manufacturing towards knowledge-intensive services, urban areas in general and the largest cities in particular, are in a better position to prosper. Urban areas – specially the larger ones – offer benefits that promote innovation, knowledge spillovers and consequently become complex and productive in today’s economy.

**Figure 6:** Cities, in particular the largest ones, have become more relevant in the last four decades

Source: ONS 2018; Census, 1981; BRES, 2019. Centre for Cities’ own calculations. Urban ECI computed at the Local Authority level including all local authorities. City’s ECI computed at the PUA level, including urban areas only. Largest cities measured by total employment and ECI scores are a weighted average considering each PUA’s size.

**Largest cities include:** Birmingham; Manchester; Glasgow; Liverpool; Sheffield; Newcastle; Leeds; Nottingham; Bristol.

**Past complexity is a good predictor of today’s complexity and productivity**

* The strong relationship between 1981 and 2019 complexity levels support the ideas that the past knowledge/capabilities of a city help explain its future performance. The cities that had high complexity levels in 1981 were more likely to have the necessary collective knowledge to keep innovating and remain complex and highly productive, as Figure 7 illustrates.

**Figure 7:** Complexity changes 1981-2019, at the PUA level

Source: ONS 2018; Census, 1981; BRES, 2019. Centre for Cities’ own calculations. Note that complexity scores are relative to other cities, meaning that there will always be cities with negative scores. Scores are normalised.

* + Box 4 with a bit of data and methodology for 1981
* That said, complex economies remained productive not by replicating the existing advantages they had in 1981. Evidence shows that cities, which have been historically creators of knowledge, tend to have greater transferable skills.[[5]](#footnote-5) Those urban economies kept reinventing themselves, adapting to the changes in the economy and developed advantages in new economic sectors like IT (more details, see Box 5).

Box 5: London’s growth and the role of the financial sector

The rise of London in the last decades is generally associated with the “Big Bang”, a set of financial deregulation reforms by the mid-80s that lead to the expansion of the financial sector. However, London’s economic turnaround has been much more than finance.

• The rise in finance happened in a context of an overall economic shift towards the service sector. When compared with other knowledge and business services, London’s rise of finance-related jobs was dwarfed by sectors like programming, design, advisement or research.[[6]](#footnote-6)

**Figure 8**: Finance-related employment rose but not as much as other services.

Source: Census, 1981; BRES, 2019

• Moreover, national accounts from the last two decades also support the idea that finance and insurance sector has not been the main driver of London’s growth. The sector, as a percentage of London’s economy, remained mostly unchanged. While Information and Communication; combined with Professional, scientific and technical activities have risen significantly, partially being the driver of London’s growth in the last decades. In 2019, those sectors presented 25.1 per cent of London’s economy, a 8.9 percentage points increase when compared with 1998. Moreover, their weights are substantially above the finance and insurance sector, that stood at 13.7 per cent in 2019.

**Some places, mainly large cities, were able to become more complex and attract new innovative sectors**

* The few places that were able to **break out of the ‘low complexity’ trap and attract in more complex activities are large cities**, with the exception of Dundee and Warrington. As Box 6 suggests, those cities were able to attract new knowledge activities, without necessarily having previous knowledge on that specific sector.
* These findings highlight that large cities, with their agglomeration benefits, are in the best position to attract knowledge-related sectors.

**Box 6:** Cities can develop sectors without previous knowledge in relatable areas

Some British cities were able to become relatively more complex recently, specialized in new activities in the last decades. Data at the occupational level suggests that in some circumstances, the observed improvements did not depend on the previous industrial features of a place.

**Computer-related sectors**

Today, economies with a strong IT sector generally had a comparative advantage in electronics-related occupations in 1981 (Figure 10); both sectors are seen as complex in 2019 and 1981, respectively. Half of the cities with a comparative advantage in the IT sector – like Reading, Slough, London or Brighton – were specialised in the electronics sector in 1981. Nevertheless, Leeds and Nottingham were able to become some of the few cities with a comparative advantage in IT, without having electronics’ legacy from 1981: Nottingham ranked 37th out of 62 cities in terms of being specialised in electronics.

**Figure 9:** Economies focused on electronics were more likely to move towards IT-related occupations but there are exceptions

Source: ONS 2018; Census, 1981; BRES, 2019. IT-related occupations include “Computer programming, consultancy and related activities” and “Data processing, hosting and related activities; web portals”; and Electronics-related occupations include “Electronic data processing equipment” and “Radio/electronic capital goods”.

A similar trend is found in Research-related activities, one of the most complex sectors today. Liverpool was able to build a comparative advantage in that sector, without presenting a strong legacy, as it ranked 49th out of 63 cities in Research and Development activities in 1983.[[7]](#footnote-7) Moreover, Manchester, Nottingham and Slough were some of the least specialised economies in the ‘Telecommunications’ in 1981 and today they present a comparative advantage in ‘Wireless telecommunications activities’.

* Despite the improvements in the last decades, UK’s large cities continue underperforming relative to its size, both in national and international terms. As highlighted in previous Centre for Cities’ levelling-up briefing those places should be in centre of governments’ levelling-up agenda, in order to unleash UK’s productivity potential.[[8]](#footnote-8)

**The emergence of larger cities is not result of direct policy towards cities but structural changes in the global economy**

* There is also a strand of thought that cities have ‘had it too good’, and have been explicitly favoured by policy in recent decades. This has sucked jobs into cities, so the argument goes. Finding evidence of this is difficult. There have been city specific policies, such as Michael Heseltine’s City Challenge or City Deals under the Cameron-led government. But as *Box 3* illustrates, in the wide gamut of local growth policies that have been put in place in the last 30 years, very few have been city focussed.
* **Box 3: A timeline of sub-national policies**
* While not exhaustive, the below sets out a long list of local growth initiatives that have been put in place since the 1980s. Only three have had an explicit city focus – City Challenge, City Deals and Mayoral Devolution Deals. Meanwhile there have been a number of initiatives that have been more explicit in not having a city focus, such as the creation of the Coalfield Regeneration Trust, Coastal Communities Fund and the recently announced Towns Fund.
* 1991 City Challenge
* 198x Enterprise Zones
* 1999 Coalfield Regeneration Trust
* 1997 Single Regeneration Budget
* 1998 Regional Development Agencies
* Xxxx Local Enterprise Growth Initiative
* Xxxx Pathfinders?
* 1998(?) New Deal for Communities
* Xxxx Coastal Communities Fund
* 2011 Local Enterprise Partnerships
* 2014 Local Growth Fund
* 2012 Enterprise zones
* 2011 City Deals
* 2009-18 Mayoral Devolution Deals
* 2019 Towns Fund
* 2019 Future High streets fund

* Other non-spatial policies have inadvertently helped cities. The expansion of higher education has seen the growth of universities that are largely city based. While immigration policy has also benefited London in particular.
* But the main driver has been global economic forces that have altered the geography of the UK economy. Skills-biased technological change and a shift to an ever more services-based economy has changed the nature of firms in the national economy. These businesses have different locational preferences to those of the past, looking for the benefits that density provides. And these benefits have seemingly become increasingly desirable despite advances in communications technologies.

**Promoting existing advantages in struggling cities is unlikely to turn things around**

* Places that experience a relative decline in economic complexity – unlike the ones that were able to remain complex – typically kept specialising in their 1981’s comparative advantages. As the economy evolved over the decades, those cities have struggled as their economic structure remained relatively unchanged and global economy kept innovating.
* Highly productivity cities like Reading and Edinburgh moved from being specialised in electronic-related activities in 1981 to IT-related jobs in 2019, innovation allowed them to remain productive over the decades. Meanwhile, Blackpool and Swansea continued replicating the exact same activities they were in 1981 (Aerospace; Iron and Steel, respectively), reflecting in a relative decline of its economic position (see Table 2).

**Table 2:** Reinventors vs. Replicators, most prevalent occupation % of exporting jobs in 1981.

|  |  |  |  |
| --- | --- | --- | --- |
| **PUA** | **1981** | **2019** | **Complexity** |
| Edinburgh | Radio/electronic capital goods (8.2%) | Computer programming, consultancy and related activities (19.0%) | Remained high |
| London | Banking/bill-discounting (8.4%) | Computer programming, consultancy and related activities (16.8%) | Remained high |
| Reading | Electronic data processing equipment (4.8%) | Computer programming, consultancy and related activities (37.4%) | Remained high |
| Aberdeen | Extraction: mineral oil/natural gas (24.5%) | Extraction: mineral oil/natural gas (28.3%) | Deteriorated |
| Blackpool | Aerospace manufacture/repairing (20.6%) | Aerospace manufacture/repairing (26.7%) | Deteriorated |
| Swansea | Iron and Steel industry (12.1%) | Manufacture of basic iron and steel and of ferro-alloys (13.6%) | Deteriorated |

Source: Census, 1981; BRES, 2019.

**Overspecialisation in existing competitive advantages limits the future performance of a city**

* Data on job concentration, which acts as a proxy of specialisation in a single sector, shows that specialising in a single sector (manufacturing and extraction in particular) hinders the economic over the long-term. Cities with low complexity today have, on average, high levels of concentration in a single (low sophistication) activity sector in 1981.[[9]](#footnote-9)Economies with low complexity today had, 18.8 per cent of its jobs in a single sector, on average; compared with 11.1 per cent for high complexity economies.

* There is also evidence that cities with the same specialisation in 1981 but different degrees of concentration moved in opposite directions in the decades ahead. Highly concentrated economies, specially in manufacturing and extraction activities, struggled to bring new knowledge-intensive activities, when compared with its peers as Table 3 illustrates.

**Table 3:** Divergence between cities with the same specialisation in 1981 but different degrees of specialisation

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **PUA** | **Most prevalent sector (1981)** | **Sectorial concentration: % exporting jobs** | **KIBS % private jobs (1981)** | **KIBS % Private jobs(2019)** | **Most complex activity (2019)** | **Complexity (1981-2019)** |
| Liverpool | Motor vehicle bodies | 10.8 | 7.2 | 12.7 | Data processing, hosting and related activities; web portals | Improved |
| Luton | 16.7 | 4.1 | 10.3 | Passenger air transport | Deteriorated |
| Nottingham | Deep coal mines | 6.8 | 5.2 | 12.6 | Data processing, hosting and related activities; web portals | Improved |
| Mansfield | 26.6 | 3.1 | 6.3 | Photographic activities | Remained low |

Source: ONS 2018; Census, 1981; BRES, 2019. Centre for Cities’ own calculations. Note that complexity scores are relative to other cities, meaning that there will always be cities with negative scores. Scores are normalised.

**‘Playing its own strengths’ means moving from one low complexity activity to another**

* Urban economies ‘trapped’ in low complexity sectors in the last four decades, which are mostly located in the North and Midlands, typically present as competitive advantage large pools of low-cost labour, combined with the availability of cheap land. As consequence, those economies tend to attract low productivity activities that require those features such as warehousing and storage, or food manufacturing.
* If cities and large towns trapped in low complexity activities keep specialising in activities based on their existing strengths, they will continue attracting low productivity and low paid jobs in the years ahead. As illustrated in Box 7, most low of complexity economies simply shifted between different low knowledge-activities in the last four decades. Their inherent strengths will not attract knowledge-related activities. Consequently, they are unlikely to benefit from knowledge spillovers, which would help cities to innovate and reinvent themselves.[[10]](#footnote-10)

**Box 7:** Coal economies – evolution in the last decades

From the 22 cities and large towns that had they complexity level below average for both 1981 and 2019, six of them were highly reliant on coal in 1981. Today, their economies had moved away from coal and become specialised in several different sectors, which typically require cheap labour and land. However, those competitive advantages had no economic relationship with coal mining; which means these economies did not benefit from accumulated knowledge of their previous specialisation.

**Table 4:** Most prevalent exporting occupation, 1981-2019



Source: Census, 1981; BRES, 2019.

This highlight how low complexity activities are unlikely to drive places towards economic sophistication through the gradual development of its existing sector (e.g. moving from mining to mining tool manufacturing, etc.). Instead, cities are likely to continue using their existing competitive advantages to attract new types of low complexity sectors that are unlikely to promote innovation.

**Sunderland’s previous strengths did not attract Nissan**

In 1984, the British government and Nissan reached an agreement to open a car plant in Sunderland and Nissan has been able to benefit from further government support in recent years.[[11]](#footnote-11) Before the car plant, Sunderland’s economy was dominated by coal mining, shipbuilding and other manufacturing activities. However, there is little evidence that Sunderland’s economic structure was the reason why Nissan located there.

If Nissan has moved to Sunderland mainly because of its industrial and labour capabilities, we should expect to see a strong relationship between those sectors (mining, shipbuilding, etc) and car manufacturing in other British cities. Figure 9 suggests that there is no relation between Sunderland’s past capabilities and the likelihood of producing car-related goods.

**Figure 10:** Cities with car manufacturing plants were not similar to Sunderland in the early 80’s

**Source:** Census, 1981; BRES, 2019. **Methodology:** Top five car manufacturing cities in 2019 include Oxford, Coventry, Luton, Liverpool and Birmingham. The most similar cities to Sunderland in 1981 are Barnsley, Plymouth, Doncaster, Mansfield and Portsmouth, based on their percentage of 1981 jobs in the following sectors: deep coal mining; Shipbuilding and repairing; Other glass products; Mechanical lifting/handling equipment; and active components/sub-assemblies.

Urban economies with some degree of specialisation in car manufacturing today (Luton, Birmingham or Oxford) did not share Sunderland’s economic features in 1981. At the same time, places focused in mining and shipbuilding like Portsmouth or Doncaster did not shift their economy towards car manufacturing. Sunderland was able to attract Nissan due to other benefits that were not directly related to its industrial base like public subsidies; and availability of cheap land and labour.

**What does this mean for levelling up?**

**Recognise the central role of cities in levelling-up the economy**

* Cities are more complex than non-urban economies because the overall economy is moving towards knowledge-intensive services
* Urban economic complexity, like previous CfC research, supports the idea that levelling up is not making all places equally productive.
* Ad-hoc pots of money to towns can improve local wellbeing but not solve the productivity challenges.

**Within cities, different places present different challenges, depending on its economic base**

**Larger cities, with the highest ‘productivity gap’**

* Cities that improved their complexity substantially since 1981, typically large cities that offer agglomeration benefits to knowledge-intensive sectors, are still in a transition process. Unlocking its productivity potential is key to level up the country as whole. Central and local governments must support cities to expand on their emerging strengths.
  + **Central government rec:** End local government austerity, give further devolved power, etc.
  + **Local government rec:** use devolved powers to improve people’s skills; strengthen transport networks; improve conditions for business (office space quality); etc.

**Economies stuck in low complexity activities**

* Central government should not expect these places as a whole to improve their productivity levels rapidly: our research shows that cities that had complexity gains in the last four decades are still lagging in terms of productivity showing how gradual the process can be.

* That said, cities can reinvent themselves and turn things around but not by building on their existing strengths, which keeps cities in a cycle of replication. In order to achieve it, it will fundamental to diversify the existing economy by attracting other sectors. Strategies based on attracting large manufacturing plants or freeports will do little to change the strengths of an economy in the decades to come.
  + **Central government rec:** support incomes and wellbeing in the areas, guarantee health and education levels converge with the rest of the country.
  + **Local government:** make cities better places for businesses (office space improvements) and adult education, etc

1. Trading places – add the footnote later [↑](#footnote-ref-1)
2. The wrong tail and trading places 2 – add the footnote correctly later [↑](#footnote-ref-2)
3. The wrong tail – add the footnote correctly later [↑](#footnote-ref-3)
4. Reference to Paul’s Level up briefing [↑](#footnote-ref-4)
5. Add footnote: A century of cities CfC [↑](#footnote-ref-5)
6. **Other knowledge-related services include (2019):** Activities of head offices; Management consultancy activities; Research and experimental development on natural sciences and engineering; Research and experimental development on social sciences and humanities; Advertising; Market research and public opinion polling; Specialised design activities; Photographic activities; Translation and interpretation activities; Other professional, scientific and technical activities n.e.c.; Computer programming, consultancy and related activities; Data processing, hosting and related activities; web portals; Other information service activities.

   **Other knowledge-related services include (1981):** Business services (Other); Advertising; Professional/technical services (Other); Research/development [↑](#footnote-ref-6)
7. Ranked by sector’s jobs as percentage of all exporting jobs [↑](#footnote-ref-7)
8. Paul’s briefing here [↑](#footnote-ref-8)
9. Moretti mentions something similar to this in the New Geography of Jobs when he speaks about Detroit and the Valley. The sophisticated sectors of the present will be lower sophistication in the future, so invest in them is not the best strategy. [↑](#footnote-ref-9)
10. Graham D (2007) Agglomeration Economies and Transport Investment, Journal of Transport Economics and Policy 41 (3) [↑](#footnote-ref-10)
11. Is your blog enough as reference about the subsidies? [↑](#footnote-ref-11)