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The Future of the UK Midlands Automotive Cluster

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BACKGROUND

The UK Economy

The industrial revolution began in Britain in the late 1700s, initiating a process that would make the country a major global manufacturing hub. In the 1950s Britain's manufacturing sector produced a third of the national output, accounted for 40% of jobs and 25% of global manufacturing exports (New Statesman, 2013). Thanks to this manufacturing base, by the mid-20th century, major UK automotive (auto) firms such as Mini Cooper and Triumph were significant global brands. Many such as Rolls Royce remain so today but with a far smaller share of the international market. A number of trends have been identified as the cause of the UK's reduced manufacturing base including: the internationalization of production; foreign ownership and mergers of key firms and a lack of competitiveness of the sector under government ownership. The growth of the service sector in general as a share of the economy in general and the finance industry in particular are also a major contributor to manufacturing's decline, a trend apparent in many advanced economies. Today the figures for manufacturing are 11% of national output, 8% of jobs and 2% of the sector's global exports.

The UK joined the European Economic Community in 1973 and signed the Maastricht Treaty in 1992, supporting the creation of the European Union (EU). Whilst the UK remained outside the single currency (the Euro), the UK signed up to the "four freedoms" of goods, services, capital and labour across the bloc. By 2016, 60% of the UK's foreign trade took place with Western Europe and many companies, particularly the auto sector, had production processes based in

EU-wide supply chains. This relationship is now almost certain to be a thing of the past. On June 23rd 2016, the UK held a referendum on the continued membership of the EU with the result being a majority vote in favour of Brexit. The UK government formalised this decision in March 2017 by triggering Article 50, a clause within EU law that begin the process of departure from the bloc. Exit negotiations are expected to take place within 2 years in the absence of an extension. Whilst GDP performance since the referendum has been largely resilient, investor confidence in the UK has fallen along with the currency. The long-term effects remain unclear and the potential risk to UK industry, particularly the auto sector, is discussed in more detail below.

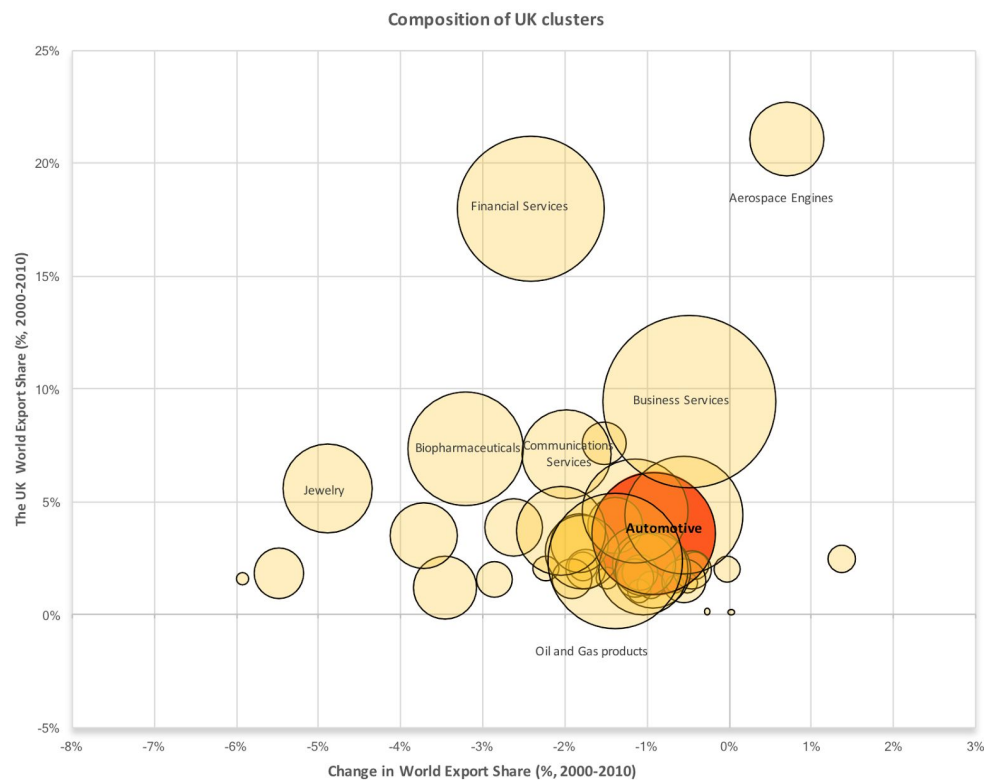
Today the UK is home to a number of world leading clusters in sectors such as pharmaceuticals, financial services, biotechnology and software development (Economist Intelligence Unit, 2017). As the Figure 1 (overleaf) shows the auto sector remains a critical, though not a leading, example of such a cluster.

Background on the UK Auto Industry

The UK is the 4th biggest auto manufacturer in Europe and the second largest market for passenger cars after Germany (EIU - Auto Sector Report, 2017). The sector - which includes finished cars and car parts - accounts for 3% of GDP value added and is responsible for directly employing over 814,000 people in the UK. A number of premium brands are UK based, notably Rolls Royce, Aston Martin, Bentley and Jaguar Land Rover (JLR) although many including JLR are foreign owned. A number of foreign company mass-manufacturers such as Nissan and

Toyota also have large scale operations in the UK. Domestic demand is below the EU average, one of the factors that makes the UK a net exporter of cars.

Figure 1 - UK Clusters as a Share the World Economy



(Source: International Cluster Competitiveness Project, 2010)

The Auto Industry After 2009

Following the onset of the global financial crisis in 2008, the UK government initiated a package of emergency measures to support the auto industry. In January 2009 then Business Secretary Lord Mandelson announced £1bn in direct government loan guarantees for car firms with a turnover above £25m (Guardian, 2009). The government also undertook steps to unlock £1.3bn in loans for the industry from the European Investment Bank. In order to develop a recovery strategy for the industry for the long term the government also established The Automotive

Council in December 2009. Chaired by a former CTO of Ford, the Council represented 100 companies. Its efforts were targeted around three streams of work: supply chains, technology and skills & human capital.

In 2013 the Council, working with the Business Department, published *Driving Success*, an industrial strategy plan for the sector. Based around the same pillars as the original work of the Council, the strategy set out concrete steps for growing the UK's share of the global value chain and "getting ahead of the game" in industry R&D. In the final section of the report, the strategy turned to measures to improve the business environment for auto producers, including as one of the goal of "maintaining strong interaction with Europe".

The UK Midlands

The Midlands has been central to the UK's automobile industry for more than a century. In 1901 the Dunlop Rubber Company began to manufacture tyres for bicycles and motorcars in Birmingham (the region's largest city). By 1954 their Fort Dunlop plant was the world's largest factory, employing 3,200 workers. Whilst the plant itself has long closed, the region remains a major area of auto manufacturing, albeit it one that faces significant challenges to remain globally competitive.

Birmingham is sometimes referred to as England's Detroit. Both were major centres of automobile and industrial production throughout the 20th century and both had been significantly impacted by deindustrialization trends in advanced economies along with the globalisation of the

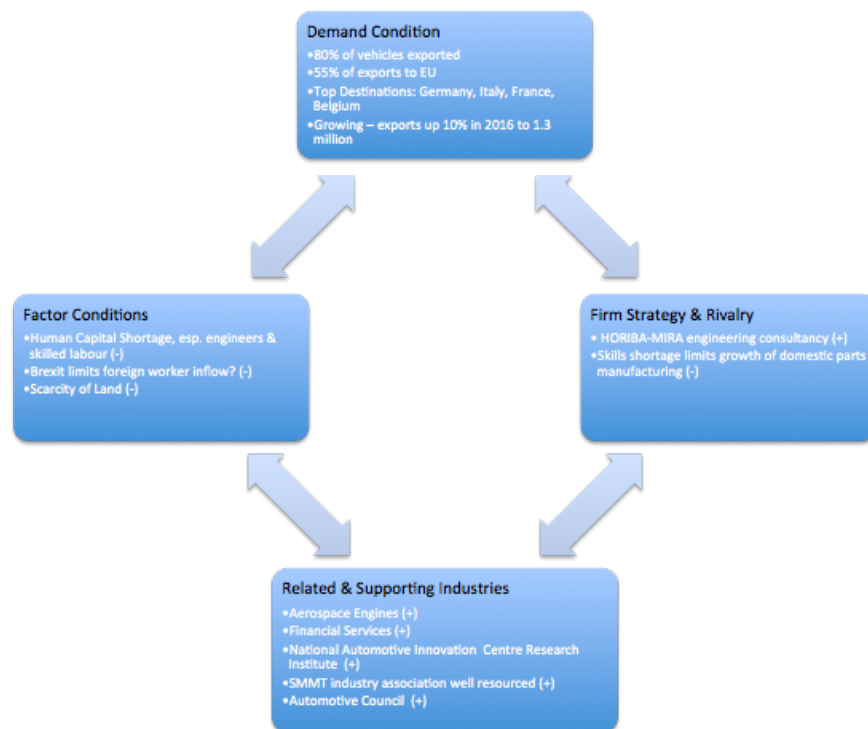
auto industry. In the early 1970s the Midlands region accounted for about 60% of total car production in the UK. By 2008, this had dwindled to 18%.

Major auto producers in the region include Jaguar Land Rover, Aston Martin, BMW & Peugeot. And major educational institutions include the University of Warwick, Coventry, Aston and Coventry. The cluster has been identified by the UK government as central to the country's industrial strategy and a special automotive business zone was designated in the region in 2016, along with £45m in investment. The Midlands auto cluster added £10.9bn gross value added to the UK economy in 2014, making it the third largest industrial cluster by GVA outside of London and the 2nd largest in England.

COMPETITIVE ADVANTAGE OF THE SECTOR

Industrial clusters can be analysed by reference to Michael Porter's Diamond Theory of National Advantage. The model identifies four elements - the points of the diamond - that explain the competitive advantage of a country, sub-national unit or a cluster within it. For the UK Midlands auto sector these elements are summarised in Figure 2 below. The remainder of this section will consider each in more detail in order to determine the most productive areas for reforms that could support the long-term growth of the sector.

Figure 2 - Porter's Diamond



Demand Conditions

The UK automobile industry has a strong demand stemming from abroad, which is about 80% of total demand for UK vehicles in a broad market of more than 160 countries worldwide. According to SMMT reports as of 2016, more than 55% of cars exported are shipped to the EU where Germany, Italy, France and Belgium are the top four importers. Other destinations for UK automobile are the US (14.5%), China (6.5%), Turkey (3.1%) and Australia (2.5%). Exports of cars account for 10-12% of total exports of the UK. In 2016, exports of auto industry increased by 10.3% to 1.3 million vehicles.

Factor Conditions

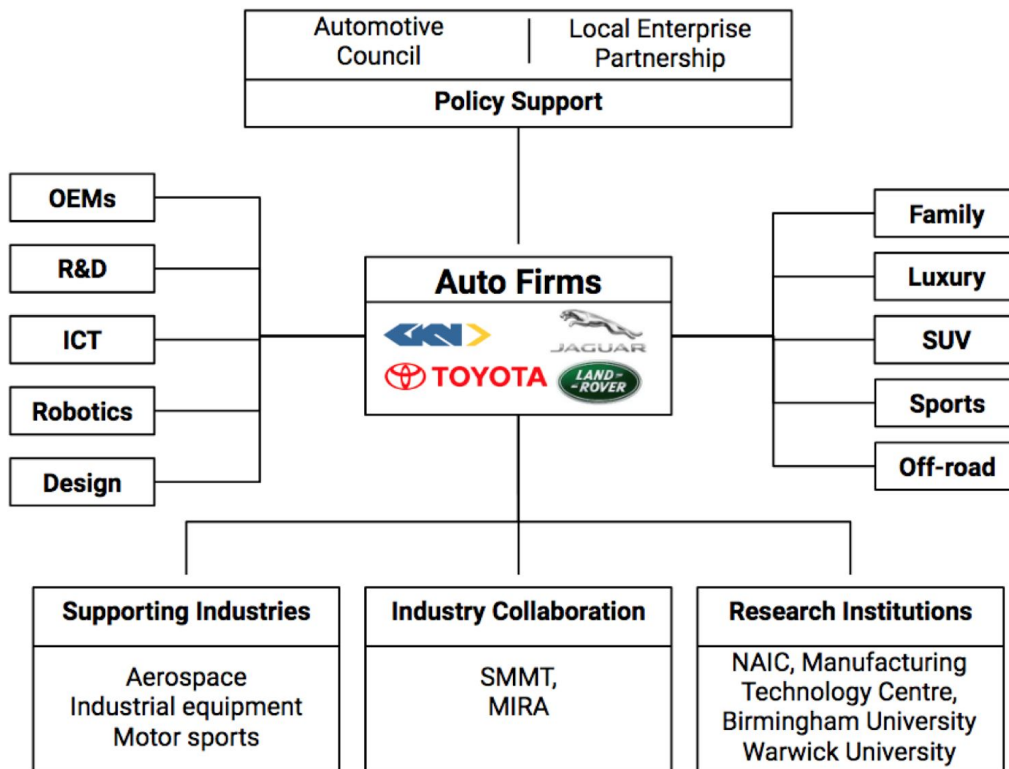
Human capital shortages in supply chain appears to be holding the auto sector back. Although the UK ranks high in terms of labor productivity, due to scarcity of engineers and skilled labor in the supply chain, the cost of labor is high. (Automotive Council, 2015). According to the Automotive Industrial Partnership 40% of current job vacancies are critical and need to be filled immediately or within 12 months. (UK Automotive Council, 2016). The shortage of skills has prompted private sector initiatives in apprenticeship and training programs such as the JLR Academy, which is training more than a quarter of its employees. However, these major programs tend to syphon skilled labor from small scaled supply chain employers rather than creating skilled labor force for the whole industry, resulting in an aggregate skill shortage problem. Small firms in the supply chain have limited capacity to deliver high quality parts, hence major manufacturers such as the JLR are more likely to order significant parts from abroad (Sharman, 2015). To reduce the problem of lagging behind the major manufacturers' expansion,

a “Skills Matching” service was initiated in 2016 by Automotive Industrial Partnership with employers’ collaboration. Yet in the aftermath of Brexit (and therefore the UK’s likely departure from the single market), the ease of migration for professionals may be severely burdened thereby leading to outward migration or a slowdown in inward migration of skilled labor from the EU (Head & Mayer, 2016). Hence there is imminent risk of slowing expansion and higher cost in the automotive sector due to skills shortage both in the main and supply chain manufacturers.

Scarcity of land may also limit sector expansion in the region. According to Prof. David Bailey at the Aston Business school, one of the reasons for major manufacturers such as the Aston Martin expanding outside of the Midlands areas is decreasing pool of industrial site for expansion. Furthermore, the JLR has confirmed plans to expand in Slovakia where approximately 300,000 cars a year will be built starting 2018. Currently Midland’s local authorities are facing a dilemma to ration greenbelt land for housing or industrial purposes, as the UK seeks to address a chronic shortage of homes. For instance, a 2,000-home estate is planned to be built on Aston Martin’s doorstep in Gaydon (Sharman, 2015).

Related Industries and Stakeholders

Figure 3 - Mapping the Midlands Auto Cluster



(Source: Team Analysis)

Industry associations

The Society of Motor Manufacturers and Traders (SMMT) advocates for the UK motor industry, by supporting and promoting its members' interests to the government, stakeholders and the media. SMMT represents more than 700 automotive companies in the UK and runs an Industry Forum in Birmingham with support from the UK Business Department (BEIS) to express their

views on issues affecting the sector, helping to form competitive strategies and build positive relationships with the regulatory authorities.

One of the most important assets of the automotive cluster in the midlands is HORIBA-MIRA, an engineering and development consultancy company located 25 miles from Birmingham. The center creates a collective value to the cluster by performing activities that, due its large costs, no single firm could afford by itself. "Since the mid-seventies MIRA has operated as an independent and completely self-funding, commercial operation with governance moving from a council to a board of directors", as described by its literature.

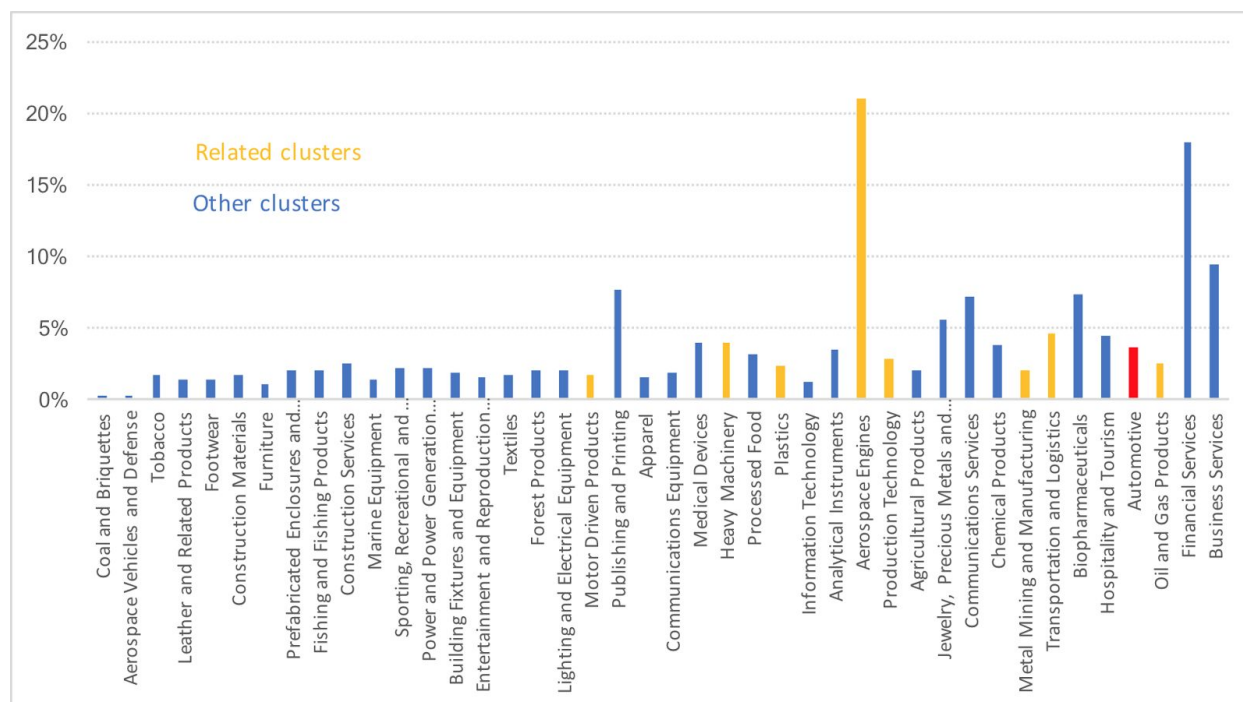
Today MIRA provides a wide range of development services to a large segment of the UK automotive sector, including the leading vehicle, bus and trucks manufacturers. Its services include product engineering, research, testing, information and certification services and have been crucial for sustaining the technological progress of domestic firms and, in more recent years, have also attracted international firms to locate in the same cluster. The vehicle engineering department has conducted joint innovative projects with leading firms in pressing technological challenges, such as chassis engineering design and development, hybrid and electric propulsion systems, optimised systems integration and safety integration programmes for EuroNCAP rating enhancement. The organization achieved success in terms of technological services provided to its cluster and economic and financial sustainability, and in the early 2000's, MIRA became a limited consultancy firm. Its strong performance attracted international attention, and in 2015, MIRA was acquired by the Japanese-owned testing equipment group Horiba, what could be regarded as an evidence that the center had already achieved international

excellence while relying on the local expertise and connections with the domestic firms. As it accumulated technical competence in the automotive industry, MIRA has also expanded its scope to other segments of metal-mechanics industries, diversifying into rail, aerospace and defense. MIRA's strategy reflects the relative technological proximity between those sectors and the automotive industry and may drive, in the future, a further diversification of the automotive cluster itself.

Related clusters

Clusters such as the aerospace engines, motor products, metal manufacturing and transportation and logistics are closely related to the automotive industry in the country, of which aerospace engines cluster has the greatest footprint. The clusters of robotics, design and ICT industries also play a critical role in supporting the automotive sector.

Figure 4: Related Clusters by Share of World Exports



Research and Educational Institutions for Innovation and Training

The automotive industry has been active in forming close collaboration with local universities to advance research and innovation for the industry. For instance, the Manufacturing Technology Centre a technology park committed to advance innovation, support competitiveness, train and improve synergies with supply chain, was jointly created in Coventry by 44 industry members and Universities of Birmingham, Loughborough and Nottingham. The University of Coventry has created the Advanced Manufacturing Institute in partnership with the Unipart Manufacturing Group with similar commitments for the region. Specific for the auto industry, the National Automotive Innovation Center, a research institution at the Warwick University joint venture between WMG, Jaguar and Tata, focuses on automotive research by combining expertise from industry, university academics and supply chain companies. It is intended to support advances in technology to reduce dependency on fossil fuels and vehicle emissions. Most importantly, the NAIC focuses on the shortage of skilled R&D staff across the automotive supply chain, developing the talent required for the demands of emerging technologies. Aside from universities, major manufacturers such as the JLR prefers to train its employees at its own academia, which offers “everything from apprenticeships to PhDs”. (Sharman, 2015)

National and Local Government Institutions

In recent years, the government has begun to take active role in the industry through both central and local authorities. The latest strategy of the Automotive Council (referred to above) focuses on manufacturing ultra-low emission vehicles. (HM Government, 2014) One of its most significant initiative is the Automotive Industrial Partnership, established in 2014, which aims to bring together leading automotive companies and the government to define skills gap to ensure continuous flow of skills now and in the future. Currently, significant employers such as Bentley, BMW, Ford, GKN, Honda, Jaguar Land Rover, Nissan, Toyota and Vauxhall, the SMMT and employer-led skills organization Semta are involved.

After 2011, the Department for Business, Innovation and Skills (now BEIS) established a series of local partnerships between entrepreneurs and local authorities to help determine local economic priorities, lead economic growth and job creation. Currently, six of these Local Enterprise Partnerships (LEPs) in Midlands area take active role in the *Drive West Midlands* programme. Run by inward investment agency Marketing Birmingham and UK Trade & Investment (UKTI), the programme aims to support companies throughout the supply chain, promote the UK automotive sector abroad and attract new investment through the West Midlands Investment Forum. One of its main target is to fill the sourcing gap in Britain's automotive industry – and bring new highly skilled jobs to the West Midlands. Currently, a third of components for UK vehicles are made in the country. With national vehicle production expected to increase from 1.5m in 2014 to over 2m by 2018, there is huge potential for companies in local supply chains. (Holweg, Padgett, & Davies, 2015)

Firm Strategy and Rivalry

The innovative pattern in the automotive sector traditionally has been shaped by the vehicle makers, which invested in in-house R&D, mainly focusing in the development of new engines and in the design as factors driving their competitive gains. The emergence of new environmental and safety regulations, combined with fast changes in automotive technologies, has changed the relative importance of vehicle makers and strengthened the importance of smaller specialist suppliers. Technologies related to embedded electronic systems, for instances, are usually developed by a wide range of smaller and more flexible firms, often working in collaboration or creating joint-ventures for specific projects.

Germany provides the most sophisticated example of a virtuous dynamic between the large vehicle makers and their suppliers: the long-term relationship across firms dilutes the risk of purchasing highly-specific capital goods or labor skills. Competitive automotive clusters than become more diversified, with few firms producing the same output or services, and with a higher than average degree of collaboration. Also, repetitive transactions enhances trust and favors the exchange of ideas and common solutions. The presence of a diversified and competitive network of specialist suppliers thus becomes one of the main factors for an innovative automotive cluster.

Despite the importance of the network of suppliers, large vehicle manufacturers play a critical role in sustaining an innovative environment. In order to gain market share and adapt to the fast-changing demand, vehicle makers increase the pace of technological absorption, changing the requirements of their inputs. As most of the intermediary services and products are specific

to each vehicle company or even model, suppliers and vehicle makers need to be physically located near to each other, allowing a constant flow of information. The innovative pattern has changed in the last 20 years, but the vehicle makers' demand power still play a crucial role.

The research done by Amison and Bailey (2014) points out that the Midlands region has sustained over the years the requirements for an innovative automotive cluster: "There is a sufficient agglomeration of automotive and motorsport-related activity and expertise in the area to attract and retain these firms. In addition, a number of the firms interviewed were already serving major German and Japanese automotive manufacturers, indicating an ability to compete internationally at the highest level".

RECOMMENDATIONS FOR THE SECTOR

In 2016 a record 88 million vehicles were sold worldwide and profit margins were at a 10-year high. However, that these positive figures mask a more challenging future outlook for the international auto sector over the coming years (PWC, 2016). The industry is facing fundamental shifts. Global demand patterns will change as emerging markets, specifically China, will drive industry growth. Production facilities may follow demand, moving from Eastern Europe to lower-cost locations in Asia. Technology will continue to be the largest driving force for change, revolutionizing the auto industry with autonomous and electric cars as well as increased safety technology and advanced materials and components. In order to remain competitive amidst these changes, the Midlands auto cluster must undertake a number of steps.

Mitigating the Risk of Brexit

The free trade agreements with the EU are integral to the success of the UK auto industry. The Brexit negotiation process is now a source of uncertainty and possibility of leaving the EU within 2 years without having established new advantageous trading terms poses a serious risk for the UK automotive cluster. Membership of the Single Market means unrestricted access to EU market, provided that the products meet necessary technical, safety and environmental standards set by an EU Directive. Moreover, access to the Single Market is access to critical investment chains as well as to funding to support R&D, globally integrated and mobile skills and experience, and cross sectoral EU regulations including Employment law, the Digital Single Market Regulations, Environmental law, Company law. These are all key to competitiveness and

growth of the sector. In addition, the UK's membership of the Single Market gives the automotive sector the opportunity of free trade with the EU, not only trade of final products but also of components within the supply chain. In the absence of a separate EU trade agreement post-Brexit the UK would default World Trade Organisation (WTO) tariff rates. The impact of this is forecasted by SMMT analysis as additional tariffs of £2.7 billion to imports and £1.8 to exports, an average export tariff of 4.5% for UK companies selling components to the EU while an export tariff of 10% for manufacturers of vehicles. Further potential consequences of lack of Single-Market-like new trade terms can be listed as increase in list price of cars produced, emergence of non-tariff trade barriers (e.g loss of passporting rights for services). Alternatively, building new global relationships as a substitute of the EU does not seem feasible in a short-medium time since EU has a very large share in exports. Therefore securing a continued membership of the Single Market and the Customs Union until favorable trade deals are made can be assessed as a short-term challenge for the UK auto industry.

The growth of the Mexican auto industry following signing of the North American Free Trade Agreement (NAFTA) demonstrates the positive impact that reducing tariff barriers can have on an industry. Inward FDI increased dramatically, with GM, Ford and Chrysler invested \$39.1 billion in the years following NAFTA (Lauridsen, C et al, 2013). *“Mexico saw a sharp increase in trade flows, with exports more than doubling between 1993 and 1995 and imports growing significantly”* (Lauridsen, C et al, 2013). Today the country is the world's seventh largest vehicle producer and the auto sector accounts for 18.3% of the national manufacturing sector and 3.2%

of GDP (Promexico, 2016). Foreign firms continue to use Mexico as a strategic gateway into the American market and to capitalize on lower labour and operating costs.

Expand the Cluster Beyond the Midlands

Power is shifting from manufactures to OEMs, forcing manufacturers to collaborate or perish. Numerous OEMs have consolidated over the past few years, making them an increasingly powerful market force. “These companies/alliances have the capability to invest in high cost systems and exploit global scale economies across vast manufacturing footprints.” (Legged, 2017). UK auto manufacturers must respond by increasing collaboration among all of the national clusters (e.g. South Wales), including the Midlands, to strengthen the industry as a whole .

Accounting for more than 30% of domestic production in the UK in recent years, JLR is positioned well to lead the regional integration efforts. Despite the economic crisis initiated in 2008, the firm has increased the production from its British plants by more than 240%. For the coming years, the company is focusing its innovative efforts in three main technological challenges: their in-house developed Ingenium engines will achieve higher levels of efficiency and enhance torque; their cars will adopt aluminium chassis, enabling a lighter and stronger structure than its steel equivalent; and finally, driver-assistance systems will enhance levels of connectivity across the car components and with personal devices.

While the driver-assistance technologies and the aluminium chassis constitutes sectoral-wide trends, the JLR's focus in a new generation of oil-based engines challenges reflect its focus in the upper segment of the market, where the quest for efficiency is not as pressing. Most of other firms in the cluster will likely invest more attention to the transition to hybrid or completely electric vehicles.

Financial constraints

The Midlands presents a positive perspective when one takes into account the expertise retained in local universities and technological institutions. Also, the region hosts large automotive firms that are currently investing in their expansion and implementing advanced technologies. The network of suppliers, on the other hand, faces important challenges to preserve its capability to sustain the necessary level of investments to keep up with the technology progress (Amison, 2014). Since their investments are highly specific to their buyers' needs, their investment projects are regarded as risky by the banks. Also, their assets are often too specific to be accepted by the banks as collateral. Lastly, their investment has a larger time horizon.

- In order to induce a better access to the banking system, the UK Government should create a specific agency to complement the suppliers' guarantees to the banks, following the models of the US Small Business Administration, which offers a Loan Guarantee Program.

- Larger vehicle makers should also adopt clear purchase agreements with their suppliers, using a market-friendly language. These contracts would enhance the creditworthiness of suppliers when applying for loans or favor their access to the Loan Guarantee Program.

Address Human Capital Shortages

As previously discussed, the UK auto industry is facing a skills shortage that could limit the sector's growth. The Automotive Council estimates that there could be up to 5,000 unfilled positions in the UK as a result of skills shortages, many of which are engineers (SMMT News, 2016). This could be exacerbated if EU nationals are restricted from working in the UK post-Brexit (Davies, R., 2016). Although automation has decreased reliance on humans for lower-skilled work, but there remains a strong demand for highly skilled tradespeople as well as engineers, especially in the supply chain network.

Recent initiatives such as the "Skills Matching" by public private partnerships suggest the UK is headed in the right direction in terms of building skill sets for the industry's need. The Automotive Apprentice Matching Service is a partnership between major UK-based auto manufacturers and industry associations, including Government funding. They work to match skilled apprentices to job opportunities. While the progress being made in the private sector is promising, more needs to be done to strengthen the public institutional framework to support apprenticeship programs at UK education institutions. Germany, where close to 60% of youth train as apprentices, has long been cited as a model. Combining on-the-job training and classroom instruction, it works closely with industry, including Daimler and Bosch (Jacoby, T.,

2014). Apprenticeship programs are expensive, costing anywhere between \$25,000-\$80,000 per student, but as automation improves, the demand for highly-skilled workers who can problem solve in technical environments will only increase.

Increase Automotive R&D and Target Efforts

The UK government has embraced the shift towards a technology-based auto industry. One of the most promising developments in recent years has been the government-industry commitment to make the UK a centre for R&D on low carbon emissions technology.

The cornerstone of this initiative is the Advanced Propulsion Centre, a 1 billion pound, ten year commitment to fund industry-driven R&D. The most recent round of funding provided 62 million pounds for seven initiatives with companies such as BMW, Ford and Land Rover (Advanced Propulsion Centre, 2017). There have also been a number of other high-profile investments at the firm level. In April 2017 Toyota announced a 240 million pound investment in its Derybshire factory to enhance the production of electric vehicles (Stoker, L., 2017). London Taxi company has also invested 300 million pounds to a factory in Coventry that will produce iconic black cabs and conduct R&D (Chapman, B., 2017).

Collaborate more Closely with the German Auto Sector

The UK should increase collaboration with Germany, the largest and most sophisticated auto manufacturer in Europe. Links already exist between the two countries; Germany exported over 810,000 cars to the UK in 2015, making it their largest export destination, and German manufacturers have over 100 production sites in the UK (Reuters, 2016). However, a restrictive

trade environment post-Brexit could drive German auto manufacturers and OEMs to continental Europe (Reuters, 2016).

German firms could be valuable partners for the UK auto manufacturers as they look to deepen their R&D capabilities. Germany is a leader in automotive R&D with their OEMs spending 19.7 billion Euros in 2014, a third of all global spending (German Trade and Invest, 2016). Germany is a good example of how automotive R&D can be used to drive the national innovation agenda. Their auto sector accounts for 35% of all R&D expenditure, 54 Billion Euros in 2014, employing 100,000 researchers (FTE equivalent) (German Trade and Invest, 2016). Opportunities for collaboration are only expected to increase with the recent launch of the German “High Tech Strategy” and accompanying commitment to spend 3% of GDP on R&D (German Trade and Invest, 2016).

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