GREATER MANCHESTER INDEPENDENT PROSPERITY REVIEW

# GLOBAL COMPETITIVENESS AND INNOVATION

A technical report for the research on
**Innovation & Global Competitiveness**

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GMCA Research Team produces high quality research and intelligence to form the evidence base underpinning policy and strategy for the city region.

Hatch Regeneris provides social and economic research, analysis and advice to the private, public and non-profit sectors. Hatch Regeneris deliver evidence-based economic analysis and social insights to help clients make better decisions. The wider Hatch company is an international multi-disciplinary business which provides integrated design, engineering and support services from project concept to completion.

The Data City is a Data as a Service (DaaS) company. It has built its DataCity platform using open data, the web and The DataCity Artificial Intelligence to analyse and classify activity, organisations and research across seventeen industrial classifications that are outside standard industrial classifications.

This data asset has been applied to Greater Manchester providing data events, academic research and organisations which are presented on the GM Tech Profile Website

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

GMCA GREATER MANCHESTER COMBINED AUTHORITY

THE DATA CITY

HATCH REGENERIS

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.

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)

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 (GM), 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.

A call for evidence and international comparative analysis, developed in collaboration with the Organisation for European Cooperation and Development (OECD) and European Commission, also supported this work.

All of the Greater Manchester Independent Prosperity Review outputs are available to download at **www.gmprosperityreview.co.uk**.

This technical report is one of a suite of Greater Manchester Independent Prosperity Review Background Reports.

# 1. Introduction and Scope

## 1.1 Understanding global competitiveness and innovation in GM

Central to a local industrial strategy is an understanding of what places are good at, and what they might be able to be good at in the future. Identifying current and future specialisms is, however, extremely challenging to get right. This is particularly the case if potential specialisms are within niche areas and when invariably they involve a combination of sectors and/or new technologies which may not yet have been fully envisioned.

This work takes a data-driven approach to identifying current and future specialisms. It recognises that there are a number of conventional ways of assessing area competitiveness, based on data on firms, alongside innovation and trade metrics and a growing array of non-conventional approaches using data science techniques such as web-scraping to explore niche opportunities and potential future opportunities.

The methods included in this report to identify specialisms are:

- **A detailed audit –** undertaken jointly with Cheshire East[1] and led by a Task and Finish Group with University of Manchester (as scientific lead), and Greater Manchester Combined Authority (GMCA)/Greater Manchester Local Enterprise Partnership (GMLEP) (as innovation lead).[2]

- **Official metrics on industry specialisms** – metrics include: size and scale (employment and economic output); growth rates; productivity; where available wider indicators including business investment (R&D & Capital); trade and exports; and inward investment to identify specialisms and benchmark against peers nationally and internationally.

- **An experimental approach to understanding strengths** – experimental data analysis by The Data City, a Smart Cities and Economics Data as a Service (DaaS) company to explore the business base using Companies House data supplemented with web-scraping and classification by machine learning against the sectors of interest to Greater Manchester and in particular the emerging technology sector. Leading indicators of innovation, academic papers and events have also been explored and benchmarked internationally and nationally.

This work complements wider work commissioned by the Greater Manchester Independent Prosperity Review (the Prosperity Review) including work by the University of Cambridge, which applies an Economic Complexity Framework to the city region and individual districts to assist in identifying potential futures for areas based upon their industry mix, skills profile and wider opportunities.

[1] Greater Manchester and Cheshire East Science and Innovation Audit (2016) https://www.greatermanchester-ca.gov.uk/media/1136/science_audit_final.pdf
[2] European Commission, Smart Specialisation Platform, http://s3platform.jrc.ec.europa.eu/

# 2. Greater Manchester Science and Innovation Audit: Research Strengths in Greater Manchester

## 2.1 Core research strengths and fast growth opportunities

The Greater Manchester and Cheshire East Science and Innovation Audit (SIA) undertaken in 2016 provides evidence on Greater Manchester's research specialisms and areas of world-class excellence. It serves as a solid base from which to explore evidence from official statistics and less conventional approach on Greater Manchester's specialisms.

The SIA was led by a Task and Finish Group which included University of Manchester (as scientific lead), and GMCA/GMLEP (as innovation lead) and it was overseen by a Core Membership consortium of key local partners. Enabling collaborators were drawn from universities and organisations, both in the UK and overseas, with which GM and Cheshire East have strong collaborations.

The SIA identified strengths which emerged from the analysis conducted for the 2014 EU Smart Specialisation Platform[3] and reflect a combination of genuine local scientific strengths, current innovation opportunities, and the medium-term potential to deliver overall improvements in local productivity through ongoing investment. They also match the priority strengths identified as part of the Northern Powerhouse Independent Economic Review[4] and the 'leading innovation capabilities' for the North West as identified by the North West Business Leadership Team.[5]

The SIA identified two areas of research focus for the city region: **'**core strengths' in **Health Innovation** and **Advanced Materials**, where GM has existing, internationally recognised excellence, which include:

- **Health Innovation –** Greater Manchester and its surrounding area has the largest concentration of excellence in health research nationally, outside South East England. Key facilities in support of cutting-edge research and innovation are set in the context of a large and stable population exhibiting significant health challenges. 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 will help refocus priorities around a system and place. Synergies were also identified with the digital sector (for example health informatics) which has the potential to enable Greater Manchester also to drive towards becoming a globally leading centre for clinical trials.

- **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

[3] European Commission (2016) Smart Specialisation Platform http://s3platform.jrc.ec.europa.eu/
[4] Northern Powerhouse Independent Economic Review (2016) https://www.transportforthenorth.com/wp-content/uploads/Northern-Powerhouse-Independent-Economic-Review-Executive-Summary.pdf
[5] NWBLT, "Discovery to Delivery – NW England a premier location for science and technology innovation": (i) Advanced Materials and Molecular Manipulation; (ii) Energy Research including Nuclear Energy and Nuclear Engineering; (iii) Cancer Research and Health Innovation; (iv) HPC, Big Data and Digital Manufacturing. 29 "Core strengths" are based on existing internationally recognised excellence; "Fast-growth opportunities" are based on current trajectory and potential.

creation of new start-up companies. It identified the need to systematise the pathway through higher 'technology readiness levels' (TRLs) with the opening of the Graphene Engineering Innovation Centre (GEIC) and hence to turn discoveries to applications. Particularly important is the need for accompanying training programmes, which will give Greater Manchester a large concentration of graphene scientists with additional entrepreneurship training. The Sir Henry Royce Institute will create a national focus to overcome traditionally long lead times and act as a 'rapid accelerator' through TRLs to application, notably in the manufacturing sector. Other assets covered in the SIA include the BP International Centre for Advanced Materials, and the Cockcroft Institute.

The SIA also presented three 'Fast-growth opportunities' focused on the future potential of **digital**, **energy**, and **industrial biotechnology**, where GM's research assets and capabilities offer real scope for future development:

- **Digital –** this is a key enabling technology for the other sectors, and there are specific opportunities in Big Data, in GM's extended programme of demonstrator and test-bed projects in the domain of Smart Cities/Internet of Things (IoT), and via the dynamic creative, digital and media economy in the region.
- **Energy –** opportunities arise from GM's leading position in nuclear research, and in low carbon energy generation, transmission and storage.
- **Industrial biotechnology –** the concentration of this sector in the North of England provide opportunities to drive technological advances in molecular biology and biotechnology to support drug discovery and development, as well as sustainable and clean production of chemicals for use in manufacturing.

# 3. Official metrics to understand Greater Manchester's Industry Strengths

## 3.1 Introduction

This section uses official metrics to identify industry specialisms and benchmark the findings with national and international peers across a number of indicators: size and scale (employment and economic output); growth rates; productivity; and, where available, wider indicators: business investment (R&D & Capital); trade and exports; and inward investment.

## 3.2 Top line findings: industry specialisms

Greater Manchester is the most diverse city region in the UK, according to the Krugman Specialisation Index (KSI)[6]. The two city regions which stand out as being the most diverse, GM and Leeds, also have average growth rates that are higher than many of the other comparator city regions.

Within this diversity, however, there exist a number of distinct industry specialisms. The analysis reinforces the findings of the SIA, that health innovation and advanced textiles (proxy for advanced materials) are a key strength and opportunity area for the city region.

Health innovation includes scientific research and development, in particular natural sciences, molecular diagnostics, and biotechnology/bioinformatics sciences, where Gross Value Added (GVA) per worker is almost three times the national average. Advanced textiles (including spinning, weaving, finishing and specialist products) is also highly concentrated in Greater Manchester.

Other high productivity sectors which, if not nationally unique, have been identified as strengths which Greater Manchester should build on are:

- **Manufacturing** – the manufacture of paper, paperboard and related products delivers over three times the national average level of productivity
- **Digital and creative industries** – there are strengths in broadcasting, with almost three times the national average productivity, but also in software, digital telecoms, and e-commerce; and Greater Manchester is an emerging hotspot for public agencies and companies specialising in cyber security.
- **Professional services** – in particular, shared services, human resources, office services such as translation, and the activities of membership and representative organisations; around twice the national average level of productivity is presented in these sub-sectors.

In addition, the data also highlights high absolute productivity in a number of key sub-sectors, which perform relatively well against sectoral benchmarks for productivity (i.e. close to or exceeding the UK average), and have a link to those listed above, including: advertising and market research (GVA, £500m, 8,000 employees); computer

[6] GMCA: Sector Deep Dives and Productivity in Greater Manchester, 2016 and 2017

programming/software (GVA, £1.5m, 26,000 employees); and digital & telecommunications (GVA, £1.25m, 13,000 employees).

Figure 1: Comparative analysis of specialisms based on official data, and assets

| Broad industry sector | Product -ivity | Scale | Trade | Areas of 'specialism' |
|---|---|---|---|---|
| Construction | - | + | - | Built environment, site preparation, civil engineering and building project management |
| Advanced manufacturing/engineering | + | - | + | Electrical components and systems, semi-conductor/diodes, machinery, automotive components/bodies |
| Food and drink manufacturing | - | + | - | Manufacture of bread; manufacture of fresh pastry goods, Cereals (In particular foreign parent company) |
| Materials, textiles & clothing manufacturing | ++ | - | + | Automotive textiles, protectives, medical textiles, clothing, advanced materials (light weighting/carbon fibre) |
| Other manufacturing (not elsewhere classified) | + | - | + | Paper and printed products. Technical ceramic products & coatings, Bulk chemicals (coatings, adhesives, paints) |
| Health Innovation, Scientific R&D | ++ | + | + | Scientific Research & Development (in particular within natural sciences, molecular diagnostics, biotechnology |
| Environmental goods and services | + | - | - | Waste management services (LCEGS, see later) |
| Logistics (transport and storage) | -- | ++ | - | Air transport (passenger and freight), and Operation of warehousing and storage for land transport activities |
| Retail and wholesale | + | + | - | E-Commerce |
| Business Financial, and Professional Services | -- | ++ | - | Translation services, shared services functions, advertising and market research, management consultancy |
| Digital and Creative industries | ++ | + | - | Broadcasting, computer programming/software development and design. Digital telecommunications. |
| Hospitality, tourism, sport | - | + | + | Sport (Football clubs) |
| Public administration. Healthcare. Education | -- | ++ | - | Higher education |

### 3.3 Detailed findings

*Output and Employment Benchmarking*

Greater Manchester has significant output (GVA) and employment concentrations, expressed as location quotients (LQ), in Professional, Scientific, Technical Activities, Administration, Support Service Activities (GVA: LQ of 1.47); Public Administration, Compulsory Social Security, Education, Human Health (GVA: LQ of 1.16). It is also strong in Distributive Trade, Repairs, Transport, Accommodation, Food Services Activities (GVA: LQ of 1.09) (see Figure 2).

There are also clear strengths in manufacturing and identifiable manufacturing sub-sectors with high LQs in terms of GVA and employment include (see Figure 3):

- Bulk Chemicals, Pharmaceuticals (GVA £1,700m, 9,000 employees).[7]
- Paper Manufacturing and Products (GVA £550m, 15,000 employees).
- Textiles/Clothing/Materials (GVA £500m, 9,000 employees).

The UK has significant employment concentration in Professional, Scientific, Technical Activities, Administration, Support Service Activities (GVA: LQ of 1.37); Information & Communication (GVA: LQ of 1.20); Financial & Insurance Activities (GVA: LQ of 1.16); and Construction (GVA: LQ of 1.12)

[7] Definition will include part of Health Innovation

At an OECD-wide scale, Information and Communication stand out as important growth sectors across OECD countries (Compound Annual Growth Rate (CAGR) of 3.1% between 2005-2015); Professional, Scientific, Technical Activities, Administration, Support Service Activities (CAGR of 1.9%); and Real Estate Activities (CAGR of 1.5%).

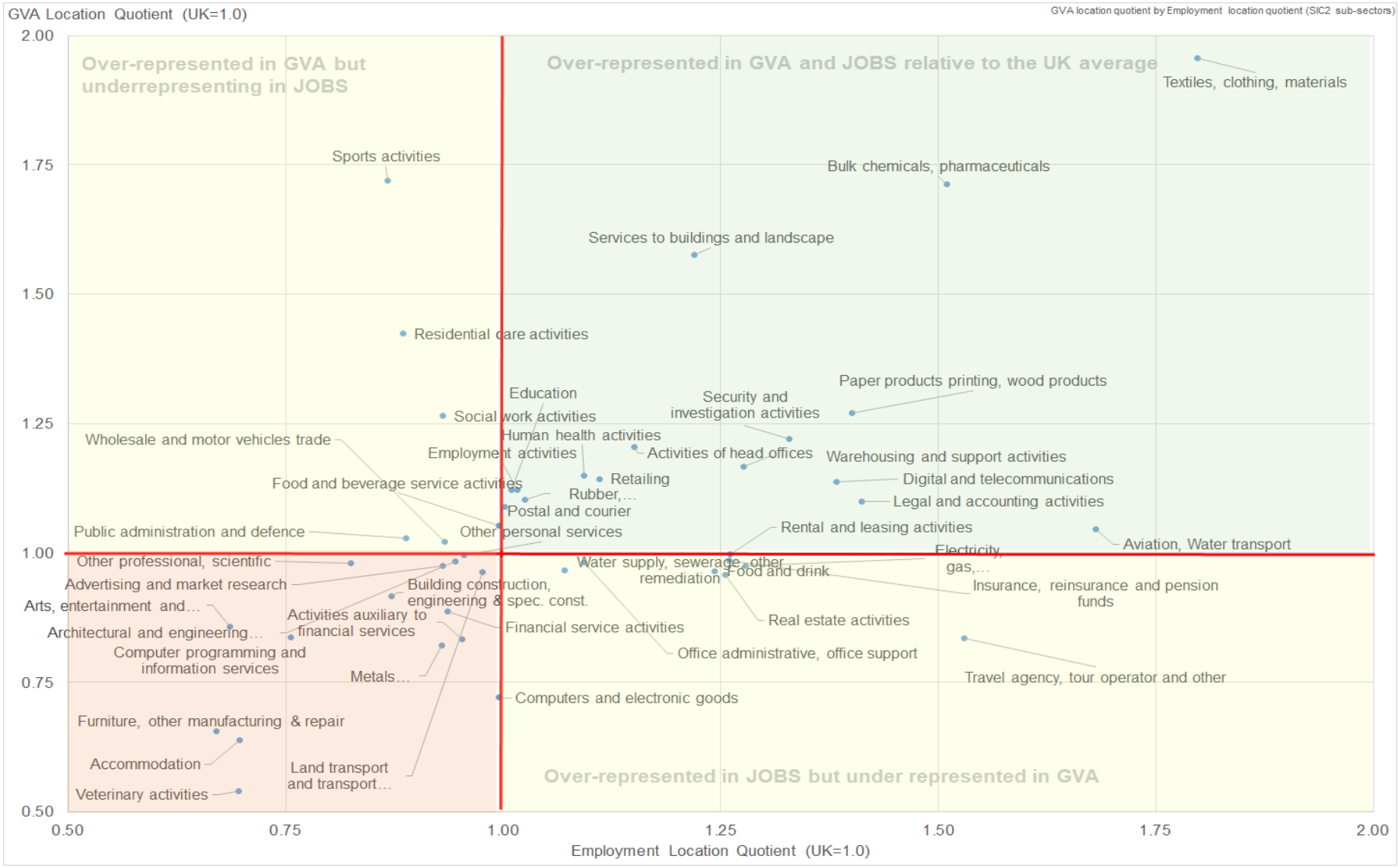
Manufacturing, as a whole, is just as important to the UK economy as it is to the OECD economy. GVA: LQ is 0.84 (compared to around 1.0 a decade ago). However, the comparator city region data highlights that only Birmingham and Liverpool have a higher concentration of GVA linked directly to manufacturing, compared to all other city regions.

- In terms of the main city region benchmarks, there is a varied pattern in the concentration of GVA compared to the UK average; the main concentrations by area are as follows:
  - Bristol: Financial & Insurance Activities (GVA: LQ of 1.27) and Professional, Scientific, Technical Activities, Administration, Support Service Activities (LQ of 1.71).
  - Nottingham: Utilities and Other Industry (GVA: LQ of 1.17) and Distributive Trade, Repairs, Transport, Accommodation, Food Services Activities (LQ of 1.19).
  - Leeds: Financial & Insurance Services (GVA: LQ of 1.33).
  - Liverpool: Transport, Accommodation and Food Services (GVA: LQ of 1.11).
  - Sheffield: Public Administration (GVA: LQ of 1.57), and Construction (GVA: LQ of 1.32).
  - London: stands out in a number of sectors, in particular those experiencing higher growth rates across the OECD, including Information & Communication (GVA: LQ of 2.03); Financial & Insurance Activities (GVA: LQ of 2.41); Real Estate Activities (LQ of 1.24); and Professional, Scientific, Technical Activities, Administration, Support Service Activities (GVA: LQ of 2.00).

Figure 2: Recent OECD output growth (CAGR GVA 2005 to 2015) and UK, GM and a selection of comparator Location Quotients for GVA by sector 2015 (ONS and OECD)

| Sector | OECD CAGR (2005-15) | UK | GM | London | Birmingham | Leeds | Bristol | Liverpool | Nottingham | Sheffield |
|---|---|---|---|---|---|---|---|---|---|---|
| Manufacturing | 1.1% | 0.84 | 0.61 | 0.13 | 0.89 | 0.78 | 0.59 | 0.81 | 0.56 | 0.75 |
| Construction | -0.6% | 1.12 | **1.04** | 0.90 | 1.04 | 1.01 | 1.11 | 0.93 | 1.02 | 1.32 |
| Transport, Accommodation, and Food Services Activities | 0.8% | 1.05 | **1.09** | 0.91 | 1.05 | 1.05 | 0.96 | 1.11 | 1.19 | 1.09 |
| Digital, Information & Communication | 3.1% | 1.20 | **1.02** | 2.03 | 0.80 | 0.79 | 1.10 | 1.03 | 1.16 | 0.74 |
| Financial & Insurance Activities | 1.3% | 1.16 | **1.07** | 2.41 | 1.11 | 1.33 | 1.27 | 0.79 | 0.46 | 0.75 |
| Real Estate Activities | 1.5% | 1.06 | **1.02** | 1.24 | 0.87 | 0.93 | 0.92 | 0.99 | 0.87 | 0.86 |
| Professional, Scientific, Technical Activities, Support Activities | 1.9% | 1.37 | **1.47** | 2.00 | 1.18 | 1.26 | 1.71 | 1.12 | 1.34 | 1.00 |
| Public Administration, Social Security, Education, Health | 1.0% | 1.02 | **1.16** | 0.76 | 1.18 | 1.20 | 1.17 | 1.35 | 1.41 | 1.57 |
| Other Services | 0.5% | 0.83 | 0.91 | 0.92 | 0.86 | 0.71 | 0.58 | 0.87 | 0.70 | 0.62 |

Figure 3: Location quotients for GVA and Employment, GM relative to the UK average (UK=1.0) (Source: GMFM-2018)

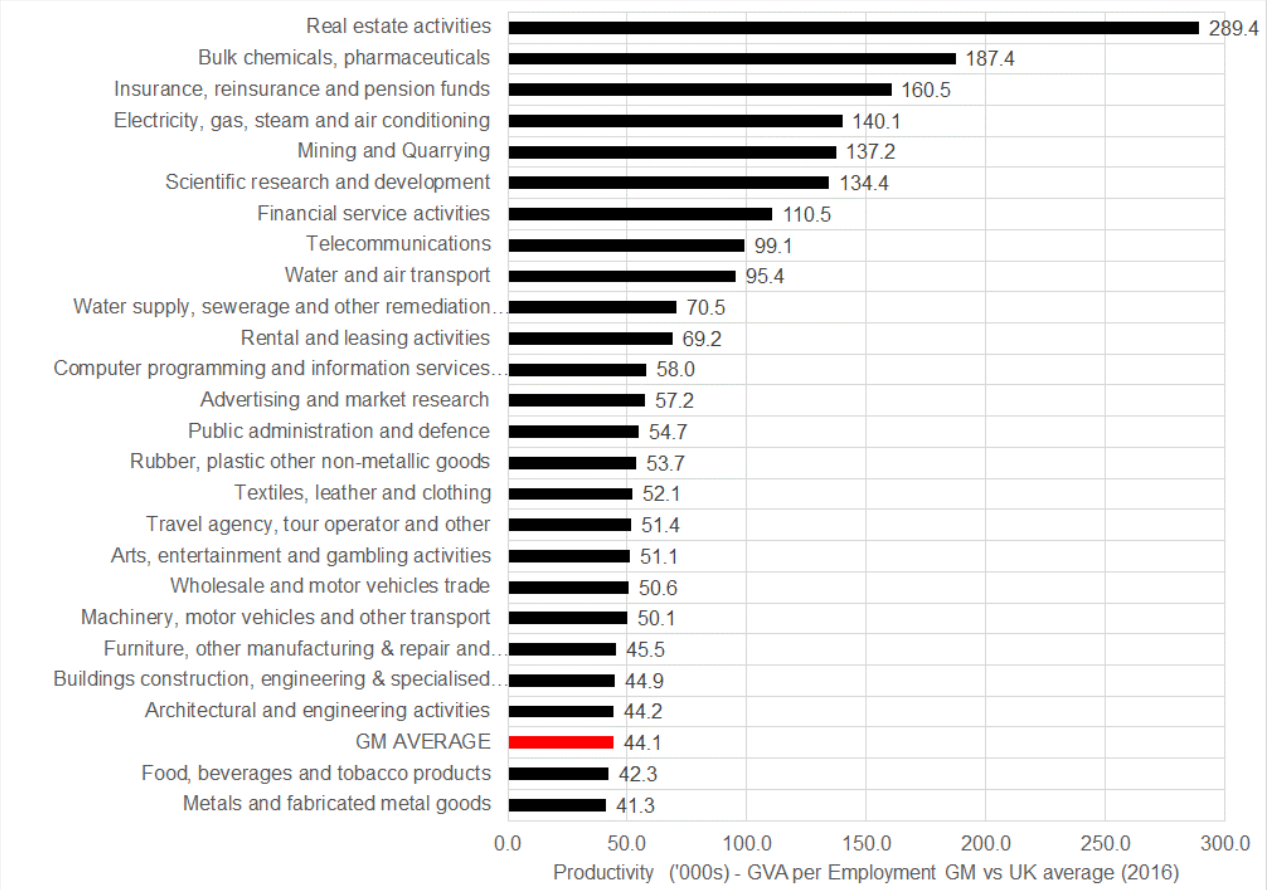


*Productivity*

Productivity analysis, particularly at a sub-sectoral level, can further aid in assessing where GM's competitive advantage lies by identifying the most productive sectors[8].

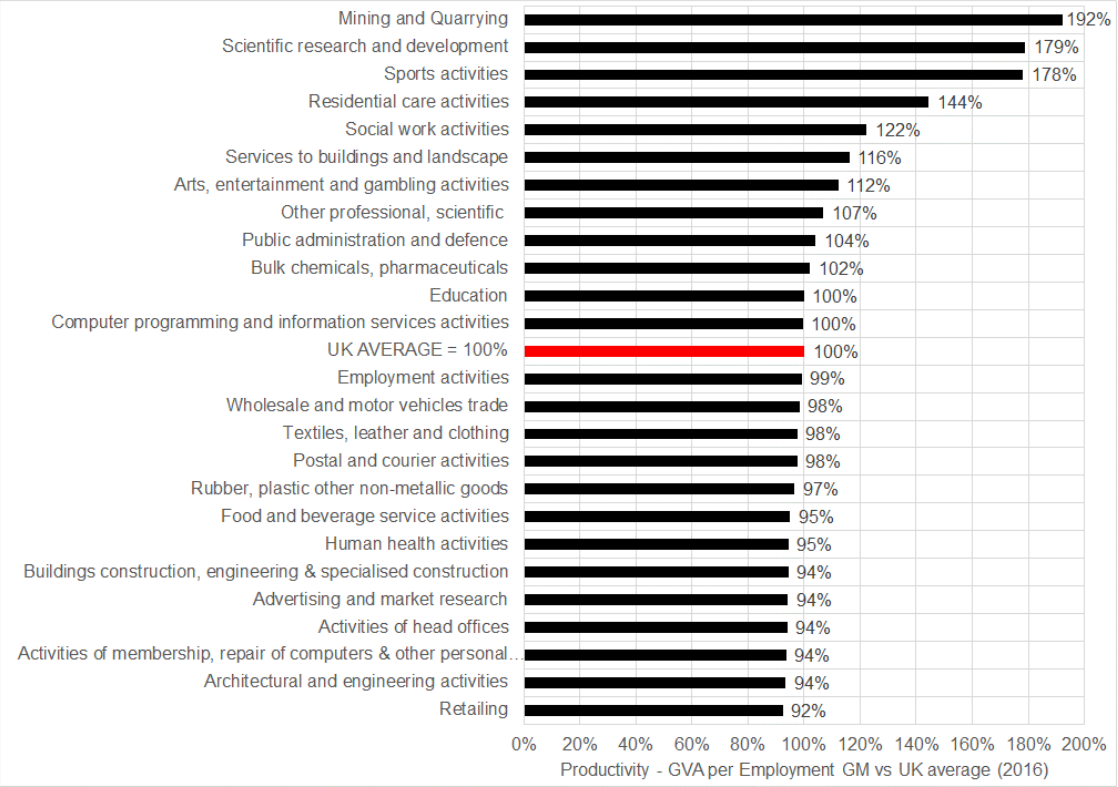
This analysis shows the importance of Scientific Research & Development (in particular within natural sciences, including molecular diagnostics, biotechnology/bioinformatics, nano-technology, and tissue-engineering), Manufacturing of Chemicals and Pharmaceuticals (which includes Health Innovation) – both in relative and absolute terms. It also highlights the importance of Sport within GM (in relative terms), as well as other potential specialisms within Digital Industries (Computer Programming), and parts of Construction, and Professional Services.

Figure 4: Rank of absolute productivity by GM sub-sector (top 25 from 50)
(Source: Greater Manchester Forecasting Model)




[8] Productivity analysis includes data from the Greater Manchester Forecasting Model (GMFM-2018) down to 2 digit standard industrial classification, which is then augmented by firm-level data from ONS down to 3 digit sic code.

Figure 5: Rank of relative productivity, GM vs UK average by sub-sector (top 25 from 50) (Source: Greater Manchester Forecasting Model)




Analysis at a more granular level using firm level data reveals the following subsector specialisms:

*Manufacturing specialisms*

- Manufacturing of Paper and Printed Products, paper and paperboard for further processing, packaging, sanitary/medical paper goods, filtration materials.
- Manufacturing Advanced Textiles, including flooring, automotive textiles, materials finishing – including flame-proofing, protectives, filtration, and medical non-wovens.
- Manufacture of Technical Ceramic products, thermal insulators, seals, coatings.
- Manufacturing of Electronic Components, and Wiring, semiconductors, diodes, processors/circuits, and other related components for electronic applications.
- Manufacturing of detergents, hygiene and cleaning related products.

*Other specialisms, where there over 1000 employees*

- Broadcasting, radio and television broadcasting organisations, and media.
- Construction, in particular engineering and site preparation, and demolition services.
- Waste Management, treatment and processing of hazardous/non-hazardous waste.
- E-Commerce, including direct home shopping, fashion/clothing, homewares.
- Translation and interpretation services.
- Air transport, passenger and freight[9].

[9] Analysis of 2 digit SIC productivity, GVA and employment data from the Greater Manchester Forecasting Model-2018

Figure 6: Productivity in GM by sub-sector, absolute vs relative to UK, where UK for each industry = 100% (Source: GMFM-2018)

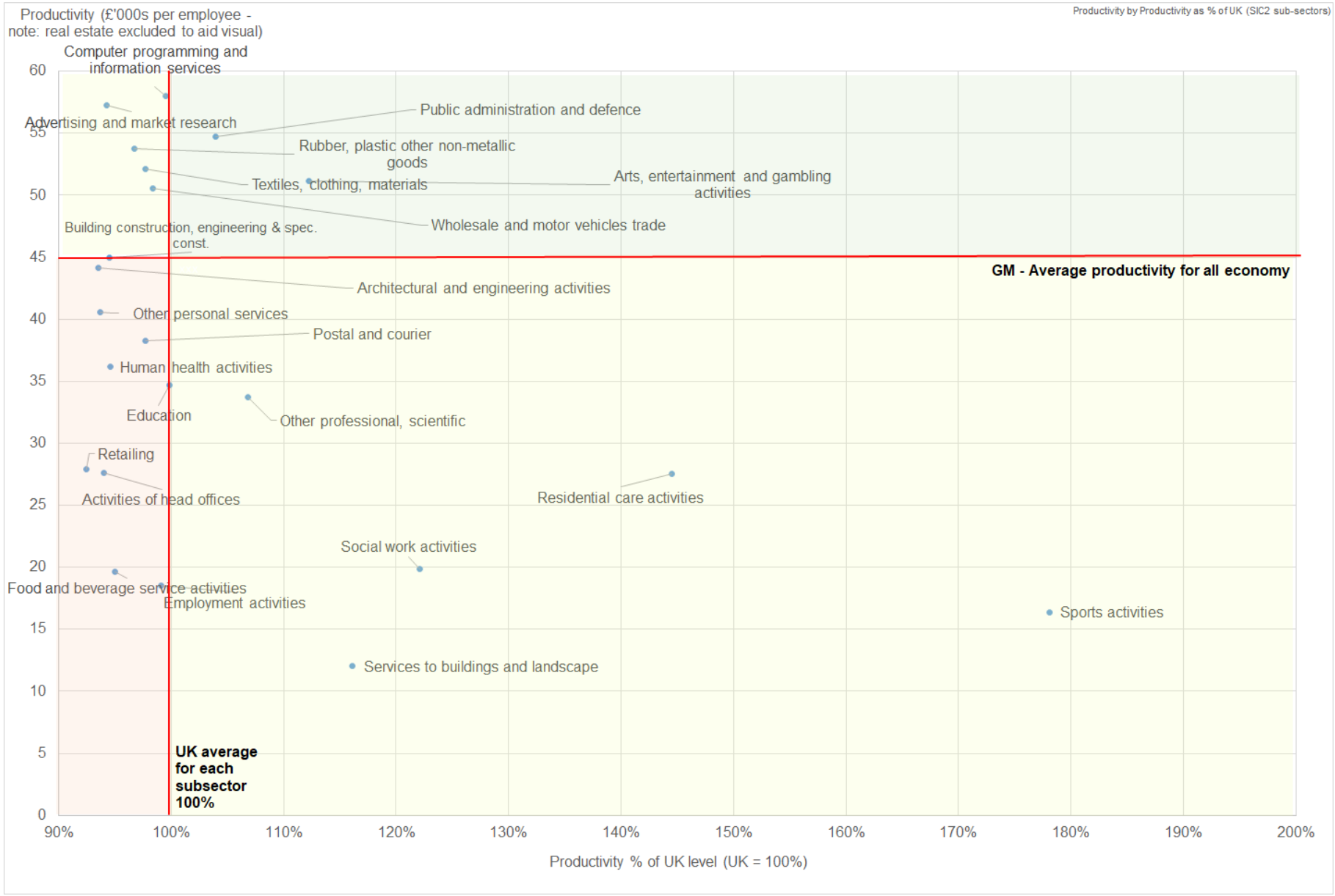
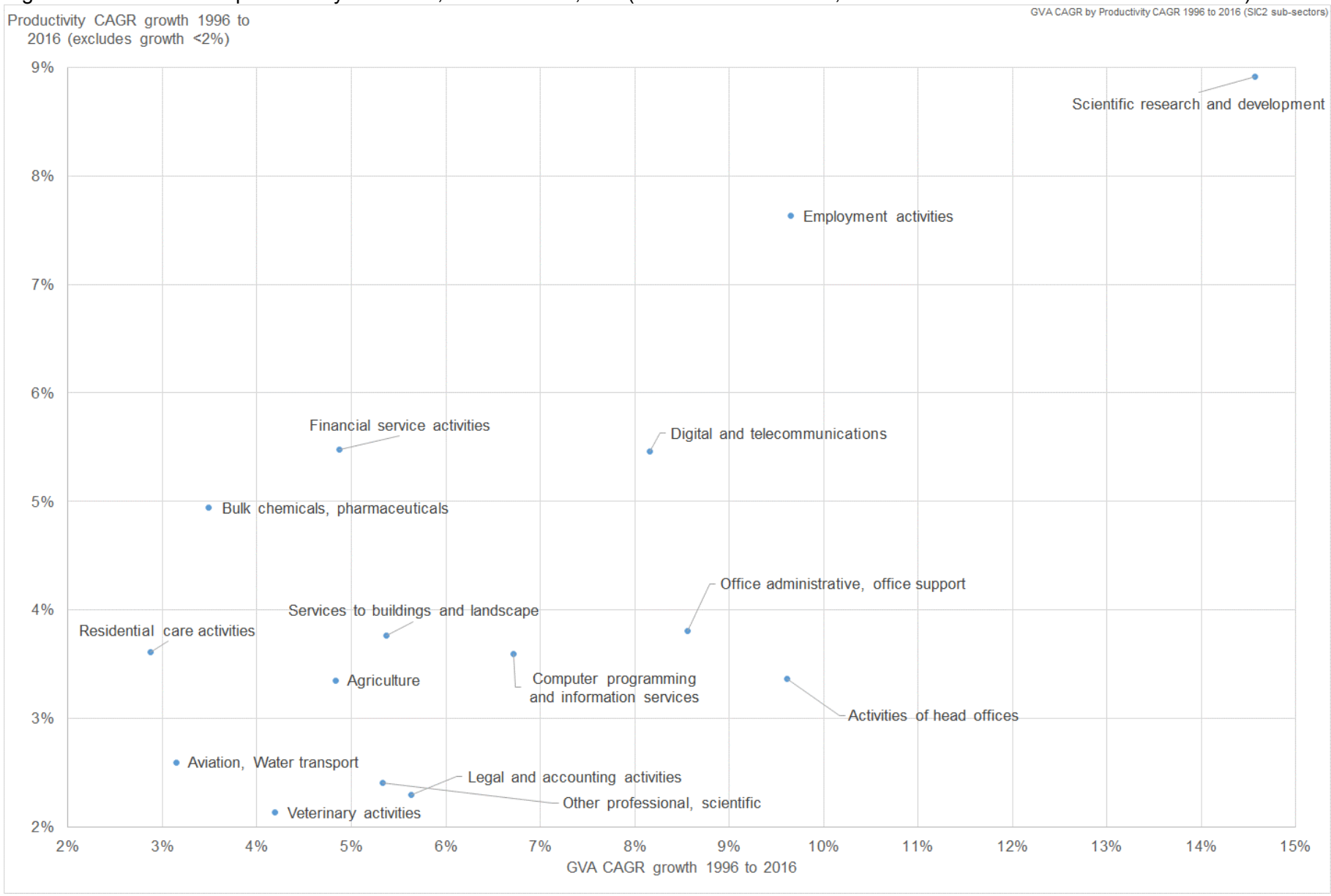


Figure 7: Growth rate in productivity and GVA, 1996 to 2016, GM (Source: GMFM-2018, excluded CAGR less than 2 for illustration)



*Business investment in R&D and innovation*

Official metrics on innovation, R&D and trade linkages provide another way of assessing Greater Manchester's specialisms and supplementing the analysis on size, scale and growth opportunity.

*Patenting and innovation*

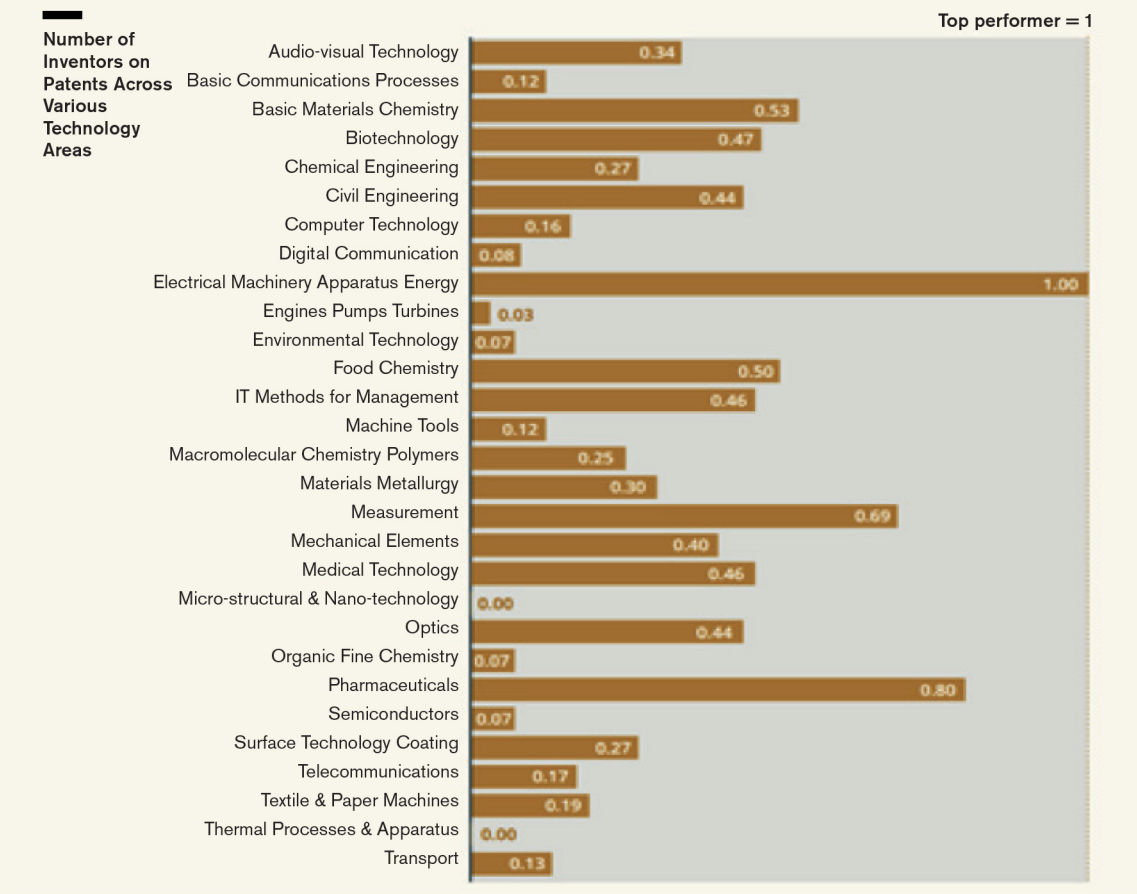
Recent patenting analysis[10] at the UK level and data from the Smart Specialisation Hub[11] shows Greater Manchester with strengths in knowledge-intensive industries such as: BioSciences, Healthcare, Materials, Digital Industries, High Value Manufacturing, and Sustainable/Low Carbon economy[12].

However, while there is a critical mass of research institutions in GM, the track record on translating this research excellence into marketable products is relatively poor. According to the EU Commission's Regional Innovation Scoreboard, registered intellectual property rights (patents, trade marks, designs) are all below average, both for the UK and the rest of EU[13]. Furthermore, proxy indicators of innovation, such as patent applications per million inhabitants (2008 to 2012), show that GM (37) falls well below that seen in both other UK core cities such as Bristol (168), Sheffield (105), and also London (95). GM also falls significantly behind other leading European benchmark cities, e.g. Munich (590)[14].

Figure 8 compares the number of inventors on patents in GM with the leading area (top performer) in the UK over the last decade. This shows where GM has relative 'strengths' compared to other benchmark locations within England, in particular within the manufacturing of electrical machinery relating to energy management.

[10] UK Patenting Office (2018)
[11] Smart Specialisation Hub - https://smartspecialisationhub.org/
[12] http://smartspecialisationhub.org/publications/mapping-englands-innovation-activity-refreshed/
[13] EU Commission Regional Innovation Scoreboard (2017) http://ec.europa.eu/DocsRoom/documents/24188
[14] Eurostat (2012): European Patenting Office – patents per million inhabitants

Figure 8: Number of inventors on patents across various technology areas, GM vs top performing city regions = 1.0 for each technology (Source: IPO 2018)



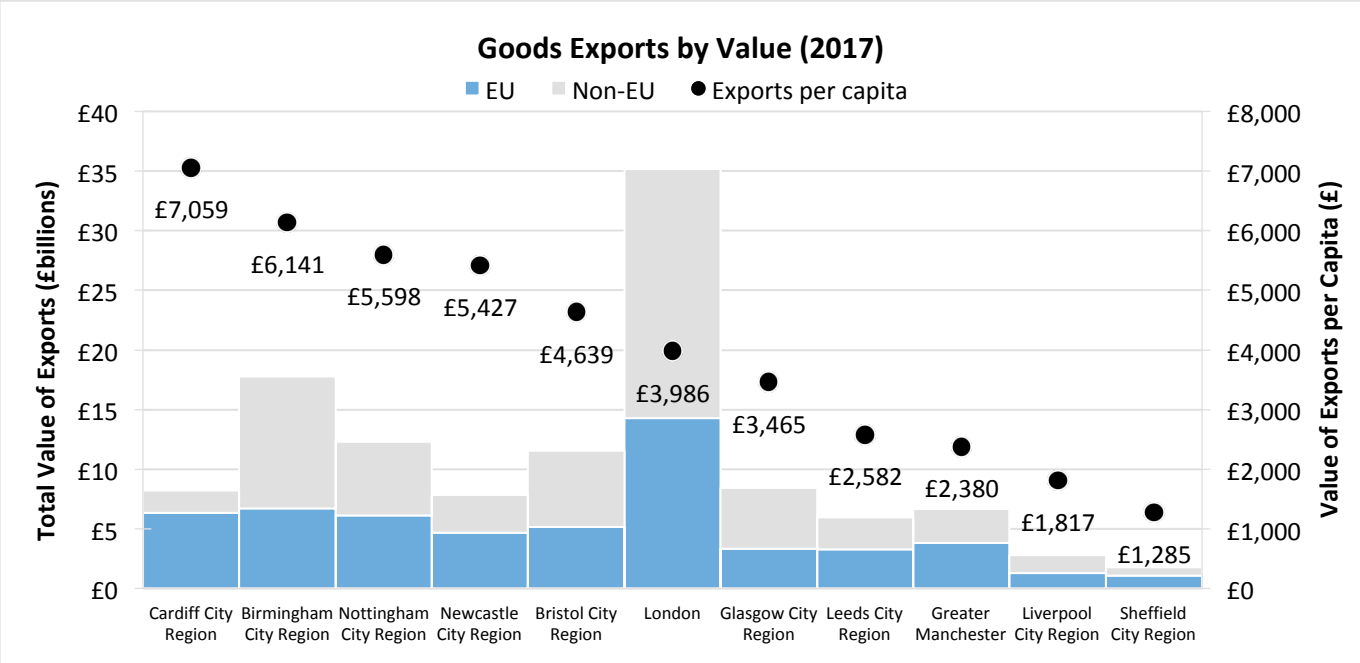

*Trade and exports*

*Manufactured goods*

Export data at the city region level is only available for goods at broad classification, making it difficult to identify specific trade specialisms. However, what is clear from latest HMRC trade data is that GM has one of the most diverse bases of goods exports compared to most other UK cities. While most other city regions have one or two clear specialisms, GM is less weighted toward a single specialism, reducing the risk of specific industrial decline.

The total value of GM goods exported in 2017 was £6.7 billion, a 5% increase from 2016 (having risen by 16% between 2015 and 2016); this places GM 19th out of 40 UK NUTS2 regions in terms of total export value. Despite this, GM's export value per head of population, at £2,380 per resident, is lower than the UK average £4,972; and behind other comparators: Birmingham (£6,141), Bristol (£4,639), and Leeds (£2,582) (see Figure 9). The latest GM Business Survey estimates that 16% of firms in GM export (16,000 enterprises). However, the survey also indicates that the majority of SMEs are focused on domestic markets.

Figure 9: Total goods exports by value for Greater Manchester and peers, 2017 (Source: HMRC)




GM's biggest export sector is in Manufactured Good & Commodities, accounting for 38% of GM exports compared to 24% of UK exports. This gives GM a LQ of 1.54, placing it third among city region comparators behind only London (2.01) and Sheffield (1.89), although it should be noted that in terms of value, GM exports approximately 3 times more than Sheffield in this category (£2.5 billion versus £825 million) (see Figure 10).

This group covers areas of industry which also correspond to those highlighted in other analysis, including:

- **Manufacturing of paper and printed products**
- **Manufacturing advanced textiles**
- **Manufacturing of technical ceramic products**
- **Manufacturing of electronic components and wiring/wired devices; and**
- **Manufacturing of detergents, hygiene and cleaning related products**

Another notable finding is that GM exports a lower proportion of machinery and vehicles compared to other city regions. However, it is also important to note that GM-based firms are included in the automotive and aerospace supply chain, in terms of component manufacture. Therefore, the data used here on final goods exported, whilst confirming some areas of specialism in GM, does not highlight the full picture of manufactured products.

Analysis of trade data also shows that GM exports more than double the UK average of crude materials (excluding fuels), although this only accounts for 5% of GM exports[15] (see Figure 11).

[15] HMRC and UK Trade-Info (2018): Data for English Local Enterprise Partnerships

Figure 10: City region goods exports by type for Greater Manchester and peers, 2017, Source: HMRC (% under 3% not labelled)

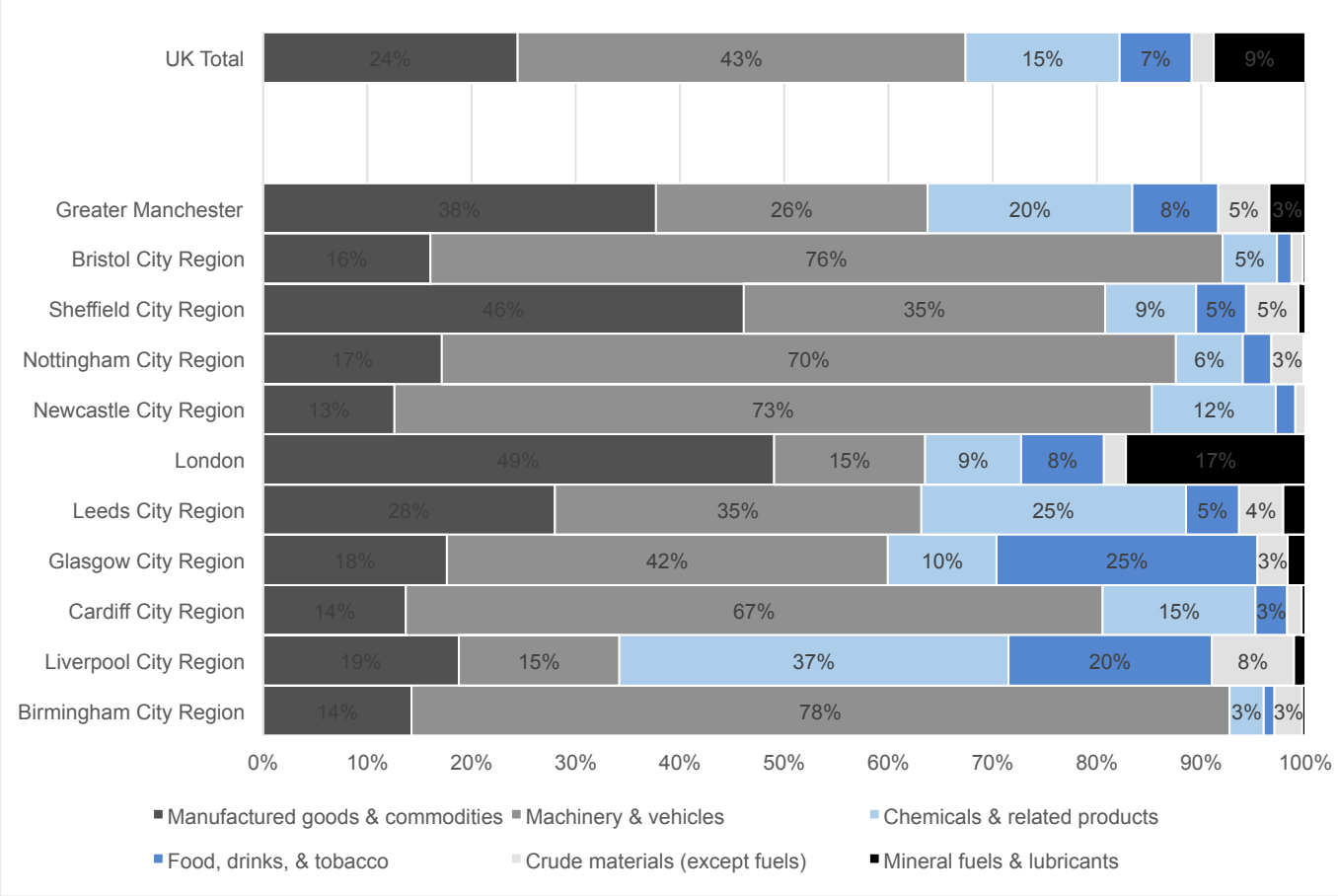
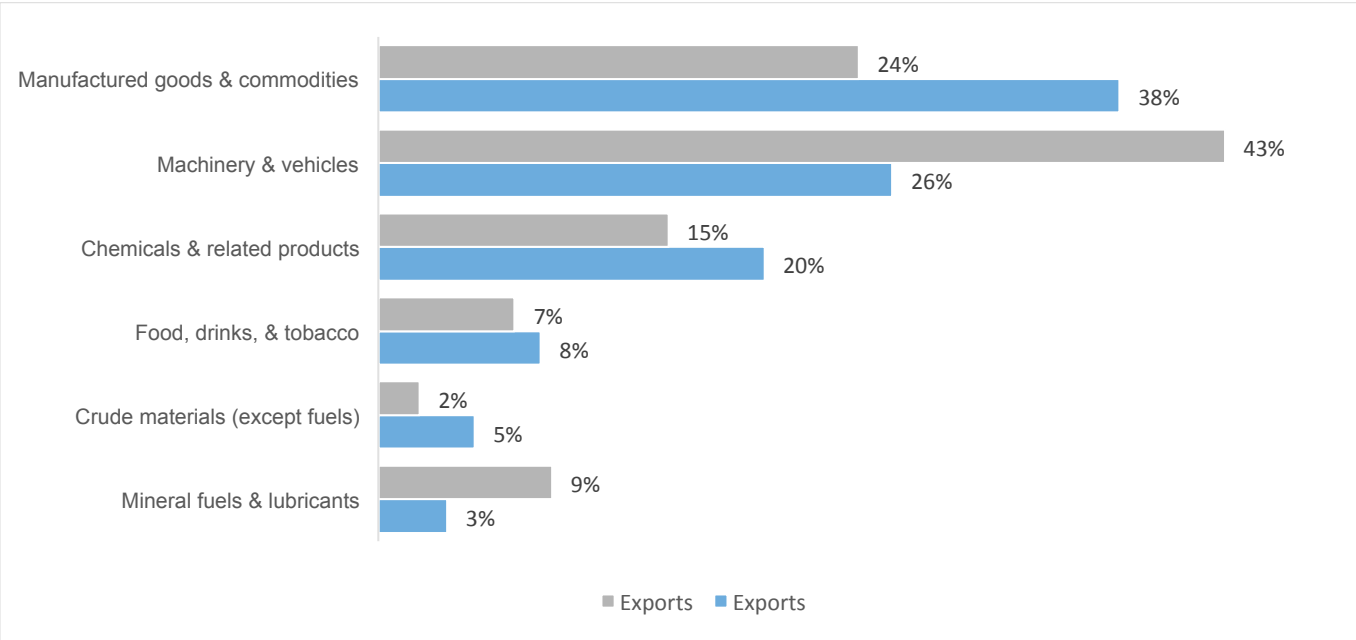



Figure 11: Exports by type (% of total) for Greater Manchester and UK average, 2017 (Source: HMRC)



*Traded services*

Service exports evidently make a major contribution to GM's total exports and the Office for National Statistics (ONS) has recently produced experimental statistics breaking down national services exports to the subnational estimates[16]. This data has recently been made available at Joint Authority, NUTS2 and NUTS3 level at nine functional classifications. It can be used to obtain a better understanding of the city region's potential within the global services market.

According to experimental estimates from ONS, UK Services exports are dominated by London, with London accounting for 47% of Great Britain's total services exports in 2016 (£117.3bn total). The two NUTS3 areas of Camden and City of London (£35 billion) and Westminster (£25 billion) contributed almost a quarter (24%) of total Great Britain service exports.

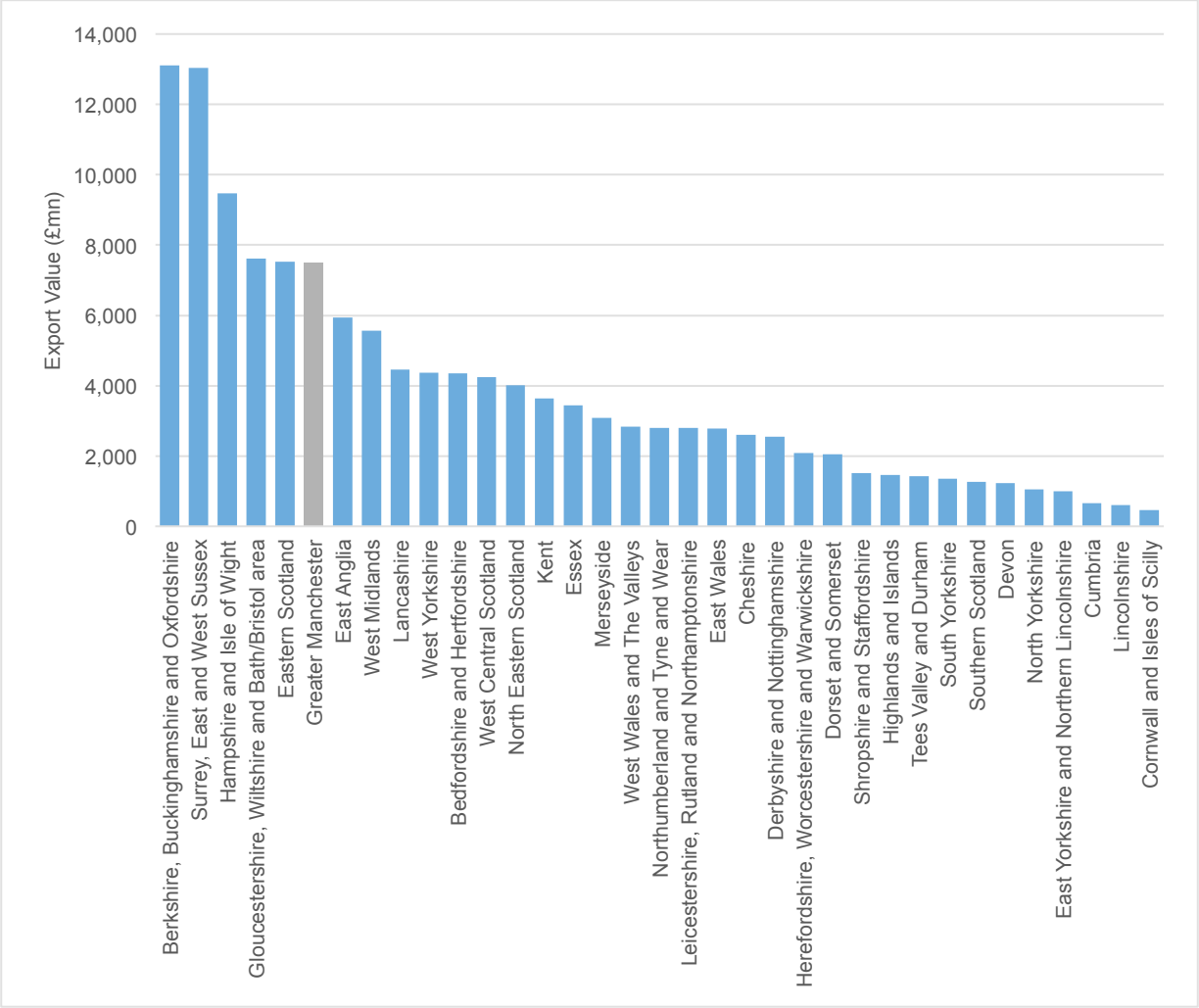
The next three largest exporters of services (at the NUTS2 level) outside of London are based in the South East: Total services exports from Berkshire, Buckinghamshire and Oxfordshire were valued at £13.1bn, while Surrey, East and West Sussex exported £13bn, Hampshire and Isle of Wight £9.5bn in 2016.

Outside of London and the South East, however, Greater Manchester was one of the UK's most important services exporters, with services exports valued at £7.5bn in 2016, placing it second only to Bristol City Region, which exported £7.6bn of services. The next comparable city region in terms of services exports in 2016 was Birmingham City Region with £5.6bn, although Eastern Scotland (which includes Edinburgh) exported £7.5bn of services, edging just ahead of Greater Manchester.

Greater Manchester is an important driver of services exports from the North West, with the city region accounting for 42% of the North West's services exports in 2016, and the NUTS3 area of Manchester contributing 25% alone.

[16] ONS (2018): Estimating the value of service exports by destination from different parts of Great Britain in 2015

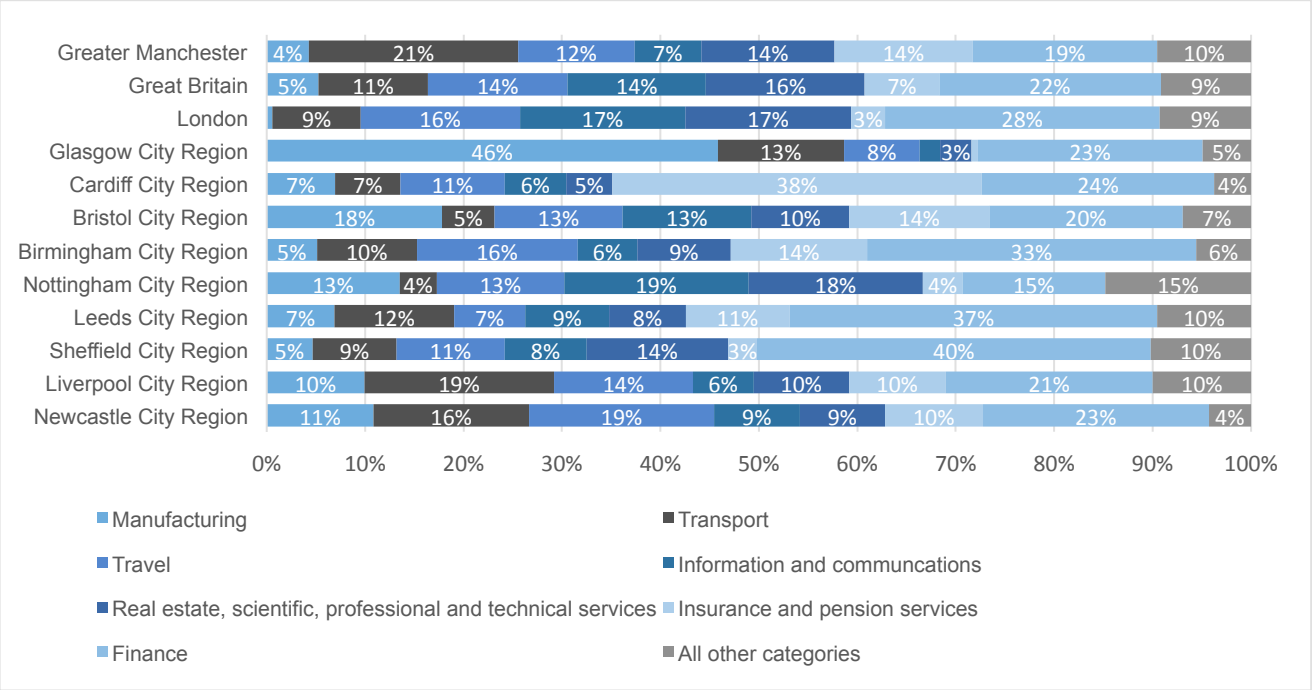
Figure 12: Total Export Services by Value (£m by NUTS2 Region, 2016 (Source: ONS; excludes London)




Greater Manchester (see Figure 13) has a notable export specialism in Transport services, with the city region exporting £1.6bn worth of Transport services – 21% of total services exports – in 2016. This is the second largest city region and fourth largest overall for Transport services exports, behind London (£10.5bn), Surrey, East and West Sussex (£2.5bn), and Hampshire and Isle of Wight (£1.6bn). It is likely that this reflects the importance of Manchester Airport.

Greater Manchester also has an export specialism in Insurance & Pension services, exporting £1.1bn (14% of total services exports) in 2016. This places Greater Manchester third among comparable city regions (or fourth if Edinburgh is included) and 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 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 13: City region services exports by type for Greater Manchester and peers, 2016 (Source ONS)



# 4. Experimental approach to understanding Greater Manchester's strengths

## 4.1 Introduction

Experimental data analysis by Data City, a Smart Cities and Economics Data as a Service (DaaS) company, commissioned for this Review, has enabled us to explore Greater Manchester's strengths, with particular focus on emerging technology strengths from a different perspective.

Whilst not directly comparable to official statistics, the work reveals highly complementary findings as well as additional areas of potential strength[17].

The data science work includes:

- Analysis of the business base using an approach to identifying priority sectors, based on Companies House data, supplementary web scraping and classification by machine learning.

- An innovation global index (based on published academic papers[18] and patents and clustered at city level[19]).

- Events taking place across the UK on a rolling 12-month basis, as a leading indicator of innovation (based on MeetUp and EventBrite data[20].)

Greater Manchester should continue to test the value of this type of research for policy making, planning and programme design. More work is also required by the research community to validate these methods.

## 4.2 Methodology

Innovation activity can be hard to measure and Standard Industry Classification (SIC) codes may be poorly suited to understanding the modern economy. Current datasets can often miss:

- large companies that span many industrial sectors,
- technology companies which operate in small and frequently changing niches markets, and
- companies that operate in emerging sectors which have not yet been classified.

The analysis in this section is based on experimental and iterative ongoing analysis of the Emerging Tech economy in Greater Manchester. The data upon which the analysis is based has been generated by The Data City.

[17] www.thedatacity.com/products/gmtechprofile/
[18] Data regarding Academic papers is sourced from https://www.openacademic.ai/
[19] The analysis is primarily based on an OECD definition of Manchester to allow international comparison beyond the EU. For definition of geographies used see http://www.oecd.org/cfe/regional-policy/functionalurbanareasbycountry.htm. For countries not covered by OECD urban area definitions we use an additional dataset created by Maisonobe et al. https://journals.openedition.org/cybergeo/29637.
[20] 380,000 events and meetups in the past year, 90,000 of which are in the UK, and classified them into 16 key sectors of interest to Greater Manchester's industrial strategy.

The work covers:

- **Businesses**: using data from Companies House which has been augmented with information openly published on each company's website and analysed using a machine learning process to allocate businesses into emerging sectors. The base data for this element is available at Organisations Explorer.

  The approach uses machine learning to classify businesses based on the words they use to describe themselves. The first step is for a relatively small number of websites and businesses, which the team are confident to say represent a sector or area of interest, to be manually classified. This initial dataset is then used to train a machine-learning algorithm to identify similar businesses. The dataset will be further updated as examples of miscategorised businesses are flagged up and additional signals emerge from the data.

  The business analysis has been undertaken in two ways:

  1) A structured assessment based on an agreed set of potentially interesting sectors, which includes advanced manufacturing and materials, health innovation and digital.

  2) An unstructured analysis using commonly occurring keywords used by Emerging Tech businesses to describe what they do. The unstructured analysis has concentrated on looking at keywords that are used by at least 200 Emerging Technology businesses and where Greater Manchester has a high concentration relative to the national average (i.e. a LQ of greater than 2). Business are associated with more than one keyword and consequently, the numbers associated with each keyword should not be added up.

  A detailed description of the methods used can be found at The Data City Website Our Data & Industrial Sector Classification.

- **Academic Papers**: presents a classified ranking of academic publishing activity to capture the more formal base of innovation in the city[21]. It uses the Open Project Academic Knowledge Application Programming Interface (API) which is part of https://www.openacademic.ai/. The base data for the element is available at Innovation Explorer.

- **Events**: uses data drawn from ~~data in~~ Eventbrite and Meetup in the last twelve months which has been analysed to try to reflect early stage innovation activity. Events have been classified against themes of interest using a machine learning process. The base data for the element is available at Events Explorer.

[21] This dataset uses OECD definition of the Manchester Standardised City and not the conventional GMCA boundaries.

The data for Events and Companies has been presented for English sub-regions defined by Local Enterprise Partnerships and Combined Authority boundaries. Comparisons are made throughout between Greater Manchester and its peers. The academic data has been collated around the OECD defined Standardised City for Manchester which stretches up into East Lancashire and down to East Cheshire.

Source data is available here: https://www.thedatacity.com/products/gmtechprofile/

**4.2 Topline Findings**

The business base analysis includes 27,000 businesses registered in Greater Manchester that have been allocated to one of the Emerging Tech sector's records. It shows that Greater Manchester is consistently well represented across these important emerging technology sectors, with strength in the priority sectors identified in the SIA. These businesses are in nascent and established markets and many are also growing markets in their own right.

Papers published in peer-reviewed journals and patents have also been analysed 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 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). Manchester's top five fields are ontology (computer science), design methods, residual stress (material science), qualitative research, and ageing. This backs up the established view that Greater Manchester is strong in material science.

Events are a leading indicator of a vibrant scene for collaborative knowledge sharing. This analysis places 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 depth of innovation meet ups seen in Manchester. Manchester edges out Bristol, Edinburgh, and Cambridge in terms of AI and data events and leads Brighton in terms of creative events.

**4.2 Experimental approach to understanding Greater Manchester's identified specialisms**

This section takes a closer look at the digital and emerging technology sector, as well as advanced manufacturing/materials and health innovation, both of which have growing connectivity and interlinkages with emerging technologies.

***Digital and emerging technology sector***

Greater Manchester consistently ranks among the top tier as a home to Creative, E-Commerce, Gaming, IoT and Med Tech businesses, as well has having a strong core Digital sector in its own right.

GM appears to have niche strengths in Service Design (E-commerce, Digital Transformation, User Experience), the Physical Layer of Digital (ie Data Centres, Storage, Hardware etc) and Digital Solutions such as Cyber Security, AI, Sensors and Gaming. There is also a very small but identifiable proportion of R&D and manufacturing businesses engaged in digital.

Greater Manchester has a vibrant digital-themed event scene and there appears to be a base of research in Data Science, Data Mining, AI and Machine Learning as well as Marketing and Advertising which could be useful assets for the sector to draw on.

Further iterations and refinements of this analysis are needed to extend our understanding of how best Greater Manchester should further develop its profile and competitive edge. As a starting point, this could delve into the apparent set of R&D and Manufacturing sector businesses which are engaged in Digital.

Analysis has looked at Digital sector in its own right alongside related emerging technology sectors such as FinTech, MedTech, IoT, Gaming and E-Commerce.

The analysis has identified 1,304 digital business, as well as 8,575 Creative, 3,020 E-Commerce, 258 Gaming, 60 IoT, 17 Med Tech and 5 FinTech businesses.

Just over half (54%) of GM's Digital businesses sit solely within the Digital sector; however, there is clear crossover with other sectors such as Gaming and Creative (which nearly a quarter of GM's Digital business also sit within). The early iterations of the data process suggest that Greater Manchester more closely mirrors London and the South East in its terms of its digital business focus, whereas Leeds has a larger Digital-Creative crossover (see Figure 14). Manufacturing and R&D businesses also feature in this list, albeit in very small proportions, and may warrant further investigation.

Figure 14: Digital Sector Crossover With Other Sectors

| Sectors | Greater Manchester | Leeds City Region | London | South East |
|---|---|---|---|---|
| Digital | 54% | 14% | 59% | 59% |
| + Creative | 10% | 55% | 10% | 8% |
| + Gaming | 15% | 5% | 20% | 20% |
| + Hardware | | 2% | | |
| + Manufacturing | | 2% | | |
| + eCommerce | | 1% | 1% | 1% |
| +R&D | 1% | 4% | 1% | 1% |
| + Telecoms | 4% | 0% | 2% | 1% |
| + eCommerce | 3% | 1% | 1% | 1% |
| + Manufacturing | 1% | | | 1% |
| + R&D | 1% | | 1% | 1% |
| + Data | 1% | | 1% | 1% |
| + Other | 9% | 15% | 4% | 7% |

Unstructured business analysis identifies further potential emerging technology specialisms in the city region in:

- Service Design: User Experience, E Commerce, Payments, Digital Transformation and IT Services
- Physical Layer: Data Centres and Management, Platforms, Storage, Hardware and Connectivity inc Wifi
- Digital Solutions: which sit at the overlap between a number of themes such as:
  - Cyber Security
  - Big Data, AI
  - Sensors, IoT
  - VR, Gaming and Animation

Figure 15: Unstructured business analysis Digital Related Themes

| Keyword | Number Registered Businesses | LQ |
|---|---|---|
| Digital Transformation | 322 | 3.4 |
| Cyber Security | 329 | 3.3 |
| Data Management | 334 | 3.0 |
| Cyber | 575 | 2.9 |
| Sensors | 645 | 2.9 |
| Data Centre | 250 | 2.7 |
| Gaming | 502 | 2.7 |
| Mobility | 860 | 2.7 |
| WiFi | 458 | 2.7 |
| Artificial Intelligence | 240 | 2.6 |
| Big Data | 229 | 2.6 |
| E-commerce | 1,184 | 2.6 |
| IT Services | 368 | 2.6 |
| Virtual reality | 225 | 2.6 |
| Automation | 984 | 2.5 |
| Electronics | 982 | 2.5 |
| Payments | 1,550 | 2.5 |
| AI | 329 | 2.3 |
| Connectivity | 638 | 2.3 |
| Hardware | 1,402 | 2.3 |
| Platforms | 1,188 | 2.2 |
| Storage | 2,603 | 2.2 |
| Animation | 461 | 2.1 |
| Internet of Things | 202 | 2.1 |
| Mobile Apps | 201 | 2.1 |
| User Experience | 443 | 2.1 |
| Virtual Reality | 204 | 2.1 |

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 also 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.

Greater Manchester has a vibrant scene for Digital and emerging technology themed events. The city region also ranks well in the more modest and nascent market place for FinTech, MedTech, IoT, Gaming and E-commerce related events. Media, Marketing, Service Design and User Experience also emerge as themes on Greater Manchester's Digital event scene.

The research and event analysis supports the identified business strength in service design; Manchester has nearly twice as many academic papers on service design innovation and e-commerce published than any city outside London. There are also more than twice as many tech events on the topic of 'service design', 'ethics in

technology', and 'tech for good' held in Manchester than in any other city outside London.

### *Advanced Manufacturing*

Greater Manchester has a core of Advanced Manufacturing businesses emerging from its traditional base and upon which it might build further competitive advantage.

The city's traditional Manufacturing business base is evolving into a broad range of sub-sectors and creating connections into other Emerging Technology sectors such as R&D, Digital, Energy, Creative, Waste and E-Commerce. The unstructured keyword business analysis has also identified a clutch of interrelated Material-Tech themes such as Resilience, Coatings, Surface, Testing and Protective where Greater Manchester is highly represented.

Greater Manchester hosts a good number of events focused on topics relevant to Advanced Manufacturing businesses (including AI and Digital) and appears to have a vibrant start-up trend on which to build. The city region hosts a solid base of research on Light Alloys, Coatings, Graphene, Composites and Materials Science, which could point to areas for further specialisation and advantage for the city's businesses to capitalise upon.

Further investigation is needed to clarify the sub-sector strengths of the Advanced Manufacturing sector and to understand better how the city's research base could help the sector grow, and at the same time build up the scale and range of specialist fields of investigation where it stands out internationally.

The analysis has identified 5,788 Advanced Manufacturing businesses registered in Greater Manchester and 246 specialising in materials[22].

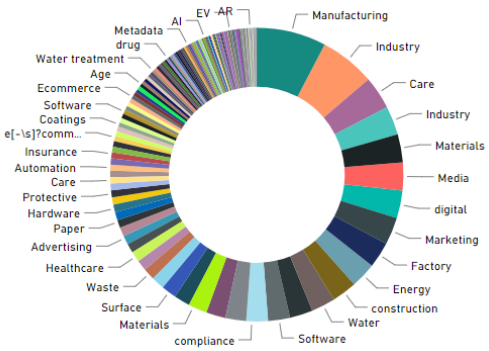
Figure 16 shows the composition of the Advanced Manufacturing & Materials sector based on the machine learning process benchmarked against the UK. It shows Greater Manchester's Advanced Manufacturing sector businesses are broadly in line with the wider national breakdown in terms of the keywords they use to describe themselves.

This early run has drawn out manufacturing businesses with a focus on care, media, marketing and software, all of which represent emerging market opportunities which should be further explored.

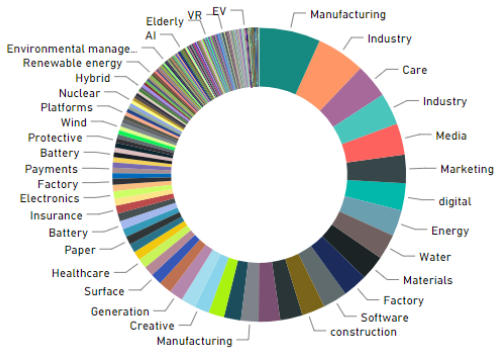
[22] Keywords used to identify Advanced Materials Businesses 3D Printing; Additive Manufacturing; Advanced Manufacturing; Advanced Materials; Carbon Fibre; Coatings; Composites; Graphene; Light Alloys; Materials; Materials Science; Membranes; Paper; Photovoltaic; Protective; Sensors; Surface; Textile.

Figure 16: Manufacturing Sector to Keyword Composition

Greater Manchester



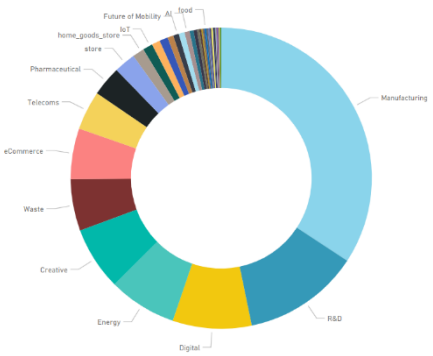

National



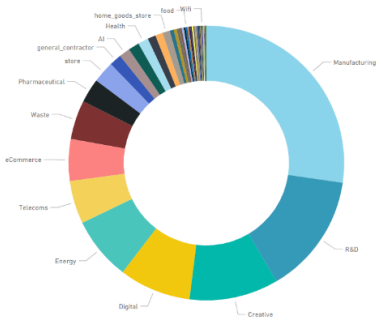

Analysis of keywords associated with manufacturing, Figure 17, further helps to show potential linkages and crossover between sectors. Not surprisingly, many of these businesses are assigned to the Manufacturing sector, but it also shows businesses assigned to the R&D Sector, Digital, Energy, Creative, Waste and E-Commerce sectors appear to be engaged in activities associated with manufacturing. When compared against the national picture Manufacturing in GM appears to be a prominent theme among businesses in the Digital and Waste Sectors.

Figure 17: Manufacturing Keywords to Sector Composition

Greater Manchester




National



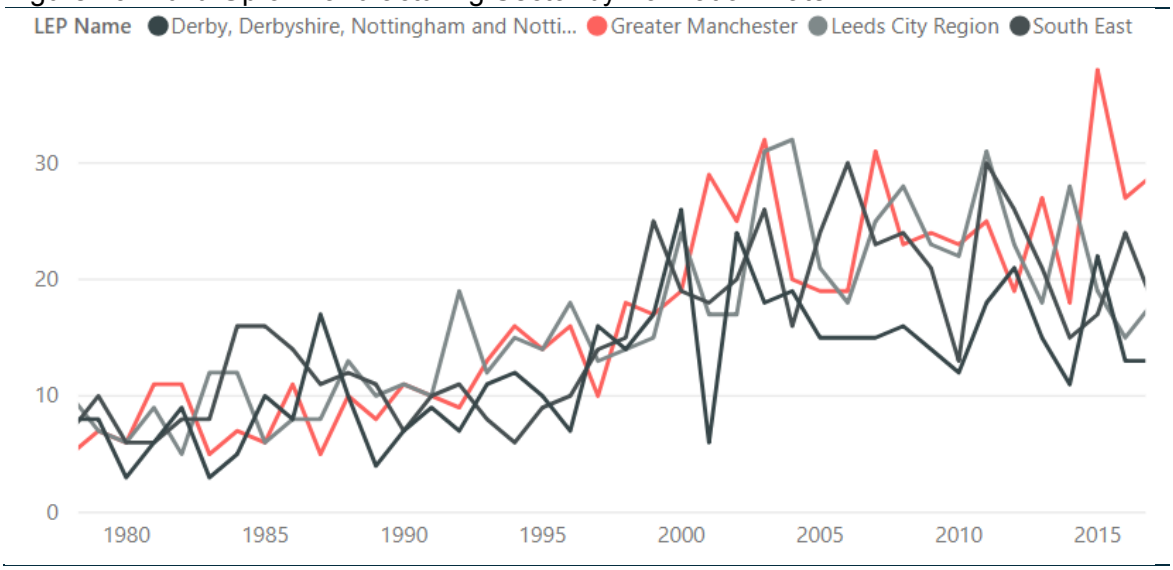

Further insight from the unstructured business analysis, Figure 18, reveals a concentration of businesses using terms Resilience, Coatings, Surface, Testing and Protective to describe what they do. It also shows Greater Manchester has strong representation in Steel, Textiles and Paper. Not surprisingly more broad and conventional terms associated with manufacturing are also prominent such as Factory, Industry and Engineering.

Figure 18: Unstructured business analysis: Material Tech Related Themes

| Keyword | Number Registered Businesses | LQ |
|---|---|---|
| Coatings | 448 | 2.9 |
| Chemicals | 793 | 2.7 |
| Textile | 382 | 2.7 |
| Protective | 710 | 2.4 |
| Resilience | 350 | 2.4 |
| Noise | 633 | 2.2 |
| Paper | 2003 | 2.2 |
| Engineering | 3147 | 2.1 |
| Manufacturing | 3395 | 2.1 |
| Steel | 2295 | 2.1 |
| Surface | 1628 | 2.1 |
| Testing | 2393 | 2.1 |
| Factory | 1436 | 2.0 |
| Industry | 6299 | 2.0 |
| Materials | 3498 | 2.0 |

There is an upward trend in the number of new businesses entering the city region's Advanced Manufacturing sector each year (Figure 19). This largely mirrors the pattern seen among Greater Manchester's nearest sub-regional comparators, however for GM this trend also appears to have translated into a slightly higher proportion of micro-businesses than the national sector at large.

Figure 19: Build-Up of Manufacturing Sector by Formation Date




Our analysis of academic publications suggests Manchester's research outputs are reasonably well-ranked in a number of highly active materials-related research disciplines. Although there is scope for the city region to enhance its standing, Manchester is already well-placed in the fields of Light Alloys, Coatings, Graphene, Composites and Materials Science.

Looking at events related to manufacturing, Greater Manchester is ranked fourth among the English sub-regions (behind London, West of England and Cambridge/Peterborough). Figure 20 illustrates the range of keywords extracted from the online descriptions used to advertise these events. Greater Manchester has good representation of Digital and AI among its Manufacturing themed events when looked at against other sub-regions.

Figure 20: Greater Manchester Manufacturing Events Keyword


***Health Innovation***

Greater Manchester is a top tier sub-region in terms of its base of Innovative Healthcare business and events, and the city region has relevant research strengths on which to build. The local business base is diverse and mirrors the national make-up in terms of the common keywords it uses to describe its activities and the sub-sectors it operates in.

The analysis reveals common strengths that would normally be expected in broad health and care sectors with the themes of medicine, care and ageing frequently recurring. There also appears to be a base emerging in digital and telematics associated with health.

Further research is required to better understand the potential for a growing relationship between health and social care delivery and health innovation activities including manufacturing.

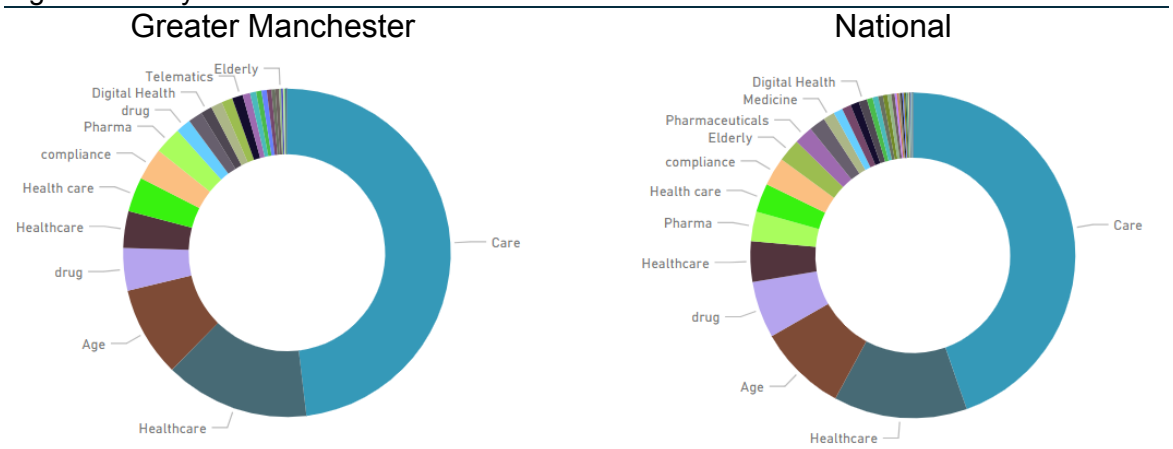
The analysis has identified 7,674 businesses in the wider, and more loosely defined, Health sector in Greater Manchester, as well as 237 registered business in the pharmaceutical sector, 17 in the very nascent Med-Tech sector (12 of which are also trading in the pharmaceutical sector). Keyword analysis has been used to drill down to identify a firmer core of 594 Health Care Innovation businesses[23] registered in Greater Manchester.

[23] Keywords used to identify Healthcare Innovation businesses: Age; Ageing; Ageing Population; Ageing society; Bioavailability; Biologic; Biomarkers; Biometrics; Biosimilar; Care; Compliance; Digital Health; Drug; E-Health; Elderly; Health & Social Care; Healthcare; Health Innovation; Health Tech; Healthcare; Healthcare Analytics; Medicine; Med Tech; Nutraceutical; Orphan Drug; Pharma; Pharmaceutical Manufacturing; Pharmaceuticals; Precision Medicine; Regenerative medicine; Small Molecule; Telematics

Keyword analysis shows, as expected, strong crossover with broader care and healthcare/health care categories, as well as with businesses using terms around age/elderly and ageing to describe themselves. Greater Manchester, somewhat distinct from the national picture, appears to show a marginally greater link with telematics and digital health sectors (see Figure 21).

A closer look at Pharma suggests that it is the Manufacturing element of the sector where the larger proportion of businesses (compared to the national picture) can be found in Greater Manchester. Analysis of subsequent iterations of the data process need to delve into the emerging data to look for distinguishing patterns which might help identify further sub-sector strengths on which to build.

Figure 21: Keyword Breakdown of Innovative Healthcare Sector




The unstructured business analysis, Figure 22, sheds further light on GM strengths connected to Medicine (Pharma, Compliance, Drugs), Care and Ageing (including Mobility)[24].

Figure 22: unstructured business analysis: health related Themes

| Keyword | Number Registered Businesses | LQ |
|---|---|---|
| Ageing | 415 | 3.2 |
| Mobility | 860 | 2.7 |
| Age | 1951 | 2 |
| Care | 5849 | 2 |
| Compliance | 2546 | 2.5 |
| Healthcare | 2625 | 2.4 |
| Medicine | 835 | 2.4 |
| Pharma | 297 | 2.4 |
| Pharmaceuticals | 291 | 2.4 |
| Health care | 667 | 2.2 |
| Drug | 567 | 2.1 |

[24] Note that some of the reference to ageing is related to the resilience of materials

Greater Manchester ranks second in the country for Innovative Healthcare events; however, the total number (46) is small. GM is only just ahead of rival sub-regions and is dwarfed by the base of activity in London (339 events). Looking more narrowly at Pharma-related events, GM has a focus on Medicine and Compliance themes, but less so on Manufacturing in contrast with the focus of the local pharmaceutical businesses.

### 4.3 Clean Growth Grand Challenge

Mission-oriented innovation policy defines an ambitious goal, and then uses this to create a long-term policy landscape, setting out tasks that mobilize various actors for bottom-up experimentation across different sectors.

Greater Manchester's identified mission-oriented approach to Clean Growth represents an attempt to trigger new innovative activity. The mission-based approach is centred around Greater Manchester's aim to become a carbon neutral city region by 2038 has been discussed in more detail in a technical report developed by University College London, Institute for Innovation and Public Purpose (UCL-IIPP). This section complements this work, outlining from the experimental analysis the activity currently underway for the mission to build on.

The analysis reveals a relatively high incidence of business trading in Greater Manchester and using words to describe their activities which relate to Energy/Clean Growth. GM appears to have a relatively high incidence of businesses working in and around the Built Environment and increasingly focused on matters relating to Waste, Energy Efficiency/Saving). Alongside that there is a group of businesses associated with Energy Generation who use keywords such as Biomass, Renewables, Nuclear, Wind and within which the terms Battery and Lighting are prominent.

Figure 23: Clean Growth/Energy Related Themes

| Keyword | Number Registered Businesses | LQ |
|---|---|---|
| Biomass | 269 | 3.2 |
| Renewables | 339 | 3.0 |
| Energy efficiency | 347 | 2.6 |
| Energy saving | 288 | 2.6 |
| Nuclear | 409 | 2.5 |
| Renewable energy | 498 | 2.5 |
| Wind | 868 | 2.5 |
| Battery | 955 | 2.4 |
| Environmental | 2606 | 2.3 |
| Lighting | 1683 | 2.3 |
| Waste | 1991 | 2.3 |
| Generation | 1801 | 2.1 |

Figure 24: Built Environment Related Themes

| Keyword | Number Registered Businesses | LQ |
|---|---|---|
| Civil Engineering | 472 | 3.8 |
| Building Information Modelling | 279 | 3.5 |
| Insulation | 761 | 3.3 |
| Asset Management | 573 | 3.1 |
| Brick | 490 | 2.7 |
| Environmental management | 249 | 2.7 |
| Water treatment | 251 | 2.7 |
| Concrete | 813 | 2.6 |
| Energy efficiency | 347 | 2.6 |
| Energy saving | 288 | 2.6 |
| Infrastructure | 1,890 | 2.6 |
| Waste management | 440 | 2.5 |
| Computer Aided Design | 910 | 2.4 |
| City | 3,990 | 2.4 |
| Resilience | 350 | 2.4 |
| Connectivity | 638 | 2.3 |
| Construction | 3,151 | 2.3 |
| Environmental | 2,606 | 2.3 |
| Lighting | 1,683 | 2.3 |
| Waste | 1,991 | 2.3 |
| Architect | 398 | 2.2 |
| Architectural | 822 | 2.2 |
| Noise | 633 | 2.2 |
| Water | 3,141 | 2.1 |

# 5. Summary & Recommendations

Central to a local industrial strategy is an understanding of what places are good at, and what they might be able to be good at in the future. Identifying current and future specialisms is, however, extremely challenging to get right.

This work takes a data-driven approach to identify current and future specialisms. It recognises that there are a number of conventional ways of assessing competitiveness, based on data on firms, alongside innovation and trade metrics, and experimental approaches using data science techniques such as web-scraping, to explore niche opportunities and potential future opportunities.

The data-driven analysis provides a useful basis, alongside wider evidence from the Prosperity Review, including the Economic Complexity Analysis by University of Cambridge, to assess the city region's strengths and areas of opportunity.

The work confirms that Greater Manchester has some world-class strengths, particularly in **Advanced Materials** and **Health Innovation**, supported by high productivity sectors which, if not nationally unique, remain important strengths and include: **Manufacturing, Digital** and **Creative** industries and **Professional Services**. It is recommended that these sectors are the focus of the Local Industrial Strategy.

Within Health Innovation, particular specialisms emerge in Natural Sciences, Molecular Diagnostics, and Biotechnology/Bioinformatics Sciences, where GVA per worker is almost three times the national average, as well as Digital and Telematics. The experimental analysis has identified links with the broader health and social care sector and this should be developed further in order to future proof the sector and maximise the benefits of technological innovation. There is an opportunity to strengthen the health innovation ecosystem by better co-ordinating research and development and its application and diffusion across the city region for health and economic benefit.

Within Advanced Materials strengths are emerging in Advanced Textiles (including Spinning, Weaving, Finishing and Specialist Products) and Material-Tech (ie Resilience, Coatings, Surface, Testing and Protective). The city region hosts a solid base of research on Light Alloys, Coatings, Graphene, Composites and Materials Science which could point to areas for further specialisation and advantage for the city region's businesses to capitalise upon. The city region is now in a position to learn the lessons from work that has been done to commercialise graphene, capitalise on the investment in facilities which has been made, and develop an appropriate partnership between the Government, the GMCA, universities and the private sector. This should be informed by independent research.

Greater Manchester consistently ranks among the top tier as a home to Creative and Emerging Technology – E-Commerce, Gaming, IoT and Med Tech businesses, as well has having a strong core Digital sector in its own right. The analysis reveals niche strengths in Service Design (E-commerce, Digital Transformation, User Experience), Physical Layer of Digital (ie Data Centres, Storage, Hardware etc) and

Digital Solutions such as Cyber Security, AI, Sensors and Gaming. There is also a very small but identifiable proportion of R&D and manufacturing businesses engaged in Digital. Creating the right conditions and ecosystem for these often small and micro businesses to develop and flourish is essential.

The experimental analysis also indicated that the city region may have a distinctive, albeit currently small, asset base of businesses engaged in **Clean Growth**-related activities around Energy Generation and the Built Environment. This aligns with the city region's wider ambition to be carbon neutral by 2038 and represents an opportunity for Greater Manchester to develop its capabilities further in this area.

Data and intelligence on evolving industry specialisms and innovation opportunities is not straightforward, but it is invaluable. Greater Manchester has drawn on a combination of conventional data alongside experimental analysis to understand better the emerging tech specialisms in the city region. This is a new approach, which provides new perspectives. The approach requires ongoing and regular iterations to refine the analysis and reflect the ever-evolving nature of the local economy.

More work is required particularly by the research community to validate these methods, but this initial analysis has provided some helpful insights to corroborate the city region's headline priorities. It has shed light on some of the sub-sectors where we have real advantage and identified some new areas of possible strength that need to be more deeply analysed fully to understand their full potential.

# Glossary

| | |
|---|---|
| API | Application Programming Interface |
| CAGR | Compound Annual Growth Rate |
| FAME business database | Financial Analysis Made Easy – financial information database of 7 million companies in the UK and Republic of Ireland |
| FDI | Foreign Direct Investment |
| GDP | Gross Domestic Product |
| GEIC | Graphene Engineering and Innovation Centre |
| GM | Greater Manchester |
| GMCA | Greater Manchester Combined Authority |
| GMCVO | Greater Manchester Centre for Voluntary Organisation |
| GM Districts | The ten local authority districts which make-up Greater Manchester: Bolton, Bury, Manchester, Oldham, Rochdale, Salford, Stockport, Tameside, Trafford, Wigan |
| GMS | Greater Manchester Strategy |
| GVA | Gross Value Added |
| H&SC | Health & Social Care |
| IoT | Internet of Things |
| LEP | Local Enterprise Partnership |
| LIS | Greater Manchester Local Industrial Strategy |
| LQ | Location Quotient |
| MIDAS | Manchester Investment Development Agency Service |
| MIER | The Manchester Independent Economic Review (MIER) consisted of a Commission of prominent economists and business leaders, supported by a Policy Advisory Group and Secretariat, with responsibility for commissioning high-quality evidence-based research to inform decision-makers in Manchester. The MIER reports were published in 2009 |
| MSB | Mid-Sized Business |
| NUTS | Nomenclature of Territorial Units for Statistics (NUTS) is a geocode standard by Eurostat for referencing the sub-divisions of the UK and Northern Ireland for statistical purposes |
| OECD | Organisation for Economic Co-operation and Development |
| ONS | Office for National Statistics |
| R&D | Research and Development |
| Regional Centre | Broadly covers Manchester City Centre, inner Salford and Trafford Wharfside. Technical definition includes the Regional Centre planning policy definition used within the Draft Greater Manchester Spatial Framework published October 2016 and the Manchester City Centre definition developed by Manchester City Council. |
| SIA | Greater Manchester and Cheshire East Science and Innovation Audit |
| SME | Small & Medium-sized Enterprises |
| STEM | Science, Technology, Engineering and Mathematics |
| TfGM | Transport for Greater Manchester |
| UK | United Kingdom |