Innovation hotspots

Clustering the New Economy

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Executive summary

Of all the responses being considered to help rebalance the economy and address the UK's sluggish productivity growth, the development of clusters in cutting-edge industries gives the greatest consideration to geography. Both parties are committed to supporting clustering across the country, with the Government and the Metro Mayors currently preparing Investment Zone proposals centred on that aim.

Drawing lessons from research into agglomeration and 'knowledge spillover' effects, this report examines the clustering of innovative 'new economy' firms over very short distances in the UK. Emphasising the importance of proximity and place, the report identifies 'hotspots' of promising cutting-edge activity across the country. Unlike many traditional cluster analyses, which draw links between firms over larger – often regional – scales, the approach taken by this report permits analysis of what determines the formation of hotspots within, as well as between, urban areas.

This report identifies 344 hotspots across the UK. 115 of these are in London, and 105 are found across the rest of the Greater South East. Although they are found in every region, most of the remaining hotspots are in the North West, West Midlands, and South West of England. The report further finds that:

- While they account for a small share of the overall economy, firms in hotspots punch above their weight. Together, clustered new economy businesses are worth around 1 per cent of national output and 200,000 jobs, despite accounting for 0.6 per cent of businesses and 0.1 per cent of land. The places in which hotspots are located are generally more productive and have grown faster since the financial crisis than those without them.
- Nearly 90 per cent of clustered new economy firms are in urban areas. The largest hotspots are in city centres, with central London alone containing nearly 40 per cent of all the clustered new economy firms

in the country. This trend results from the inherent advantages cities offer in relation to labour markets, connectivity, and the potential for knowledge spillovers. That said, most major cities outside London – such as Birmingham, Glasgow, Manchester, Liverpool, and Sheffield – are presently falling short of their potential.

- Contrary to prevailing ideas about clusters being centred around one industry, clustering over the distances used in this report is rarely specialised. Instead, hotspots are almost always melting pots of different sectors. This suggests that place and the benefits that places offer to businesses provide a more useful lens for policy than sector.

Regression analyses show how the benefits of agglomeration – namely access to a deep pool of skilled workers and a network of knowledge-based businesses – affect the formation of hotspots. Labour market areas with large, highly-skilled workforces have proportionally more clustered new economy activity than smaller places. Within cities and towns, neighbourhoods with good transport links are more likely to have hotspots than elsewhere, and dense city centres are the most likely place to find the UK's clustered new economy businesses.

The regressions also assess the role of universities and large high-technology employers. Universities have little positive impact on the size of the new economy in their labour market areas, but they do play a role in organising innovative companies into hotspots in their vicinities. These effects decrease significantly with distance, and leading research-intensive institutions have a much larger impact than other universities. Large, high-technology employers similarly organise new economy firms into hotspots and appear to perform this anchoring role more effectively than universities.

If government policy is to pursue the support of local clustering, then the best approach is to support and grow existing hotspots, rather than devoting significant resources in attempts to create new hotspots. Policy should concentrate on three main areas:

1. Ensuring that land use policy is aligned with the needs of innovative businesses matters across the country, but the situation is much more urgent in the Greater South East. Improving the provision of office space near existing hotspots and other well-connected locations will allow the clustered new economy to grow.
2. Outside the Greater South East, the most significant potential for growth lies in the major cities. Policy should:
    - Prioritise addressing the major cities' connectivity problems. This is especially the case in their city centres, which host most of their clustered new economy businesses.
    - Metro Mayors should formulate Investment Zone proposals which

double down in their cities' existing advantages and resist the urge to spread their resources too thinly.

- The diversity of the clustered new economy also means that Metro Mayors and other stakeholders should treat interventions structured around specific industries with caution. Supporting clustering at small scales depends far more on offices and connectivity, amenities which are applicable to a wide variety of businesses rather than specialised manufacturing sites.

3. Where hotspots do not appear to be operating under specific constraints, such as in business and science parks in non-urban parts of the country, stakeholders should look to hotspots as anchors for other interventions, such as transport investment and regeneration schemes, and support existing activity as required. National interventions to promote levelling up should similarly consider places with hotspots as locations within cities, towns, or regions as among the best potential destinations within their areas to capitalise on new investment.

01

The concept

Policymakers have lately revived interest in encouraging clustering among innovative businesses. In last year's Autumn Statement, the Chancellor announced his intention to refocus the Investment Zones programme to catalyse high potential clusters.[1] As part of his report of the Commission on the UK's Future, Gordon Brown identified clusters as an important part of Labour's future economic growth strategy.[2] Local authorities and pan-regional partnerships, such as the Midlands Engine, have similarly shown interest in understanding and supporting the clustering of knowledge-intensive activities.[3]

While research into clustering burgeoned in the 1990s, the roots of cluster theories lie in work on agglomeration which stretches back to the early 1900s.[4] Clustering occurs because there are benefits to co-location – especially among complex, knowledge-intensive activities – which come from related firms sharing infrastructure and access to workers and credit.[5] Co-location also allows the development of robust supply chains and knowledge spillover effects rooted in the exchange of knowledge within and between firms.[6]

Knowledge spillovers depend on face-to-face interactions. As a result, they require proximity and strong networks to operate most effectively.[7] They are of great importance to startups and emerging high-technology businesses – the 'new economy' – for whom the sharing of ideas and techniques can be helpful for

1 HM Treasury (2022), Autumn Statement 2022, London: His Majesty's Stationery Office
2 Commission on the UK's Future (2022), A New Britain: Renewing our Democracy and Rebuilding our Economy, Newcastle: The Labour Party
3 Midlands Engine (2023), Exploring the Investment Potential of Midlands Clusters, Nottingham: Midlands Engine
4 Charles D (2022), The evolution of business networks and clusters, in Wilson J, Corker C and Lane, J (eds.) Industrial Clusters in the UK: Knowledge, Innovation Systems and Sustainability, Abingdon: Routledge
5 Swinney P, Graham DJ, Vera O, Anupriya, Hörcher D and Ojha S (2023), Office politics: London and the rise of office working, London: Centre for Cities
6 McCann P (2008), Agglomeration economies, in Karlsson C (ed.) Handbook of Research on Cluster Theory, Cheltenham: Edward Elgar
7 Ganguli I, Lin J and Reynolds N (2020), The Paper Trail of Knowledge Spillovers: Evidence from Patent Interferences, American Economic Journal: Applied Economics, 12 (2): 278-302; Andrews M (2020), Bar Talk: Informal Social Interactions, Alcohol Prohibition, and Invention, SSRN Working Paper 3849466; Atkin D, Chen K and Popov A (2022), The returns to face-to-face interactions: Knowledge spillovers in Silicon Valley, NBER working paper 30147

development. Presently in its infancy, the new economy is of national importance and is growing rapidly. Its constituent firms have thus far attracted billions of pounds of investment and Innovate UK grants.[8] Recent evidence suggests that the knowledge spillover benefits enjoyed by these types of companies operate over very short, neighbourhood-level distances and weaken significantly after as little as 250 metres.[9]

Guided by these findings, this report examines the clustering of innovative new economy firms over very short distances. It does this by identifying hotspots where these valuable new economy firms cluster together (see Box 1 for the methodology) and by using statistical tools to understand why hotspots appear in specific locations.

Designed to find businesses that are deliberately positioned to benefit from agglomeration, the hotspot concept offers a perspective on clustering which emphasises the importance of proximity and place in supporting this nationally important innovative activity. In doing so, it sheds light on the factors which encourage the formation of hotspots in specific parts of cities and towns.

The report begins with an overview of the economic value of hotspots and their composition. Section 3 explores the geography of the clustered new economy. In Section 4, the report uses two types of regression analysis to assess the importance of inputs such as labour market size, skills, connectivity, universities, and large high-technology employers on hotspot locations and amounts of clustering in labour markets. Section 5 makes recommendations for policymakers.

Box 1: Data and clustering method

Geographical definitions

Centre for Cities' research focuses on the UK's 63 largest towns and cities. Unless otherwise stated, cities and large towns are defined as Primary Urban Areas (PUAs), using a measure of the built-up area of a large city or town, which sometimes spans beyond the core local authority. Full methodology is available at centreforcities.org/puas.

Cities are divided into two areas – city centres and suburbs – and the rest of the country is divided into hinterland and deep rural areas. City centres are defined based on the postcodes within a circle from the pre-determined city centre point. The radius depends on the size of the residential

8 For breakdowns by different RTICs, see: https://thedatacity.com/rtics

9 Kubara M (2023), Spatiotemporal localisation patterns of technological startups: the case for recurrent neural networks in predicting urban startup clusters, Annals of Regional Science; Rammer C, Kinne J and Blind K (2019), Knowledge proximity and firm innovation: A microgeographic analysis for Berlin, Urban Studies, 57 (5): 996-1014; Ferretti M, Guerini M, Panetti E and Parmentola A (2022), The partner next door? The effect of micro-geographical proximity on intra-cluster inter-organizational relationships, Technovation, 111: 102390

population (3.2km in London, 1.3km in cities with more than 550,000 residents, and 0.8km elsewhere). Suburbs are determined based on the postcodes that fall within the rest of a city.

Hinterlands are non-urban areas that are considered to be within commutable distance of cities. This varies from place to place and is determined by the average distance that a worker living outside a city travels to their job within it, defined using Census 2011 data. For example, the travel catchment area for London is 63km, but for Worthing it is 20km. The deep rural areas make up the remaining part of the physical landmass of Britain and fall outside of the travel catchment area of cities.

Data source

The data on new economy firms used in this report were collected by the Data City and were made available at the postcode level. The Data City uses 'web-scraping' of websites to identify companies engaged in cutting-edge activities and classify them according to a system of Real Time Industrial Classifications (RTICs). Specifically designed to group firms in emerging sectors, RTICs provide a more precise overview than that which can be gleaned from the official Standard Industrial Classification (SIC) used in most other research. Examples of RTICs include FinTech, advanced manufacturing, software as a service, and wearables.[10]

Centre for Cities uses 47 of 48 upper-level RTICs present in the Data City data (business support services were dropped for technical reasons). This leaves 88,162 new economy firms (NEFs) which together account for around 3 per cent of all businesses, according to the ONS in 2021. By examining their RTICs, new economy firms can be divided broadly into service and non-service activities. Service RTICs include FinTech and AdTech. Non-service RTICs include modular construction and advanced manufacturing.

There are two potential limitations of this dataset. First, because there are limited corresponding employment data, the analysis must treat all firms equally. In reality, some new economy firms will be bigger and more profitable than others. Second, the postcodes provided refer only to each firm's registered address. This leads to the assumption that all the innovative activity undertaken by the firm happens in one location. Fortunately, sixty per cent of the businesses in the dataset have only one address, and firms with many addresses have been removed.

Accounting for instances where a registered address is a placeholder or the address of an accountant is more difficult. However, stress-testing of the data in previous Centre for Cities research suggested that the data were

10 A full list of RTICs can be found at: https://thedatacity.com/rtics/

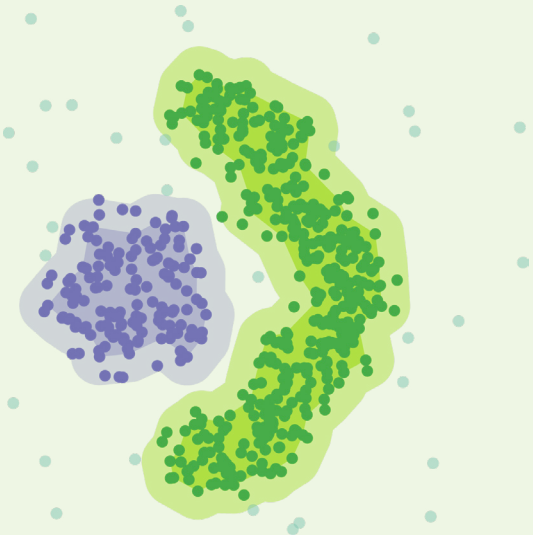
broadly robust to this problem.[11] Cases where more than 500 businesses were registered to one postcode were manually checked to see whether they were the locations of accountants and, if so, a secondary address was used instead. Despite these problems, it is important to note that this dataset is the best available for analysis such as that contained in this report.

Clustering method

In order to identify and analyse locations in which new economy firms organically collocate over short distances, this report applies a clustering algorithm – Density-Based Clustering with Noise (DBSCAN) – to the postcodes in which new economy firms are located. DBSCAN is a popular algorithm used by economists, epidemiologists, and data scientists to identify clusters of various types.[12]

DBSCAN groups points which are close together and discounts those located in sparsely populated regions. Unlike other approaches to clustering, such as location quotients or specialisation indices, DBSCAN's operation is not dependent on externally imposed geographies (such as wards or local authority districts). Using just two criteria – the minimum size a grouping can be and the maximum distance beyond which two points are not considered to be related – the algorithm is able to separate co-located observations from the rest.

Figure 1: An illustration of data grouped by DBSCAN



Source: https://commons.wikimedia.org/wiki/File:DBSCAN-density-data.svg

11 Rodrigues G, Vera O and Swinney P (2022), At the frontier: the geography of the UK's new economy, London: Centre for Cities

12 Including in research commissioned by the UK Government: NIESR, SpazioDati, City REDI (2017), Industrial Clusters in England, London: The Department for Business, Energy and Industrial Strategy

The hotspots identified by this report contain a minimum of 15 firms and are subject to a 250m maximum distance threshold. This means that any two new economy firms within 250m of one another are considered to be related by the algorithm. This conservative distance threshold increases the likelihood that the observed clustering is deliberate.

Various minimum size thresholds, ranging from 10 to 50 firms yielding between 25 and 800 hotspots respectively, were considered. Higher minimum size requirements resulted in hotspots located almost exclusively in city centres, and lower thresholds a more even balance across the country. London and the Greater South East stand at the centre of the clustered new economy in all specifications.

Defining clustering of any kind is always a difficult and somewhat arbitrary process. The agreed definition of clusters – 'geographic concentrations of interconnected companies and institutions in a particular field' – is broad and has no set rules regarding linkages and distance thresholds.[13] The aim of the approach to clustering used in this report is to provide a precise picture of neighbourhood-level co-location in the new economy which is fair to different parts of the country and realistic in scope. The 344 hotspots identified in this report are comprised of 18,468 firms spread across every region.

13 Porter M (1998), Clusters and the new economics of competition, Harvard Business Review, 76 (6): 77-90

02

Hotspots matter to the national economy

Using the methodology set out above, this section sets out how many hotspots there are, discusses their characteristics, and highlights their contribution to the national economy.

There are many hotspots of innovative activity across the country

There are 344 hotspots across the UK. Within these hotspots there were 18,468 new economy firms. In absolute terms, this is a small number, accounting for just 0.6 per cent of the UK's businesses, but there are several things to note. The first is that their small size follows from their definition – this approach examines a nascent part of the economy where growth is most likely to come from in the future. The second is that they punch above their weight. According to Centre for Cities' broad estimates, these 0.6 per cent of all businesses, in hotspots covering just 0.1 per cent of land, already account for around one per cent of national output – £18.5 billion in 2019 – and 200,000 jobs.[14]

Places with hotspots are more productive and have grown faster than the rest of their region

Data limitations mean that it is not possible to observe the impact of firms in hotspots precisely. However, by linking hotspots to small geographies (see Box 2) it is possible to get a sense of the economic performance of places in which hotspots exist over the medium term. Because the GVA data used in this analysis are experimental, the neighbourhoods with hotspots are aggregated together at a regional level to improve reliability.[15]

14 These estimates were calculated from public data on firms, GVA, and jobs at small geographies.
15 ONS (2023), UK small area gross value added (GVA) estimates 1998-2020

Box 2: Linking hotspots to other geographies

The tight distance thresholds used in the identification of hotspots makes it possible to align hotspots with Lower Super Output Areas (LSOAs) and their closest equivalents in Scotland and Northern Ireland.[16] LSOAs are neighbourhood sized geographical units with an average population of 1500 spread across 650 households. Linkages with LSOAs facilitate estimation of the productivity and output growth of the places in which hotspots are located. They also enable logistic regression analysis to explore why hotspots exist in particular neighbourhoods.

In order to reduce the chances of erroneous linking, LSOAs were only considered to be part of a hotspot if they contained a large enough share of that hotspot's firms. Because hotspots vary significantly in size, a static threshold (such as 25 per cent of the hotspot's firms) is inappropriate. Instead, a dynamic threshold inspired by Droop's quota for the single transferable vote electoral system is used.[17] The formula, displayed below, establishes a quota number of firms that an LSOA must have in order to be linked to a hotspot. While the methodology may exclude some LSOAs unnecessarily, it ensures that only neighbourhoods with a concrete link to a new economy hotspot are included.

$$LSOA\ quota: \left(\frac{Total\ number\ of\ firms\ in\ the\ hotspot}{Number\ of\ LSOAs\ touched\ by\ hotspot + 1}\right) + 1$$

E.g. for a hotspot comprised of 16 firms spread over three LSOAs:

$$LSOA\ quota: \left(\frac{16}{(3 + 1)}\right) + 1 = 5\ firms$$

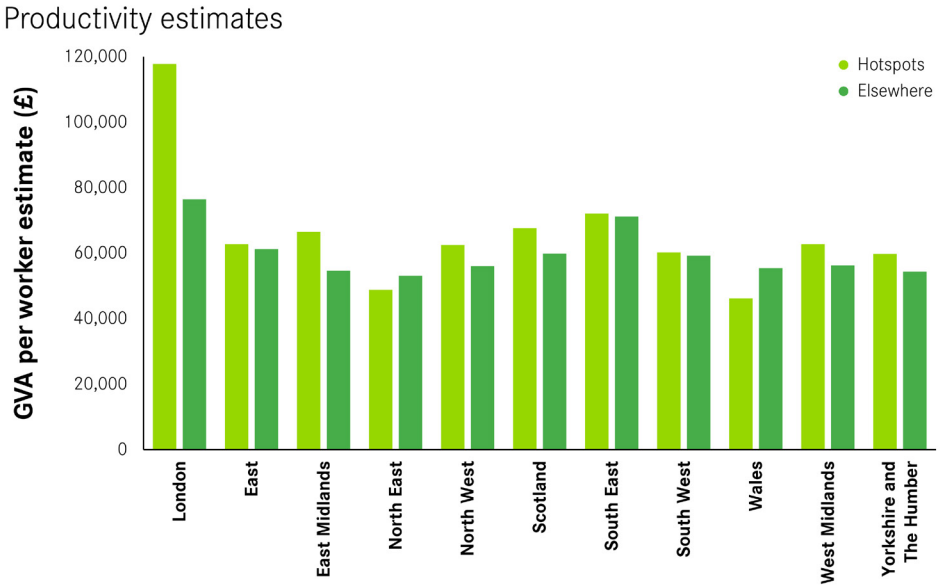
If the firms were divided among the three LSOAs on a 7 firm, 6 firm, and 3 firm basis, only the first two would be included.

Considered as a whole, places with hotspots appear to be both more productive and faster growing than those without them. This relationship holds in most regions, as Figure 2 shows. Outside London, areas with hotspots are 7 per cent more productive than those without on average. Exceptions to this trend can be seen in Wales and the North East, where places with hotspots have lower productivity than those without them.

16 'Data Zones' and 'Super Output Areas' respectively. Because the analysis in which they are used most heavily depends on location rather than other attributes (such as size) the fact that these geographies are not perfect equivalents of LSOAs has very little impact.

17 Droop H (1881), On methods of electing representatives, Journal of the Statistical Society of London, 44 (2): 141–196

Figure 2: Regional productivity estimates, 2019



Source: ONS, The Data City, and Centre for Cities calculations

Box 3: Local services and productivity premiums

While the premiums seem modest, there is a limit to the extent to which large productivity gaps are beneficial. One of the most important roles that productive 'exporting' firms (in that their outputs are sold beyond the immediate vicinity) play in local economies is the generation of income to be spent on local services such as hospitality and retail.[18] This multiplier effect is one of the principle means through which a place benefits from dynamic businesses and skilled workers.

Local services firms tend to be less productive than exporting firms. As a result, their appearance in places with hotspots will likely lower the average productivity of the area. This means that locations with enormous productivity differences between places with hotspots and their surroundings could easily be a sign of weak multiplier effects (innovative firms which do not support local services) as much as an indication of dynamism and innovation.

As Figure 3 shows, the gulf between places with hotspots and those without in relation to growth is much larger. In more than half of Britain's regions, areas with hotspots have grown at an annualised rate of above 2.5 per cent per year – a figure well in excess of the average national growth rate for the same period.

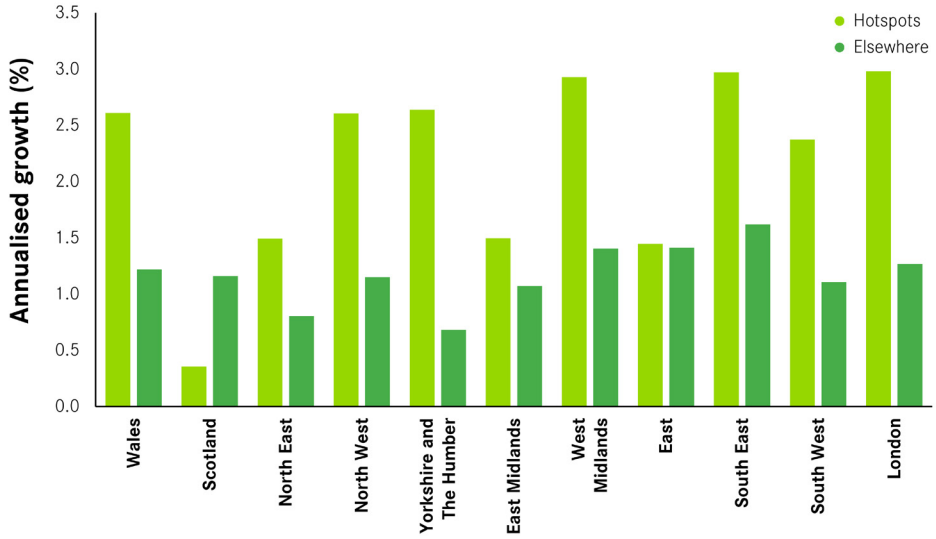
18 Moretti E (2010), Local Multipliers, American Economic Review, 100 (2): 373-77

Scotland is the sole outlier in this post-recession trend, although even here areas with hotspots outperform the rest when the period 1998-2019 is considered instead.

Areas with hotspots in all regions of the UK outperform places without hotspots across the 1998-2019 period. It is not possible to draw an indisputable causal link between the appearance of hotspots and outcomes in relation to growth and productivity. Nevertheless, it is likely that the new economy plays some role. At the very least, innovative firms opt to locate in areas in which output has been expanding rapidly despite sluggish growth in the rest of the economy.

Figure 3: Annualised GVA growth estimates

Real economic growth, 2007 - 2019



Source: ONS, The Data City, and Centre for Cities calculations

Hotspots vary in size and so in national importance

Not all hotspots are the same, however. Although hotspots have a minimum size limit (see Box 1), there is no ceiling on how many firms can be present. The average (median) number of firms in a hotspot is 21, and 95 per cent have 100 firms or less (see Table 1). There are a number of very large hotspots which are a lot bigger. Confined mostly to city centres (discussed in more detail below), these hotspots are much more important than their peers to the national economy.

Table 1: Distribution of hotspot sizes

Hotspot size	Frequency	Minimum size	Maximum size
15 to 34	276	15	34
35 to 54	31	35	54
55 to 74	9	55	74
75 to 94	8	76	94
95+	20	99	6,295

Source: The Data City and Centre for Cities calculations

Hotspots are melting pots rather than monoclusters

Much of the conversation about clustering in the past has centred in on the clustering of specific industries. Despite this, the approach used here shows that hotspots are best thought of as melting pots of new economy activity rather than 'monoclusters' centred on a single industry (such as advanced manufacturing). When measured using relative or absolute specialisation indices, few hotspots display concentration of any kind.[19] Only 24 hotspots can be described as specialised around particular industries. This sectoral diversity also holds at both a labour market (travel-to-work area or 'TTWA') and regional levels; only five per cent of TTWAs possess specialised clustered new economies.

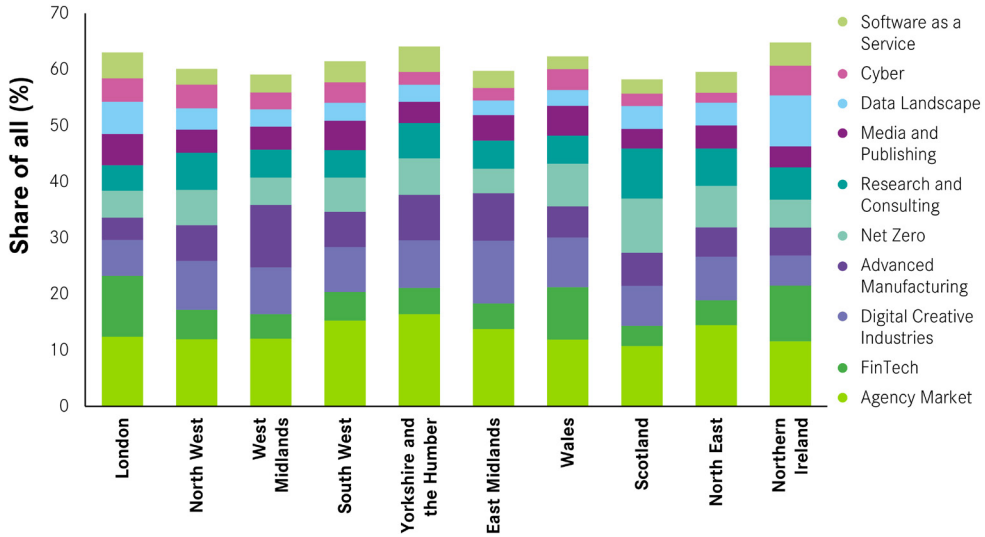
Despite the diversity within hotspots, there is a divide between new economy industries which tend to appear in hotspots and those which do not. For example, whereas nearly half of all firms in AdTech are in hotspots, only five per cent of those in modular construction are. The difference tends to fall along a service versus non-service divide. Hotspots are generally comprised of businesses engaged in service-orientated activities, such as FinTech and streaming, and tend to contain fewer firms in energy generation, electronics manufacturing, and advanced materials. Across the country, 61 per cent of new economy companies are engaged primarily in service activities. The equivalent figure for hotspots is 72 per cent.

Therefore, while their exact composition varies between places, innovative service companies have a presence in almost all hotspots. The core 'ingredients' from which hotspots are composed are actually remarkably similar across the country, as Figure 4 shows. Although there is some variation – activities such as FinTech are play a bigger role in London than the North West, for example – the ten most common clustered new economy industries account for 60 per cent of the activities present in hotspots in all regions.

19 Palan N (2010), Measurement of Specialization – The Choice of Indices, FIW Working Paper 62

Figure 4: The frequency of the 10 most common new economy industries among clustered firms by region, 2022

Sector composition of clustered new economy firms



Source: The Data City and Centre for Cities calculations

Two factors explain these trends. First, service and non-service firms generally have different floorspace requirements. While service-orientated activities are generally based in offices, non-service firms often require industrial spaces and laboratories which tend not to be located in dense urban areas. This means non-service firms are more likely to fall foul of the 250m distance threshold than their service-orientated cousins.

Second, whereas innovative firms of all kinds have the potential to benefit from 'matching' (shared access to workers with the right skills) and 'sharing' (joint use of infrastructure and supply chains) agglomeration, intellectual property protectionism means that companies specialising in some non-service ventures (such as pharmaceuticals) have less to gain from inter-firm knowledge spillovers.[20] This again reduces the relative attractiveness of hotspots for non-service firms.

Service firms, by contrast, are not overly constrained by sector and can share inputs and benefit from agglomeration economies within relatively diverse ecosystems. Recent research has shown that this diversity can be an asset in innovation, as the clustering of firms in different fields over a short distance supports the emergence of unconventional approaches and ideas.[21]

20 The three main types of agglomeration are described in Duranton G and Puga D (2004), Micro-foundations of urban agglomeration economies, NBER Working Paper 9931

21 Berkes E and Gaetani R (2021), The Geography of Unconventional Innovation, Rotman School of Management Working Paper No. 3423143

03

The geography of the clustered new economy

While hotspots are spread across the UK, there are common themes in terms of where they can be found. This section explores the geography of the 344 hotspots in more detail.

Hotspots are in every region, but they are overwhelmingly urban

Figure 5 shows that hotspots are present in most parts of the country. They exist in every region, and more than four in every five people live within ten miles of at least one. Firms in hotspots add value in every part of the country. Around 40 per cent of the jobs and 30 per cent of the output generated by the clustered new economy can be attributed to companies based outside of London.[22]

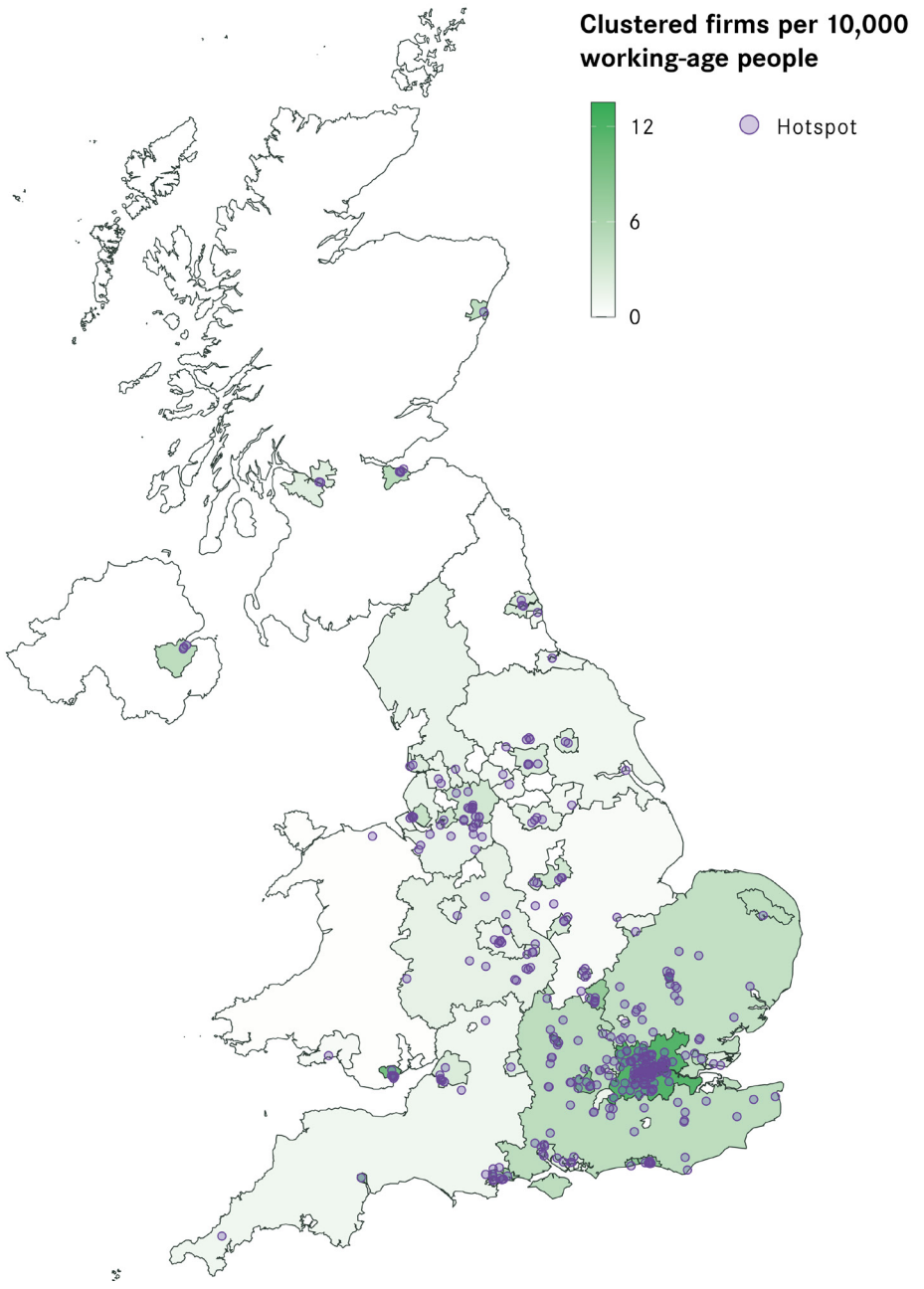
Two measures are relevant when trying to understand the geography of the clustered new economy. On one hand, there is the location of the hotspots themselves. On the other is the relative amount of clustered new economy activity, which can be measured by comparing the number of firms to the working-age population of a given place. The two measures are displayed together in Figure 5, where the locations of individual hotspots are displayed alongside the amount of new economy activity in urban and non-urban parts of Britain's various regions.

From a regional perspective, the Greater South East (London, the South East and the East of England) stands out as central to the clustered new economy. Together, this part of the country accounts for 60 per cent of all hotspots – far outstripping that of any other region. As with other types of high-technology and knowledge-intensive businesses, the ability of this part of the country to attract

22 Source: ONS

activity means that the geography of the clustered new economy reflects Britain's longstanding north-south divide.[23]

Figure 5: Distribution of hotspots and the intensity of clustering across regions and PUAs, 2022



Source: ONS, The Data City, and Centre for Cities calculations

Despite these regional imbalances, the formation of hotspots is an overwhelmingly urban phenomenon. Almost nine in 10 clustered new economy

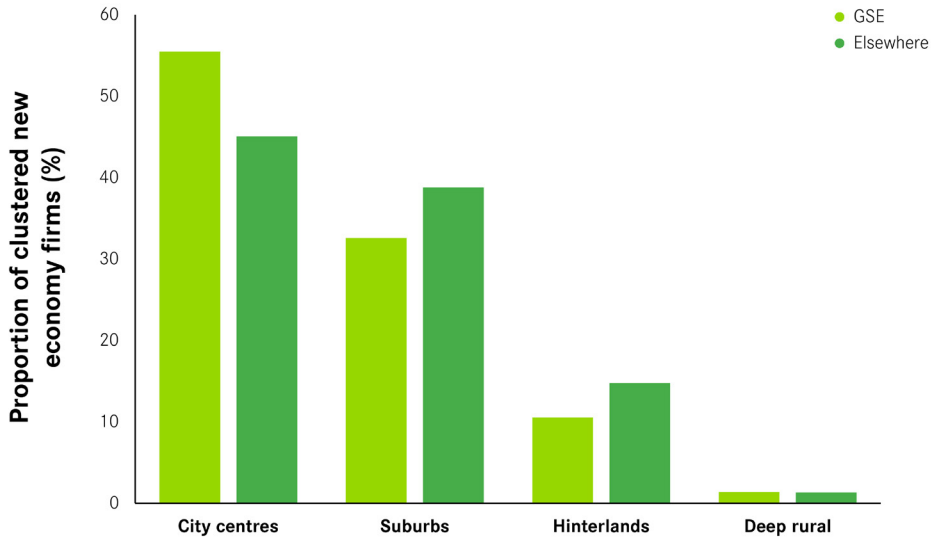
23 Rowthorn R (2010), Combined and Uneven Development: Reflections on the North–South Divide, Spatial Economic Analysis, 5 (4): 363-388

firms are located in cities and large towns. Even in the Greater South East, where non-urban areas perform strongly, London alone accounts for 77 per cent of all clustered new economy firms.

These forces are similarly at work within urban areas. More than half of all the innovative firms in hotspots observed nationally can be found in city centres. Although suburban locations are relatively more popular outside the Greater South East, as Figure 6 shows, city centres are the most common choice. Even firms located outside urban areas tend to be located close by. Of the 13 per cent of clustered new economy firms not located in cities and towns, 89 per cent are in the hinterlands of urban areas. Hotspots tend not to form in deep rural locations.

Figure 6: The share of all clustered new economy firms in city centres, suburbs, hinterlands, and deep rural locations, 2022

Locations of clustered new economy firms



Source: The Data City and Centre for Cities calculations

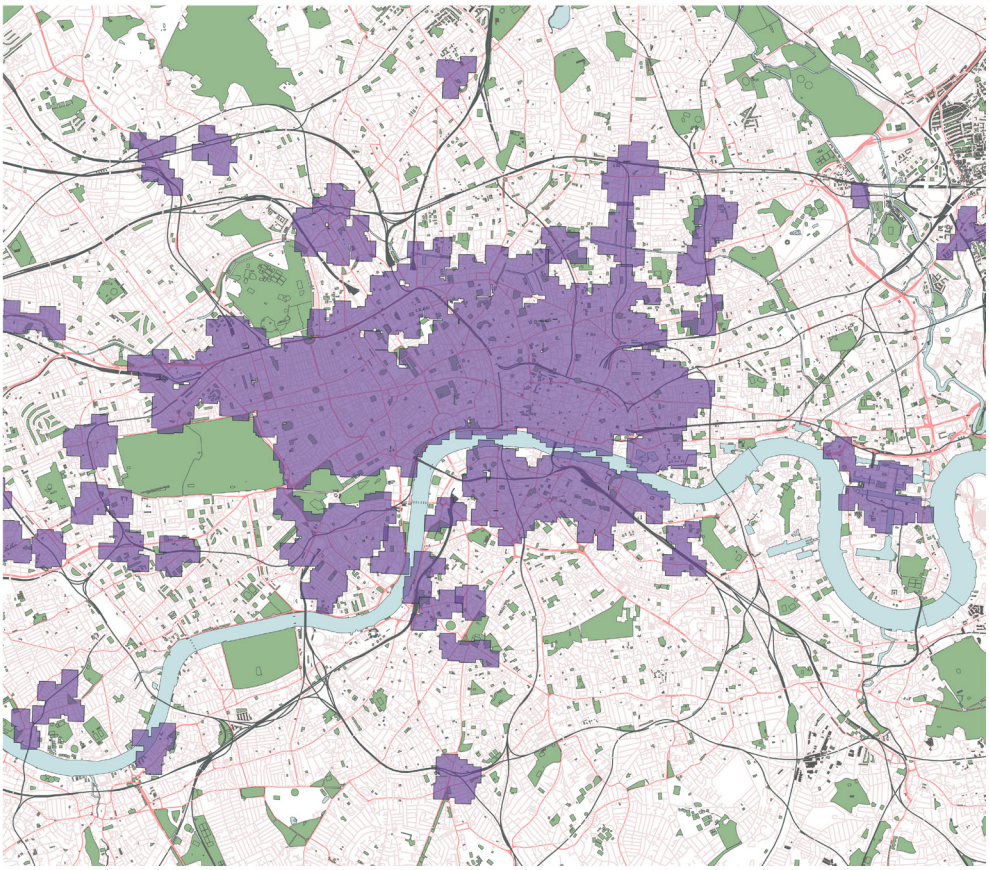
The dominance of city centre hotspots can also be explained by the fact that they tend to be much larger than those found elsewhere. The average city centre hotspot contains more than 200 firms, while the average suburban hotspot has 32 firms. Rural and hinterland hotspots contain just 20 new economy businesses on average. The larger scale of city centre hotspots likely has benefits in relation to innovation. Recent analysis of patent data over the long run suggests that the number and quality of patents filed by inventors increases when they move to places with larger clusters in their respective fields.[24]

The most striking example of these differences in scale can be seen in London, which has an extremely dense clustered new economy, and the Greater South

24 Moretti E (2021), The Effect of High-Tech Clusters on the Productivity of Top Inventors, American Economic Review, 111 (10): 3328-3375

East, where the average non-urban hotspot contains 24 businesses. As can be seen in Figure 7, alongside London's immense central hotspot – spanning an area from Paddington to the City – are sizeable hotspots in Camden Town, Pimlico, and along the South Bank. Examples of successful regeneration, notably Canary Wharf but also parts of the project at King's Cross, also overlap with significant clustered new economy activity. In all, the centre of London hosts nearly 7,000 new economy businesses – 37.8 per cent of all clustered new economy firms in the country.

Figure 7: Hotspots in the centre of London, 2022



Source: The Data City, OpenStreetMap, and Centre for Cities calculations

In suburbs, most clustered new economy firms are in smaller economic centres with strong transport links.[25] A good example of this trend can be seen in Altrincham and Stockport within Greater Manchester, which contain relatively large numbers of clustered new economy firms in their town centres.

Other leading locations for hotspots outside city centres include science and business parks. For example, 60 per cent of Cardiff's clustered new economy firms are located in a business park to the north of the city centre. Good

25 Information on the types of places in which hotspots are found outside city centres come from 'workplace zone' definitions used by the ONS. Workplace zones are small geographical units grouped into categories depending on the types of employment and businesses found in the area. See University of Southampton (2015), 2011 COWZ-UK

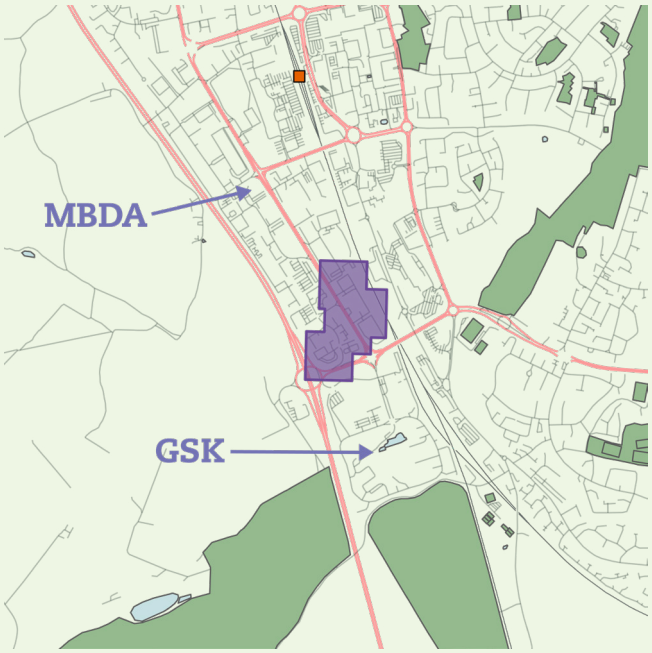
examples outside urban areas include the Milton Science and Technology Park and Harwell Innovation Centre in Didcot and the 'Sci-Tech' campus in Daresbury near Runcorn in Cheshire. Each of these locations are important centres of significant scientific research which play host to high-technology new economy firms.

These trends relate both to local opportunities and firms' individual needs. Although the scale is much smaller than that observed in city centres (hotspots in business and science parks have just 20 firms on average) places such as science parks provide the facilities and proximity some innovative firms need to benefit from agglomeration.

Box 4: Business park hotspots, transport, and high-technology employers

Business parks with hotspots are often in close proximity to transport connections such as major road junctions and stations and, as in Runcorn and Didcot, possess large high-technology employers. Another example of the phenomenon can be seen in relation to the hotspot located in a large business park in south Stevenage (Figure 8). The hotspot sits next to Junction 7 of the A1(M) and approximately one mile from Stevenage station (displayed as an orange square). Trains travel between Stevenage and Kings Cross around 100 times per day and the journey takes 39 minutes on average.[26]

Figure 8: The location of a hotspot in Stevenage, 2022



Source: The Data City, OpenStreetMap, and Centre for Cities calculations

26 Trainline, Trains from Kings Cross to Stevenage, https://web.archive.org/web/20230602174709/https://www.thetrainline.com/train-times/stevenage-to-london-kings-cross [accessed 2 June 2023]

Among other activities, the hotspot is situated between campuses belonging to two high-technology employers. The first, MBDA, is firm which develops and manufactures missiles. The second, GlaxoSmithKline, is a multinational pharmaceutical and biotechnology company, which is presently spending £400m on expanding its campus in the area.[27] It is not possible to establish a direct link between all the hotspot's firms and the area's major employers. Nevertheless, a number of them are either in the same or allied sectors, and others list one of the major employers as a client. In the long run, a successful hotspot will grow and diversify into a host of different innovative activities and, ideally, create multipliers for local services.

Box 5: Public sector relocation has a mixed record

The relocation of public sector jobs – especially civil servants – is one of the most direct tools that policy makers can use to move jobs around the country. Recent examples include the creation of the Darlington Economic Campus, first announced in 2021, which the government argues plays a role in its levelling up agenda.[28]

Projects such as these have political value, but prior Centre for Cities research has shown relocation to have variable economic consequences on local economies.[29] A mixture of impacts can also be seen in relation to the formation of hotspots, with relatively successful relocations such as Salford Quays standing in contrast to others such as that of the ONS to Newport.

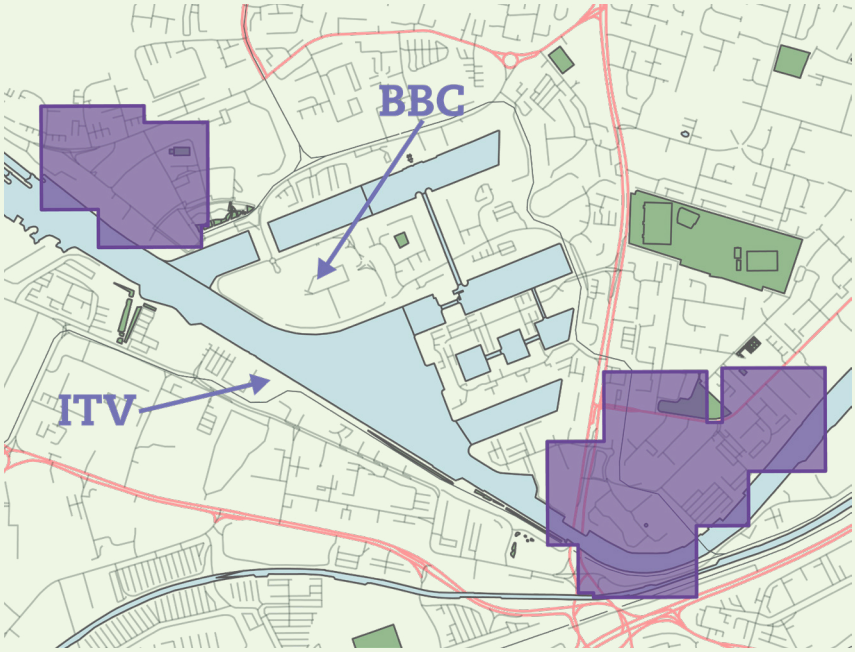
The Salford Quays example suggests that the ability of relocations to foster new areas of clustered new economy activity depends at least somewhat on the type of activity moved. It is easier for a relocation to eventually lead to a self-sustaining innovation ecosystem if there are roles for firms either in allied industries or in the supply chain to which other firms can, in turn, supply goods and services and benefit from knowledge spillovers. This is certainly the case in broadcasting, which is a highly 'unbundled' industry that relies heavily on small companies and freelance workers.

27 Sweeney M, GSK plans £400m life sciences campus in Stevenage, The Guardian 16 July 2021

28 HM Treasury (2022), 'Preferred site for Darlington Economic Campus unveiled as recruitment drive hits a century, https://web.archive.org/web/20220411104411/https://www.gov.uk/government/news/preferred-site-for-darlington-economic-campus-unveiled-as-recruitment-drive-hits-a-century

29 Swinney P and Piazza G (2017), Should we move public sector jobs out of London?, London: Centre for Cities

Figure 9: Hotspots in Salford Quays, 2022



Source: The Data City, OpenStreetMap, and Centre for Cities calculations

The relocation of the ONS to Newport, by contrast, has not led to the appearance of a hotspot in that economy. All the hotspots in Wales are confined to Cardiff and Swansea. Here, the lack of an obvious role for businesses in the supply chain has probably been a factor. However, other constraints, such as the skills profile of Newport or the composition of its economy, are also likely to have played a role.

A different, longer-term, example of public sector relocation can be found in Cheltenham, which possesses Britain's 25th largest hotspot at its centre. At 82 firms, this hotspot is more than twice the size of those in Salford and contains almost as many clustered firms as there are in the entirety of Sheffield. Cheltenham's clustered new economy contains a range of activities including design and modelling, media and publishing, net zero, and rehabilitation.

One potential explanation for the Cheltenham phenomenon is the presence of the headquarters of GCHQ, Britain's signals intelligence agency, and the area's previous association with telecommunications technology.[30] The secrecy of GCHQ's work means that its impact cannot be explained in terms of supply chains or direct knowledge spillovers. However, it is possible that over the last seventy years the presence of the agency has helped to foster a highly-skilled and technologically-orientated labour market which has allowed other sorts of innovative activity to thrive.

30 Freeman P (2005), How GCHQ came to Cheltenham, Cheltenham: Government Communications Headquarters

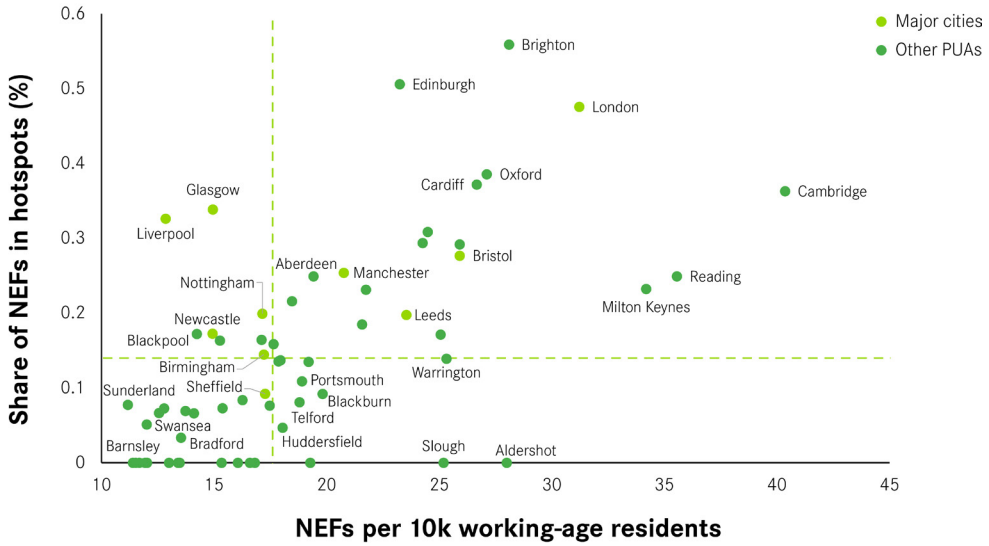
The big cities are falling short of their potential

While hotspots are overwhelmingly urban, there is a great deal of variation between cities and large towns both in terms of the size of their new economies and the degree to which innovative companies are organised into hotspots (see Figure 10).

- The top-right quadrant contains urban areas where the new economy is large and the share of new economy firms in hotspots is high. The places in this quadrant, such as Reading, Brighton, and Milton Keynes, tend to be strong performers in most economic metrics. London, Bristol, and to a lesser extent Leeds and Manchester appear alongside the top performing local economies.

Figure 10: Clustering rates and the size of the new economy across urban areas, 2022

Amount of clustering and the size of the new economy



Source: ONS, The Data City, and Centre for Cities calculations

- The bottom-left quadrant is populated by places where the new economy is small and clustering is uncommon. Swansea, Sunderland, and Bradford are accompanied in this quadrant by Sheffield, the worst performing major city.
- The bottom-right and top-left quadrants indicate intermediate situations. Places in the bottom-right quadrant have reasonably large new economies but relatively little clustering. In Blackburn, Huddersfield, and Telford, this is explained by a lack of cluster-prone, service-orientated new economy firms. The cause in Slough and Aldershot is less clear, although limitations imposed by the built form are a possible explanation.
- Finally, the top left quadrant contains places with relatively large amounts

of clustering despite a general lack of new economy firms. Five major cities – Glasgow, Liverpool, Nottingham, Newcastle, and Birmingham – are in this category.

As can be seen in Table 2, the resulting difference in scale between London's clustered new economy and those of the other major cities is enormous. Although it is less than one-tenth the size of that found in London, Manchester has by far the largest clustered new economy outside the Greater South East. Sheffield has the smallest, consisting of just 87 firms spread across four small hotspots.

Table 2: Hotspots and clustered new economy firms in major cities

City	Hotspots	Clustered new economy firms	Size of largest hotspot
London	101	10,111	6,295
Belfast	3	162	113
Birmingham	6	397	266
Bristol	6	355	245
Glasgow	2	346	246
Leeds	4	240	156
Liverpool	4	181	94
Manchester	15	843	495
Newcastle	3	143	100
Nottingham	3	152	70
Sheffield	4	87	34

Source: The Data City and Centre for Cities calculations

The issue for these places is not that they struggle to foster hotspots, but that they have a broader problem of attracting new economy firms. For example, Liverpool's new economy firms appear in hotspots at rates not dissimilar to those seen in Oxford or Cambridge, yet the relative size of its new economy is closer to that of Bradford or Barnsley than anywhere in the Greater South East. Even Manchester, a relatively strong performer, is closer to Blackburn, Portsmouth, and Telford than Cardiff, Edinburgh, or London in terms of the number of new economy firms per capita.

The relative lack of innovative businesses in the major cities therefore limits the overall size of the clustered new economy at both regional and national levels. As Table 3 shows, cities account for the overwhelming majority of clustered new economy firms in their regions, but their lead in relation to the amount of new economy firms per 10,000 working-age residents is smaller. A striking exception to this rule is the West Midlands, where urban areas anchor the clustered new economy to a lesser degree than elsewhere.

Table 3: Amount of new economy firms and location of hotspots by region

Region	Share of clustered NEFs in urban areas (%)	NEFs/10k (urban)	NEFs/10k (non-urban)	Urban lead (%)
North East	100	13.7	12.4	10
Northern Ireland	100	18.4	10.4	77
Scotland	100	17.7	11.1	59
Wales	93	17.6	13.7	28
East Midlands	88	18.1	18.6	-3
Greater South East	88	28.8	25.5	13
North West	85	18.3	17.7	3
Yorkshire and Humber	83	17.0	18.9	-10
South West	74	22.2	21.4	4
West Midlands	66	17.0	24.1	-29

Source: The Data City and Centre for Cities calculations

One of the reasons for this is the relative lack of cluster-prone, service-orientated new economy firms in the urban parts of the West Midlands. On average, 64 per cent of new economy firms in urban areas are engaged in services. In Birmingham, by contrast, it is just 52 per cent, and in Coventry it is 51 per cent. This structural difference puts a natural limit on the formation of hotspots.

However, the structural factors provide an incomplete explanation. As Table 3 shows, West Midlands stands out as a place in which the amount of new economy activity in urban areas is far below that found in the rest of the region. This can be partly attributed to the relative strength of the non-urban parts of the West Midlands, which contain a similar number of new economy firms per 10,000 working-age residents as Edinburgh. However, the new economy of the urban West Midlands is small, possessing similar numbers of firms per capita as Huddersfield.

The West Midlands' problems therefore have two dimensions. First, the region's urban areas have comparatively fewer cluster-prone firms than other parts of the country. Second, the size of the urban new economy is small relative to its population. Addressing the underperformance of the West Midlands' urban centres therefore presents significant opportunities for growth.

04

Why do hotspots appear where they do?

What, then, determines where hotspots emerge? This section uses two types of regression analysis (see Box 6) to understand firstly why clustering is more likely to happen in certain parts of the country than others, and secondly why hotspots are more likely to emerge in certain neighbourhoods than others.

The analyses show that the benefits of agglomeration – that is the benefits that cities provide to businesses through access to workers and access to other knowledge-based businesses – are the main drivers of clustering of these firms. Beyond this universities and large high-technology employers are all shown to play a role.

Box 6: Regression analyses

Regression analysis refers to a group of statistical techniques which can model the influence of different factors (independent variables) have on a topic of interest (the dependent variable). One of the most important advantages of regression models is that they show the impact of a given factor, such as universities, on an outcome, such as the number of new economy firms, whilst holding other things (such as skills) constant. This enables researchers to assess how important different factors are relative to one another and control for the influence of other components.

This report uses two types of regression analysis to understand why the amount of new economy activity varies between labour market areas and why hotspots appear in specific neighbourhoods. The geographical units of interest across the two types of analysis are Travel-to-Work Areas (TTWAs) – largely self-contained labour market areas developed by the ONS – and LSOAs respectively. Unlike LSOAs, TTWAs are rarely in perfect

alignment with administrative boundaries. Although this complicates recommendations for local policymakers, TTWAs are a useful unit of analysis because they provide a realistic picture of the geography over which local economies are organised. This is important when trying to understand what new economy firms find attractive. An approach based on TTWAs also aligns with the government's Investment Zone strategy.[31]

The first set of regression analyses use linear models to assess how differences in independent variables, such as the number of workers with post-secondary qualifications, determine differences in the amount of new economy (or clustered new economy) activity, measured in terms of the number of NEFs per 10,000 working-age residents, across TTWAs. Data limitations mean Northern Ireland is excluded from these regressions.

An average labour market area has around 17 new economy firms per 10,000 working-age residents, and all 218 have at least one new economy firm. The average number of clustered new economy firms across the 80 labour market areas with hotspots is just 2 per 10,000 working-age residents.

The second set of analyses use logistic regression models. Logistic models are used to understand how different factors, such as proximity to a university, influence the odds that a given neighbourhood (LSOA) has a hotspot. It is necessary to use this type of model because the dependent variable, whether an LSOA has a hotspot, is a binary outcome. The topic of interest is therefore not an amount which varies in size across places; an LSOA either has a hotspot assigned to it or it does not.

Logistic models are harder to interpret than linear models, but for the purposes of this study two factors matter. First, whether a factor increases or decreases the odds that an LSOA has a hotspot. Second, which factors have the greatest influence. Data limitations mean that only England and Wales are considered in these regressions.

No model can explain everything. The results of the regression analyses provide an indication of how a small number of factors influence the relevant dependent variables rather than a complete account of clustering processes. This is especially the case in relation to the logistic regression models. Just 1.1 per cent of LSOAs in England and Wales have a hotspot. Even a 100 per cent increase in the odds a LSOA has a hotspot still means the chance of a given location having one are low.

Further details, including results tables for the models used in this report, are available in the appendix.

31 Department for Levelling Up, Housing & Communities (2023), Investment Zones Place Selection: Methodology Note, His Majesty's Stationery Office

The size and skill level of the labour force matters for hotspots

Research has shown that agglomeration and skills are important enabling factors in profitable innovation.[32] In the regression models, jobs density – a proxy for agglomeration based on the number of people working in a place relative to the resident population – has the largest impact in almost all models.[33] Innovation hotspots do not form in a vacuum; rather, they emerge in dense locations alongside other businesses . Among other advantages, places with comparatively large numbers of workers are ideal locations to benefit from knowledge spillovers. The role of jobs density helps to explain the urban bias of the clustered new economy.

The linear regression models suggest that size and nature of the pool of potential workers is an important factor. Doubling the raw number of workers with post-secondary ('L4+') qualifications in a place would boost new economy activity by 8 per cent and increase clustered new economy activity by 30 per cent compared to the average observed across all labour market areas. The models further suggest that similar effects could be induced by increasing the share of the workforce with post-secondary skills in an area by around 8 percentage points.

The fact there are two separate effects – one relating to the proportion of a labour market with skills and another depending on the raw number of skilled workers – means that size matters. All else being equal, the models suggest that a big city will have more new economy firms per 10,000 working-age people than a small one, even if the share of the labour force with post-secondary qualifications is the same.

More evidence on the importance of the size of the skilled labour pool can be gleaned from the logistic regression models, which are used in this report to understand the factors which alter the chances a neighbourhood has a hotspot (see Box 6). To measure the number of skilled workers who can reach a neighbourhood, this report focuses on the 'quality' of nearby rail and metro stations. Because most people travel to work by car, rail and metro stations are an imperfect proxy of accessibility.[34] However, they are important hubs for different kinds of public transport and hotspots are often located nearby to them.

Box 7: Using stations to estimate neighbourhood-level access to skilled workers

On average, a hotspot is between 0.7 and 1.3 km from a station. In this analysis, stations within 0.8 km are considered to be 'nearby'. The size of a

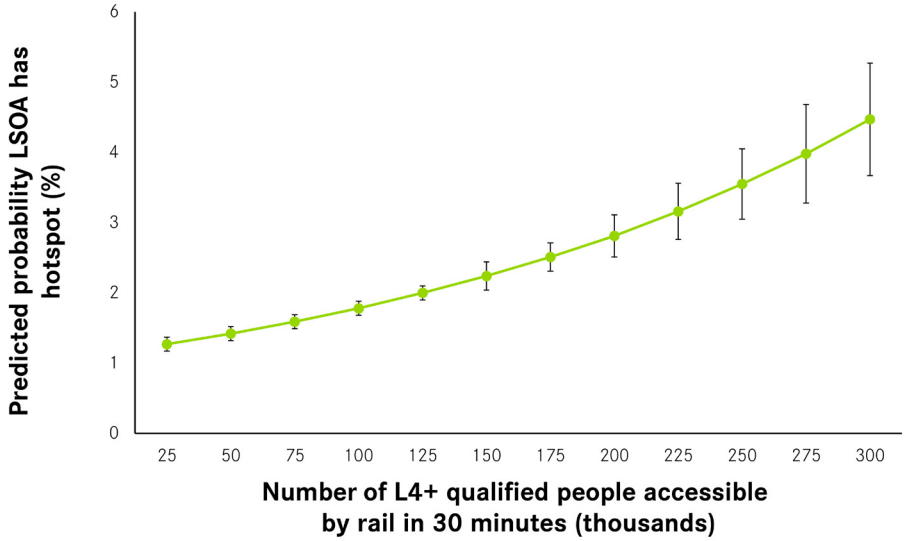
32 Leiponen A (2005), Skills and innovation, International Journal of Industrial Organization, 23 (5-6): 303-323
33 In the linear models, only the control for Greater South East location is larger (see Appendix).
34 Le Vine S, Polak J and Humphrey A (2016), Commuting trends in England 1988-2015, London: Department for Transport

neighbourhood's skilled labour pool is measured as the number of people with post-secondary qualifications who can reach the best nearby station by public transport in 30 minutes.[35] Of the nearly 35,000 neighbourhoods in England and Wales, 9,000 have a rail or metro station nearby. The average station in England and Wales can be reached by 22,000 people, although this figure varies across the country. The best-connected neighbourhood, located in central London, has access to 340,000 highly-skilled workers via its strongest nearby station; the least well-connected neighbourhood within 0.8 km of a station can be reached by just 2,300.

The regression models suggest that increasing the number of skilled workers who can reach a neighbourhood by around 40,000 increases the odds that the neighbourhood has a hotspot by 27 per cent. As can be seen in Figure 11, the impact of accessibility scales strongly. All else being equal, the odds that a neighbourhood in walking distance of Manchester Piccadilly, which is accessible to around 130,000 highly-skilled workers, having a hotspot are around two per cent. For a place close to London Waterloo, which more than 300,000 highly-skilled workers can reach in 30 minutes, the odds are 4.5 per cent. Considering that just one per cent of neighbourhoods have hotspots, the impact of access to larger pools of labour is considerable.

Figure 11: Predicted probability that a neighbourhood has a hotspot depending on accessibility

Probability of a hotspot by rail accessibility



Source: ONS, The Data City, and Centre for Cities calculations

35 The figures are computed from output areas containing stations and census data. Analysis confined to England and Wales for data availability reasons. Sources: ONS (2022), UK Travel Area Isochrones; ONS (2023), Census of Population 2021

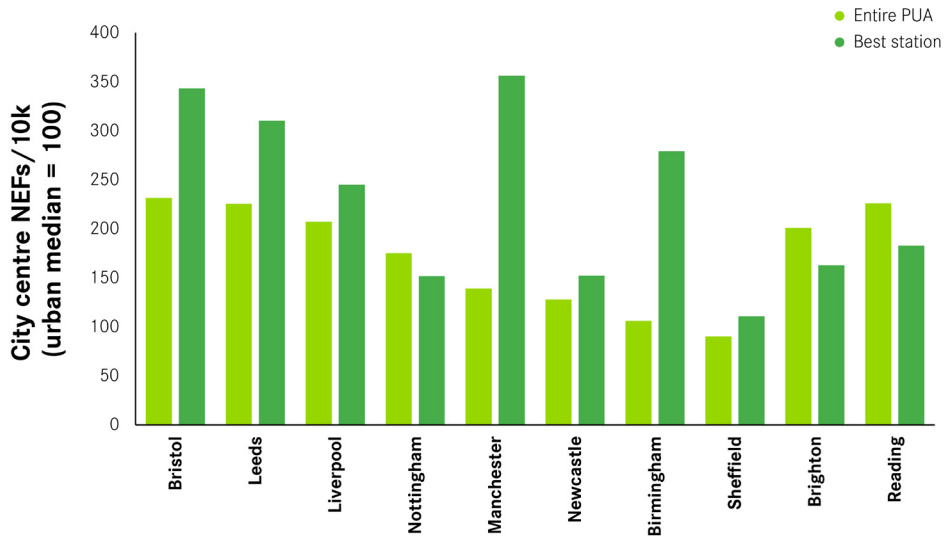
Many large cities are not offering the access to skilled workers that their size would suggest

At first glance, these findings appear to contradict the underperformance of large cities observed in Section 3. However, although these cities are large on paper, prior Centre for Cities research has shown that poor transport connections in British cities makes them effectively smaller than their populations suggest, whilst European cities have access to much deeper pools of labour thanks to their strong connectivity.[36]

It is therefore likely that part of the observed weakness of major cities' new economies can be attributed to 'effective size' problems. In Figure 12, the size of the major cities' city centre new economies, relative to the urban average, is given in relation to their nominal and effective sizes. The latter metric, displayed in the dark green bar, gives a sense of the size of the new economy of each city centre relative to the number of highly-skilled people who can actually get there, rather than the residents of the city as a whole.

Figure 12: City centre new economies measured against population and effective size

Effective size of skilled population



Source: ONS, The Data City, and Centre for Cities calculations

Three important observations emerge from the data. First, major cities have larger city centre new economies than city centres in general. Sheffield and Birmingham are exceptions to this rule, with Birmingham's city centre possessing an average-sized new economy and Sheffield's being 10 per cent smaller.

36 Rodrigues G and Breach A, Measuring up: Comparing public transport in the UK and Europe's biggest cities, London: Centre for Cities

Second, most major cities look stronger when the number of highly-skilled people who can reach the city centre, rather than the total number of highly-skilled people in the whole city, are considered. The difference is particularly striking in relation to Manchester and Birmingham, which move from middle-to-low performers to positions much closer to that of Bristol and Leeds. Among major cities, Manchester's city centre new economy is second only to that of London when effective size is considered.

Third, the performance of city centres in small successful cities such as Brighton and Reading is much more explicable after taking effective size into consideration. These cities are well connected hubs and, as such, are effectively larger than their raw populations suggest. Using their populations, as is the case in Figure 10, rather than effective sizes, therefore overstates the success of their city centre new economies.

Together, the evidence from Figures 10 and 12 show that when considered in terms of effective size, major cities such as Manchester, Birmingham, and Liverpool have successful new economies which cluster strongly into hotspots. The unfortunate fact is that despite ostensibly possessing large, highly-skilled, labour forces, these cities are effectively much smaller. The best-connected station in Brighton can move more highly-skilled workers into the city centre in 30 minutes than the best-connected stations in Bristol, Leeds, Liverpool, and Newcastle and only around 8 per cent less than those in Birmingham, Nottingham, and Sheffield. While this is great for Brighton, it speaks to a fundamental problem in major cities elsewhere in the country, which draw fewer benefits from their skilled workforces than would be the case with better transport connections.

Universities play a role in organising new economy businesses into hotspots, but their impact is conditional on research quality and distance

Universities have been shown to support innovation through research outputs, incubators, the provision of infrastructure, and the deployment of reputational and intellectual capital.[37] The quality of the institutions, measured in relation to their research outputs, is an important factor in determining their effectiveness.[38] The Government appears to be applying research in this area to its Investment Zone strategy, which includes a role for research-intensive institutions and innovation catapults.[39]

The impact of universities on clustering at the spatial scales analysed in this

37 Jaffe A (1989), Real effects of academic research, The American Economic Review, 79 (5): 957-970; Porter M (1990), The Competitive Advantage of Nations, New York: Free Press; Heaton S, Siegel D and Treece J (2019), Universities and innovation ecosystems: a dynamic capabilities perspective, Industrial and Corporate Change, 28 (4): 921-939

38 Fritsch M and Slavtchev V (2007), Universities and Innovation in Space, Industry and Innovation, 14 (2): 201-218

39 Department for Levelling Up, Housing & Communities (2023), Investment Zones Place Selection: Methodology Note, His Majesty's Stationery Office

report is, however, mixed. While universities do not appear to increase the amount of new economy activity in their vicinities, they are associated with the organising of the innovative firms into hotspots. Successful research-intensive universities perform this function far more effectively than their peers, although their impact is still relatively modest.

Box 8: Identifying and classifying universities

Data on university locations come from the Higher Education Statistics Agency.[40] Following the methodology used by DLUHC in identifying locations suitable for Investment Zones, this report relies on the classification system contained in the annual Transparent Approach to Costing (TRAC) reports in order to gauge institutional quality.[41] The system divides universities into six 'peer groups' depending on their research incomes and possession of certain departments, such as medical schools.[42] For the purposes of this report, only universities in the top TRAC-A group are considered to be 'research-intensive'.

The primary evidence for the role of universities being confined to the spatial organisation of the new economy comes from the linear regression models. At a labour market level, the impact of universities on new economy activity is statistically insignificant at best. The models even suggest that research-intensive universities actually reduce the per capita number of new economy firms to an extent similar to halving the number of skilled workers in a place. Despite this, universities do increase the amount of clustered new economy activity in their labour market areas, with research-intensive institutions providing a boost nearly eight times larger than other universities. Therefore, although universities do not seem to increase the stock of new economy firms in a place, their boost to the number of clustered new economy firms suggest that they help organise the local new economy into hotspots.

Their impact is, however, mediated by distance. One logistic model shows that neighbourhoods within 5km of a research-intensive university are 48 per cent more likely to have a hotspot than those further away. Another, which considers linear distance, suggests that a 1 km increase in the distance between a neighbourhood and the research-intensive university in its labour market area reduces the odds it has a hotspot by 3.2 per cent. A neighbourhood 6.5 km further away from the university than another is 20 per cent less likely to have a hotspot.

40 Higher Education Statistics Agency (2021), Unistats dataset

41 Department for Levelling Up, Housing & Communities (2023), Investment Zones Place Selection: Methodology Note, His Majesty's Stationery Office

42 Office for Students, Peer groups for annual TRAC, TRAC fEC and TRAC(T) benchmarking 2021-22, London: TRAC

While these effects are sizeable, the rarity of hotspots means that these effects are relatively modest in practice. Holding everything else constant, the linear distance models suggest that the probability that a neighbourhood within 1km of a research-intensive university has a hotspot is 1.5 per cent. The equivalent figure for those 10km away is 1.2 per cent.

One explanation for universities' relatively small impact is that their role is most prominent at the beginning of a company's development, and as a result the size and number of associated innovative firms (some of which may be formal spin-off ventures) are small.[43] It is therefore possible that the effects observed in this report are a reflection of businesses supported by universities moving away as they grow, limiting the overall number of new economy firms nearby and leaving behind only those businesses still in early stages of development. Data limitations prevent deeper analysis of this question. It may also be the case that these clustered firms perform better because they are close to a research-intensive university, and that the impact of these institutions is felt indirectly over larger distances. But once again further data would be required to explore this.

Box 9: Finding places with large, high-technology employers

Two challenges exist in relation to the identification of important employers. First, data on specific firms are tightly controlled by the ONS in order to prevent disclosure. Second, publishable data are only available at the level of middle layer super output areas (MSOAs), which are reasonably large geographical units containing four to five LSOAs. These factors necessitated careful choice in metrics and a strategy based on estimation.

The approach taken by this report is as follows. First, public MSOA-level counts of firms and employees across industries (using two- and three-digit levels of aggregation of the SIC) are compared to determine instances where suppression has been used to prevent disclosure. The total number of suppressed firms in each industry are then divided evenly among MSOAs where suppression has probably occurred (places where employees in an industry are recorded despite the reported number of firms being zero).

Second, the number of employees in a given industry in a specific MSOA are divided by the estimated number of firms. This gives the average size of firms in that industry in the MSOA. Third, an MSOA is deemed to possess a relatively large employer in an industry if the average size of the firms is above that seen both in the MSOA in general and the industry nationally. This is by no means a perfect metric, but it gives an indication of places in which a particular industry's firms are relatively large.

43 Bagchi-Sen S, Baines N and Lawton Smith H (2022), Characteristics and Outputs of University Spin-offs in the United Kingdom, International Regional Science Review, 45 (6): 606-635

Some industries are more important than others. For the purposes of this analysis, the 747 MSOAs (10 per cent of all MSOAs) with relatively large firms in nine high-technology industries (SIC codes 21, 26, 30.3, 59-63, and 72) are considered.[44] Among the industries are pharmaceuticals, computer hardware, spacecraft, broadcasting, telecommunications, software, and scientific research. Because MSOAs are large, the statistic used in the logistic regression analyses is the distance (in km) between an LSOA and the closest MSOA with relatively large high-technology firms.

At a local level, high-technology employers are stronger anchors than universities

Large, high-technology employers have been shown to play important roles in translating local academic research into product development.[45] Evidence from the biotechnology sector also suggests that large innovative companies can act as anchors around which start ups and small enterprises can benefit.[46]

The logistic models show that high-technology employers have a positive impact on the odds that a neighbourhood has a hotspot. As Figure 13 shows, holding all else equal, the odds that a neighbourhood within 1km of a major high-technology employer has a hotspot are just over two per cent, while the chance that those 10km away is just over one per cent.

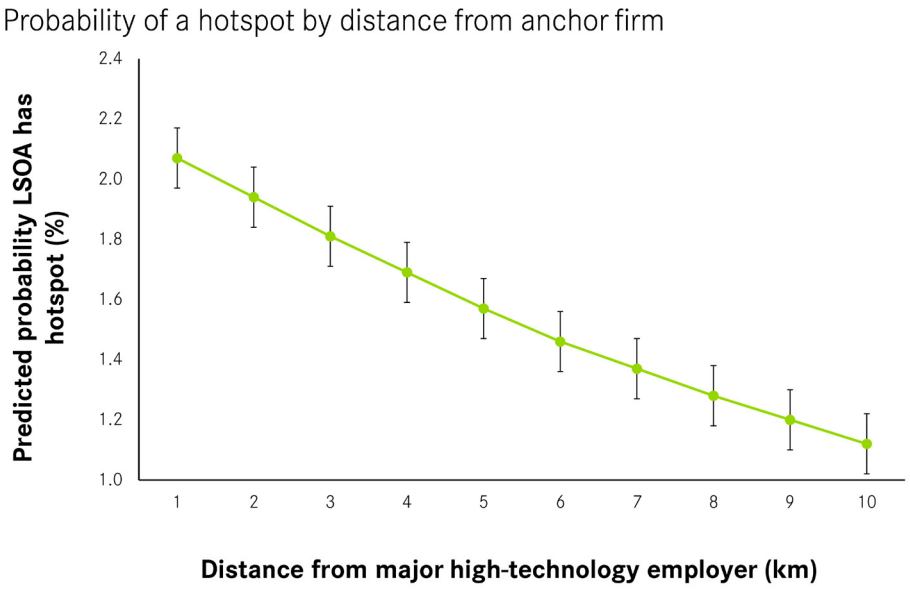
Penalties for being far away from these major employers are therefore large. A 1km increase in a neighbourhood's separation from a high-technology employer implies a 15 per cent reduction in the probability that it has a hotspot. Although the strength of the penalty wanes with distance, the impact is still significant. A neighbourhood 6.5 km further away from a major employer than another is 67 per cent less likely to have a hotspot.

44 The choice of sectors is akin to that used in other clustering research, e.g. Advanced Oxford, Oxfordshire's Innovation Engine 2023, Oxford: Advanced Oxford

45 Agrawal A and Cockburn I (2003), The anchor tenant hypothesis: exploring the role of large, local, R&D-intensive firms in regional innovation systems, International Journal of Industrial Organization, 21 (9): 1227-1253

46 Feldman M (2005), The Locational Dynamics of the U.S. Biotech Industry: Knowledge Externalities and the Anchor Hypothesis, in Quadrio Curzio A and Fortis M (eds.) Research and Technological Innovation, Heidelberg: Physica-Verlag

Figure 13: Predicted probability that a neighbourhood has a hotspot by distances from a large high-technology employer



Source: ONS, The Data City, and Centre for Cities calculations

Large, high-technology employers can therefore act as anchors for clustered new economy activity, and they seem to perform this function more strongly than research-intensive universities. Like universities, however, the anchoring effect is strongest in the immediate vicinity. As is the case in Stevenage (Box 4), places which host major institutions are ideal locations for innovative companies looking to share inputs and benefit from relationships in the supply chain or in the wider labour market.

Firms are willing to pay a premium to enjoy the benefits of hotspots

Evidence from rateable value data suggests that innovative firms are willing to pay a premium to form hotspots in desirable locations, even in the parts of the country where floorspace costs are already high.[47] As can be seen in Figure 14, the per metre rateable value of office space in areas with hotspots is generally higher than that in areas without across PUAs and non-urban local authority districts.

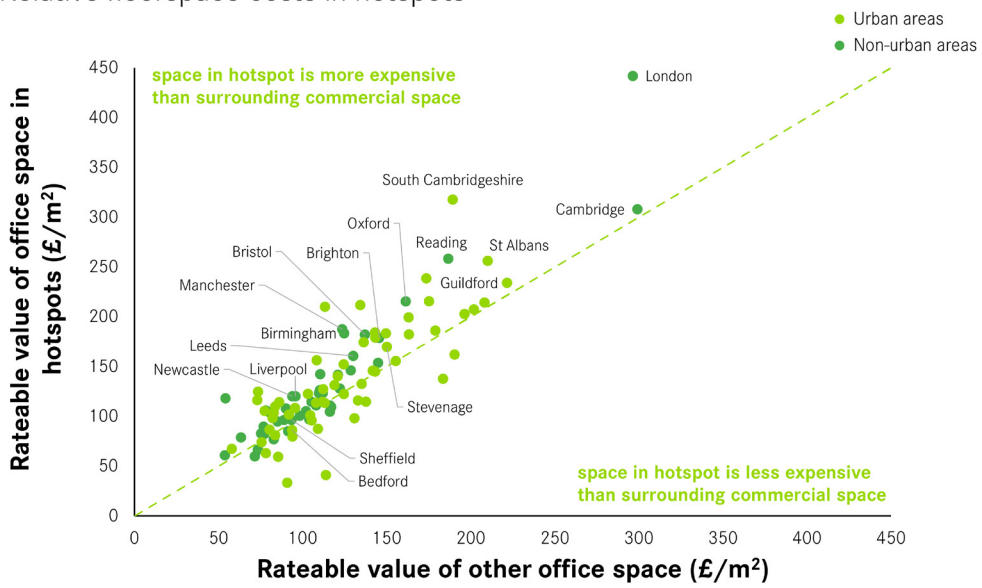
The average premium on office space is between 11 and 13 per cent, although this varies across the country. In London, which has the most expensive office space in the country, the difference in cost between places with and without hotspots is around £150 per square metre. The premium on hotspot office space is also large in Reading, Oxford, Birmingham, and Manchester. Despite

47 These costs are excluded from the regression models because of high collinearity with jobs density, which is a far more important explanatory variable.

being somewhat elevated in places with hotspots, floorspace costs in Liverpool, Newcastle, and Sheffield are much lower.

Figure 14: Rateable value of office space and hotspots and elsewhere across local authorities

Relative floorspace costs in hotspots



Source: Valuation Office Agency, The Data City, and Centre for Cities calculations

The rateable value of floorspace and the various premiums give an indication as to where the development of hotspots may be encountering constraints imposed by the built environment. London, and other cities and towns in the Greater South East such as Reading, Oxford, and St Albans are obvious examples. There, office space is generally expensive, and space in hotspots even more so.

The premium on the cost of space in South Cambridgeshire is the highest of any labour market area. Where these hotspots are, though, is revealing, with most of the area's clustered new economy firms being found in close proximity of Cambridge itself. This, coupled with the high cost of commercial space in Cambridge points to a chronic undersupply of commercial premises. This undersupply, especially laboratory space, in Cambridge and Oxford has received significant attention in the last few months.[48] Among the prevailing concerns is that a lack of facilities is pushing valuable activity overseas and hurting national growth prospects.[49] In response to these challenges, the Government has announced the formation of a Cambridge Delivery Group to oversee the expansion of the city over the long term.[50]

48 Howard T, Science superpower dreams thwarted by lack of laboratory space, The Times 14 February 2023
49 Foster P, Lab space shortage threatens life science boom in Oxford and Cambridge, Financial Times 1 August 2022
50 Gove M (2023), Long-term plan for housing: Secretary of State's speech, https://web.archive.org/web/20230810164405/https://www.gov.uk/government/speeches/long-term-plan-for-housing-secretary-of-states-speech

05

Lessons for policy

As places where companies can benefit from different kinds of agglomeration effects, hotspots have an important role to play in advancing the development of the new economy. Britain is already a leader in financing and developing innovative companies.[51] Considering the well-known national productivity slowdown, building on these strengths is of national importance.

Hotspots do not form in a vacuum, rather they are attracted to specific locations because of their attributes. Existing agglomeration, the extent of the skilled labour market, anchor institutions, and connectivity all play important roles. Any attempts to develop hotspots in new places should therefore be mindful of the degree of commitment required, the sorts of anchors available, and the characteristics of the wider labour market.

Working to support existing hotspots, and expanding the clustered new economy in places with the greatest potential, are much more likely to bear fruit. In that regard, the analysis of this report suggests that different interventions are required in different places. This means that national and local government, in conjunction with other stakeholders, have important roles to play in supporting and expanding the clustered new economy.

Land use policy has a critically important role to play in developing hotspots. In existing centres of clustered new economy activity, relieving physical constraints on places where demand is high is of paramount importance. This means releasing land and permitting new commercial development around hotspots in Cambridgeshire, London, and other locations in the Greater South East. Stakeholders should now work to ensure there is enough available space for existing hotspots in central locations and near well-connected transport hubs to expand. The best tools for achieving this aim include:

51 Department for Digital, Culture, Media & Sport (2022), UK tech sector retains #1 spot in Europe and #3 in world as sector resilience brings continued growth, https://web.archive.org/web/20230724152450/https://www.gov.uk/government/news/uk-tech-sector-retains-1-spot-in-europe-and-3-in-world-as-sector-resilience-brings-continued-growth

- Making full use of the National Development Management Policies contained in the Levelling Up Bill and Local Development Orders to speed up planning processes. Interventions such as these will be especially important in places such as Oxfordshire and Reading, where there are already many new economy firms and floorspace costs are high.
- Taking advantage of the introduction of 'Class E' commercial space in the Use Class Order, which allows commercial space to be used flexibly, and focusing less on retail in future development.[52]

The failure of previous attempts to pursue development in the Greater South East, such as the last Labour government's proposal to create a string of 'eco-towns', or the more recent political difficulties in implementing the proposed 'Ox-Cam Arc', demonstrate the scale of the challenge. One particular sticking point will be the release of green belt land for commercial development, which has faced widespread opposition. In the long run, moves towards a planning framework based on flexible zoning will help alleviate some of these problems.[53]

Outside the Greater South East, the most significant opportunities for growth lie in the major cities. Although they are presently falling short of their potential, they have significant amounts of clustered new economy activity in their cores and have been successful in organising the firms they have into hotspots. The big cities also possess deep labour pools, research-intensive universities, and robust local institutions in their mayors and combined authorities.

Considering the opportunities for growth, the analysis in this report suggests that the Government's decision to pivot the Investment Zone strategy towards the Mayoral Combined Authorities (MCAs) was the correct one. However, other interventions, such as assistance in expanding commercial space, R&D funding allocations, and expanding and extending the City Region Sustainable Transport Settlement would also assist the development of hotspots in major cities.[54]

Elsewhere in the country, especially in locations where clustered new economy activity does not appear to face any specific constraints, places with hotspots should be viewed as nodes of activity around which future policy interventions can be structured. In practice, this means ensuring that regeneration schemes and new transport investment work with, rather than against, the interests of existing local hotspots.

Attempts to promote levelling up through the relocation of public bodies should similarly consider hotspots when choosing sites. As places with existing innovative activity, places with hotspots are among the best equipped to

52 Breach A and McDonald R (2018), Building Blocks: The role of commercial space in Local Industrial Strategies, London: Centre for Cities.

53 Breach, A (2020), Planning for the future: How flexible zoning will end the housing crisis, London: Centre for Cities; Breach, A (2022), A very short guide to planning reform, London: Centre for Cities

54 Rodrigues G, Vera O and Swinney P (2022), At the frontier: the geography of the UK's new economy, London: Centre for Cities

capitalise on new investment in their local economies. This is especially the case in struggling towns, where new investment is less likely to generate brand new hotspots and is therefore best targeted on pre-existing assets. Policymakers should, however, be mindful of the type of activity being moved, as civil service administration is less likely to have an impact on the new economy than broadcasting or public research institutes.

Recommendations for Investment Zones

While Investment Zones are not the only intervention required to make the most out of Britain's clustered new economy, the findings of this report have clear implications for MCAs developing their proposals and the implementation of the policy by central government. The priority should now be focused on:

1. Choosing Investment Zone sites where hotspots presently exist and focus on improving them.
    - The government's intended model for Investment Zones includes a central 'core' surrounded by a broader 'cluster ecosystem'.[55] In each of the 12 combined authorities which will host an Investment Zone, the centre of the largest city possesses the largest hotspot. This means that city centres should be an important focus of Investment Zone proposals, and MCAs should make full use of the planning and local infrastructure parts of the Government's policy offer to improve connectivity and ensure that companies have access to suitable premises.
    - Other locations should be chosen carefully, and MCAs should resist the temptation to spread their resources too thinly. Lessons from regeneration projects such as those at Canary Wharf and King's Cross in London emphasise the importance of concentrated investment over many years.[56]

2. Carefully selecting higher education institutions and large, high-technology employers to act as anchors, and ensure that new developments are situated to benefit from their input.
    - This research has found little evidence that anything but the leading research-intensive universities have an impact on the formation of hotspots, and that their impact, as well as that of high-technology employers, is felt most strongly in the immediate vicinity. Both the Government and the MCAs need to select institutions with the most capacity to support innovative activity to anchor Investment Zones and provide them with the support they need to translate research

55 HM Treasury and Department for Levelling Up (2023), Housing & Communities, Investment Zones: Policy Offer, London: His Majesty's Stationery Office

56 Bridgett S, Leeman T and Breach A (2022), Making places: The role of regeneration in levelling up, London: Centre for Cities

into meaningful development in their localities.

3. Helping cities grow the entirety of their clustered new economies and avoiding sectoral prejudices.
    - The hotspots identified by this report are seldom specialised, and relatively few clustered new economy firms are in manufacturing-orientated industries that require large premises and investment in heavy machinery. This means that, in most cases, policymakers keen to promote the formation and expansion of hotspots should focus on the Government's more broadly defined 'priority sectors' (such as 'Digital and Tech') rather than commit to specific industries with more complex needs and a greater propensity to produce lower quality jobs – if, indeed, the Government is to continue to insist that hotspots are to be organised around sectors.[57]

Box 10: South Yorkshire Investment Zone proposal

The South Yorkshire Combined Authority was the first to announce a detailed Investment Zone proposal.[58] Consisting of a central core stretching from the Centre of Sheffield to Rotherham and a smattering of 'opportunity sites', the proposal covers the area's main hotspots, which are located in Sheffield city centre and in the Advanced Manufacturing Park situated to the east. It also linked with major employers and the University of Sheffield, a research-intensive institution.

The analysis contained in this report suggests that these dimensions to the proposal are positive, although the geographical scale of the proposals risks resources being spread too thinly. Sheffield's clustered new economy lags behind that of other major cities; as such, a more fruitful strategy would be to focus on the region's existing assets, which are still comparatively small, rather than pursue new ventures elsewhere.[59]

57 HM Treasury and Department for Levelling Up (2023), Housing & Communities, Investment Zones: Policy Offer, London: His Majesty's Stationery Office

58 South Yorkshire Mayoral Combined Authority (2023), South Yorkshire Investment Zone, Sheffield: SYMCA

59 A small hotspot exists next to Doncaster Airport, but it lies outside the proposed Doncaster City Centre Opportunity Site.

06

Appendix

Linear (OLS) results

This report uses four OLS models to assess the role of different factors on the amount of new economy and clustered new economy activity across TTWAs. The dependent variable in Model 1 and Model 2 is the number of new economy firms per 10,000 working-age residents in a TTWA. The dependent variable in Model 3 and Model 4 is the number of clustered new economy firms per 10,000 working-age residents.

Table 4: Linear regression results

	Model 1	Model 2	Model 3	Model 4
University campuses	-0.077*		0.152***	
	(0.045)		(0.016)	
TRAC-A university campuses		-1.338**		1.453***
		(0.664)		(0.279)
L4+ workers (share)	0.165***	0.177***	0.076***	0.070***
	(0.048)	(0.047)	(0.021)	(0.020)
log(number of L4+ workers)	1.238***	1.378***	0.580***	0.536***
	(0.296)	(0.311)	(0.077)	(0.076)
TTWA jobs density	27.545***	27.316***	3.880***	4.145***
	(3.855)	(3.812)	(1.406)	(1.422)
Greater South East dummy	4.516***	4.340***	1.012***	1.200***
	(0.594)	(0.610)	(0.344)	(0.350)
Constant	-21.103***	-22.693***	-10.573***	-10.133***
	(3.385)	(3.522)	(1.291)	(1.360)
Number of observations	218	218	218	218
R^2	0.57	0.58	0.59	0.58

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Robust standard errors, clustered at the TTWA level, given in brackets

Logistic regression results

This report uses logistic regression models to assess the degree to which different factors alter the odds that an LSOA has a hotspot. In all models, the dependent variable is therefore a binary outcome reflecting whether or not an LSOA has a hotspot. The coefficients reported in the table are odds ratios.

In Models 2 to 4, the impact of the urban and Greater South East dummies (included as controls) on hotspot formation appear negative. This is because the other independent variables, such as jobs density or access to skilled workers by trains, contain the bulk of the advantages offered by cities and Greater South East locations. Without them, as can be seen in Model 1, the advantages of urban and Greater South East locations are substantial.

Some of the analysis of the impact of universities, and the results displayed in Figure 12 and Figure 14, originate in marginal effects (calculated in STATA) derived from these models.

Table 5: Logisitic regression results

	Model 1	Model 2	Model 3	Model 4
TRAC-A university campus in TTWA dummy		1.002		1.326
		(0.148)		(0.331)
TRAC-A university campus within 5km dummy			1.483**	
			(0.243)	
TRAC-A university campus beyond 5km dummy			-	
Distance to nearest TRAC-A university campus (km)				0.997
				(0.004)
Interaction: university dummy*distance				0.968**
				(0.015)
L4+ workers (share TTWA)		1.060***	1.058***	1.060***
		(0.013)	(0.012)	(0.013)
L4+ workers within 30 mins of best nearby station		1.000***	1.000***	1.000***
		(0.000)	(0.000)	(0.000)
Distance to nearest large high-technology employer (km)		0.847***	0.854***	0.855***
		(0.029)	(0.029)	(0.029)
Jobs density		1.531***	1.529***	1.528***
		(0.048)	(0.047)	(0.048)
Urban dummy	2.149***	0.738**	0.694***	0.670***
	(0.225)	(0.099)	(0.092)	(0.099)
Greater South East dummy	2.812***	0.966	1.039	1.032
	(0.271)	(0.186)	(0.188)	(0.198)
Constant	0.005***	0.001***	0.001***	0.001***
	(0.001)	(0.000)	(0.000)	(0.000)

Number of observations	34,753	34,753	34,753	34,753
Pseudo R^2	0.037	0.261	0.263	0.263

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Robust standard errors given in brackets

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