

**GREATER  
MANCHESTER  
INDEPENDENT  
PROSPERITY  
REVIEW**

# **INNOVATION AND GLOBAL COMPETITIVENESS RESEARCH SUMMARY**



March 2019

**THE GREATER MANCHESTER  
INDEPENDENT PROSPERITY  
REVIEW WAS COMMISSIONED  
TO PROVIDE A DETAILED AND  
RIGOROUS ASSESSMENT OF  
THE CURRENT STATE, AND  
FUTURE POTENTIAL, OF GREATER  
MANCHESTER'S ECONOMY.**

**TEN YEARS ON FROM THE  
PATH-BREAKING MANCHESTER  
INDEPENDENT ECONOMIC  
REVIEW, IT PROVIDES A FRESH  
UNDERSTANDING OF WHAT  
NEEDS TO BE DONE TO IMPROVE  
PRODUCTIVITY AND DRIVE  
PROSPERITY ACROSS  
THE CITY REGION.**

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Independent of local and national government, the Prosperity Review was carried out under the leadership of a Panel of six experts:



**Professor Diane Coyle**  
Bennett Professor of Public Policy,  
University of Cambridge, and Chair of  
the Greater Manchester Independent  
Prosperity Review



**Stephanie Flanders**  
Head of Bloomberg Economics



**Professor Ed Glaeser**  
Fred and Eleanor Glimp Professor of  
Economics, Harvard University



**Professor Mariana Mazzucato**  
Professor in the Economics of  
Innovation & Public Value and  
Director of UCL Institute for  
Innovation and Public Purpose



**Professor Henry Overman**  
Professor of Economic Geography,  
London School of Economics, and  
Director of the What Works Centre for  
Local Economic Growth



**Darra Singh**  
Government and Public Sector Lead  
at Ernst and Young (EY)

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The Panel commissioned studies in four areas, providing a thorough and cutting-edge analysis of key economic issues affecting the city region:

- Analysis of productivity, taking a deep-dive into labour productivity performance across Greater Manchester, including a granular analysis of the ‘long tail’ of low-productivity firms and low pay;
- Analysis of education and skills transitions, reviewing the role of the entire education and skills system and how individuals pass through key transitions;
- Exploration of the city region’s innovation ecosystems, national and international supply chains and trade linkages; and sources of global competitiveness, building on the 2016 Science and Innovation Audit; and
- Work to review the infrastructure needs of Greater Manchester for raising productivity, including the potential for new approaches to unlock additional investment.

The Prosperity Review’s findings and recommendations will underpin the ambitious Local Industrial Strategy that Greater Manchester is developing jointly with the Government and will inform the actions of local and national decision-makers from across the public and private, as well as the voluntary, community and social enterprise sectors in driving forward Greater Manchester’s future productivity and prosperity.

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# ABOUT THIS RESEARCH SUMMARY

This research summary brings together the central themes and wide-ranging findings from the technical reports on innovation and global competitiveness and has been developed to inform the reviewers' recommendations. The seven technical reports are: *Greater Manchester and Cheshire East Science and Innovation Audit*; *Sources of Global Competitiveness and Innovation in Greater Manchester*; *Economic Complexity Analysis*; *Industry Relatedness Analysis*; *A Mission Oriented Approach to Greater Manchester's Clean Growth Challenge*; *Understanding Innovation and Innovation Ecosystems*; and *Ecosystem Approach to Supply Chains*. The research summary concludes with a section on recommendations for Greater Manchester on innovation and global competitiveness.

The research on innovation and global competitiveness has addressed the following research questions:

- Where do Greater Manchester's sources of global competitiveness and industry strength lie?
- What possibilities exist for industrial specialisation in the future?
- How can the city region boost its levels of innovation and strengthen, support, and maintain its future sources of global competitiveness?

Innovation and Global Competitiveness Technical reports:

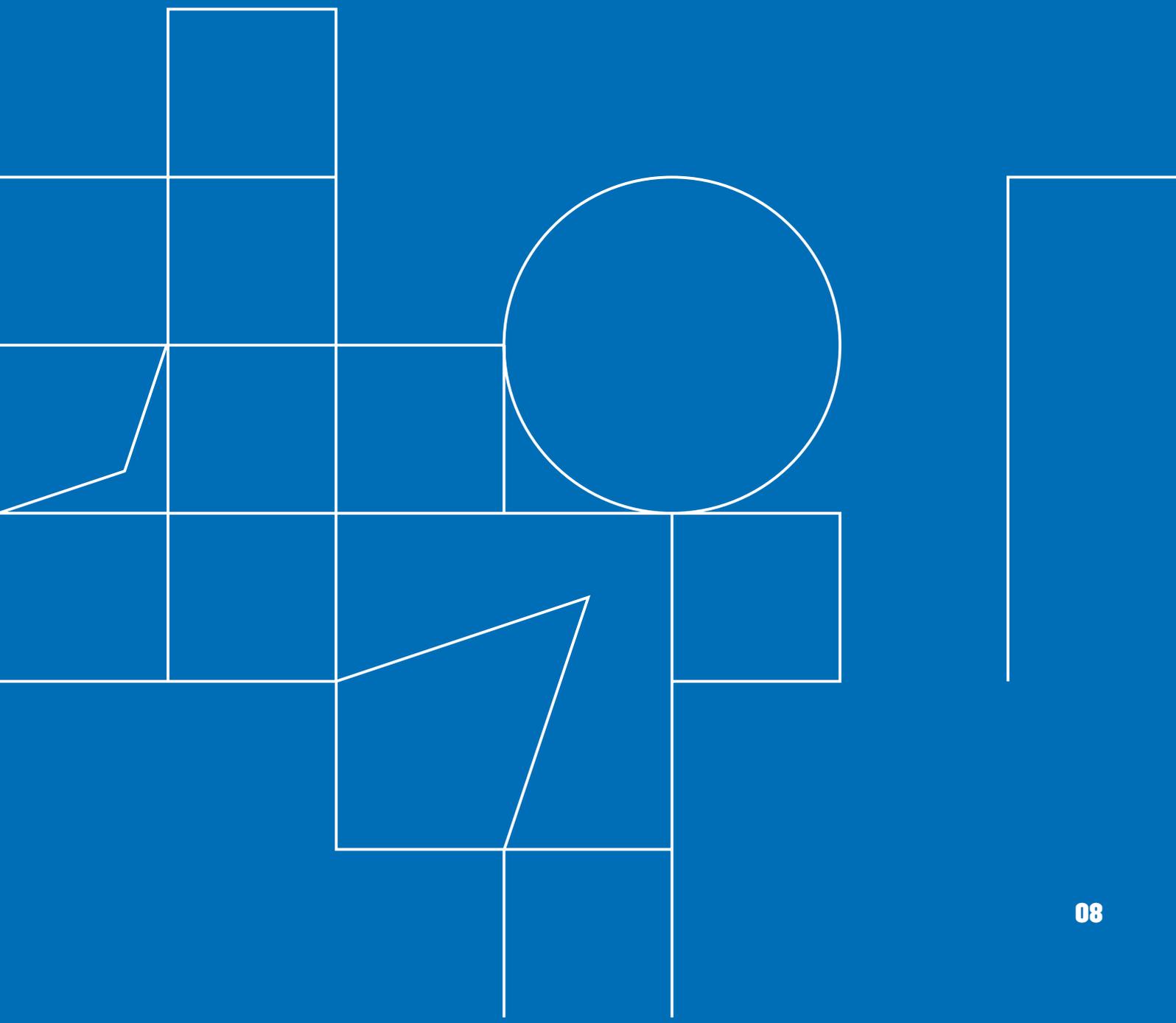
- *Greater Manchester and Cheshire East Science and Innovation Audit* (SIA). The Audit jointly developed by Government, Greater Manchester and Cheshire East was first published in 2016 and provides detailed analysis of Greater Manchester and Cheshire East's capabilities, and the substantial opportunities for future economic growth.
- *Sources of Global Competitiveness and Innovation in Greater Manchester*: A deeper dive into Greater Manchester's distinctive offer, building on the SIA, using official and novel data to explore areas of current and potential growth. The report has been produced by Greater Manchester Combined Authority (GMCA), the Data City and Hatch Regeneris.
- *Economic Complexity Analysis*. This research uses the economic complexity framework; a new, network-based empirical methodology, to study a place's current comparative advantage and future growth potential. The analysis has been produced by the Bennett Institute for Public Policy at University of Cambridge.
- *Industry Related Analysis*. This analysis uses network analysis to better understand economic diversity and industry relatedness in cities. The report is based on PhD research at the Bartlett at University College London, funded by the Engineering and Physical Sciences Research Council (EPSRC).

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- *A Mission-Oriented Approach to Greater Manchester’s Clean Growth Challenge*. This report explores in more detail a mission-oriented approach to innovation and policy and applies this to the clean growth challenge in Greater Manchester. This report has been produced by researchers at the Institute for Innovation and Public Purpose (IIPP) at University College London.
  - *Understanding Innovation and Innovation Ecosystems*. This research provides an understanding of the latest literature on innovation, covering: innovation diffusion; adoption; trajectories; innovation in services and creative industries; skills relatedness; and knowledge complexity on innovation. It looks at place-based innovation and includes recommendations as to how Greater Manchester as a place can develop its innovation ecosystem. This analysis was produced by the Manchester Institute of Innovation Research (MIOIR) at University of Manchester.
  - *Ecosystem Approach to Supply chains*. This analysis looks at supply chains in more depth using available data sources and interviews with Greater Manchester technology businesses. The report provides reflections on how policy can support firms’ ability to develop and sustain their connectivity to supply chains in ways that can enhance their productivity. This report has been produced by the Bennett Institute for Public Policy at University of Cambridge.

The views expressed in this report are those of the authors of the technical report inputs cited above and, as usual, errors and omissions in this report remain the responsibility of the authors alone.

This report, alongside a further two research summaries for the thematic of ‘Education and Skills’ and ‘Productivity and Pay’ – which also bring together wide-ranging subject matter – are available alongside the technical reports and wider evidence for the Greater Manchester Independent Prosperity Review at [www.gmprosperityreview.co.uk](http://www.gmprosperityreview.co.uk)

# 01. BACKGROUND AND CONTEXT



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## GLOBAL COMPETITIVENESS

What are places good at currently and what might they be able to become good at doing in the future? These are central questions for an effective industrial strategy, but they are difficult to answer. Central to exploring them is an understanding of existing strengths and of how regions and city regions diversify.

New activities rarely start from scratch. They require local capabilities, knowledge, skills, networks and institutions, as well as the right conditions to grow and flourish. These local capabilities provide opportunities for growth, but they also often set limits to the diversification process, as an area is far more likely to diversify into new activities which relate to its existing offer. Unrelated diversification, the acquiring of wholly new knowledge, skills and institutions, is certainly possible, but it is the exception – related diversity is the rule<sup>1</sup>.

The level of economic complexity – an indicator of the breadth of sectors and occupations present in an economy – enhances the opportunities for diversification by the number of potential linkages which can be made between actors, firms and institutions. Key mechanisms of sharing (e.g. supply chain linkages); learning (knowledge spill-overs); and matching (the linking of labour market supply to demand)<sup>2</sup> take place in cities, leading to ‘localisation economies’ when they benefit firms within the same sector, or ‘urbanisation economies’ in more complex city economies when cross-sector sharing of goods, knowledge and labour takes place<sup>3</sup>.

Particularly in a complex economy, related diversification can often happen organically and it follows that this diversification is likely to have a higher economic impact when it is in complex activities such as advanced materials in the manufacturing sector, or health informatics in the services sector. If the economy is heavily reliant on less complex activities, such as hospitality or retail, however, then this can simply reinforce more of the same. Balland and Rigby have identified this in their work on the Rust Belt states in the United States<sup>4</sup>. Within Greater Manchester, this has specific relevance, as there are substantial differences in complexity levels across the conurbation. Intervention may be needed to transform the fortunes of an area with a tendency towards lower value activities, to prevent it from being ‘locked-in’ and to support its growth towards higher value opportunities.

1. Boschma et al, Towards a theory of regional diversification: combining insights from Evolutionary Economic Geography and Transition Studies, *Regional Studies*, 2017
2. Duranton & Puga, (2003) Micro-foundations of urban agglomeration economies. NBER Working Paper Series 2003
3. Overman et al, The case for agglomeration economies, *Manchester Independent Economic Review*, 2009
4. Balland & Rigby, *The Geography of Complex Knowledge*, *Economic Geography*, 2016

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## INNOVATION

Innovation is distinct from, but a necessary condition for, global competitiveness. Defined here as the development and deployment of new ideas, it takes place in all sectors of the economy and within the private, public and third sector. Innovation plays a fundamental role, alongside other factors such as human capital and infrastructure, in raising productivity in the local economy. Econometric analysis undertaken for the Prosperity Review shows that doubling the proportion of science and technology jobs in an economy – a proxy for innovation – could increase productivity by up to 4%<sup>5</sup>.

Analysis of the Greater Manchester Business Survey found that innovative firms were more likely to be higher productive firms, and that innovative firms exist in all sectors of the Greater Manchester economy<sup>6</sup>. For example, in retail, a typically low productive sector, innovative firms may be using cutting-edge retail sector technologies and e-commerce platforms. In Advanced Materials, innovative firms may be identifying new applications for 2D materials and the commercialisation of their use.

Wider work for the Prosperity Review shows that the main characteristics associated with higher performing firms are that they trade internationally and/or are foreign-owned. A factor common to both would be the size of the market firms can access. Better access to larger and more sophisticated markets also increases innovation and investment. These factors seem more important than a simple focus on firm size, age, or broad sector<sup>7</sup>.

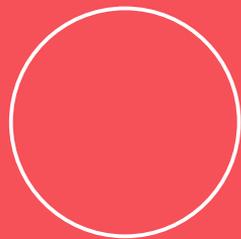
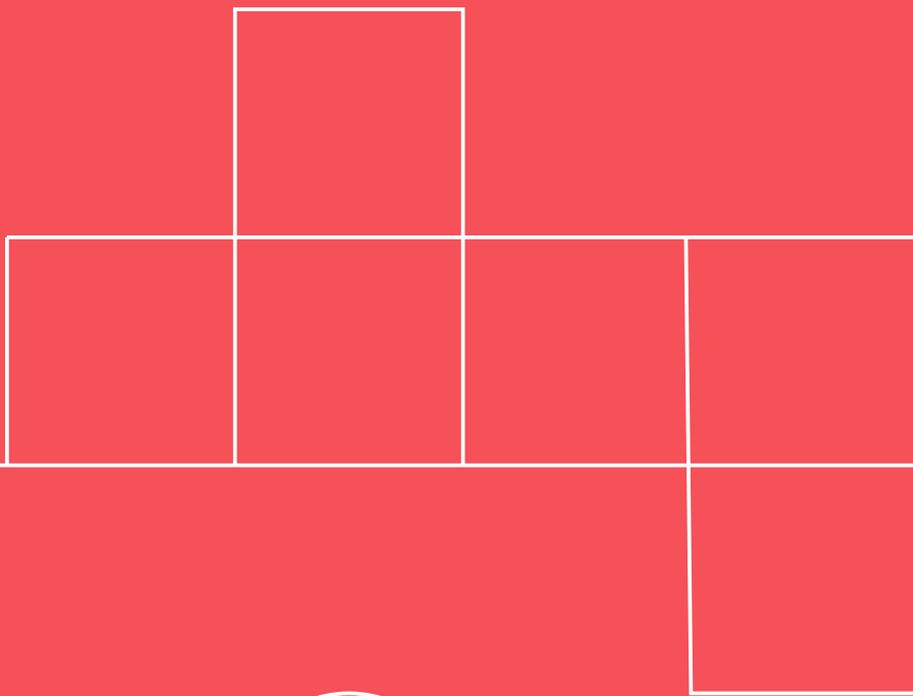
Complex economies, as described above, create a breeding ground for innovation. A sophisticated mix of industries and supply chains create multiple growth opportunities and diversification routes for business. It can however be challenging to determine the extent to which city regions are innovative, as official statistics do not provide the full picture on innovation, particularly process innovation<sup>8</sup>.

This overview looks at globally competitive areas of opportunity now and in the future for Greater Manchester set in the context of a greater understanding of the innovation ecosystem and how innovation can be raised across the city region.

5. Audit of Productivity, Greater Manchester Independent Prosperity Review
6. GMCA, Greater Manchester Business Survey, 2017, [https://www.greatermanchester-ca.gov.uk/media/1703/2017\\_gm\\_business\\_survey\\_final\\_report.pdf](https://www.greatermanchester-ca.gov.uk/media/1703/2017_gm_business_survey_final_report.pdf)
7. Audit of Productivity, Greater Manchester Independent Prosperity Review
8. NESTA, Hidden innovation: how innovation happens in six low innovation sectors, 2007

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# 02. IDENTIFYING FUTURE INDUSTRIAL OPPORTUNITIES



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An understanding of Greater Manchester's existing offer has been explored in depth in two of the Prosperity Review's technical reports – the Greater Manchester and Cheshire East Science and Innovation Audit (SIA) and the Sources of Global Competitiveness and Innovation in Greater Manchester Technical Report. This latter report includes a data science approach by The Data City, a Smart Cities and Economics Data-as-a-Service (DaaS) company, and analysis of official metrics.

Greater Manchester has a diverse business base and sophisticated mix of industries and supply chains. It is the most diverse city region in the UK in terms of businesses and jobs, according to the Krugman Specialisation Index (KSI)<sup>9</sup>. The two city regions which stand out as being the most diverse, Greater Manchester and Leeds, also have average growth rates that are higher than most of the other comparator city regions.

Further evidence to illustrate the complexity and sophistication of the city region's economy was developed using a data science approach that analysed papers published in peer-reviewed journals with authors at a Greater Manchester institution and patents in over 2,000 fields of study to calculate global rankings for 404 global cities. In the UK, London, Cambridge, and Oxford dominate; however, Greater Manchester is best placed outside the golden triangle. It ranks top 10 globally in five scientific fields: ontology (computer science), design methods, residual stress (material science), qualitative research, and ageing. This is behind Oxford (top five in eleven fields) and Cambridge (top five in 18 fields), although a long way behind London (top five in 473 fields).

Event analysis is a good indicator of a vibrant scene for collaborative knowledge sharing. Analysis of Meetup and Eventbrite data positions Manchester second, only behind London, for events in important sectors/themes such as digital, energy, fintech, creative and manufacturing. Although other major cities host events across a similarly broad set of areas, they do not have the volume of meet-ups seen in Manchester. Manchester edges out Bristol, Edinburgh, and Cambridge in terms of Artificial Intelligence (AI) and data events and leads Brighton in terms of creative events.

The SIA identifies two globally competitive areas within the city region's breadth of offer. These 'core strengths' are in Health Innovation and Advanced Materials, both of which are challenging to track using official metrics.

9. GMCA: Sector Deep Dives and Productivity in Greater Manchester, 2016 and 2017

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## HEALTH INNOVATION

The SIA confirmed that Greater Manchester and its surrounding area has the largest concentration of excellence in health research nationally, outside South East England. The city region has key research strengths on which to build, set in the context of a large and stable population exhibiting significant health challenges. In particular the city region has strengths in natural sciences, molecular diagnostics, and biotechnology / bioinformatics sciences, where GVA per worker is almost three times the national average.<sup>10</sup>

Health and social care devolution to Greater Manchester has created an unprecedented opportunity for a concerted push towards innovation for both health and economic benefit. The creation of Health Innovation Manchester also helps to refocus priorities around a system and place.

There are significant synergies between the city region's health sector and its wider strengths in digital. Data City's analysis demonstrates the crossover between digital and broader care and healthcare categories and highlights that Greater Manchester appears to have a greater focus on telematics and health informatics than nationally. Strengths in data (and big data), analytics, data science, computer science, AI, and imaging, are leading to innovation in disease prevention, diagnosis, treatment and care in non-clinical settings.

## ADVANCED MATERIALS

The SIA highlighted the opportunity to develop 'Graphene City', founded on the unique presence of world-leading science in advanced materials (including at the National Graphene Institute), engagement with business, and the creation of new start-up companies. The city region is increasingly a recognised global hub for transitioning breakthrough graphene and 2D materials science into new and disruptive products and applications.

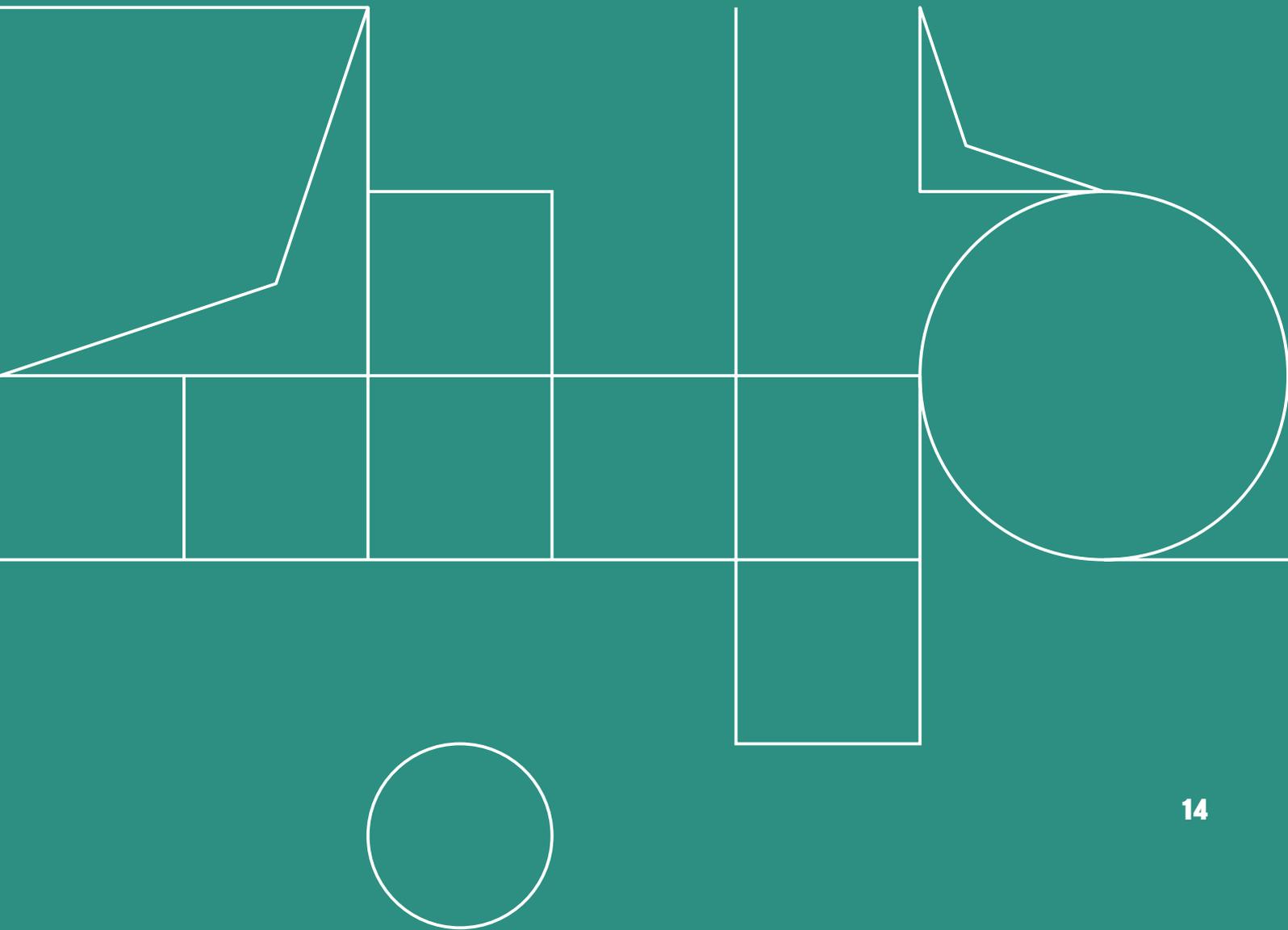
The data science analysis identified a clutch of interrelated Material-Tech themes such as Resilience, Coatings, Surface, Testing and Protective, where Greater Manchester is highly represented. The city region also hosts a solid base of research on Light Alloys, Coatings, Graphene, Composites and Materials Science.

Assets include the National Graphene Centre, the Graphene Engineering Innovation Centre, and the Henry Royce Institute for Advanced Materials Research and Innovation. Wider assets include the BP International Centre for Advanced Materials, Cockcroft Institute and nuclear and industrial biotechnology excellence at the University of Manchester; centres for Advanced Materials and Surface Engineering, computational intelligence, big data, and industrial digitalisation at Manchester Metropolitan University; the Institute for Materials Research and Innovation at the University of Bolton; and specialisms in robotics, AI and automation at the University of Salford. Greater Manchester's universities are also a pipeline of manufacturing talent, producing 5,000 engineering, maths and science graduates per year.

<sup>10</sup>. ONS and OECD

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# 03. OTHER HIGH PRODUCTIVITY SECTOR STRENGTHS



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Other high productivity sectors have been identified which, if not nationally unique, present significant opportunities for Greater Manchester to build on. They include Manufacturing, Professional Services and Creative and Digital.

## MANUFACTURING

Highly interlinked with advanced materials, the Manufacturing sector has a strong legacy in Greater Manchester and remains a significant contributor to the local economy. It includes four main subsectors: Advanced Manufacturing, Food and Drink Manufacturing, Textiles Manufacturing, and Other Manufacturing.

The sector has undergone significant transformation over the last few decades and whilst the total number of manufacturing jobs has been in decline, it remains one of GM's economic strengths, employing over 120,000 people, with high levels of productivity per employee and generating Gross Value Added (GVA) of £7.9bn.<sup>11</sup>

Advanced manufacturing makes up almost half of manufacturing jobs in Greater Manchester. The manufacture of paper, paperboard and related products delivers over three times the national average level of productivity, and in advanced textiles (including spinning, weaving, finishing and specialist products) it is twice the national average.<sup>12</sup>

## BUSINESS, PROFESSIONAL AND FINANCIAL SERVICES

Business, Professional and Financial Services is a major employer for Greater Manchester. It is a broad sector encompassing banking and fund management, pensions and insurance, legal and accounting, management consultancy, architectural and engineering consultancy and real estate. While London is a clear driving force behind the UK financial services industry, Greater Manchester thrives as a centre in its own right, particularly for domestic and regional markets.

The business, professional and financial services sector accounts for 290,000 jobs and generates £17.5bn.<sup>13</sup> Shared services, human resources, office services such as translation, and the activities of membership and representative organisations are around twice the national average level of productivity.

The conurbation is the centre for a number of major regional and national firms, including for example: The Co-operative Banking Group, BNY Mellon, Royal Sun Alliance Group, DWF LLP, Freshfields Bruckhaus Deringer, Eversheds, KPMG and Addleshaw Goddard LLP. Key assets within the city region include the city centre office market (encompassing iconic developments such as Spinningfields and NOMA), Trafford Park Quays and MediaCityUK, and the area surrounding Manchester Airport.

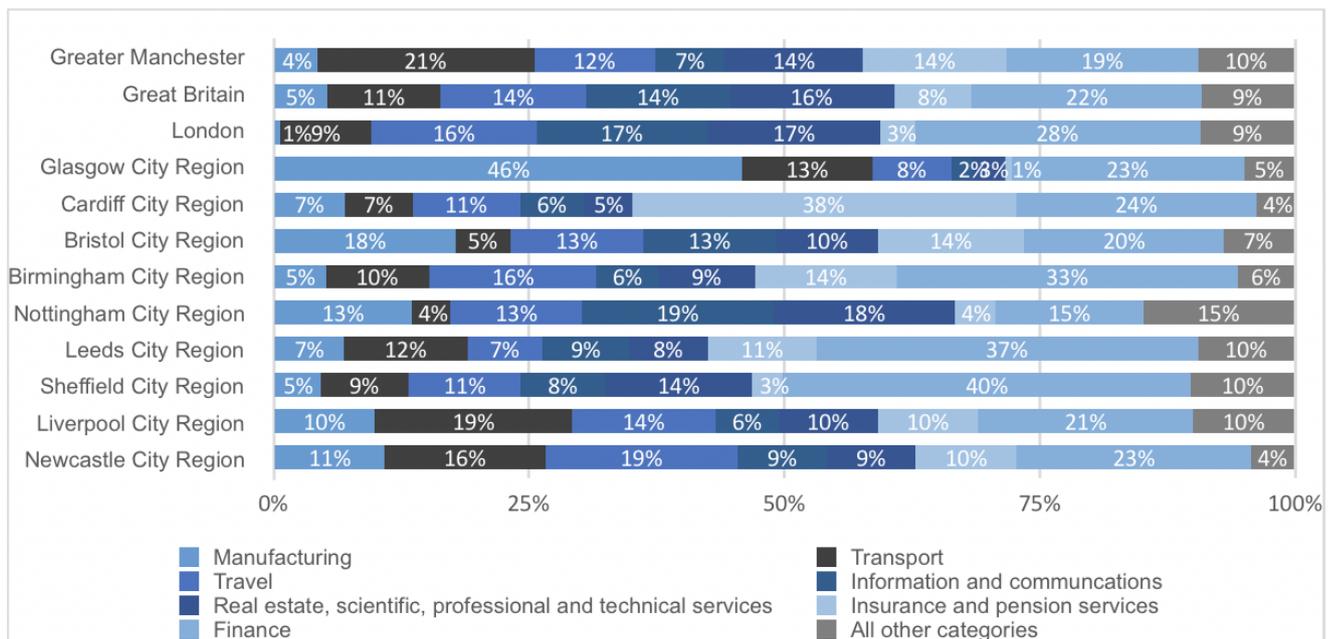
11. Business Register and Employment Survey (BRES), ONS 2017 and Greater Manchester Forecasting Model (GMFM), 2016

12. ONS and OECD

13. Business Register and Employment Survey (BRES), ONS 2017 and Greater Manchester Forecasting Model (GMFM), 2016

Whilst export data for service industries is relatively limited, the information available demonstrates that Greater Manchester has an export specialism in the professional services sub-sector of Insurance & Pension services, exporting £1.1bn (14% of total services exports) in 2016. This places Greater Manchester fifth overall in terms of total Insurance & Pension exports, behind London (£4.0bn), Surrey, East and West Sussex (£1.9bn), Eastern Scotland (£1.4bn), and Bristol City Region (£1.1bn). Other significant services exports include Transport Services (£1.6bn or 21% of total services exports) in part reflecting the significant asset that is Manchester Airport, Finance (£1.4bn or 19% of total services exports), and Real Estate, Scientific, Professional and Technical services (£1.0bn or 14% of total services exports).

Figure 1: City region services exports by type for Greater Manchester and peers, 2016 (Source ONS)



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## DIGITAL AND CREATIVE INDUSTRIES

Greater Manchester has the largest digital and creative sector outside London, accounting for 73,000 jobs and £4.3bn of economic output<sup>14</sup> each year.

The cluster of activity in the regional centre of Greater Manchester is a nationally significant asset, which includes developments such as MediaCityUK, The Factory, the Sharp Project, and the new National Institute of Coding. These developments are changing the make-up of the industry across the North. Smaller digital and creative clusters exist across the city region, particularly in town and district centres.

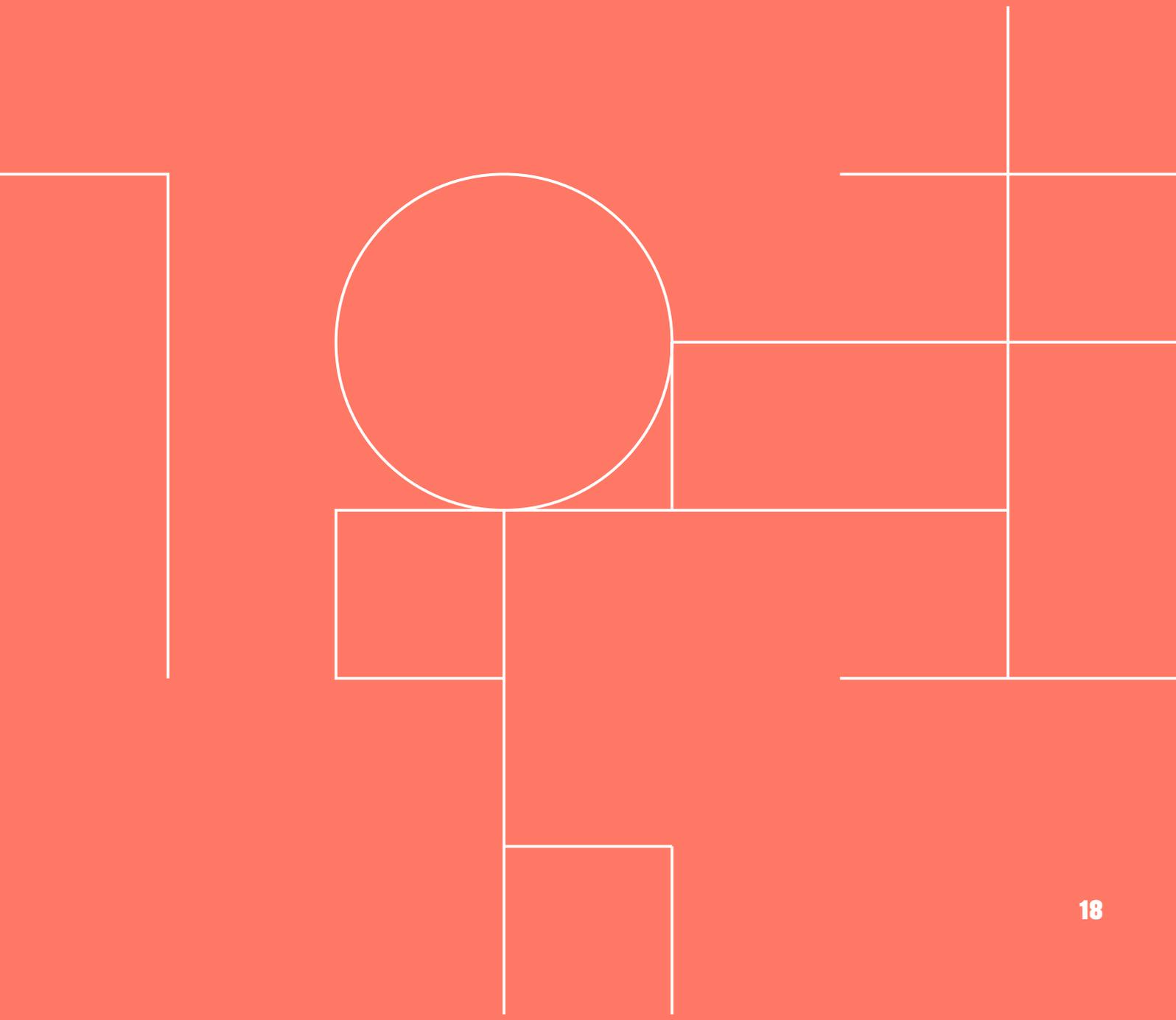
Official data shows sub-sector strengths in broadcasting, with almost three times the national average productivity, but also in software, digital telecoms, and e-commerce<sup>15</sup>; and the data science analysis identifies niche strengths in Service Design (E-commerce, Digital Transformation, User Experience), the Physical Layer of Digital (i.e. Data Centres, Storage, Hardware etc) and Digital Solutions such as AI, Sensors and Gaming. Greater Manchester is an emerging hotspot for public agencies and companies specialising in Cyber Security.

Digital and emerging technology relevant research undertaken in Manchester places the city reasonably well in terms of established and broad topics such as Databases and Software. There are signs that this is generating a competitive level of research outputs on emergent topics such as Data Science, Data Mining, AI and Machine Learning. Greater Manchester also has an internationally competitive base of research outputs around Marketing and Advertising.

14. Business Register and Employment Survey (BRES), ONS 2017 and Greater Manchester Forecasting Model (GMFM), 2016

15. Office for National Statistics

# 04. IDENTIFYING FUTURE INDUSTRIAL OPPORTUNITIES



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Underpinned by a strong understanding of existing strengths in Greater Manchester, future industrial possibilities have been explored in depth within three of the technical reports: *Economic Complexity Analysis*, *Industry Related Analysis* and *A Mission-Oriented Approach to Greater Manchester's Clean Growth Challenge*. These reports explore both related and unrelated diversification opportunities for the city region and take a whole city region through to district and neighbourhood level approach.

## ECONOMIC COMPLEXITY ANALYSIS AND INDUSTRY RELATED ANALYSIS

Building on what an area is currently good at and, crucially, where it has the potential to move to higher product complexity is a logical route for informing growth and for capability upgrading policy in a place. For the first time, the University of Cambridge has undertaken an economic complexity analysis across a UK city region and at a district level. The research used data on the current industry profile and skills mix to identify possibilities to broaden into new specialisms and demonstrates that there are opportunities for new, higher productivity industries in all districts of the city region.

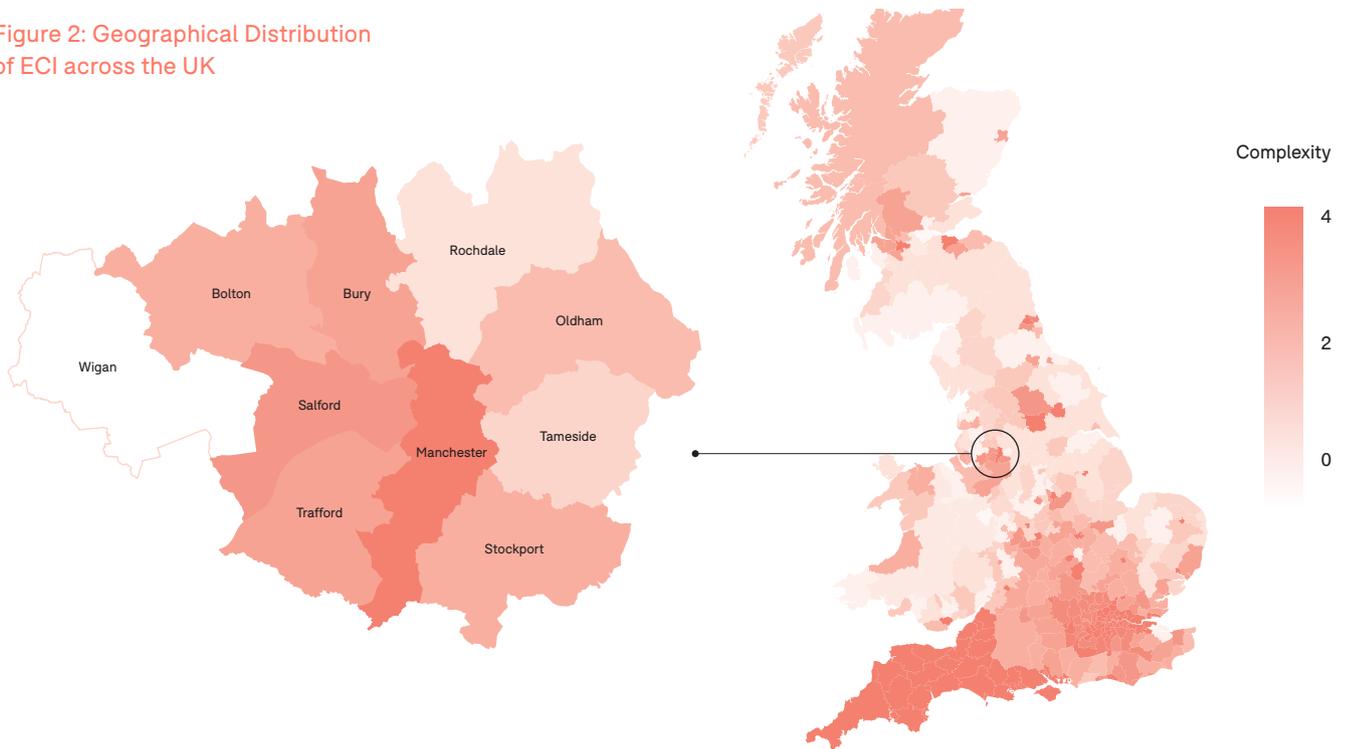
Economic complexity measures, originally developed by Hausmann and Hidalgo to understand cross-country differences in productive capabilities from export data, have proved to be particularly successful at understanding complexity, explaining variation in per capita GDP and predicting future growth rates across countries.<sup>16</sup> Similar findings have been shown to apply to regional data.<sup>17</sup>

The analysis of economic complexity measures revealed that, despite their relatively close geographic proximity, there are stark differences between the districts of Greater Manchester. Manchester and Salford have the highest Economic Complexity Index (ECI) score, followed by Trafford and Stockport, which indicates they have relatively similar industrial profiles concentrated in higher-skilled service industries. In contrast, Wigan, Rochdale and Tameside have much lower ECI values, suggesting they have quite different areas of competitiveness, more concentrated in manufacturing activities. An effective industrial strategy needs to take account of these differences, as the realistic possibilities for future growth are likely to look very different across these different areas.

16. Hidalgo, C. A., & Hausmann, R. The building blocks of economic complexity. *Proceedings of the national academy of sciences*, 2009; Hausmann et al. *The Atlas of Economic Complexity: Mapping paths to prosperity*, 2014.

17. Gao, J., & Zhou, T. Quantifying China's regional economic complexity. *Physica A: Statistical Mechanics and its Applications*, 492, 1591-1603, 2018; Mealy, P., Farmer, J., & Teytelboym, A. Interpreting Economic Complexity. *Science Advances*, forthcoming, 2018; Mealy, P., Farmer, J., & Hausmann, R. Determining the differences that matter: Development and divergence in US states over 1850-2010, 2018 Available at SSRN: <https://ssrn.com/abstract=3235193>

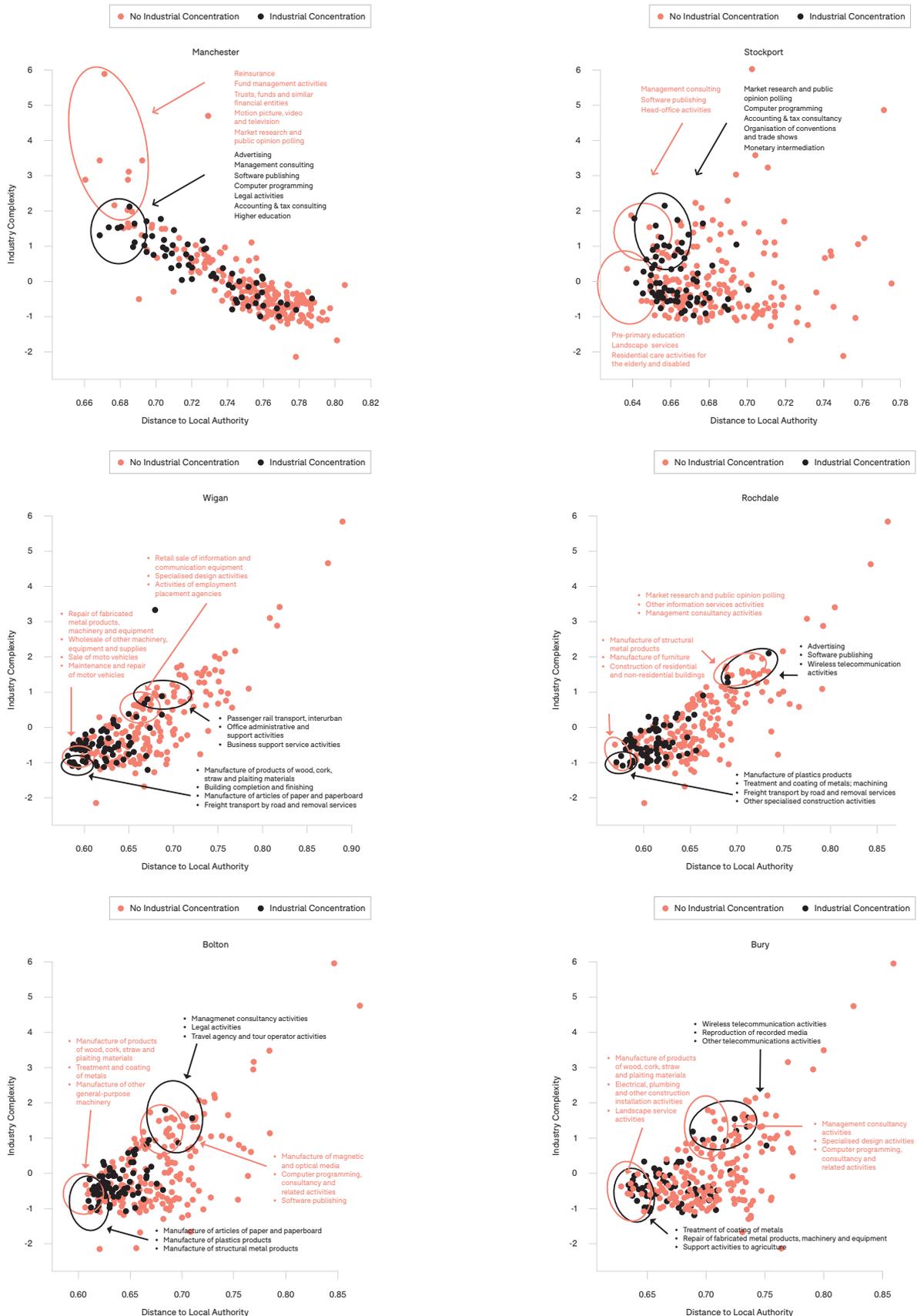
Figure 2: Geographical Distribution of ECI across the UK

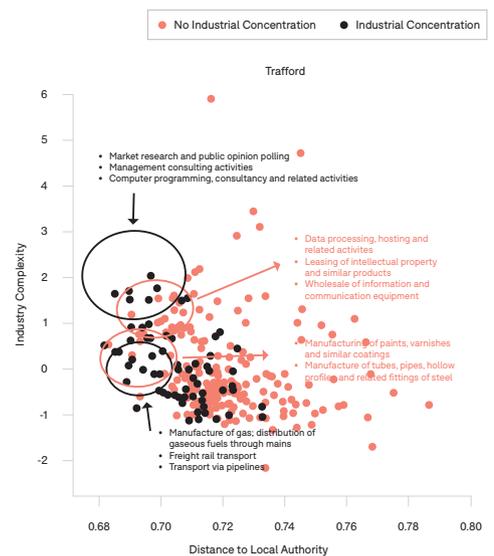
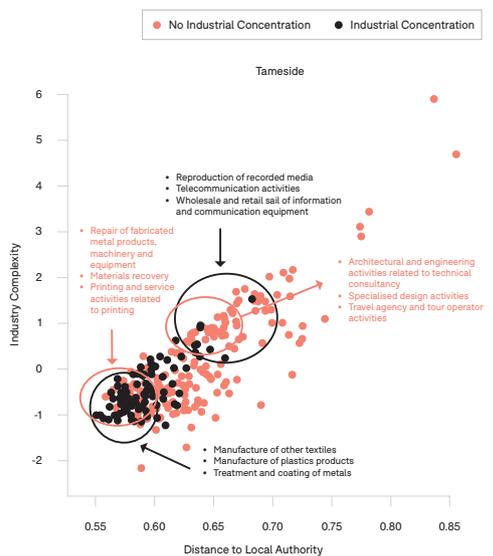
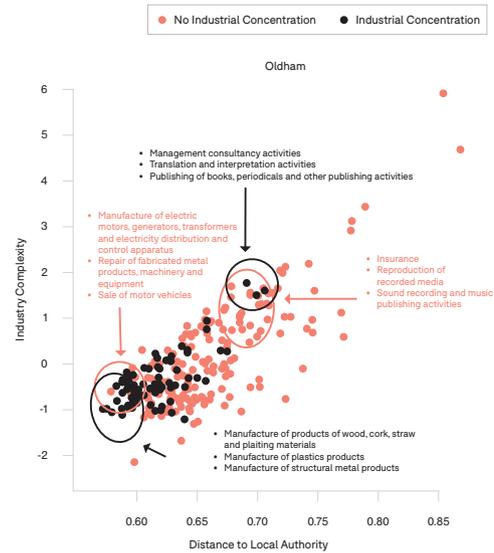
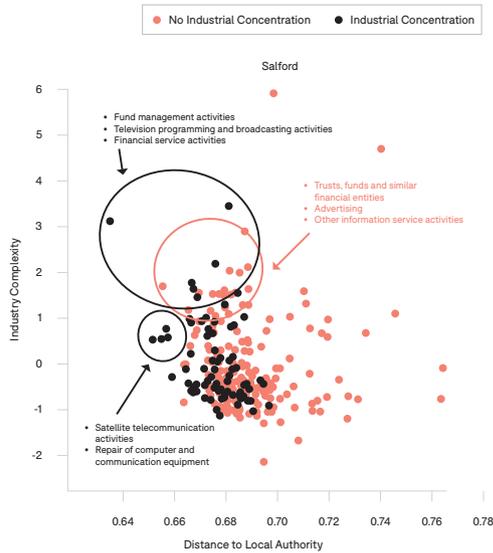


To explore possibly related opportunities for areas, the plot for Manchester (see Figure 3), shows ‘related’ opportunities for the city in market research and public opinion polling, trusts and fund management activities, and motion pictures, video and television, that complement the local authority areas’ existing strengths in advertising, management consulting and computer programming. Not only are these specialisms well aligned to Manchester’s current industrial strengths, they also have higher product complexity, which has the potential to be positive for earnings and growth performance. The plot for Stockport shows that, owing to its different set of existing capabilities, it has a number of ‘related’ opportunities including management consulting, software publishing and head-office activities with a high product complexity and also some with a low product complexity, such as pre-primary education, landscape services, and residential care activities.

In contrast, Wigan’s and Rochdale’s nearest future industrial opportunities have lower levels of product complexity, including in wholesale activities in Wigan and construction activities in Rochdale. They do, however, also have some competitive strengths in more complex and less typical activities for their particular industrial capabilities. In Wigan this includes business support service activities and in Rochdale wireless telecommunication activities. Bolton, Bury, Oldham and Tameside similarly have existing strengths and nearby growth opportunities which tend to relate to less complex manufacturing activities. However, each of these local authority districts also has a few key strengths in more complex, high-value areas such as management consultancy and telecommunications-related activities. Salford and Trafford have a more diverse portfolio of competitive strengths, with potentially greater ability to leverage existing capabilities in market research, computer programming and financial services into more complex, higher skilled activities relating to data processing, information services, advertising and financial management.

Figure 3: Identifying new industrial possibilities for the 10 GM districts





An understanding of the skills-related industries in an area can further aid the identification of potential opportunities. Data from Neffke et al, has been used within the 'Industry Related Analysis' report to develop a model predicting potential skills-relatedness between industries in Greater Manchester.<sup>18</sup>

This found potentially strong skills-related links between service sector industries in Greater Manchester. Regression analysis showed that advertising, accounting, computer programming, creative, employment services, financial services, legal, management consulting, motion picture and real estate appear most likely to be clustered together at the neighbourhood scale in the city region. TV broadcasting, which is particularly concentrated in the city region, appears to be relatively well embedded in the broader knowledge-intensive services economy, and may be contributing to the sector's higher than average productivity. Manufacturing, wholesale and retail sectors also often appear within

18. Neffke, et al (2016), Inter-industry labor flows. IAB-Discussion Paper 21/2016. IAB, Federal Employment Agency.

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the same community in the analysis, suggesting that there is a considerable sharing of skills and labour across these broad industrial categories.

Within and across these sectors there are significant opportunities for sharing, matching and learning. This level of networking between related sectors can support the identification of new opportunities and innovation, as well as ways to boost productivity and turnover.

## A MISSION-ORIENTED APPROACH

Innovation and economic growth have not only a rate but also a direction. Structuring innovation policy around solving bold societal challenges can lead to new cross-sectoral innovation with technological and economic spill-overs. Furthermore, orienting innovation towards developing solutions to global challenges means that – if successful – the potential market for these future industrial opportunities is global. The UCL Institute for Innovation and Public Purpose (UCL-IIPP) has been working closely with the Government on shaping its Industrial Strategy through a series of Grand Challenges and missions, and has also supported the Prosperity Review to consider how national and local missions can create opportunities for cross-sector interaction. Professor Mariana Mazzucato suggests that societal challenges “are useful to ensure focus” but by themselves are “too broad to be actionable”.<sup>19</sup> Identifying targeted missions within each challenge can bring a greater focus and level of granularity. Missions can stimulate cross-sectoral and cross-actor innovation, and also crowd-in private sector investment by setting clear growth opportunities. It also combines this bottom-up innovation with top-down direction through concrete targets and deadlines. At a national level, this demand-side ‘mission-oriented’ approach to industrial policy sets out an ambitious goal, and then uses this to create a long-term policy landscape, setting out tasks that mobilise various actors for experimentation across different sectors.

The transition to a carbon neutral economy is a global challenge and, while Greater Manchester has been taking action to improve its environmental impact, the city region recognises that more needs to be done. Greater Manchester has set a leading ambition to become a carbon neutral city region by 2038 in the 5 Year Environment Plan published in March 2019.<sup>20</sup> This is more than a decade earlier than the national target set and aims to improve quality of life, create new jobs and attract investment into new green industries.

There are many reasons to aim for a carbon neutral Greater Manchester, from ameliorating the local environment to supporting the mitigation of global climate change. There are also recognised wider benefits, particularly from improving local air quality, the subject of Greater Manchester’s Low Emissions Strategy and Air Quality Strategy and Action Plan. Emissions and air quality are associated with low productivity and decreased economic activity. The concurrent challenge of a growing population and of jobs growth across the conurbation, but especially in Greater Manchester’s regional centre,<sup>21</sup> could lead to residents and visitors

19. Kattel, R., Mazzucato, M. (2018). Mission-oriented innovation policy and dynamic capabilities in the public sector. UCL Institute for Innovation and Public Purpose, Working Paper Series (IIPP WP 2018-5). <http://www.ucl.ac.uk/bartlett/public-purpose/wp2018-05>

20. GMCA, 5 Year Environment Plan for Greater Manchester, 2019-2024, 2019, [https://www.greatermanchester-ca.gov.uk/media/1986/5-year-plan-branded\\_3.pdf](https://www.greatermanchester-ca.gov.uk/media/1986/5-year-plan-branded_3.pdf)

21. The regional centre is an area encompassing Manchester City Centre, inner Salford and Trafford Wharfside. The regional centre is now the location of one in five jobs in the city region and it accounted for a third of all jobs growth in Greater Manchester between 2010 and 2015

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being more highly exposed to poor air quality.<sup>22</sup> DEFRA's 2007 National Air Quality Strategy states that poor air quality costs society between £8.5 billion and £20.2 billion a year.<sup>23</sup> The city region already has a diverse and thriving group of around 2,500 companies involved in Low Carbon Environmental Goods and Services, which employ over 45,000 people and so present a strong basis on which to build the new types of jobs and industries at the forefront of clean and green growth.

Despite it being the right thing to do based on climate change evidence however, the challenges that a carbon neutral ambition represent should not be underestimated. The process could act as a constraint on economic growth as the economy's reliance on carbon is diminished, unless it is implemented carefully. The quality of the environment in Greater Manchester will also clearly depend on the actions of other city regions and countries. Furthermore there are serious technical and design challenges to tackle to realise carbon neutrality and these will require a collected and concerted global effort to address them.

This firm aspiration on a city level also lends itself to being framed through the mission-oriented innovation method. The box on page 25 outlines a potential mission-based roadmap to address this issue. It is important to note that the projects suggested are indicative and have not been fully evaluated for their appropriateness and impact.

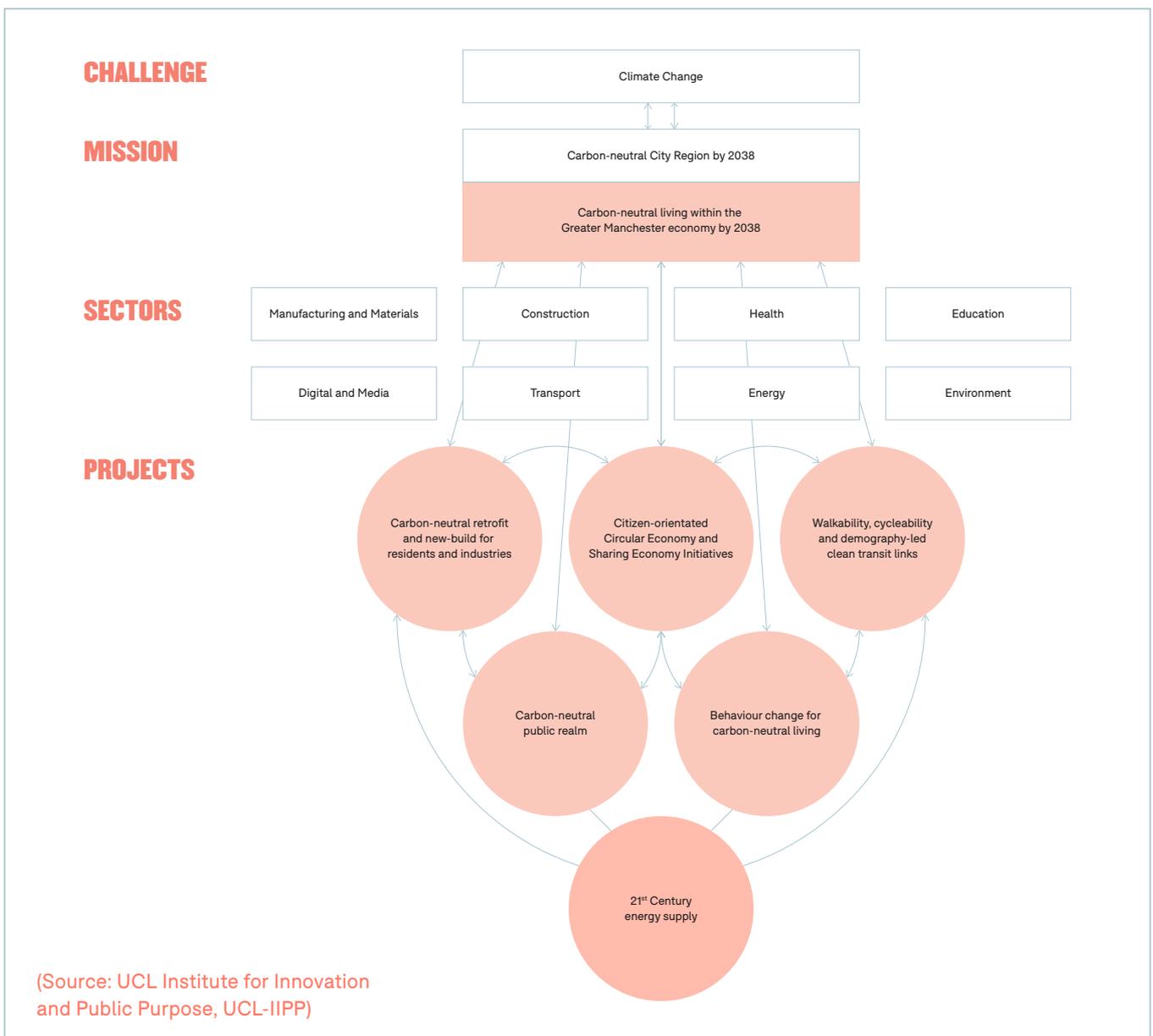
22. TfGM, GMCA, "Greater Manchester Low-Emission Strategy," 2016

23. *ibid*

## A MISSION-ORIENTED APPROACH TO CLEAN GROWTH IN GREATER MANCHESTER

UCL-IIPP have worked closely with the Greater Manchester Combined Authority to begin developing a mission-oriented approach exploring how this can be inspiring and measurable across the city region. Using IIPP's 'mission roadmap' format, key sectors have been identified which are best placed for cross-sector interaction and an understanding of areas of cross-sectoral interest and commonalities has started to develop.

## CARBON-NEUTRAL LIVING WITHIN THE GREATER MANCHESTER ECONOMY BY 2038



**05.  
CREATING  
THE CONDITIONS  
FOR GROWTH –  
UNDERSTANDING  
INNOVATION  
ACROSS GREATER  
MANCHESTER**

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## UNDERSTANDING INNOVATION IN GREATER MANCHESTER

Greater Manchester has a broad and relatively deep base of innovation but there are recognised areas for improvement in both cutting edge research and development (R&D) and in innovation adoption. The SIA and two technical reports – Understanding Innovation and Innovation Ecosystems and Ecosystem Approach to Supply Chains – have explored innovation and the ways in which this can be raised across the city region.

Salter and Martin identify six ways in which universities influence innovation and technological change. They increase the stock of knowledge; train skilled graduates; create new instrumentation and methodologies; facilitate the formation of problem-solving networks; increase the capacity for problem solving; and create new firms.<sup>24</sup> The role of universities is particularly important in knowledge commercialisation (e.g. licensing a patent, creating a spin-off or technology-transfer office, as well as other incubator structures). They also create a talent pipeline and foster innovation capacity by creating ‘public space’ functions for meeting and conference hosting, entrepreneurship centres and access to networks and personnel exchanges.<sup>25</sup> Greater Manchester benefits from four universities with main campuses in the city region (University of Manchester, Manchester Metropolitan University, University of Salford and University of Bolton) with over 96,000 students. The four universities together generated almost 20,000 first-degree graduates, and graduate retention rates, already strong, are rising.

Greater Manchester, as identified above, has an internationally recognised set of research and innovation assets. The major differentiator for growth which the SIA identified, compared to the other UK locations, is the location of outstanding research assets within Corridor Manchester<sup>26</sup> in close proximity with major assets in other sectors including in digital industries and in professional services. In combination these assets form a globally competitive innovation district covering technology space and support services and institutions from MediacityUK in Salford, through the Manchester Corridor and Airport City to Alderley Park and the Cheshire Science Corridor.<sup>27</sup>

Despite cutting-edge innovation assets and activity taking place within the city region, there are significant gaps in the innovation ecosystem. There are fewer high performing businesses than the national average in GM engaged in leading-edge R&D, collaboration and leadership i.e. - ‘new to market’ activities. The SIA also highlighted the importance of encouraging more businesses to take up innovation technologies and management practices once they have been developed – ‘new to firm’ activities.<sup>28</sup>

At the leading edge, official statistics reveal a gap between Greater Manchester and other areas across official measures for public and private sector investment in R&D (e.g. patent box, R&D tax credit take up, InnovateUK funding

24. Salter, Ammon J., and Ben R. Martin, “The Economic Benefits of Publicly Funded Basic Research: A Critical Review.” *Research Policy* 30, no. 3, March 1, 2001

25. Cosh, A. and Hughes, A., “Never Mind the Quality Feel the Width: University–industry Links and Government Financial Support for Innovation in Small High-Technology Businesses in the UK and the USA.” *The Journal of Technology Transfer* 35, 2010

26. Corridor Manchester employs over 63,000 people within this large scientific and digital community

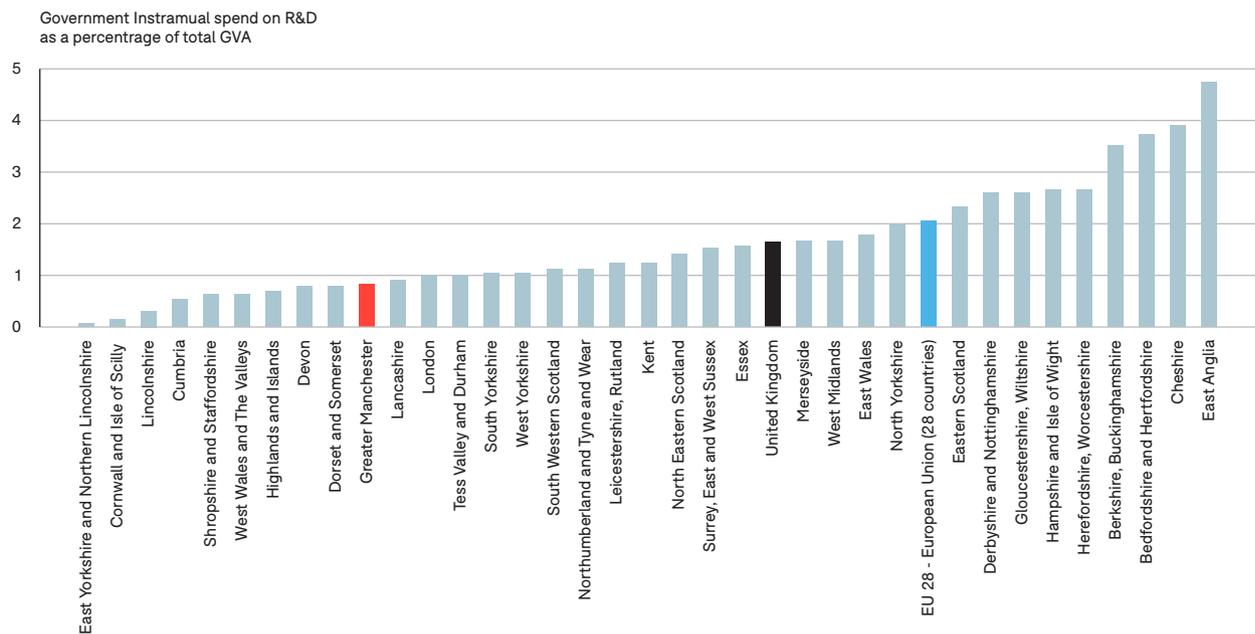
27. Greater Manchester and Cheshire East Science and Innovation Audit, 2016, [https://www.greatermanchester-ca.gov.uk/media/1136/science\\_audit\\_final.pdf](https://www.greatermanchester-ca.gov.uk/media/1136/science_audit_final.pdf)

28. Greater Manchester and Cheshire East Science and Innovation Audit, 2016, [https://www.greatermanchester-ca.gov.uk/media/1136/science\\_audit\\_final.pdf](https://www.greatermanchester-ca.gov.uk/media/1136/science_audit_final.pdf)

and university R&D spending). Spending is lower across all of these measures in Greater Manchester than might be expected for a city region of its size.

Greater Manchester’s R&D spend as a proportion of Gross Value Added (GVA) stands at just 0.96%.<sup>29</sup> In the context of the Government’s commitment to raise total research and development investment to 2.4% of Gross Domestic Product (GDP) by 2027 the city region is clearly lagging behind and is in the bottom ten equivalent areas in the UK.<sup>30</sup> While this can in part be explained by Greater Manchester’s service-led industrial profile, there is scope for improvement. Data on the uptake of R&D tax credits also shows that the region is fifth in the UK rankings in 2016 on R&D tax credit claims, with £130m compared with £725m in London.<sup>31</sup>

Figure 4: Intramural expenditure on R&D by all sectors, Greater Manchester and benchmarks (Source: GMCA analysis of ONS data on intramural R&D expenditure)



29. GERD - intramural R&D expenditure – (R&D undertaken ‘within the walls of firms’)

30. Eurostat, Regional R&D spending

31. GMCA, Deep Dives Phase 2 Report – Productivity in Greater Manchester, 2017, <https://www.greatermanchester-ca.gov.uk>

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Local intelligence on innovation from the Greater Manchester Business Survey indicates that the majority of firms surveyed were involved in at least one specific innovation activity over the last three years. Yet when this finding is explored in more detail, far fewer had engaged in some of the most highly innovative practices, such as engaging with universities to transfer knowledge (19%) or transforming their business models (27%). Obtaining a clear and universally accepted definition of what ‘is’ and ‘is not’ innovation is challenging, as the term is open to interpretation. The survey also revealed that almost one in five (18%) of firms had experienced barriers to innovation. Lack of finance (8%) is a prominent barrier, along with the cost of new product or service development (6%).<sup>32</sup>

Work for the Prosperity Review also suggests that some leading-edge innovation is ‘hidden’ and that this may be masking the true extent of innovation in Greater Manchester, particularly given its service-driven economy. Work by MIOIR for the Prosperity Review found that, particularly within official metrics, product innovation is routinely captured over process innovation. For services firms this is likely to be less appropriate as a measure, as the models and practices of innovation may be very different from those seen in traditional manufacturing sectors. As the service economy grows, traditional innovation indicators are likely to miss progressively more and more of the innovation activity going on in that economy. The public sector is another potential site of hidden innovation. Innovation in public services requires the generation of new ideas, rigorous experimentation, public and political tolerance for experimentation, as well as processes that diffuse learning and knowledge about successes and failures.

In terms of innovation adoption and diffusion, Greater Manchester – in line with national intelligence – is likely to experience a gap. The SIA highlighted the importance of supporting more firms to develop their absorptive capacity. This would enable them to take advantage of the opportunities created by the place assets highlighted above or new technologies and management practices as they arise. Examples of tried and tested technologies and practices include cloud computing, supply chain digitisation and business process outsourcing.

Issues around ‘diffusion of innovation’ are not unique to Greater Manchester. CBI released a paper ‘From Ostrich to Magpie’ in 2017<sup>33</sup> which highlighted nationally low levels of take-up of readily available technology and management best practices and saw this as a major factor in the UK’s productivity problem. The report identified ‘Ostrich firms’ who stuck to what they knew and ‘Magpie firms’ who had the skills and will try tested ideas and technologies. The BEIS Business Productivity Review also considered the role of leadership and management practices and technology adoption as mechanisms for driving up productivity, recognising the challenge of low productivity firms in all sectors.<sup>34</sup> This is discussed in more detail in the Productivity and Pay Research Summary accompanying this report.

Leadership and management practices and their importance for innovation, productivity and profitability, in particular, have been considered in detail, including in leading work by John Van Reenen and Nicholas Bloom. Their

32. GMCA, Greater Manchester Business Survey, 2017 [https://www.greatermanchester-ca.gov.uk/media/1703/2017\\_gm\\_business\\_survey\\_final\\_report.pdf](https://www.greatermanchester-ca.gov.uk/media/1703/2017_gm_business_survey_final_report.pdf)

33. CBI, From ostrich to magpie increasing the business take up of proven ideas and technologies, 2017 <https://www.cbi.org.uk/articles/from-ostrich-to-magpie-increasing-business-take-up-of-proven-ideas-and-technologies/>

34. BEIS Business Productivity Review, 2018 [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/712342/Business\\_Productivity\\_Review\\_call\\_for\\_evidence\\_.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/712342/Business_Productivity_Review_call_for_evidence_.pdf)

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analytics of management practices globally further confirmed that measures of better management practice are strongly associated with superior firm performance in terms of productivity<sup>35</sup>. Recent work by Buffington et al identified that firms that adopt more of the structured management practices related to monitoring, targeting, and incentives are more productive, more profitable, and grow faster than firms with lower levels of structured management practice adoption.<sup>36</sup>

Supply chains have also been identified as important mechanisms for creating spinoffs, innovations and ultimately prosperity and higher wages. Evidence from the Manchester Independent Economic Review a decade ago suggested that firms were not maximizing the potential of local supply chains. Volterra's 'Innovation, Trade and Connectivity' (ITC) report<sup>37</sup> suggested that innovation generally spreads more easily within a supply chain with trading links than amongst a group of competitors. The work found, particularly in Greater Manchester, that a large number of firms identified themselves as having no trading links with other firms in the city region. Whilst these firms were seen as an important conduit for innovations from elsewhere, it suggested that the spread of innovations within the city region may be hampered by this and further analysis was needed.

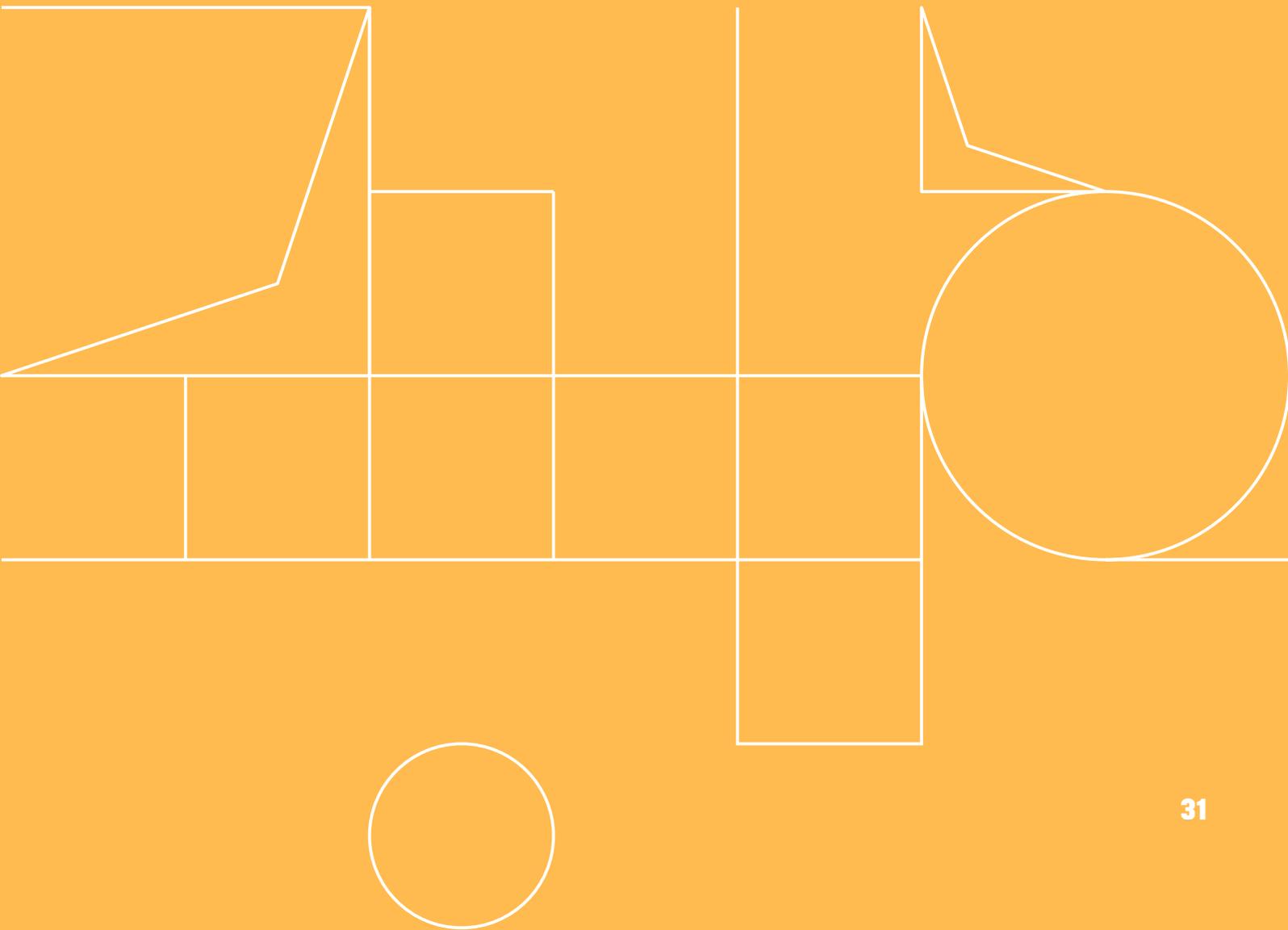
An Ecosystem Approach to Supply Chains for the Prosperity Review has taken this discussion forward particularly for the tech sector. Based on case study interviews with businesses in Greater Manchester's tech sector, this research finds that most businesses are strongly rooted in the city region – partly because of 'hard' factors such as access to skills, but also partly because of 'softer' factors such as the 'ethos' or image a Greater Manchester base conveys. It recognised that technology and globalization is changing the way in which they operate, but that at the core of their operations they still rely on business relationships. In practice, this meant that personal contact was important. Yet, despite the importance of local networks, the research found that most of the businesses interviewed do not supply or sell to other businesses in the area.

35. Bloom and Van Reenen, Measuring and Explaining Management Practices across firms and countries, *The Quarterly Journal of Economics*, Vol. CXXII November 2007 Issue 4

36. Buffington et al, *The management and organisation practices survey (MOPS): an Overview*, 2017

37. Volterra, *Innovation, Trade and Connectivity*, for Manchester Independent Economic Review, 2009, <https://volterra.co.uk/wp-content/uploads/2013/02/Innovation-Trade-and-Connectivity-MIER.pdf>

# 06. RECOMMENDATIONS



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## SOURCE OF GLOBAL COMPETITIVENESS AND INDUSTRY STRENGTH

Picking ‘winners’ is a notoriously difficult exercise, given the level of future gazing required and, often, the paucity of data available, particularly for niche and new sectors. Picking the wrong ‘winners’ and investing heavily in these areas also comes at great expense for, often, little reward. Notwithstanding these challenges, the identification of demonstrable niche strengths is an important activity for any city or locality. It raises the visibility of these opportunities and can support the case for designing specific measures that can realise their economic potential.

In Greater Manchester, two globally competitive industrial opportunities emerge: Advanced Materials and Health Innovation. Both are sectors where national and international funding can be attracted and local investment can have significant impacts. They should be a focus for the local industrial strategy.

**Health Innovation:** health and social care devolution to Greater Manchester, together with the largest concentration of health research excellence outside the south east, and a large and stable population exhibiting significant health challenges, has created an unprecedented opportunity for a concerted push toward innovation for health and economic benefit.

**Advanced Materials:** the city region is home to world-leading science including the National Graphene Institute (NGI) and is increasingly recognized as a global hub for transitioning breakthrough graphene and 2D materials science into new and disruptive products and applications. There are strong opportunities to capitalise on investments that have been made in facilities like the NGI, to learn from the lessons to date to commercialise graphene, and to grow the business base in this sector at pace.

These world-class strengths are complemented by opportunities in other high productivity sectors: **Manufacturing, Creative and Digital** and **Business, Finance and Professional Services**, which, if not nationally unique, present significant opportunities for the city region. They should also form an important part of Greater Manchester’s offer in the local industrial strategy.

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## IDENTIFICATION OF FUTURE INDUSTRIAL POSSIBILITIES

The range of options for future industrial specialization – those that are not yet fully formed – are varied and strong in Greater Manchester. This is due to the high levels of complexity which the city region's economy exhibits. These possibilities have been explored in novel ways, including through the Economic Complexity Analysis undertaken by University of Cambridge which has looked at related possibilities for each of the ten districts to diversify into, based on their sector make-up and skills base. By no means definitive, it offers a clear sense of potential and an understanding of how the existing mix might transform in the future. The analysis should be used to inform how the Greater Manchester Local Industrial Strategy can enable growth and new jobs across all parts of the city region.

The work of UCL's Institute for Innovation and Public Purpose also highlighted the value and role that a mission-based approach can bring to driving new innovation and opportunities. It demonstrated the importance of political buy-in and will to accelerate opportunities and ambitions into economic outcomes. UCL's report focused on Clean Growth and outlines how the conditions can be created to develop the Clean Growth sector and engage actors from a diverse range of backgrounds, corralled around a clear mission of achieving carbon neutrality by 2038. It will be imperative that the city region's clean growth and wider environmental ambitions, when delivered, prioritise actions that directly benefit local residents, such as by improving air quality, urban planting, and housing.

Continued monitoring and tracking of future economic possibilities using increasingly sophisticated data-driven approaches can aid in their identification. A data science approach has been taken through this Prosperity Review to explore leading indicators of innovation and future global competitiveness. Whilst these methods remain in their infancy for this type of work, they should be revisited. They are increasingly important for understanding the modern economy, as it shifts ever further away from traditional economic structure codified in Standard Industrial Classification (SIC) codes.

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## STRENGTHENING THE INNOVATION ECOSYSTEM

The Prosperity Review also seeks to respond to the important question of how the city-region can boost its levels of innovation and strengthen, support and maintain its future sources of global competitiveness.

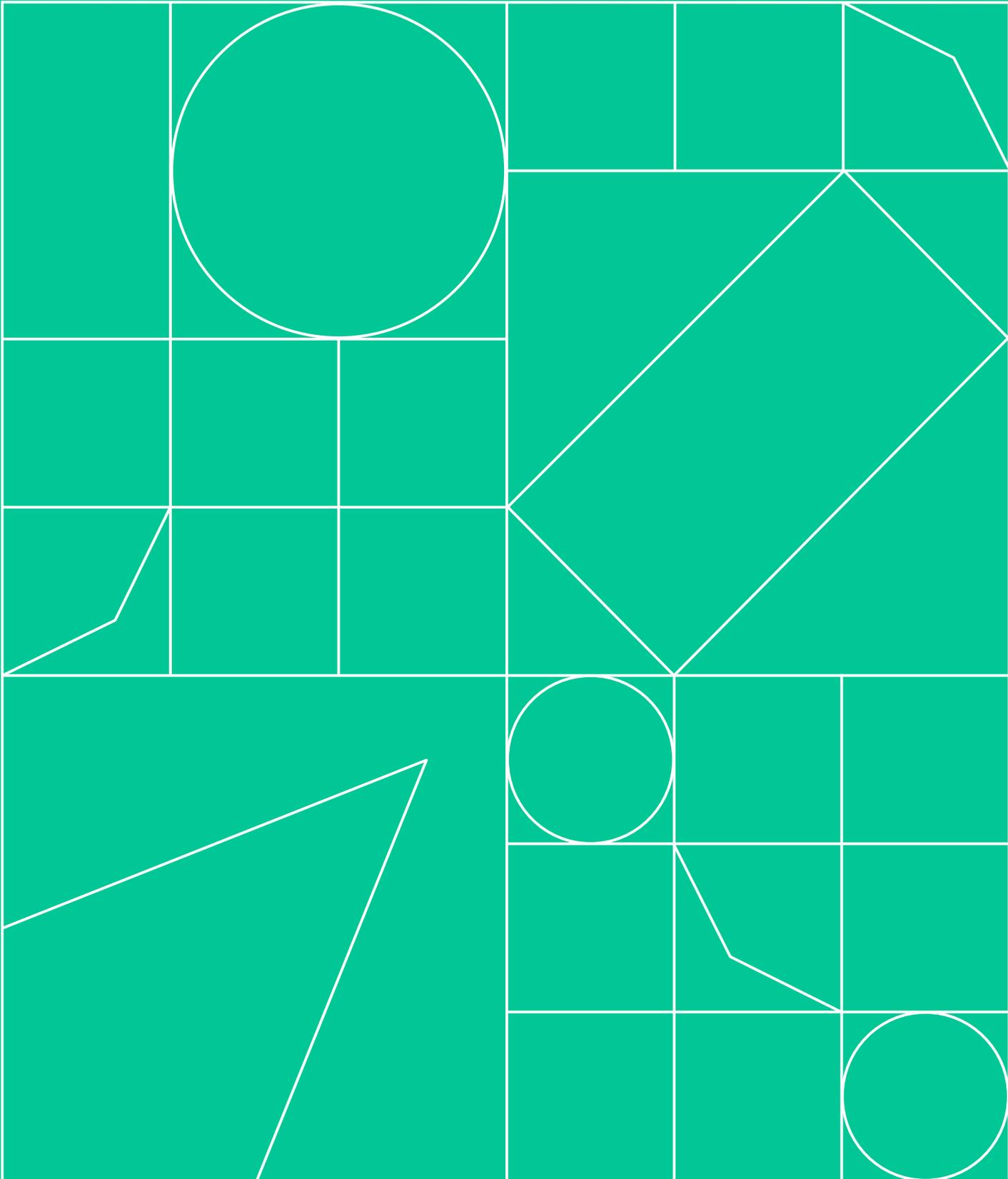
The wider work undertaken as part of the Prosperity Review has articulated that, to make a step change in addressing the productivity challenge and in raising prosperity for all, a sole focus on the most innovative and frontier sectors will not be enough. There needs to be a focus on improving the foundations of productivity and raising innovation more broadly across all sectors, including those in the 'routine' or 'foundational' economy such as retail, hospitality and tourism, and social care.

Despite the cutting-edge innovation taking place in the city-region, it is clear that gaps in the innovation ecosystem have been identified at all scales. There are not enough high performing businesses in the city-region, engaged in leading-edge 'new to market' activities, nor are there enough businesses taking up innovation practices – 'new to firm' activities. Some of this activity may be hidden according to MIOIR, yet evidently more can be done to address these issues.

A combination of: tailored business support focused on raising productivity; greater emphasis on the value and role of leadership and management; and creating greater opportunities for engagement with HEIs will be critical. These can build on the existing offer in Greater Manchester which includes the Business Growth Hub, alongside tailored programmes such as Made Smarter (a pilot currently being run across the north west which is supporting manufacturing firms to adopt new digital techniques to support the digitalization of the sector). Activities outside firms and within places is also crucially important. This includes supporting networks within and between sectors which bring together like-minded individuals and boosting access and availability to venture capital. Greater Manchester must also continue to build on its existing social and cultural offer – recognising the vital role that these 'softer' factors play in attracting and retaining talent and encouraging businesses to locate.

The evidence drawn together as part of the Prosperity Review demonstrates that these 'horizontal' activities are as, if not more, significant for the local industrial strategy, as they create an environment for all sectors and businesses to flourish. The experience of the last two decades suggests that public service providers in Greater Manchester have been more effective in supporting positive economic changes when they have focused on the development of assets that are of general benefit – to residents as well as businesses and organisations. This places even greater emphasis on the need to focus not only on demonstrable niche strengths, but also on activities which will benefit all businesses and sectors. It is these activities that are likely to reap more widescale productivity gains in the longer term.

Finally, to address the gaps in the innovation ecosystem, we need better ways of understanding and measuring innovation. The paucity of data on innovation has been highlighted in this work. New techniques such as data science and novel frameworks like the Economic Complexity Framework for understanding industrial opportunities are vital to improve our understanding particularly of innovation and global competitiveness. It will be important to continue testing new approaches to support local, regional and national analysis.



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