North East
Local Enterprise Partnership

# Advanced Manufacturing – Evidence base

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# 2 Definitions

## 2.1 Defining advanced manufacturing

Advanced manufacturing can be defined in many ways, but typically is regarded as manufacturing that is capital and knowledge intensive, uses a high level of technology, includes elements of service provision, and relies on specialist skills[1]. Advanced manufacturing is often linked to the emergence of 'industry 4.0', a shorthand for how increased connectivity, analytics and automation can be used to accelerate the manufacturing processes[2]. For instance, advanced manufactures often use more embedded technologies and techniques such as statistical methods to improve quality, and therefore typically have higher digital readiness levels[3].

In 2014 the North East LEP's strategic economic plan identified advanced manufacturing as one of four areas of strategic importance for the North East's Economy, with existing regional specialisms in automotive and medicine manufacturing[4].The plan also identified the importance of the region's engineering, research and innovation capabilities which provide underpinning assets for the growth of advanced manufacturing in other sectors such as energy technologies and chemistry.

[1] Renewing industrial regions? Advanced manufacturing and industrial policy in Britain (2021)
[2] Industry 4.0: Reimagining manufacturing operations after COVID-19 (2020)
[3] For example, as defined in BSI PAS1040 (2019)
[4] The North East Strategic Economic Plan (2019)

# 3 Economic Context

## 3.1 The recent history of manufacturing in the North East

The North East has a long and distinguished manufacturing history, benefiting from a geography providing easy access to the sea through the region's rivers and plentiful land suitable for the construction of factories and other infrastructure. This history has been punctuated by significant periods disruption and change, but since the 1980s the region has developed clear specialisms in automotive, pharmaceutical, and offshore energy manufacturing.

The opening of the Nissan manufacturing plant on the former RAF Usworth Aerodrome was a key turning point in the development of a North East automotive cluster. This significant investment against a background of declining employment in manufacturing established the North East as an exporter of automotive vehicles. Nissan has invested a further £3.7 billion in the site since 1984 and continued to produce new car models at the plant, including the electric Nissan LEAF[5].

The significance of the Nissan plant extends beyond its direct impact. The plant supports 27,000 jobs in the regional supply chain[6]. It has also contributed to upskilling the local workforce and building a strategic relationship with Japan, leading to other original equipment manufacturers such as Hitachi and Komatsu to invest in the region too. The plant has provided a key driver on which emerging strengths in related industries such as batteries and energy storage are being built.

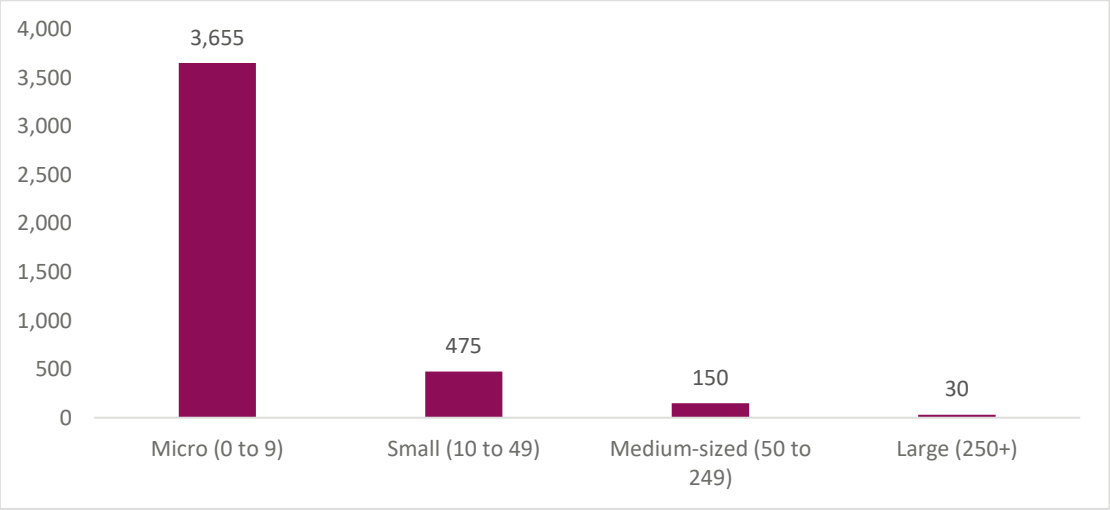
The North East's other longstanding specialism is in pharmaceutical and chemicals manufacturing. Chemical manufacturing has been a significant presence in the wider North East since the development of the Imperial Chemicals Industries plant in Billingham 1920s. The business base in the sector has become more diverse and fragmented over time, but the sector still contributes significantly to employment, skills, and exports through a cluster of pharmaceuticals businesses in the North East LEP area.

These longstanding strengths have been joined by a growing specialisation in offshore and wind power manufacturing. This can be seen as an example of an industry pivoting, first from shipbuilding to the offshore oil and gas boom of the 1970s and 80s, and now to offshore renewables. The approval of several large wind farms off the coast of the North East region, including the Dogger Bank wind farm, has further stimulated the growth of an offshore energy industry. The existence of these regional specialisms provides a strong business base on which North East manufacturing can expand in the future.

Using data from the UK business counts the North East LEP found that in 2021 there were 4,310 enterprises in the advanced manufacturing area across the North East LEP. Advanced manufacturing also employed 64,000 people in 2020[7]. In common with most areas of the economy, most enterprises in advanced manufacturing were SME's (less than 250 employees) with these enterprise accounting for 85% of the total. However, advanced manufacturing also accounts for an above average proportion of the North East LEP's large enterprises. Advanced manufacturing accounted for 8% of all enterprises in the North East LEP area but 15% of large (250+ employees) enterprises in 2021.

[5] North East times, 30 years of Nissan UK - North East Times (2016)
[6] North East times, 30 years of Nissan UK - North East Times (2016)
[7] More detail and the methodology can be found on the North East Evidence Hub (2021)

Figure 1 – North East LEP Advanced manufacturing enterprises by employee size band (2021)

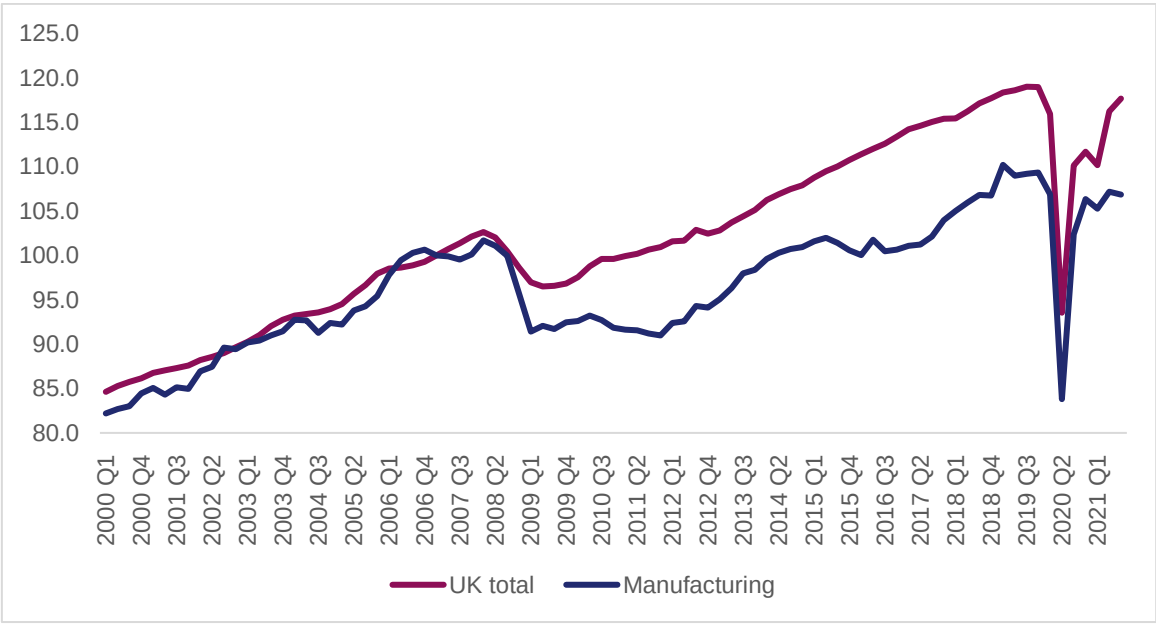



## 3.2 2008/9 recession and 'recovery'

The 2008/9 recession had a substantial impact on the UK's economy and led to significant long-term consequences. Manufacturing was hit especially hard, with sector output falling by 10% between Q1 2008 and Q3 2009, compared to a 6% fall for the whole economy[8].

Manufacturing output recovered much more slowly than the rest of the economy. The UK's overall output had returned to Q1 2007 levels by Q2 2011. Manufacturing did not reach these levels again until three years later in Q2 2014. Prior to the onset of the COVID-19 pandemic in Q4 2019 manufacturing output was still only 9% higher than in Q1 2007 while total UK output was 19% higher.

Figure 2 - Economic output (Gross Value Added), Chained volume, Indexed Q1 2007 = 100




In the North East there is some evidence that lower-level manufacturing was particularly impacted by the 2008 recession. This highlights the importance of advanced manufacturing to regional resilience in the face of economic shocks. Motor vehicles manufacturing in the UK for instance, while initially seeing a greater fall

[8] Source: ONS, Low level aggregates tables (November 2021)

in output that other sectors of manufacturing, grew significantly more quickly than the sector as a whole between 2008 and 2018[9]. This growth was underpinned by both domestic and international demand.

### 3.3 COVID-19

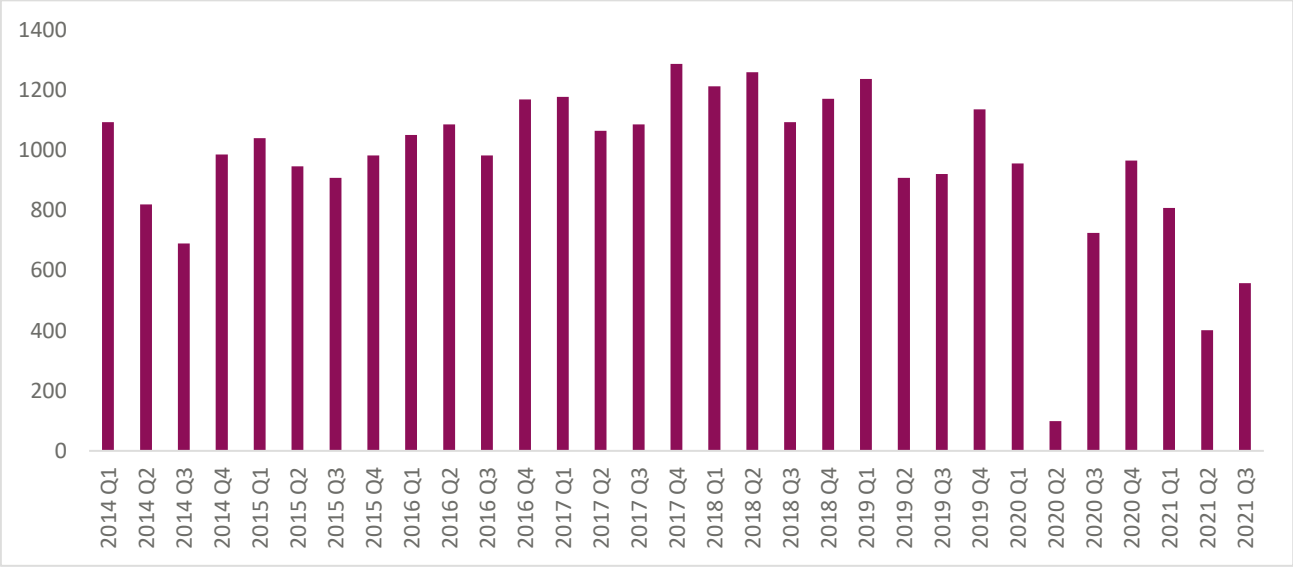
The national and regional economy is currently in the processes of recovering from the unprecedented shock of the COVID-19 pandemic. The onset of the pandemic led to falls in business activity, consumer spending and employment on a scale that has rarely been seen in modern times. By Q4 2020 regional output in the North East was 6.0% below the level seen in Q4 2019[10].

The economy has started to grow again and forecasters generally expect the economy to recover to pre-COVID levels relatively quickly due to the success of the vaccination programme. However, the disruption to employment, skills and supply chains is likely to have significant downstream effects on the regional economy in the future.

Manufacturing in the North East region was not as severely affected by the initial economic shock as some other sectors. Manufacturing output in Q4 2020 was 3.1% below its level in Q4 2019. This was below the North East region total (+6%) but a significantly smaller decrease than some other sectors such as Education (-16%) and Accommodation and food services (-34%)[11].

The 'second round' effects of the pandemic however, still had a significant impact on the sector. At the end of the furlough scheme in September 2021 9% of eligible employments in manufacturing were on furlough in the North East region. This was the third highest of all sectors[12]. The automotive subsector also experienced significant disruption due to a shortage of semi-conductors essential to car production. As a result, the number of cars built in UK factories fell by 27% year-on-year to 37,200 in August[13]. This shortage also had a clear impact on road vehicles exports from the North East which fell from £808 million in Q1 2021 to £401 million in Q2 2022. Skills shortages (particularly in logistics), global material shortages and increases in the costs of shipping are likely to lead to increased shortages in the future[14].

Figure 3 - North East exports of road vehicles (£millions)




While the initial economic shock of COVD-19 may have passed the consequences are likely to affect the trajectory of the sector in the future. Moreover, as was demonstrated by the arrival of Omicron and

[9] ONS, The UK motor vehicle manufacturing industry: 2008 to 2018 (2020)
[10] Our Economy: Insights into the impact of COVID-19 and the EU transition on the North East economy (2021)
[11] Our Economy: Insights into the impact of COVID-19 and the EU transition on the North East economy (2021)
[12] Coronavirus Job Retention Scheme (CJRS) Statistics (2021)
[13] Society of Motor Manufacturers and Traders (2021)
[14] House of Commons Library, UK supply chain problems (2021)

subsequent ‘Plan B’ measures at the end of 2021, the end of the COVID-19 pandemic is likely to be unpredictable rather than a smooth easing of public health measures and return to pre-pandemic norms.

### 3.4 EU-Exit

One of the other significant changes to the broader economic environment has been the UK’s exit from the European Union. The UK formally excited the union on the 31st of January 2020 entering a transition period until the 31st December 2020. On the 1st of January 2021 the UK ceased to be a member of the EU single market and Customs Union, having agreed the UK/EU and EAEC: Trade and Cooperation Agreement in December 2020.

The UK’s exit from the European Union has led to changes to the procedures and regulations underpinning the import and export of goods to the EU. Border controls were introduced in stages to allow businesses the time to adapt. Full customs checks were applied January 2022.

The UK’s exit from the European Union also ended the free movement of workers between the UK and EU. The UK provided the opportunity for EU citizens to apply to the EU settlement scheme, which allowed EU, EAA and Swiss citizens resident in the UK prior to the 31st December 2020 with the opportunity to receive settled or pre-settled status (and therefore remain in the UK). 5,589,000 individuals had been granted settled or pre-settled status by the end of September 2021, including 45,600 in the North East LEP area[15].

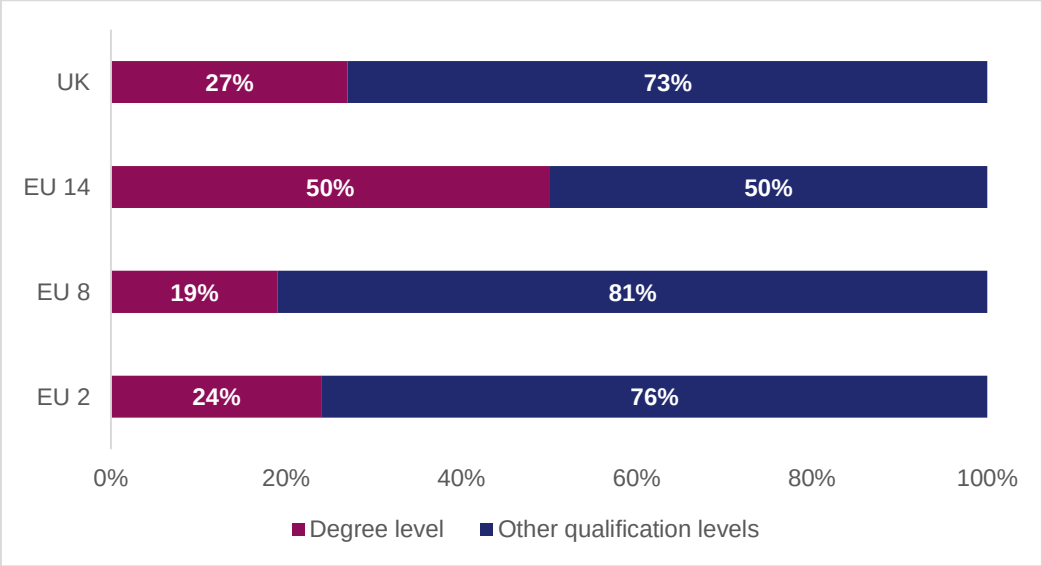
Despite the EU settlement scheme the foreign-born population of the UK appears to have fallen significantly since 2019. In Q3 2020, the estimated foreign-born population of the UK was 8.3 million, down from 9.2 million in the same quarter a year earlier[16]. This was a decline of 894,000 or 10%. The foreign-born population of the North East also fell from 5.6% to 4.5%[17]. The change in the migrant share of the population for the UK appears for both EU and non-EU born groups, with the labour force survey suggesting a 0.9 percentage point decline in the non-EU born population share and a 0.5 percentage point decline for EU citizens[18]. There is a considerable degree of uncertainty surrounding these figures due to changes away from face-to-face data collection due to COVID-19 and the likely overestimate of the UK’s current population. However, anecdotally the trend of reduced numbers of foreign nationals is in accordance with staffing shortages in many sectors.

Manufacturing in the UK is among the sectors with the highest proportion of EU workers, 11% of its workforce was EU born compared to 9% for the UK as a whole[19]. Certain subsectors have even higher proportions, for instance 19% of low-skilled factory and construction and 18% of factory and machine operators were EU born[20]. This suggests manufacturing may be more exposed to labour shortages than some other sectors.

The North East LEP’s own analysis also highlights EU nationals working in UK manufacturing possess different qualification levels to the UK national workforce. While EU nationals working in manufacturing overall are slightly less likely to possess a degree level qualification, those from EU 14 nations are significantly more likely to possess such a qualification. These high skilled workers are crucial for UK manufacturing and EU-Exit has led to uncertainty about their continued residence in the UK.

[15] Home Office, EU Settlement Scheme statistics (2021)
[16] The Migration Observatory, where did all the migrants go? Migration data during the pandemic (2021)
[17] The Migration Observatory, where did all the migrants go? Migration data during the pandemic (2021)
[18] The Migration Observatory, where did all the migrants go? Migration data during the pandemic (2021)
[19] The Migration Observatory, migrants in the UK Labour Market: An Overview (2021)
[20] The Migration Observatory, migrants in the UK Labour Market: An Overview (2021)

Figure 4 - UK manufacturing workforce by qualification level and nationality (Jan18-Dec 2020)[21]




In the short run EU-Exit provided a significant positive stimulus to UK manufacturing. Manufacturing output increased 3% between Q4 2018 and Q1 2019, the largest % increase in GVA since 1999[22]. This is generally thought to be in response to stockpiling of goods prior to the UK's exit.[23]

The longer-term impact economic impact of EU-Exit has been more difficult to measure because of the concurrent onset of the COVID-19 pandemic. However, qualitative research undertaken for the North East LEP's report on the impact of COVID-19 and EU-Exit identified a series of challenges and opportunities for business in the region[24]. This includes business in the wider manufacturing sector.

Other manufacturing (including automotive manufacturing) was identified as one of the sectors that relied heavily on trading with the EU. Many businesses that relied heavily on trading with the EU have faced additional costs and delays while transitioning to the new administrative systems. The impact, however, has varied widely by firm. Large firms that had the resources to adapt to the new regime have adjusted to the new system and are now operating largely as normal. Smaller firms have experienced much greater disruption, and many have ceased trading with the EU.

On the other hand, some manufacturing firms have been using EU-Exit as an opportunity to re-shore activity in the UK, potentially leading to greater employment opportunities in the region. MAKE UK feedback suggests that up to a quarter of manufacturing businesses intend to re-shore activity back to the UK to address weaknesses in their global supply chains, as well as to increase production and protect jobs and skills domestically. Many firms in the manufacturing sector have also identified opportunities in markets beyond the EU because of EU-Exit. Firms have suggested there may be opportunities to grow exports to Australia, Asia-Pacific and South America. It is worth noting however, that the Office for Budget Responsibility's long-term projections for UK exports suggests that UK exports will be 15% lower in the long run than if the UK had remained in the EU. They also suggest new trade agreements will have little significant impact due to the UK already having substantial agreements with non-EU partners under the EU's existing trade agreements[25].

The consequences of EU-Exit are still to be fully realised due to many subsections of the EU-UK free trade agreement still being subject to final confirmation[26]. One of the most significant of these is the Northern Ireland protocol. Currently the protocol avoids the need for a customs border on the island of Ireland by leaving Northern Ireland within the EU's customs territory and single market for goods, but consequently this requires a customs border within the Irish sea which has proven disruptive to internal UK trade[27]. The

[21] Annual population survey, three-year aggregate data, respondents who selected manufacturing as primary industry of employment
[22] Source: ONS, Low level aggregates tables (November 2021)
[23] Manufacturing: statistics and policy (2020)
[24] Our Economy: Insights into the impact of COVID-19 and the EU transition on the North East economy (2021)
[25] Office for budget responsibility, Brexit analysis (2021)
[26] UK in a changing Europe, Manufacturing after Brexit (2022)
[27] Centre for European Reform, EU-UK Relations: there is no steady state (2021)

UK wishes to renegotiate the current assumption that goods entering Northern Ireland are EU bound unless this can be proven otherwise and remove the European Court of Justice from the protocol, which could lead to the UK triggering the protocol's safeguard clause[28]. These future negotiations could lead to EU trade through Northern Ireland being further disrupted.

Other areas outstanding could have a particular impact on advanced manufacturing. For instance, the UK has retained for itself the right to diverge from REACH, the EU legislation on the regulation of chemicals in the EU[29]. Currently the UK has copied over the existing legislation meaning the respective regulatory systems are closely aligned, but any future divergence could lead to additional costs for UK based manufactures, particularly as chemical supply chains are complex and often cross the UK-EU border several times.

In addition, while the UK/EU free trade agreement allows for tariff free trade of goods between the UK and the EU, this is subject to rules of origin requirements[30]. These requirements mean that a certain percentage of the value of the goods traded must be from either the UK or the EU. Most UK goods meet these requirements but some currently rely heavily on imports from beyond Europe. The batteries in electric vehicles for instance are typically imported from Asia. While currently the existing agreements contain a special provision for electric vehicles which allows a lower required portion of the value to be from the UK/EU this is set to revert to the higher standards in the next few years. If the UK is unable to manufacture a greater portion of these batteries in the UK this could lead to a tariff of up to 10% being applied to electric vehicles exports, which as production increasingly moves to electric vehicles could have a significant impact on the overall cost for UK manufacturers[31].

[28] Centre for European Reform, EU-UK Relations: there is no steady state (2021)
[29] House of Commons library, End of Brexit transition: chemical regulation (2021)
[30] UK in a changing Europe, Manufacturing after Brexit (2022)
[31] UK in a changing Europe, Manufacturing after Brexit (2022)

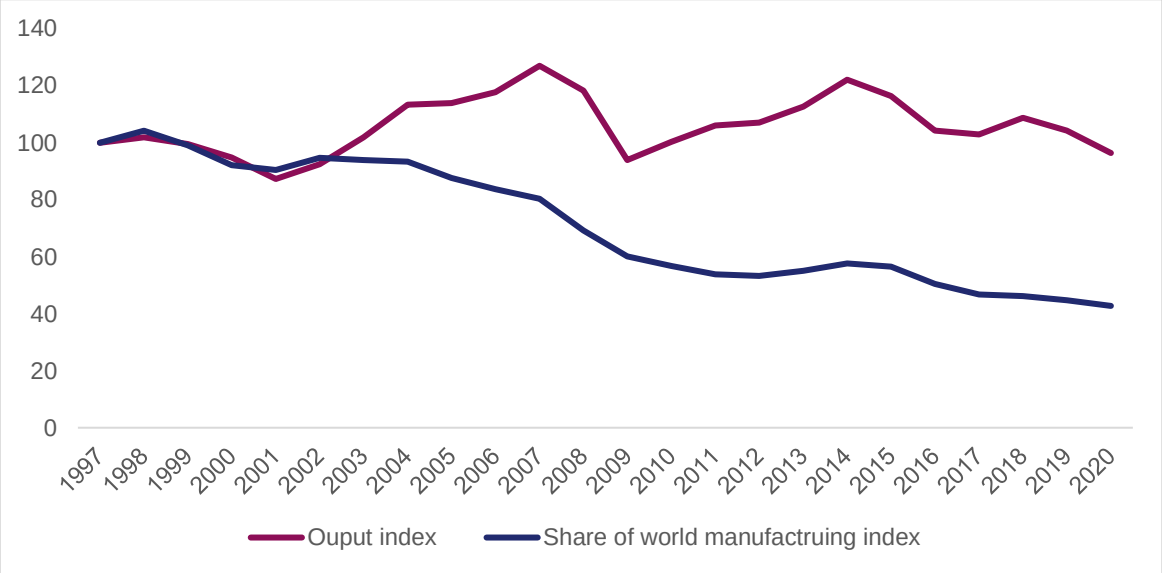
# 4 Trends in manufacturing

## 4.1 International competition

When the UK entered the industrial revolution in the 1800s it essentially had a monopoly on large scale manufacturing. Since then, the UK has steadily faced greater competition from other nations as they also industrialised. This process has continued with the spread of globalisation as developing nations gradually advance through the value chain. The UK no longer only faces competition from other developed nations but increasingly the developing world too and therefore needs to actively seek a competitive advantage.

This international competition can be seen in the UK's share of world manufacturing output. Despite the UK's output being 96% of 1997 levels in 2020, the UK's share of world output had more than halved from 3.9% to 1.7%[32].

Figure 5 - UK manufacturing output and world share indexes (1997 = 100)




## 4.2 Digitalisation

The development and improvement of digital and related technologies is expected to change manufacturing production significantly. In particular, the potential of big data, artificial intelligence, and the ability to link products and machines through the internet of things presents an opportunity for firms redesign their entire manufacturing process. Such a redesign will allow manufacturing to become more responsive and personalised. Digitalisation could also potentially shift manufacturing towards a circular economy where outputs can be reused and inputs are more sustainable[33].

There are significant opportunities available to firms and economies that embrace digitalisation. One report from KPMG and the Society of Motor Manufacturers and Traders found that the automotive sector could potentially gain £6.9bn every year between 2017-2035 by fully embracing digitisation, while the cumulative total benefit to the economy could be £74bn by 2035[34].

In 2019 the North East LEP published a science and innovation audit identifying the ways which the North East can prepare for the integration of digital technologies in advanced manufacturing. The audit found that the North East has a strong range of regional assets in both digital and manufacturing[35]. It also highlighted there are some good examples of networks working to integrate digital and manufacturing technologies (such as the Northern Accelerator). However, the audit highlighted limits in terms of the awareness of

[32] World bank, Manufacturing - value added (current US$), LEP calculations (2020)
[33] The Future of Manufacturing: A new era of opportunity and challenge for the UK Project Report (2013)
[34] The Digitalisation of the UK Automotive Industry (2017)
[35] Applied digital technologies in North East advanced manufacturing (2019)

digital technologies, skills and training, facilities and networks and business support as key gaps in the existing regional ecosystem[36]. Overcoming these gaps will be crucial in ensuring the North East capitalises on the opportunities presented by digitalisation.

The Made Smarter review in 2017 has also highlighted that uptake of digital technologies is generally poor among SMEs[37]. As most manufacturing firms in the North East LEP area are SME's, improving digital take-up among these firms will be important for increasing regional productivity.

## 4.3 Automation

Related to digitalisation, technological advances in robotics and additive manufacturing (3D printing) mean there are also increased opportunities for manufacturing to take advantage of automation. Such automation is likely to render many routine operations in manufacturing obsolete. Benefits of successful automation can include lower production and assembly costs, better product quality, and increased resource and energy efficiency. It can also allow the UK to compete effectively in an increasingly competitive global environment despite having higher labour costs than many developing nations.

The UK has been relatively slow to adopt robotics in manufacturing compared to some other developed countries. In 2015, UK manufacturing used 71 robots per 10,000 employees, compared with 176 in the US, 301 in Germany and 531 in South Korea, according to the International Federation of Robotics[38]. This is partially due to a greater proportion of UK manufacturing being focussed on food and drink, but it may also mean UK manufacturing is missing opportunities to invest in robotics capabilities.

More recently cobots have become a feature of manufacturing in addition to tradition industrial robots. Traditional industrial robots are designed to complete a specific pre-defined task within a physical workspace. Cobots in contrast are designed to physically interact and collaborate, safely, with humans in a shared workspace. Such robots can substantially increase productivity. According to the market research report Collaborative Robots Market, the cobot market is expected to be worth $4.28 billion by 2023, growing at a CAGR of 56.94% between 2017 and 2023[39]. Due to lower costs these newer cobots are often more attractive to SME's than industrial robots, which is significant as most manufacturing enterprise in the North East LEP are SME's.

## 4.4 Skilled job opportunities

The introduction of these new digital and automotive capabilities is changing the skill profile required for manufacturing. A recent study by KMPG on the preparedness for the UK manufacturing industry to respond to the opportunities associated with digitisation and automation found that increasing the skill level of the workforce was the number one priority in terms of boosting productivity[40]. Their findings highlighted an increasing gap between the number of STEM qualifications required and those existing in the workforce. Fully embracing the opportunities available within the advanced manufacturing sector will required a suitably skilled workforce.

Forecasts from the UK Commission for Employment and Skills in 2016 predicted that the manufacturing sector in the North East would require 19,200 new staff over the period between 2014 and 2024[41]. The vast majority of these are highly skilled roles, with the need for 2,800 managers, directors, and senior officials, 3,300 professionals and 3,100 in associate professional and technical roles. 13,000 of these roles were predicted to require at least an undergraduate degree too, while the number of roles for those with no qualifications was to decrease by 2,900 from 8,100 in 2014.

The results from the North East LEPs health and life sciences (including pharma) skills survey in December 2020 also highlighted that digital and technical skills were likely to become more important for the sector over the next 5 to 10 years[42].

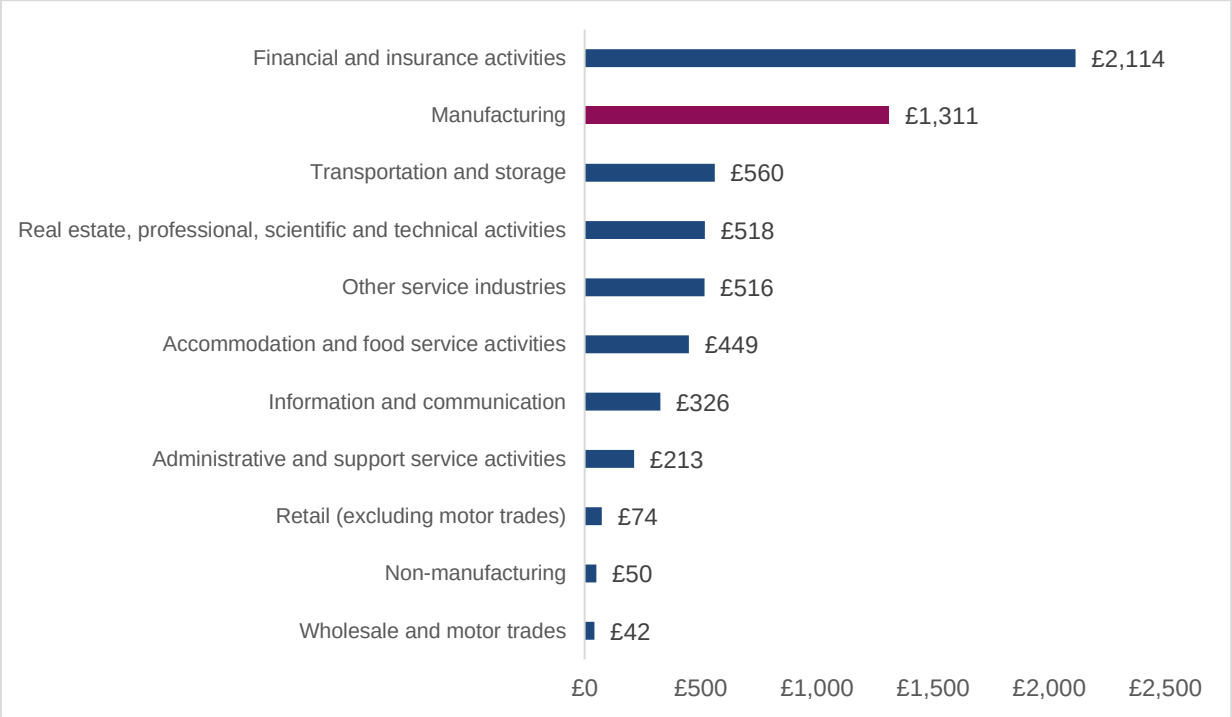
[36] Applied digital technologies in North East advanced manufacturing (2019)
[37] Made smarter review (2017)
[38] Manufacturing: statistics and policy (2020)
[39] Essentra components, Industry 4.0: Rise of the cobots? (2020)
[40] Rethink manufacturing: Designing a UK industrial strategy for the age of Industry 4.0 (2017)
[41] Applied digital technologies in North East advanced manufacturing (2019)
[42] Health and life sciences skills report (2020)

## 4.5 Servicization

In response to greater competition from abroad manufacturing firms are increasingly integrating their product and service offerings. For example, 39% of UK manufacturers with more than 100 employees derived value from services related to their products in 2011, compared with 24% in 2007[43]. By combining service offerings with their manufacturing output firms can leverage their skills and expertise, derived from a higher position in the manufacturing value chain. Effective servicization however, often requires a strong degree of digitisation and automation to adapt to customer demands in an agile fashion, reinforcing the trend of increased digitisation and automation described above[44].

Regional service exports data suggests that the North East manufacturing sector is already embracing Servicization. In 2019 the North East exported £1.3 billion of manufacturing services. This was an increase of £368 million from 2018[45]. Manufacturing was also the second largest industry grouping in service exports accounting for 21% of the North East total. In contrast manufacturing service exports accounted for only 8% of service exports from England excluding London.

Figure 6 - Service exports from the North East region (£Millions - 2019)




## 4.6 An ageing workforce

The manufacturing workforce in the UK is significantly older than the population average. In the North East, many of those recruited into the automotive industry in the 1980s (when the Nissan Plant in Sunderland first opened) are now reaching the end of their careers[46]. The UK Commission for Employment and Skills predicted in 2016 that 35,300 workers will have left the North East manufacturing workforce over the period between 2014 and 2024 (due to retirements and leaving the sector)[47]. There is a need to replace these highly skilled workers, but fewer young adults are entering the sector than previously. There is a potentially a risk of a concentration of retirements in the sector leaving the industry with an abrupt skills shortage.

[43] Future of manufacturing: a new era of opportunity and challenge for the UK - summary report (2013)
[44] Servitization: The Changing Face of Manufacturing and Service (2017)
[45] ONS: Subnational trade in services (2019)
[46] Workforce Development - Advanced Manufacturing (2019)
[47] Applied digital technologies in North East advanced manufacturing (2019)

These problems are compounded by the ageing of the UK's workforce, which combined with a trend of young adults spending more time in education means there are generally few younger workers available. Recent falls in net-migration and the UK's exit from the European Union may also mean that there is less opportunity to recruit from abroad.

# 5 Emerging policy areas

## 5.1 Net Zero

Net Zero is a key part of the UK government's agenda having brought forward legislation in 2019 committing to Net Zero by 2050. In 2021 the UK also held the presidency to the 26th Conference of the Parties (COP26) in Glasgow and released its Net Zero strategy 'Build Back Greener'. This latter document outlines how the Government intends to fulfil its commitment to reaching Net Zero.

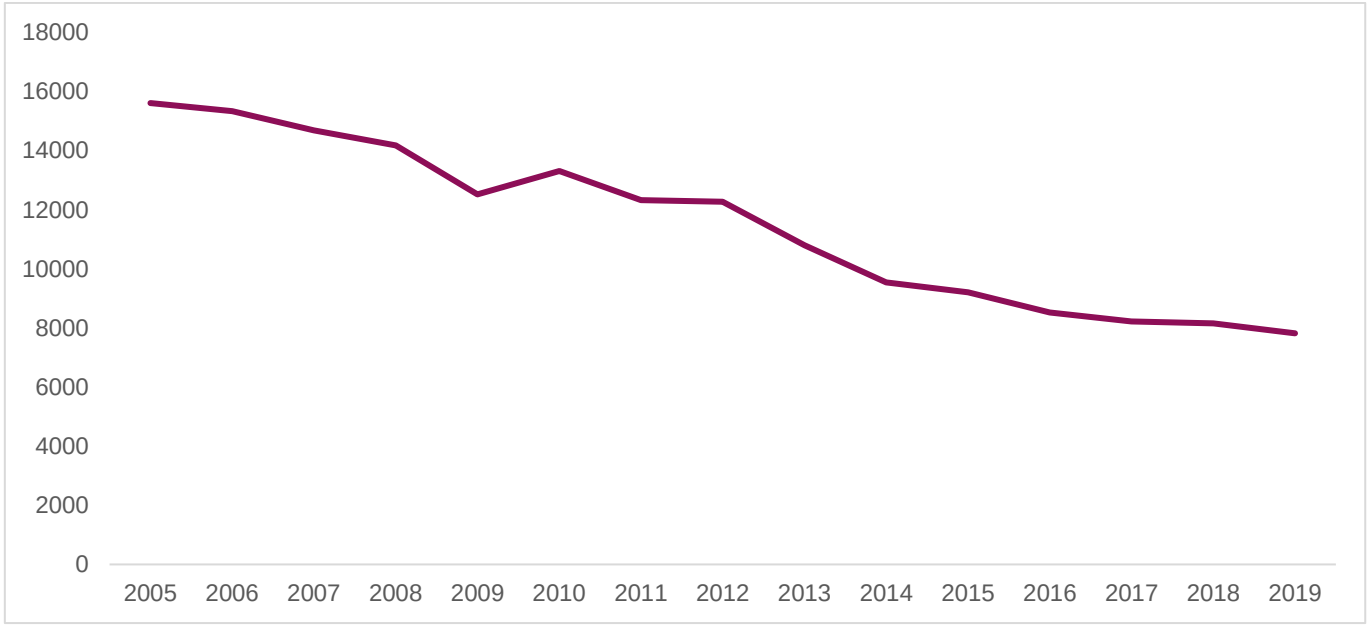
This will have a significant impact on the manufacturing sector. According to the latest data, manufacturing and construction is the third most polluting industry in the UK, responsible for 18% of UK Greenhouse gas emissions in 2020[48]. While total emissions from the industry have reduced over the last five years, this means the industry still needs to adapt significantly to reach Net Zero.

The national drive to Net Zero will also have a significant impact on demand for manufacturing products. For instance, as part of the Net Zero strategy the Government has committed to ending the sale of new petrol and diesel cars by 2030, as well as committing to ensuring all cars must be fully zero emissions capable by 2035. This has large implications for the existing automotive industry, one of the largest employers in both the manufacturing sector and in the North East LEP.

Adapting to Net Zero will also bring opportunities to the sector, particularly within the advanced manufacturing subsector. MAKE UK has identified the drive to Net Zero as an opportunity to develop and manufacture new products and services, including but not limited to electric vehicles and batteries, wind turbines and hydrogen infrastructure and related products[49]. A key challenge for the industry will be to take advantage of these emerging areas whilst also adapting manufacturing process such that they are compatible with Net Zero targets.

The North East region is in a strong position relative to its regional comparators in the drive to Net Zero, although there is still considerable further progress required. Excluding externalities emissions from the North East LEP have already halved between 2005 and 2019. This leaves annual emissions of 7,817 kt of $CO_2$ for the North East LEP region (2% of the UK total), with the North East LEP also having lower per-capita emissions than England excluding London. The proportion of emissions from industry in the North East LEP has fallen from 33% in 2005 to 16% in 2019[50].

Figure 7 – North East LEP territorial emissions kt $CO_2$ (2005-2019)[51]




[48] Manufacturing Sector Net Zero Roadmap (2021)
[49] Manufacturing Sector Net Zero Roadmap (2021)
[50] Excluding negative emissions from Land use, land use forestry change and forestry sector
[51] BIES, Local authority annual CO2 estimates (2019)

## 5.2 Levelling-up

A further key policy area for the UK Government is Levelling-up. Prior to the pandemic this was one of the Government's flagship policies and it is now positioned as the key to 'building back better'. Levelling-up is a broad agenda and at the time of writing the key metrics for defining levelling-up have yet to be published (a white-paper is expected in early 2022). However, previous speeches and policy announcements have covered addressing geographic inequalities, growing and increasing productivity, and restoring pride in local areas.

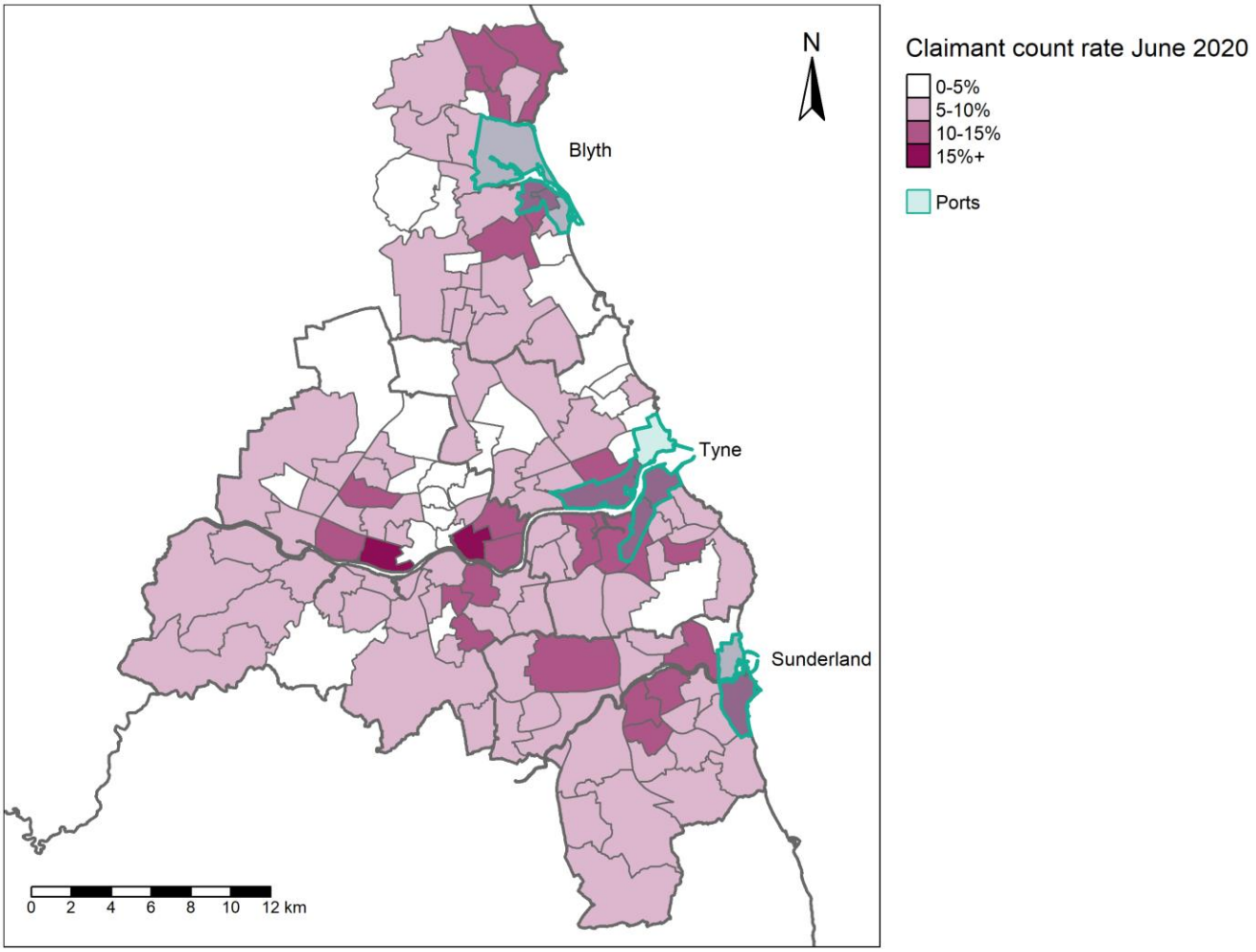
Growth in the advanced manufacturing sector can contribute to achieving these policy objectives across the North East LEP. The sector already makes a key contribution to regional employment, with 64,000 individuals in employment in the sector across the North East LEP in 2020[52]. Sub-sectors within advanced manufacturing are also considered highly productive. For example, both Electrical Equipment and Motor Vehicles Manufacturing are highly productive and employ 3,500 and 12,900 people in the North East LEP respectively[53]. These subsectors are also well positioned for future growth and due to anticipated increases in global demand. The global electric vehicle market alone is predicted to grow at a CAGR 22.6% between 21-25[54].

Employment opportunities in advanced manufacturing are located in some of the more deprived areas of the North East LEP. The sector therefore contributes to the policy objective of reducing geographical inequalities. For example, the major employer in the sector, Nissan, is located in Sunderland, which of the 316 local authorities in England (excluding the Isles of Scilly) is the 23rd most income-deprived[55]. Future growth in the sector, building on an existing skills base and ecosystem, can potentially further increase employment in relatively deprived parts of the country. The 21 sites across the North East Enterprise Zone, which enterprises in advanced manufacturing can benefit from, further help ensure that employment opportunities are distributed across the North East LEP area.

Growth in exports also disproportionally impacts deprived and disadvantaged neighbourhoods. The wards adjacent to the region's ports are amongst the most disadvantaged in the region. As manufacturing products tend to be exported through ports these wards are more likely to benefit from growth in the sector. Growth in the advanced manufacturing sector is therefore likely to reduce regional inequalities through growing regional supply chains.

[52] Business register and employment survey, North East LEP analysis (2020)
[53] Economic markets insight report (TBC)
[54] Economic markets insight report (TBC)
[55] ONS Exploring local income deprivation (2021)

Figure 8 - Claimant count rate by Ward and North East LEP ports (June 2020)[56]




Advanced manufacturing can also contribute to the Levelling-up agenda through its contribution to pride in place across the North East. Manufacturing has a long and distinguished history across the North East, which is reflected in positive public attitudes towards the sector and related industries[57]. The growth and development of the sector can build on this heritage and contribute to regional pride.

## 5.3 Re-shoring production and supply chains

The COVID-19 pandemic has illustrated the advantages of possessing significant domestic manufacturing capability whilst also exposing the risks associated with relying on external markets for key products. For instance, during the early stages of the pandemic, the Ventilator Challenge UK consortium was established to accelerate the production of medical ventilators[58]. This consortium consisted of significant UK industrial, technology and engineering businesses from across the aerospace, automotive and medical sectors. Approximately 14,000 devices were produced in around three months, accounting for over a half of all the ventilators available to the NHS frontline in July 2020[59]. The shifting of production at pace to critical products is indicative of the strength of the UK manufacturing sector and the strategic benefits this strength can provide.

At the same time demand for medical and personal protective equipment exceed supply during the pandemic, while sectors across manufacturing experienced supply chain disruption. The British Generic Manufactures association for instance has highlighted that approximately 20-25% of UK generic medicines

[56] NOMIS, Claimant count (2020)
[57] Review of Sectors, Competencies and Assets to inform development of the North East Local Industrial Strategy (2019 – Available on request)
[58] Ventilator Challenge UK (2020)
[59] Cabinet Office, Ventilator Challenge hailed a success as UK production finishes (2020)

are manufactured in the UK, 40-45% in the EU, and 30-35% in India[60]. While this global supply chain held up relatively well during the pandemic the margins were tight. The Generic Manufactures Association has called for a strategic approach to ensuring the future supply of generic medicines, particularly for products deemed high risk in the event of a future pandemic.

Beyond COVID-19 there is also a growing awareness of the instability of some key trade routes. For instance, in March 2021 the Ever Given container ship was grounded within the Suez canal for six days. This led to 369 ships in a tailback waiting to pass through the 193km canal on either side of the blockage, and it was estimated that the closure of the Suez canal could cost global trade between $6bn to $10bn a week and reduce annual trade growth by 0.2 to 0.4 percentage points[61]. There are also concerns that the risk of piracy, already costing the world economy $12 billion a year, may have become more acute due to COVID-19[62].

While support for reshoring is not universal across the manufacturing sector a significant minority of manufacturing firms intend to re-shore at least some of their production. 37% of surveyed manufacturing firms in 2019 claimed to be planning to move previously offshored processes back to the UK[63]. MAKE UK also found that up to quarter of manufacturing firms intend to re-shore manufacturing capability[64].

## 5.4 Internationalisation

A further element of the UK government's policy agenda is to increase the value of the UK's exports. Made in the UK, Sold to the World was released in November 2021 and is a refresh of the UK's previous 2018 trade strategy[65]. The ambition of the strategy is to reach £1 trillion exports annually before the current projections which suggest that milestone will be reached in the mid-2030s. It notes that exports are key to driving increased capacity in sectors crucial to the success of the Net Zero strategy.

The new trade strategy also focuses on increasing exports in strategic sectors to maximise the UK's competitive advantage. This includes sectors in which the UK is already a world leader, such as clean economy, and sectors of national significance, such as shipbuilding.

The strategy is to be supported through a 12-point plan for action. A key aspect of this plan includes the opening of new markets to UK exports through new trade deals, with the ambition to have these cover 80% of UK trade by the end of 2022. This includes trade deals that have been reached in principle with Australia and New Zealand and the ambition to ascend to the CPTPP, one of the largest free trade areas in the world covering Asia pacific and the Americas. The Government also announced the beginning of free trade negotiations with India in January 2022 with an aim to conclude an agreement by the end of the year[66]. These future agreements are focussed on the Asia-Pacific region as the Government believes future world growth will be driven by markets in this area.

The wider North East region has a significant opportunity to capitalise on this strategy. The North East already has a high exports per head compared to the rest of England. Specific aspects of government policy are also likely to create opportunities for the North East region. This includes the creation of the Tee's valley free port, officially opened in October 2021. This low-tax customs zone is expected to provide a £3.2billion boost to the local economy over the next five years[67]. The Government has also opened a second DIT headquarters in Darlington, providing close proximity to the DIT for regional exporters. The opportunities provided by this infrastructure on the North East's LEP's doorstep have the potential to significantly increase the exporting capability of the North East LEP's advanced manufacturing sector.

The North East LEP is also actively working with partners across the region to increase North East exports, having published a new trade and exports strategy in June 2021. This strategy highlighted opportunities to build on existing high levels of exports, the trend of increasing global service exports and the growing digital transformation of manufacturing. Advanced manufacturing, offshore energy and subsea technologies and

[60] British Generic manufactures association, Generic industry supply chain resilience post-COVID-19 (2020)
[61] BBC, The cost of the Suez Canal blockage (2021)
[62] Insurance Information Institute - Piracy is still a risk, the pandemic hasn't helped (2021)
[63] Business in Britain: Manufacturing (2019)
[64] Our Economy: Insights into the impact of COVID-19 and the EU transition on the North East economy (2021)
[65] Department for International Trade – Made in the UK, sold to the world (2021)
[66] DIT, UK launches India negotiations to kick off 5-star year of trade (2022)
[67] ITV, Open for business: Teesside Freeport is officially in operation (2021)

healthcare and pharmaceuticals were also all highlighted as sectors with existing and future exports potential.

## 5.5 Innovation

Underpinning the Government's ambitions with respect to building back better, net zero and internationalisation is their innovation strategy. This strategy highlights successful innovation in the private sector is an essential part of the UK's future prosperity and therefore essential to achieving the UK's other objectives. The innovation strategy was released in July 2021 and states that the Government's objective is to make the UK a global hub for innovation by 2035[68]. To achieve this the strategy outlines a series of key actions, grouped into four pillars, unleashing businesses, people, institutions & places, and missions & technologies.

The innovation strategy commits to not just designing innovative products in the UK but also manufacturing them domestically. This can reduce the delay between innovation and product launch, realising the gains from innovation more rapidly. It also ensures the resilience of key sectors such as health and life sciences in accordance with the reshoring agenda outlined above. The development of advanced manufacturing is therefore key to underpinning successful innovation.

Advanced manufacturing in the North East possesses considerable regional assets that can accelerate innovation and contribute to the wider innovation agenda. For example, the North East is home to the Centre for Process Innovation (CPI). The CPI helps companies develop and scale-new innovative products by providing access to valuable expertise and networks, and currently has over 550 staff and five sites across the North East of England.

The automotive & advanced practice group (AMAP) hosted by the University of Sunderland is another important regional innovation asset. Offering business support to advanced manufactures across the region, AMAP aims to inform, inspire, and innovate in advanced manufacturing through the application of research and knowledge. They are also responsible for hosting the Sustainable Advanced Manufacturing project, a £10.9m project to support product and processes development within the SME manufacturing base in the North East funded by the European Union Regional Development Fund.

These significant regional innovation assets, along with the further assets outlined in the next section, mean that advanced manufacturing in the North East is well positioned to contribute the Government's goal of making the UK a global hub for innovation by 2035.

[68] BIES, UK Innovation Strategy (2021)

# 6 Existing regional asset base

## 6.1 Infrastructure

- **Port connections** – The North East LEP benefits from containing several ports, including the Port of Blyth, the Port of Tyne and the Port of Sunderland. The LEP area also has easy access to the new free port in the Tees Valley. Together these ports provide convenient access to global markets for North East based firms and in 2020 alone 19 million tonnes of goods were exported out through these ports[69].
- **North East Enterprise Zone** – The advanced manufacturing sector in the North East LEP is further able to take advantage of the 21 sites across the North East Enterprise Zone. These sites provide either business rates discounts or enhanced capital allowances which can allow firms in the North East LEP to gain a competitive advantage. The sites were strategically selected to build on existing strengths across the North East LEP's economy, including the existing advanced manufacturing business base**.** They are also dispersed widely across the North East LEP areas allowing businesses across the whole region to benefit from the available opportunities.
    - **International Advanced Manufacturing Park** – One of the 21 sites in the North East Enterprise Zone, the first phase of developing the International Advanced Manufacturing Park concluded in November 2020. Major manufacturing companies such as SNOP UK, Faltec and Envision AESC have already committed to the site, while phase two of the development is due to add a further 221,997 sq m floor space. The park aims to have created 7,000 new jobs by 2030[70].
    - **The A19 Corridor** – Also one of 21 sites in the North East Enterprise Zone, this was the UK's first designated area for Ultra Low Carbon Vehicles. Near to the UK home of Nissan and a global automotive supply chain, this site has a focus on low carbon vehicles and advanced manufacturing.
- **Logistics and public transport** – Beyond the port connections the North East LEP also benefits from a substantial logistics and public transport infrastructure. In 2020 alone 47 million tonnes of goods were lifted by road freight from the North East region[71]. The North East also benefits from the Tyne and Wear metro, one of the most extensive light rail systems outside of London which supported 33 million passenger journeys in 2019/2020[72]. This logistical and transport capacity ensures that goods can be delivered to market and the employees can access employment opportunities across the North East.

## 6.2 Enabling sectors

- **Strong and diverse university sector** – The North East LEP is home to four universities, Newcastle, Northumberland, Sunderland, and Durham. These universities are a critical source of skills for the region, including the advanced manufacturing sector. In the 2019/2020 5,990 students enrolled in engineering and technology degrees in the North East LEP. The universities also play a critical role in conducting and organising relevant research efforts. Newcastle university has a particular strength in engineering technology research, while Sunderland

[69] DFT, Port freight statistics (2020)
[70] Sunderland Echo (2021)
[71] DFT, Road freight statistics (2020)
[72] DFT, Light rail and Tram statistics (2019/2020)

university is responsible for managing the Sustainable Advanced Manufacturing Project (see below).

- **Technical and further education providers** – There are nine further education colleges in the North East LEP area, providing critical technical education and further learning opportunities. These colleges are brought together through the North East LEP area College Hub which brokers strategic employer partnerships with further education institutions. Previous analysis from the North East LEP has highlighted a strength in engineering and manufacturing technology in the region's further education sector. In 2020/21 1,650 students started Engineering and Manufacturing Technologies apprenticeships in the North East LEP area[73].
- **Financial, professional and business services** – The North East LEP has a substantial financial, professional and business services sector. This includes the headquarters of established brands such Virgin Money and Newcastle Building Society, and new and innovative companies such as Atom Bank, World Pay, True Potential, Wire Card and Scott Logic. The major presence of this sector provides manufacturing firms in the region with access to financial and business support services that are key for supporting growth. The expertise of the sector can also assist manufacturing firms embrace the growth of servicization.
- **Digital** – The North East LEP is home to a growing digital sector, with the number of firms in the sector having grown 295 between 2015 and 2021 and reaching a total of 2,680 in 2021. The North East has existing specialisms in software, cloud computing, communications, buildings information modelling, and gaming, in addition to emerging specialisms in data analytics, immersive technologies and cybersecurity. With digitalisation set to reshape the future of advanced manufacturing the presence of an innovative digital sector in the North East is a major asset.
- **Construction** – Construction is also a strong contributor to the North East economy, with the North East benefiting from several midsized construction firms. While construction sector faces its own challenges, particularly in terms of skills, the presence of these midsized construction firms provides advanced manufacturing enterprises with the opportunity to expand existing production sites.

## 6.3 Networks and advocacy organisations

- **The North East Automotive Alliance** – Is an industry-led cluster group that supports the sustainable growth and competitiveness of the automotive sector in the North East. The largest automotive cluster group in the UK with over 300 participants, the NEAA explores topics including advanced propulsion and energy.
- **Advanced Manufacturing Forum** – Is a membership network that connects manufacturers and engineers across the North East. It provides support to drive sustainable growth, innovation, best practice and collaboration amongst its members.
- **Pharma North East** – Pharma North East advocates on behalf of and supports North East based pharmaceuticals companies. It does so through developing and communicating information about North East pharmaceuticals, ensuring the long-term supply of skills, and developing and securing the national and global supply chain.
- **Bionow** – Is a membership organisation supporting the biomedical, pharma and life sciences sectors across the North of England. They provide a range of specialist business support services, including a procurement support scheme and accelerator programme designed to help businesses scale.
- **North East Process Industries Cluster** – Is a not-for-profit membership organisation supporting the chemical processing sector in the North East of England. The cluster actively engages with the entire chemicals value chain to help drive the regional economy.

[73] ONS, Apprenticeships and traineeships (2021)

- **MAKE UK** – Make UK are a national membership organisation aiming to create an environment in which UK manufacturing can thrive. They do this by championing issues important to their members and offering a range of business support and advice services. MAKE UK has a dedicated Northern Make UK membership and external affairs team.
- **Engineering and Manufacturing Network** – The Engineering and Manufacturing Network offers companies across the engineering and manufacturing industries expert support and assistance so that they can realise their full potential.
- **NOF** – Are a business development organisation helping to make valuable connections between businesses in the global energy sector. They work to connect companies with the best and most innovative supply chain businesses in the UK.

## 6.4 Innovation and business support

- **Centre for Process Innovation** – Part of the High Value Manufacturing Catapult and headquartered in the North East, the Centre for Process Innovation (CPI) helps companies develop and scale new products and processes. This includes companies operating in the pharmaceutical, automotive and chemical sub-sectors. They have a team of over 550 scientists, engineers, and business specialists who can helping companies to develop, prove and commercialise new products and processes.
    - **National Formulation Centre** – One of the sites in the CPI, the National Formulation Centre offers tailored solutions for developing and optimising liquid and powder formulations, nanomaterials, composites, chemical processes and new technologies. The site provides state of the art facilities and skilled personal who can help local enterprises develop solutions to their product needs.
    - **The National Printable Electronics Centre** – Is a further site in the CPI that accelerates the commercialisation of printed and flexible electronics. By providing an environment where companies can test and develop concepts the centre supports innovators through the challenges of scaling products and process.
- **Centre of Excellence for Sustainable Advanced Manufacturing** – Is an innovation centre that supports innovation and knowledge transfer in the advanced manufacturing sector.
- **Made Smarter programme** – The Made Smarter programme supports businesses to get to market faster, cut costs and reduce downtime. It does so by helping businesses invest in digital tools, innovations and skills. Support through the Made Smarter programme in the North East LEP is available via the North East Growth Hub.
- **Automotive & advanced practice group (AMAP)** – Hosted by the University of Sunderland AMAP aims to inform, inspire and innovate in advanced manufacturing through the application of research and knowledge. They offer support to local businesses by sharing contacts and best practice, providing training, and undertaking research.
    - **Sustainable Advanced Manufacturing Project** – Is a £10.9m project to support product and processes development within the SME manufacturing base in the North East**.** The project is a collaboration between the European Regional Development Fund and the University of Sunderland and is managed by Sunderland University through AMAP.
- **North East Centre of Excellence in Satellite Applications** – The Centre helps businesses to exploit the use of satellite data, technology and applications to gain a competitive advantage in a global market. The Centre works with both organisations that are currently in the space sector but also those that have potential to operate in the sector but have not yet investigated the opportunities.
- **The Robotics and Autonomous Systems Test Site** – Part of the Offshore Renewable Energy (ORE) Catapult this new testing site for emerging robotics technology is the first of its kind in the UK. The site was awarded £3 million from the government's Getting Building Fund in February 2021.

- **Innovation Supernetwork** – The Innovation Supernetwork aims to help North East businesses bring innovative products and services to market. They do this by providing bespoke innovation support to small and medium sized enterprises in the North East LEP area, as well as increasing connectivity and sharing best practice.

## 6.5 Existing enterprises

- **Automotive Original Equipment Manufactures** – The North East is home to leading OEM's including Nissan Motor Manufacturing UK, Hitachi, Komatsu, Caterpillar, Erwin Hymer Group and Cummins These OME's are responsible for producing over 502,000 passenger cars and commercial vehicles, 6,400 non-highway vehicles, over 325,000 engines and 20% of all Electric Vehicle production across Europe[74].
- **Pharmaceutical manufacturing base** – The North East has an established pharmaceutical manufacturing base, with 15 manufacturers employing between 4,000 and 5,400 workers in the region – including GSK, MSD, Accord Healthcare, Aesica, Sterling, Arcinova, and Piramal Healthcare.
- **Offshore and wind power** – The North East has also developed a strong offshore energy and windpower cluster, in part due to its excellent proximity to key UK offshore wind development sites such as Dogger Bank, Firth of Forth and Hornsea. This includes many firms within the offshore renewable supply chain such as Soil Machine Dynamics (SMD), Tekmar, BEL Valves, Baker Hughes, Fabricom, and Royal IHC Limited.

[74] The North East Automotive Alliance (2021)

# 7 Annex (Maps)

Figure 9 - Advanced manufacturing enterprises in the North East LEP (2021)

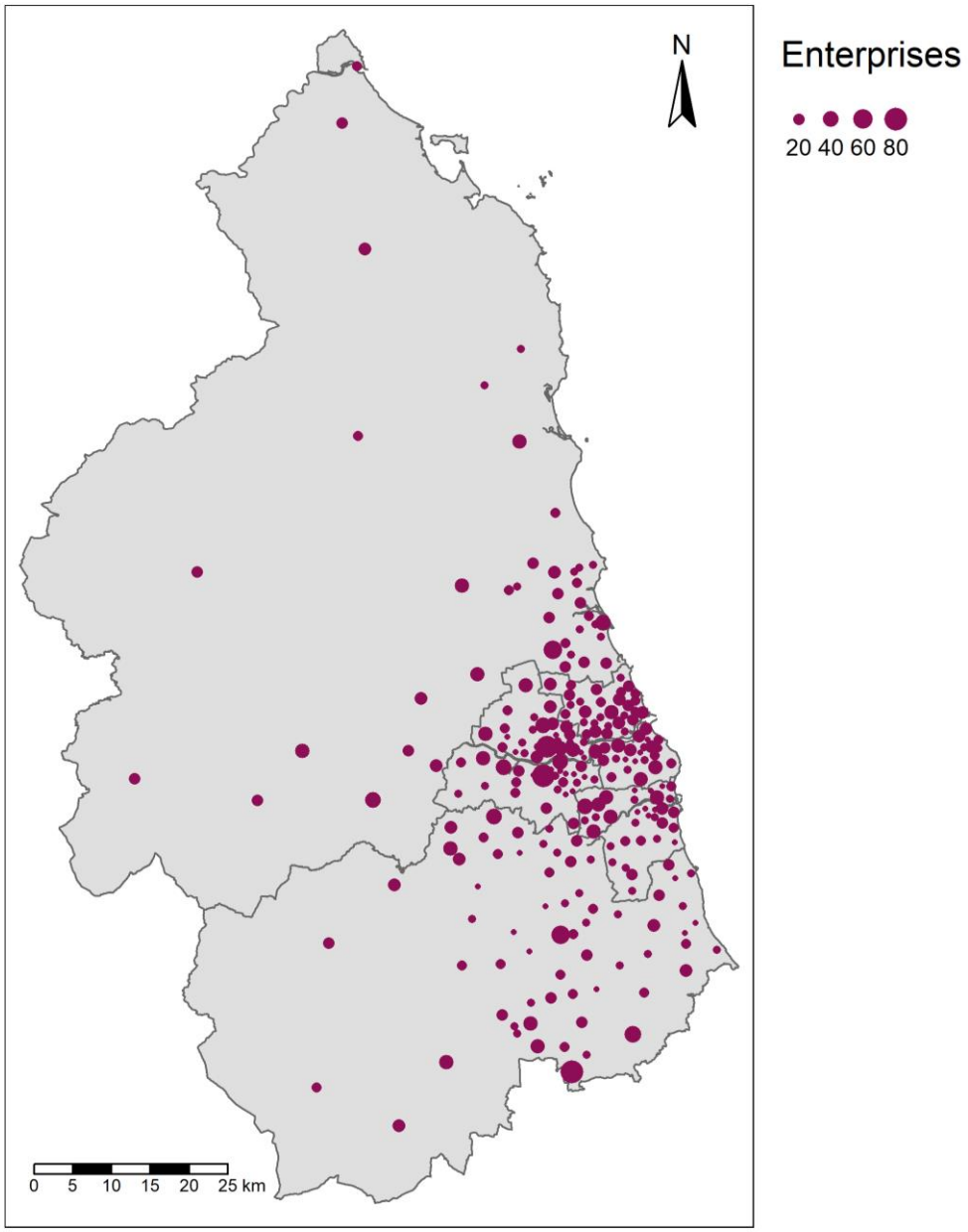


Figure 10 - Advanced manufacturing employment in the North East LEP (2020)