



Brexit and the UK Automotive Industry: Understanding the Impact

Centre for Brexit Studies report for Tom Leeson, OpenText.

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Executive Summary

This report explores the possible future trading options available to the UK and what impacts these trading options will have on the UK automotive industry. The research makes use of a wide range of data to predict the degree of impact each trading alternative will have on the UK automotive industry.

We discuss the trading practices currently in place today in the sector, and its interactions and dependence on privileged access to the Single Market. We then examine likely impacts each potential trading alternative will have on the sector.

The report considers five functional areas of business: supply chain management; operations and logistics; human resource management; regulation and compliance, and; customer communications, in order to consider the potential impact of Brexit on manufacturers in each of these areas.

Drawing on interviews with senior managers in the sector, the findings of the research suggest that all current available trade scenarios put up different types of trade barriers for the sector, potentially increasing costs and decreasing the UK's attractiveness as a base for automotive manufacturing.

The findings also suggest that the uncertainty around the UK's trading future with the EU is deterring investment into the sector, which will likely have consequences further into the future. We conclude by assessing a variety of mitigation strategies open to manufacturers, considering their viability and applicability in each potential scenario.

Recommendations

Essential to preparing for Brexit is that companies have sound risk management and scenario planning strategies in place. Some risks will be deemed acceptable given the costs of mitigation, whilst others require more urgent action.

This report therefore recommends that:

- ***Automotive manufacturers will need to have good enterprise information management policies in place for managing and reporting on contracts to implement changes and mitigate risks.***

Managing information such as contracts digitally helps establish governance processes that will help amend existing contracts and generate new contracts as the details of Brexit become law.

- ***Automotive manufacturers will need to have a strong information governance strategy in place to ensure compliance with any new regulatory requirements or checks.***

Getting control over the acquisition, management, retention and disposal of all the information within a business means, no matter what the impact of Brexit, businesses will be better prepared.

A good case here (namely for larger companies) would be to use information management to assist in attaining the status of Authorised Economic Operator (AEO).

- ***More emphasis on workforce planning and skills development is needed in the likelihood that Brexit further restricts the supply of immigrant labour.***

Human Resource Managers will most likely face a different talent market post March 2019 and should consider transforming employee information such that it is easily accessible particularly relating to employee skills and training needs that support them through any transition needs.

Recruitment teams would benefit from a digital support environment aligned to the needs of the business in recruiting missing skills.

- ***Communication and collaboration between automotive manufacturers, partners and customers will be more important than ever.***

Digital technology can be implemented such that information exchange is transacted and communicated in an efficient and consistent manner. The OEM can react quickly to supply chain changes and communicate those changes in a way that's personalised to the business needs of each partner will be essential.

- ***Automotive manufacturers need to have an improved understanding of their supply chain, particularly relevant for any new documentation and compliance requirements that might be put in place.***

New supplier relationships and possible change to existing relationships are inevitable. Companies would benefit from a fully digitized supply chain particularly for visibility and engagement of lower tier suppliers.

Companies should consider adopting a managed services approach to assist the onboarding and transactions management of both existing and new suppliers because of any changes. This approach moves towards digitising the supply chain while at the same time freeing up internal resources to focus on other priorities.

Companies should review their current processes for the delivery of good and customs procedures and adapt where applicable. Particularly they should look to achieving as frictionless trade as possible by providing a good connection to customs requirements and the use of pre-clearance and digital documentation such as Advanced Shipping Notices (ASN) to support risk-assessment of goods prior to entry.

Section 1: Introduction

Globalisation has resulted in high interdependence amongst nations, having been driven by FDI, technological development and market liberalisation. This has seen global value chains lengthening and deepening, leading to increased efficiency but also greater fragility with domestic economies becoming sensitive to disruptions in transnational supply chains (Rosecrance et al., 1977).

For the UK automotive sector, these developments have gone hand-in-hand with the development of the EU Single Market. Access to the Single Market is crucial for UK businesses: UK exports to the EU were equivalent to 15% of GDP (Ottaviano et al., 2014). Crafts (2016) argues that EU membership has increased UK GDP per capita by 8.6% to 10.6%, whilst others put the figure at an astonishing 23.7% (Campos and Coricelli, 2017). Whilst these figures are highly uncertain¹, it is incontrovertible that the high level of integration of member states has resulted in businesses becoming heavily reliant on access to the Single Market due to the complexity of European supply chains.

In this context, the decision of the UK to leave the EU on March 29th 2019 (at the time of writing) has generated a high degree of uncertainty and anxiety by UK-based manufacturers. The automotive industry has been particularly vocal in this regard, with companies such as Jaguar Land Rover, BMW and Honda warning of the threats to their continued viability to manufacture in the UK in the event of a Hard Brexit (BEIS, 2018).

As such, the importance of the automotive industry to the UK economy is evident in that in 2017, the sector was directly worth £16.5bn to the UK economy and represented over 8% of total UK manufacturing (Office for National Statistics, 2018a). Indeed, the UK is a major global manufacturer in the automotive industry. In turn, it has been argued that the UK workforce itself is a major factor that has promoted the success of the industry, in particular the flexibility the UK provides employers to meet changes in requirements and environment (Automotive Council, 2013).

However, the EU remains the single largest destination for UK manufactured vehicles, accounting for approximately 50% of UK vehicle exports (Bailey and De Propris, 2017). It is thus this situation, whereby the UK has served to provide a relatively flexible market environment for the sector within the EU, serving as a platform for production extending deep into Europe; that the prospect of Brexit poses considerable challenges for an industry dominated by Just-in-Time (Lean) production techniques.

In the sections that follow, we first consider how companies make supply-chain decisions in the sector, before turning to recent developments in the sector in the wake of the Brexit vote. We then introduce the findings of our own research on interviewing senior managers in the automotive industry in the UK who have some “ownership” of the issues raised by Brexit, before concluding with implications for supply chain management.

1.1 The Economic Contribution of UK Automotive

The importance of the UK motor industry can be analysed through its economic output, using GVA figures. GVA puts a value on goods and services that are produced within a region/ economy, less the cost of intermediate consumption. In 2017, the automotive sector was directly worth £15.2bn to the UK economy and represented over 8% of total manufacturing.

¹ Coutts et al. (2018) argue against such an effect at all.

	Current Prices (£bn)	Real terms (£bn)	% of manufacturing	% of UK total
1997	9.4	10.7	6.5	1.1
1998	9.0	11.2	6.3	1.0
1999	7.9	11.4	5.6	0.9
2000	9.4	10.8	6.6	1.0
2001	8.5	10.2	6.2	0.8
2002	8.1	11.1	6.0	0.8
2003	8.1	11.4	6.0	0.7
2004	7.6	11.5	5.7	0.6
2005	8.1	11.3	5.8	0.6
2006	8.1	10.9	5.8	0.6
2007	7.5	11.4	5.4	0.5
2008	8.2	10.8	5.7	0.6
2009	5.9	7.7	4.4	0.4
2010	8.4	9.2	6.0	0.6
2011	8.2	10.4	5.6	0.6
2012	8.6	10.8	5.8	0.6
2013	11.5	11.7	7.2	0.7
2014	13.3	12.7	8.2	0.8
2015	13.5	13.5	8.0	0.8
2016	14.6	14.2	8.3	0.8
2017	15.2	14.3	8.1	0.8

Source: Office for National Statistics (2018a)

1.2 Global Comparison & Growth

The UK is a major manufacturer in the automotive industry when compared with total world production, being the 13th largest producer of automobiles by volume in the world and the 4th largest within Europe producing over 1.8 million vehicles, of which 1.72 million were cars (Society of Motor Manufacturers and Traders, 2017). UK production was equivalent to £53.9bn or 14.7% of total value in the European industry in 2014 (MarketLine, 2015).

The UK automotive manufacturing industry had revenues of \$53.9bn in 2014, with a compound annual growth rate of 5.6% between 2010 and 2014. In comparison with other major manufacturers the UK industry outperformed (*ibid.*) The French industry had revenues of \$50.3bn indicating a declining compound annual growth rate of -3.6%, whilst the German industry had revenues of \$122.4bn and a compound annual growth rate of 1.3%, between 2010 and 2014.

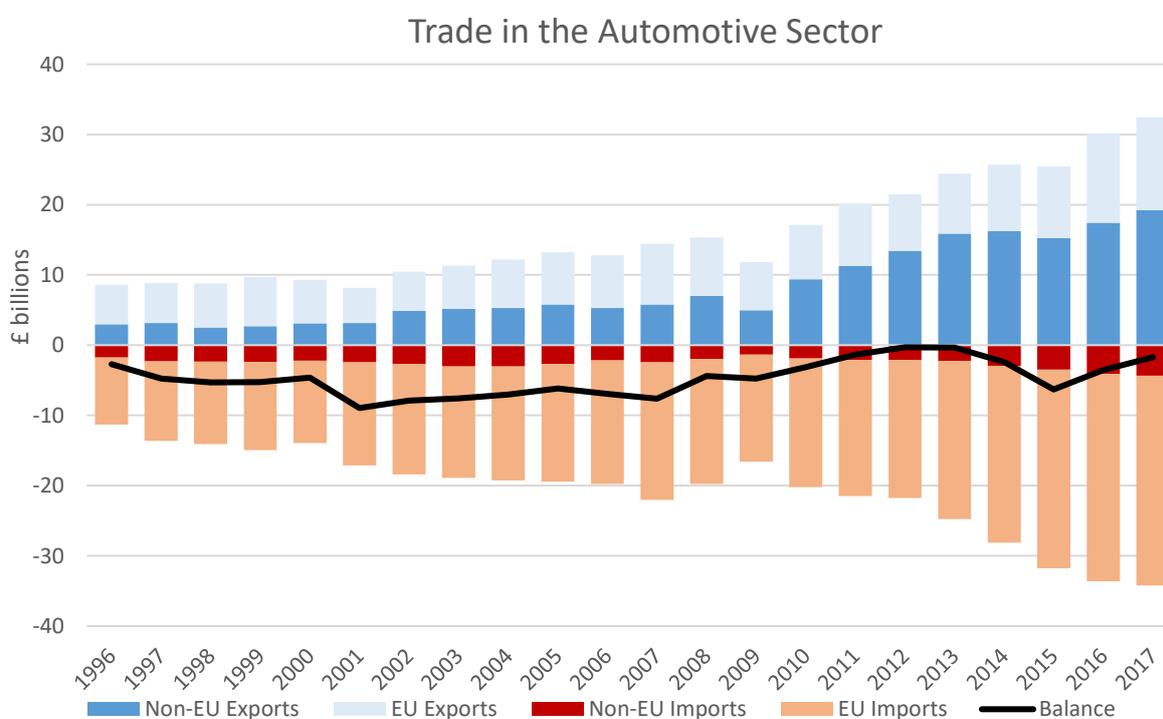
The UK automotive manufacturers have experienced steady growth over the years, with recent highs in 2016 of almost 25% above its pre-downturn peak. The UK automotive industry has of late outpaced the total UK manufacturing growth. The UK Automotive manufacturing industry is dominated by the production of cars, accounting for 94.5% of total production volume (the rest being trucks and motorcycles). It is dominated by 5 major players, which account for almost two-thirds of total production.

United Kingdom automotive industry manufacturing share by volume 2017

Jaguar Land Rover Automotive Plc	31.8%
Nissan Motor Manufacturing (UK) Ltd	29.6%
BMW UK Manufacturing Ltd	13.1%
Honda Motor Company Ltd	9.8%
Toyota Motor Corporation	8.6%
Other	36.8%

1.3 UK Automotive's Contribution to Trade

The UK automotive manufacturing industry has become, and is continuing to become more integrated within the global economy (Office for National Statistics, 2015). 80% of total UK vehicle production was exported in 2017, up from 77% in 2015 (Society of Motor Manufacturers and Traders, 2017, 2018).



(Her Majesty's Revenue and Customs, 2018b)

Exports of passenger road vehicles to the EU (almost exclusively motor cars) increased by 133% in the 20 years from 1997 to 2017 to a total of £13.3 billion. Exports to non-EU countries have shown explosive growth of over 500% from £3.2 billion to £19.2 billion over the same period. Although both imports and exports have seen huge increases over time, the value of total imports has been consistently higher than exports. The UK trade deficit in road passenger vehicles reached a recent peak of £6.3bn in 2015 (the highest since 2007), although this has since fallen to just £1.7bn last year. The EU accounted for 87% of total UK vehicle imports by value and these have more than doubled from £11.3bn in 1997 to £ 29.8bn last year.

1.4 Report Structure

Section 2 of this report reviews our existing understanding of the challenges Brexit could raise for automotive manufacturers and suppliers based on desk research. These are categorised under 5 function business areas, namely: supply chain management, operations and logistics, human resources, regulation & compliance and customer communications. The theoretical and practical issues raised by Brexit are first considered here, in order to understand what gaps remain in our knowledge.

In section 3, the report goes on to establish a clear methodology in terms of its analysis – tailored to try and fill gaps in our existing knowledge, particularly over the role of higher-tier suppliers. This informs and structures the subsequent findings, which section 4 is devoted to outlining for each of our 5 functional areas. Section 5 follows this up with a broad discussion of how these findings enhance our understanding of how Brexit will affect each of these areas.

Finally, the report concludes by summarising key findings and offering some recommendations as to actions that should be taken to try to mitigate the impact of Brexit in a variety of scenarios.

Section 2: Understanding the Likely Impact of Brexit on UK manufacturing

In this section we explore background trends and issues relating to the five functional areas of business identified in Section 1. This is conducted with reference to the UK automotive industry, and comparisons to other manufacturing sectors in the UK, as appropriate.

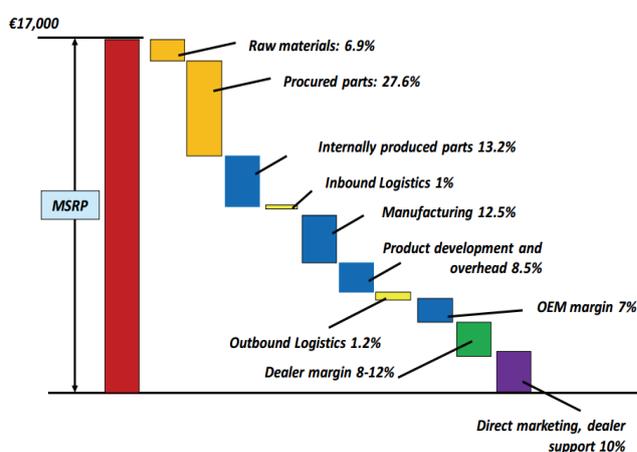
2.1: Supply Chain Management

As noted above, within discussions regarding the status of the UK automotive industry, the probable impact of Brexit on supply chains has assumed particular urgency for analysis by academics and practitioners alike. Based on prior extant research, two key sectors where supply chain implications have been considered are agriculture and manufacturing. It has been argued that Brexit could result in the labour costs of the agricultural sector increasing, which would entail challenges for cost reduction (Carson, 2018). For manufacturing industries, the likely impact of Brexit is also that costs would increase. In addition, Brexit could also adversely affect the accuracy (and increase the difficulties) of demand forecasting (Safonovs and Upadhyay, 2017). However, the impact of Brexit on supply chain is still at an early stage - as of course, at the time of writing, Brexit had not actually happened yet. Therefore, in the context of this chapter, we refer instead to the *exposure* of supply chains to Brexit developments and what *scenario planning* companies are undertaking (if any).

It is therefore possible to “pre-predict” the key issues that might be brought by Brexit (i.e., a “hard” Brexit), which could potentially affect any industry. One of key issues is rising costs. This could occur directly due to Brexit in the form of customs and excise duties if the UK exits the Single Market and EU Customs Union (Vandenbussche et al. 2017; Cumming and Zahra, 2016). Another potential impact of Brexit could be on human resources. EU skilled workers currently working in the UK could return to the EU should Freedom of Movement be rescinded – which in turn could exacerbate skills shortages in key sectors (Vandenbussche et al., 2017). In addition, some companies could close down UK branches due to shrinkage of the market, or could even relocated their plants or/and R&D centre to other (EU) countries. Finally, inbound FDI (foreign direct investment) to the UK could also decrease, due to the loss of Single Market membership (Baldwin, 2016; Bailey and de Propris, 2017; Dhingra et al., 2016).

The UK automotive industry relies heavily on its international supply chain in order to add value, reduce costs, and provide innovation to final products. Key inputs required by manufacturers are typically commodity and pre-fabricated components, often produced by their third-party suppliers (MarketLine, 2015).

Typical Automotive Cost Structure (Howleg, Davis, & Podpolny, 2009)



The UK automotive supply chain consists of a wide range of companies, ranging from small specialists firms to large multinationals. Research conducted by the Figures from the Interdepartmental Business Register (IDBR) indicate that in 2017 a total of 1005 enterprises were involved in the manufacture of motor vehicles as their primary activity (Office for National Statistics, 2018b). A further 1,385 businesses are primarily classed as manufacturers of parts for motor vehicles

the sector generated a further £13.2bn of value-added, of which over two-thirds was paid out to employees in the form of wages.

2.1.1 Case Study: Nissan in Sunderland

Nissan’s production facility in Sunderland was opened in 1986 with an initial investment of £3.5 billion (Ludwig, 2014). The facility employs over 7,314, 30% of whom work on a temporary basis, the plant produces both the Qashqai and Leaf (and more recent Infiniti models) with capacity currently set at 550,000 units per annum (ibid.), the plant produced 507,444 units in 2016 (Society of Motor Manufacturers and Traders, 2017).

The Nissan production facility has been praised by many industry experts for its efficiency and the economic activity it brings to the region. The success of Nissan could not have been achieved without its complex supply chain, sourcing diesel engines from France and automatic transmissions from Japan (Ludwig, 2014). Although Nissan states that 80% of the cubic volume of parts is sourced in the UK, a deeper analysis shows that many high value and complex parts are sourced abroad. Currently 58 out of 255 suppliers for the Qashqai range are based abroad (*ibid.*)

2.1.2 Case Study of Tier 1 Supplier GKN and EU Supply Chain Integration

GKN Driveline is based in Redditch in the United Kingdom. It is a major tier 1 supplier of the world automotive industry with operations in 46 locations across a number of countries, employing over 26,000 employees (GKN Driveline, 2018). GKN Driveline is one of the world’s top tier-1 suppliers with particular strengths in all-wheel-drive and advanced driveline technology, in spite of recent controversies over the recently announced takeover by Melrose plc. It has been reported that one in every two vehicles produced have at least one part originating from GKN driveline (Tovey, 2015).

GKN driveline illustration of supply chain

PART	Country of Origin
Forging Inner Race Cage Joint	Spain
Forging Tripod	Spain
Joint	UK
Ball bearing	China
Forging joint	Germany
Tripod	France
Joint	Italy

(KPMG / SMMT 2014, reproduced by permission of KPMG)

2.1.3 Brexit and Just-in-Time

Given that the business operations of the auto industry are based on smooth ‘just-in-time’ and ‘just-in-sequence’ deliveries, any new customs checks as a result of Brexit would add cost, cause delays and threaten productivity. In the worst-case scenario, they could even lead to assembly line stoppages. The ACEA has stressed that whatever form of Brexit scenario is pursued, EU and UK authorities should start preparing to simplify customs procedures and to reinforce their customs capacity, noting that “otherwise we will see severe land and sea-port congestion at both sides of the Channel once the UK leaves the EU.” (European Automobile Manufacturers Association, 2018).

In reality, such supply chains might be more accurately termed ‘global value chains’ (GVCs) because in practice value is added in sequential stages at different points along the supply chain system. By way of example, a typical driveline system produced by GKN, the British-based supplier of

automotive driveline technologies and systems, incorporates specialist forged parts from the UK, Spain, Italy, France and Germany.

These are assembled at GKN Driveline's UK factory in Birmingham and supplied to automotive assemblers in the UK and EU. The components, assembled drivelines and the then final assembled car could cross the English Channel several times.

It's a similar story for BMW which assembles engines at its Hams Hall engine assembly plant near Birmingham. Engine blocks come in from France before being processed at the plant. They may go to Germany for further work before being assembled. The engine may go into a MINI assembled at Oxford or the Netherlands, or into a BMW assembled in Germany. The final car could be sold anywhere in Europe or globally. Components, engines and the final car could again cross the channel numerous times in total.

Supply chains relying on "Just-in-Time" (JIT) deliveries are, in effect, the most deeply embedded and integrated of all these global value chains. High frequency deliveries from suppliers located in nearby regions or countries allows reduction of costs as well as maximizing product and service quality. The frictionless trade enabled by the EU's Customs Union and the EU Single Market operating in harmony allow such pan-European JIT supply systems to operate smoothly, and today these systems are almost ubiquitous in many areas of the UK and EU manufacturing, engineering, logistics, retail and distribution industries.

In evidence to the House of Commons Business Select Committee late last year, Honda said that it retained just an hour's worth of parts at the Swindon production line, and it required 350 trucks' worth of components to be delivered every day from Europe (Business Energy and Industrial Strategy Committee, 2018). The Japanese-owned firm stated that every 15 minutes of customs delay would cost it up to £850,000 a year, and that it would take the firm 18 months to set up new procedures and warehouses if Britain left the Customs Union. Even then, with 2 million daily component movements, just minor delays at the Channel Tunnel and Dover would force hundreds of its trucks to wait for the equivalent of 90 hours a day (*ibid*).

Honda's government affairs manager, Patrick Keating stated that "outside of the customs union, there is no such thing as a frictionless border. I wouldn't say that the just-in-time manufacturing model wouldn't work, but it would certainly be very challenging" (*ibid*). As a result, even short hold-ups at customs borders will likely cause big problems for the fine-grained supply chains involved in UK manufacturing and especially automotive, and will likely making Britain a less competitive place to assemble cars, for example.

Indeed, if the UK leaves both the European customs union and the EU Single Market it is very difficult to see how such cross-border JIT systems can survive in their current form. Customs processes, however, short, are simply incompatible with these systems, because of the uncertainty associated with delivery time variations. So it is thus of little surprise that the Business Select Committee concluded that "non-tariff barriers, in the form of border delays and increased bureaucracy, will... affect UK competitiveness. We recommend that the Government should, in its negotiations, place a high premium on securing frictionless trade for the automotive sector" (*ibid*).

2.1.4 Supply Chain Resilience

In response to the potential impacts of Brexit identified above, conventional approaches to reinforcing the supply chain have been to emphasise increased resilience. As such, it is argued that enhancing supply chain integration could help to build up a higher resilient capability. With

information sharing, the “bullwhip effect” - defined as the distortion of demand information as one moves upstream in the supply chain, causing severe inefficiencies within the whole supply chain (Costantino et al., 2013) - could be minimalised and companies would be able to make proper responses to different situations with enough evidence as support.

In addition to integration, it has been argued that Lean implementation could be another approach to enhance resilience. However, there are some arguments from industries that claimed that Brexit could “sabotage” the extant manufacturing JIT systems that are based on suppliers from the EU (Holden, 2018). However, this does not necessarily mean that Lean implementation should be stopped. When mentioning Lean, many people will equate it to “reducing cost” or being “cheap”. In fact, the term “Lean” actually refers to “a series of activities or solutions to eliminate waste, reduce non-value added (NVA) operations, and improve... value added (VA)” (Wee and Wu, 2009). Therefore, it is more apposite to interpret “Lean” as aiming to be more effective and efficient, which arguably is exactly what companies need in order to cope with Brexit-induced uncertainty.

An alternative approach to enhance supply chain resilience could be via that of supply chain segmentation (Safonovs and Upadhyay, 2017). Supply chain segmentation refers to segmented supply chains with a different supply chain strategy for different products with different levels of demand (Godsell et al., 2011). This bespoke approach suggests that it is possible to design more precise strategies for various products which could reduce costs and increase flexibility.

Alternatively, additional costs arising from Brexit could result in supplier re-evaluation, as firms seek to optimise existing supply chains and hence prepare for the supplier “earthquake” that could be brought about by Brexit. When re-evaluating current suppliers, the total cost of ownership (TCO) could be one update-to-date principle to help companies in choosing between suppliers. Some suppliers might be able to provide a lower price. However, if they are far away from the UK, then lengthy transportation times and low flexibility of changes could result in additional costs. Therefore, if considering TCO, then local suppliers might be able to provide a cheaper total cost, even if their costs of production are higher. As such, a TCO approach might result in companies seeking to “re-shore” operations to the UK in the event of a Hard Brexit. Godsell et al. (2017) suggest that this is a distinct possibility, as re-shoring could be a weapon to protect companies from the negative impacts of Brexit.

Finally, new technology development and implementation could be another approach whereby companies could build up a long-term sustainable and stable supply chain which would be less exposed to an unfavourable external environment. For example, 3D printing technology, a feature of “Industry 4.0”, could provide an innovative approach to production - which has been widely used in aerospace industry (Joshi and Sheikh, 2015). 3D printing could also help to enhance the vertical integration of production, as a result, the tiers of suppliers could be reduced (Berman, 2012). Hence, supply chains could become simpler and thus enhancing the capability against urgent change of external environment.

2.2 Operations and Logistics

In considering the impact on procurement and operations, key consideration will need to be given to the logistics of moving goods and people between the UK and the EU. A key concern here will be the status of cross-border haulage. At the time of writing, it is simply unclear as to what post-Brexit rules on cross-border haulage services would be. However, these will need to be agreed: at present, providing hauliers have the correct licenses they can effectively treat the EU as a single country. Post-Brexit this will not automatically be the case, and in the absence of any agreement, UK-registered hauliers would either require an ECMT permit (of which the UK will have less than 1000

for a 12 month period and just over 2800 monthly ones) or a permit for every EU country they travel through. Indeed, it is difficult to see how an agreement to continue the current Community Licence can be come to without some form of freedom of movement for drivers.

2.3 Human Resources and Talent Management

2.3.1 Employment

The UK automotive industry is a major employer in UK manufacturing, with 153,000 people employed in the broader motor vehicle manufacturing sector, equivalent to 6.3% of total manufacturing industry employment and 0.5% of total UK employment (Office for National Statistics, 2018c). The UK workforce is itself a major factor that has promoted the success of the automotive industry, in particular the flexibility the UK provides employers to meet changes in requirements and environment (Automotive Council, 2013). According to the OECD employment protection index the UK ranks fourth in most competitive employment laws in the developed world even surpassing many emerging economies such as Brazil, Russia and China (Organisation for Economic Cooperation and Development, 2015).

The flexibility in the UK labour force has arguably contributed to promoting productivity and capacity utilisation. Automotive employers in the UK are increasingly able to use temporary workers, agency staff, fixed term contracts, flexible working hours, 'down-days' and 'time-banking' allowing them to adapt to the environment more easily (KPMG, 2012). When compared to major western European automotive manufacturers the UK is able to maximise productivity by managing capacity utilisation and therefore remaining competitive, in contrast – it is argued – with more stringent employment laws in Europe and a lack of flexibility available as compared to the UK. Arguably this has led to them maintaining capacity levels which directly resulted in over capacity.

2.3.2 Availability of Skills

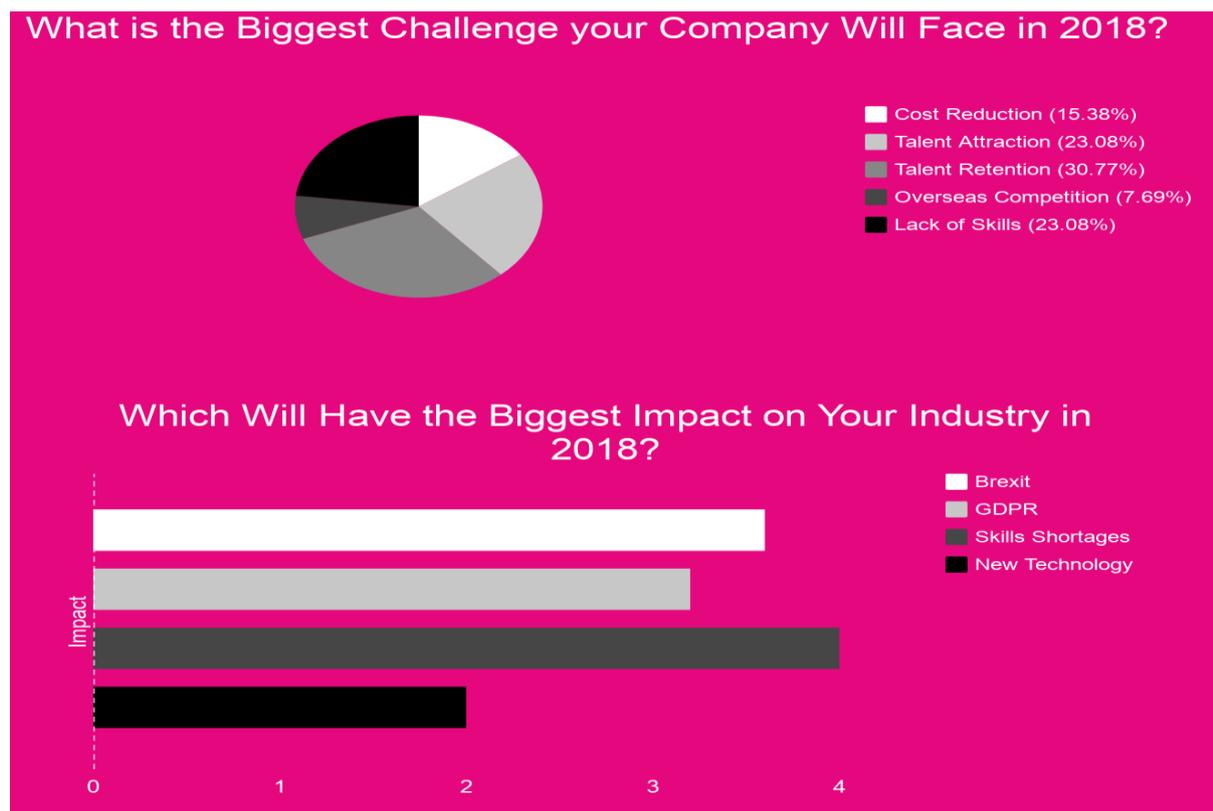
Although the flexibility of the UK's workforce has in recent years attracted FDI, as well as enhancing the UK's global competitiveness (KPMG, 2012), the automotive industry needs a steady stream of qualified employees as it grows. The Automotive Council (2013) reported that 18% of automotive sector employers experienced difficulties in filling technical vacancies. Skills levels of the UK workforce trail behind those in many other 'developed' economies but may also trail behind major emerging economies such as Brazil, China and India (*ibid.*) Employees are slightly older, on average, than employees across the whole economy. The UK government has taken practical measures in order to combat this issue (KPMG, 2012).

Interestingly, given the narrative around skills shortages and the country's lacklustre performance on some international education benchmarks, the UK spends comparatively heavily on education, devoting some 6.6% of GDP to education (including private and university education). This is well above France (5.3%), Germany (4.3%) and the USA (6.2%) (Organisation for Economic Cooperation and Development, 2014). In terms of the automotive industry the government has implemented the Wolf Review of Vocational Education, to identify and provide incentives for schools and colleges to offer high quality vocational qualifications to 14-19 year olds (Automotive council 2013). The government has also increased funding and support for apprenticeships in manufacturing as well as the automotive sector, from 2010-11 apprenticeships intakes had increased by one third as a direct result of increased support (KPMG, 2012).

Although the proposed transition period of the status quo ante (still to be subject to a Withdrawal Agreement at the time of writing) has been welcomed by UK businesses, there is still a high degree

of uncertainty over the final position with respect to freedom of movement and the status of workers from the EU. Following the end of the transition period UK employers may struggle to attract workers from other countries, which in turn could leave British manufacturing industries at a significant disadvantage. The recent Business Leaders Report (2018) would support this notion as it reveals concerns around recruitment faced by the Aerospace & Aviation, and Automotive, Engineering and Defence and Marine industries. Responses in the figure overleaf demonstrate candidate attraction, retention and lack of skills as some of the biggest HR challenges for this sector.

One of the main benefits as a member of the EU is the flexibility it offers workers, by offering them the freedom to move around from one plant to another across member countries. This in turn minimises disruption and offers companies the confidence and freedom to recruit without any additional regulatory or administrative costs being incurred. Removal of such freedoms could limit the UK's ability to attract the right skills and risks placing the UK at a disadvantage. The Aerospace and Aviation industries have been highly vocal about the impact of losing skilled workers, with 42% of industry leaders confirming a labour shortage in the maintenance technical field as the most urgent challenge for Aerospace in 2018 (Business Leaders Report, 2018). Equally for the UK automotive manufacturing industry the challenge is similar, highlighting a skill gap of 5000 people, which is projected to increase as we move closer towards our official departure date. (SMMT, 2016). Any new rules on immigration are likely therefore to affect the position above.



Source: Business Leaders Report (2018)

In this context, the long awaited report from Migration Advisory Committee (MAC, 28th Sep 2018) offered government and businesses some guidance on what a post Brexit immigration system could look like. Although the report acknowledges no evidence that the EEA migration has reduced

employment opportunities for UK born on average, instead it suggests EEA immigration has in fact had a positive effect on UK Productivity, MAC (Sep 2018). Ironically, it is exactly this concern that contributed to offering support for the leave campaign. Potentially such data and acknowledgment would have been of more benefit during the campaigning for the Brexit referendum as opposed to being shared post Brexit.

Overall proposals can be described as giving with one hand and taking from the other. Clear winners from this report are medium - highly skilled Migrants either from EEA or non –EEA countries. In contrast, lower skilled workers will face restrictions, thereby providing significant challenges for employers in sectors such as retail, hospitality and social care. Other key aspects of the report have recommended abolishing the Tier 2 general visa cap, which is a welcomed proposal; however, confirmation that the current salary threshold of £30,000 will remain in place could prove to be prohibitive for many employers. MAC (2018) recognises this point stating, “this salary threshold could be difficult (but not impossible) to meet for medium skilled jobs”. What seems to emerge from the report is a broad set of rules but no real detail for employers to work with. Equally, it is important to note they are in fact recommendations and as Brexit negotiations are still ongoing they may well be limited in their impact as they could be subject to compromises in favour of a trade deal for the UK.

As noted elsewhere, a number of deal options have been explored ranging from remaining in the single market at one end, to relying on WTO rules, at the other. However the real challenge is to drive and devise solutions without conceding on any of the UK’s ‘red lines’, Balls et al. (2018). In terms of immigration a desire to continue with controlling immigration and at the same time reflect the needs of businesses and leave voters presents a challenge and an innovate approach is needed to meet the needs of all. The table overleaf considers these with respect to free movement of labour the impact of various scenarios.

In order to fully consider the position in relation to access to a skilled workforce following, some understanding of immigration rules is needed. Early government guidance suggests adoption of the current points-based system for non-EU workers, where there is a requirement of a job offer before candidates can come to the UK (CIPD, 2017). To extend current rules for non-EU/EEA nationals to all non-UK nationals could restrict economic migration to high-skilled migrants (via a points-based system) and reduce the flow of migrant workers doing low-skilled jobs. Other implications of such an approach could see employers having to secure a sponsorship license, which will inevitably increase costs and administrative burdens.

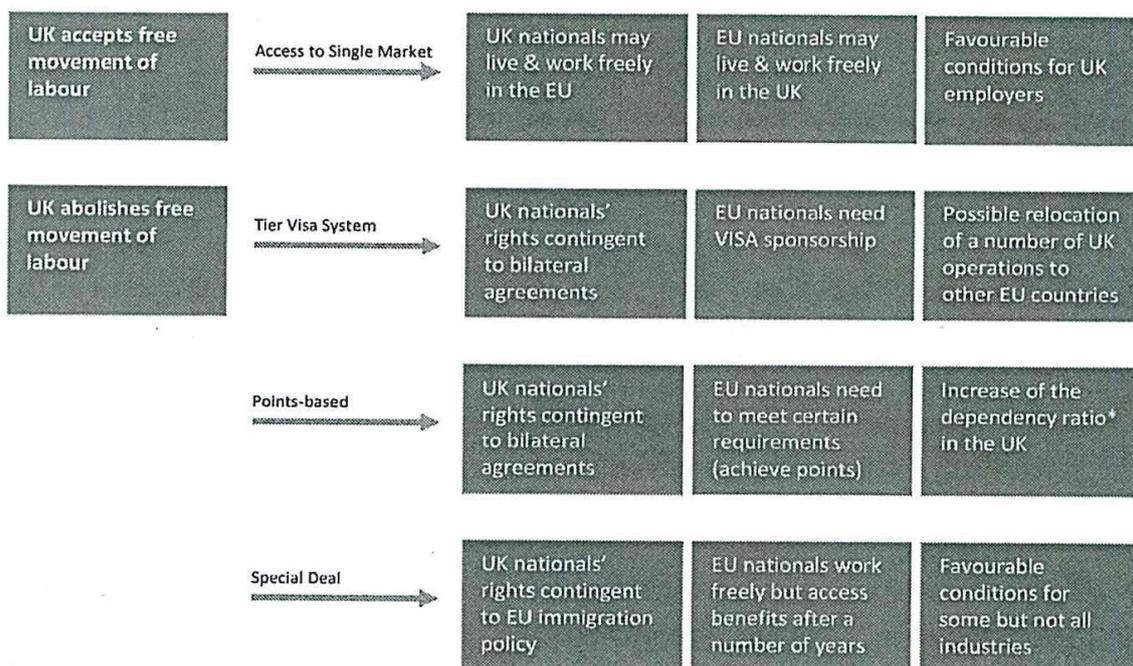
Table 1: Alternative Models of UK-EU Relations

	Leaving Single Market & having “A customs union” (with regulatory alignment)	Customs Union Turkey style	FTA Modelled on CETA	Norwegian / Model	Swiss model	WTO Status
Free Movement of people	No	No	No	Yes	Some	No
	Although this option enables tariff free trade (for goods) some form of regulatory	Turkish model will enable the government to get closer to its migration targets, as	Allows tariff free access to the single market for goods.	Although not part of the customs union It involves adhering to the four	This relationship is framed by a number of bilateral agreements and could work better	This approach would result in a hard Brexit and would

	<p>compliance is still needed & UK would need to secure agreement on this. In terms of access to a skilled workforce, some type of special deal under flexible immigration rules is a possibility but until clear guidance on immigration rules emerge this position is hard to predict.</p>	<p>movement of people is not covered. However it reduces the right to make & contribute to decisions that will impact on the UK. Therefore not fully reflecting what the leave campaign were looking for, they want a bigger say rather than be limited. Therefore an unlikely option.</p>	<p>However customs checks and compliance with EU regulations and rules of origin is required. However in terms of the aim to reduce free movement of people this approach would fit well as no obligation to sign up to free movement.</p>	<p>freedoms and having to abide by EU rules with limited opportunity to influence decisions. This would seem to go against the government's objectives.</p>	<p>for the UK. In terms of Free movement of persons this exists, but is complemented by a range of conditions. Such an approach could allow the government to balance the needs of businesses and those who voted to leave. Some aspects of this approach could be desirable. However, the EU have specified that they do not want to replicate this for the UK and, indeed, are trying to simplify their relationship with Switzerland.</p>	<p>create a high degree of uncertainty. It is not an approach that has been supported by the government and is not a favourable option due to the additional costs that would be incurred by businesses.</p>
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We noted earlier the pros and cons for migration and freedom of movement for companies' skills requirements in any post-Brexit trading scenario. As such, we would recommend a "lighter touch" system, such as bringing back the former worker registration scheme, which was last used for countries such as Romania before they were given unrestricted access in 2014, this could be a preferred option. Under this system the employer simply needs a letter of approval from the Government, which reduces the implications of additional costs. (CIPD, 2017). If we operate outside of the Single Market but remain in "a new customs union", as promoted by the Labour Opposition, then this would still restrict our access to a skilled workforce, unless a special deal in relation to movement of people can be negotiated.

Figure 1: Immigration Scenarios



Source: Adapted from: Salh, S., Nyfoudi, M. and De Ruyter, A. (2017) 'Future Regulation of the UK Workforce', in Bailey, D. and Budd, L. (eds.), *The Political Economy of Brexit, Agenda: Newcastle upon Tyne*.

*Dependency ratio represents the amount of non-working, dependent citizens (e.g. pensioners, students) divided by the amount of working citizens.

However, the UK Government (at the time of writing) is keen to reflect the sentiments expressed in the Brexit vote and manage migration conditions in line with their own domestic targets. It is imperative to note that if the UK decides to close its doors to immigrants from the European Economic Area, then it will also be exiting the European Single Market, which happens to be the largest economic block in the world, (Simionescu et al. 2003). Research confirms while there is work to be done to improve domestic education and training, attracting the best from abroad will continue to be part of the solution going forward. Many businesses stress that attracting talent from Europe has been a key factor in determining their success; and that losing access to such talent might imperil their future competitiveness (Balls et al., 2018). Following Theresa May's Mansion house speech it is clear a strong commitment to leaving the Single Market has been advocated (Guardian, 2018) in which case a barrier to free movement is created unless new immigration rules offer the flexibility businesses are looking for.

A sector by sector approach has been mooted and would be subject to appropriate immigration rules, which points to adopting a special deal type solution as indicated below. An outline below of the possible immigration scenarios that could impact on the access to a skilled labour force has been explored. The first option of access to the Single Market therefore continues to remain unlikely based on current political positions confirming the departure from the EU does not include participation in the single market.

2.4 Regulation and Compliance

In trying to understand the likely regulatory and compliance effects of Brexit, we should first be clear that the UK's membership of the EU encompasses a vast range of issues that fundamentally relate to many areas of the UK's national life. All countries in the EU are members of a number of EU agencies

including the European Aviation Safety Agency, the European Medicines Agency, the European Chemicals Agency, Euratom (which deals with nuclear safety) and others. It is possible for a non-EU country to be a member of some of these (Switzerland, for example, is a member of the European Aviation Safety Agency) but it would require negotiation and agreement, particularly if the UK is not part of the European Economic Area. This is highly unlikely in the absence of a Withdrawal Agreement. As such, the UK would, overnight, cease to be a member of any of the above agencies. This would have huge implications for aviation (where parts manufactured in the UK would all need to be re-certified upon export). It would have major ramifications for the ability to carry out even relatively routine aircraft maintenance in the UK. A multi-billion pound industry would, overnight, struggle to function.

The same would be true for the European Chemicals Agency, which deals with a frankly bewildering array of chemical compounds. This would affect diverse industries such as vehicle manufacture (for which hydraulic fluids, adhesives, anti-corrosion coatings, sealants and paints are all regulated), aircraft manufacture (for which highly specialist coatings are a particular concern) and many others. If the UK ceases to be a member of the European Chemicals Agency overnight then UK companies that are currently certified as REACH compliant would lose their rights to be able to sell into the EEA (31 countries). The automotive industry is heavily affected by REACH and loss of continuity in this regard could pose challenges (EAMA, 2018). Similarly, problems are apparent for the pharmaceuticals industry with regard to exiting the EU Medicines Agency.

None of these of course touch upon the challenges associated with customs barriers; the need to prove correct payment of customs duties, including rules of origin compliance, and the need to prove that the goods in question adhere to EU regulation. As regards customs and excise, all VAT registered traders must report (and be able to show evidence if demanded) exports to HMRC and traders who are not VAT registered would need to make customs declarations (it is an open question how well compliance could be enforced). In this context, HMRC is replacing the current Customs Handling of Import and Export Freight (CHIEF) system with a new Customs Declaration System (CDS), which is designed to be in place before March 2019 (but yet to be fully implemented at the time of writing)². As such, the National Audit Office suggest that there are several risks associated with the introduction of this new system, namely (quoted directly from NAO, 2017)³:

- the time contingency available to HMRC;
- the technical challenge of integrating the different elements of the CDS system;
- the potential increase in volumes following the UK's decision to leave the EU;
- stakeholder engagement and transition planning;
- the programme management approach adopted;
- resource gaps, and;
- the potential for additional costs.

Indeed, it is perhaps the increase in the volume of items necessary to declare for customs purposes that could cause the most difficulties – in 2015-16, CHIEF processed approximately 55 million customs clearances outside the EU. However, with a hard Brexit, this number is expected to increase five-fold, to some 255 million⁴, casting doubts on the ability of the new system to cope with the

² Jon Thompson (Permanent Secretary to HMRC), giving evidence to the Parliamentary Public Accounts Committee (PAC) on September 5th 2018 stated that ““being realistic about it”, CDS would not be fully rolled out until March, two months after it was due to come into operation” (<https://www.civilserviceworld.com/articles/news/mps-disappointed-delays-hmracs-customs-systems-upgrade>)

³ <https://www.nao.org.uk/report/the-customs-declaration-service/>

⁴ <https://www.nao.org.uk/wp-content/uploads/2017/07/The-Customs-Declaration-Service.pdf>

increased volume (indeed, the CDS to date has only been tested to process 180 million clearances a year). In addition, CDS is not the only “border system” that HMRC operate – there are 57 of these in total, and HMRC have assessed that 26 of these will need to be altered in some way to cope with a hard Brexit (ibid.).

2.5 Customer Communications

Finally, we turn to customer communications and managing expectations regarding the likely impact of Brexit. In considering the nature of customer communications, Brexit can certainly be considered as an acute example of “crisis management”. Pearson and Clair (1998) define organisational crisis management as “*a systematic attempt by organizations with external stakeholders [i.e., most organisations] to avert crises or to effectively manage those that do occur*” (ibid.).

Crisis management thus is typically something individual organisations must engage in when they have been implicated in some event that is perceived to result in a negative impact upon their stakeholders. As such, it is an integral part of “reputation management”. However, this brings into question whether a business can truly claim to be able to “manage” its reputation, given that basic parameters such as quality of products, financial performance and organisational ethics are largely outside of the control of corporate PR departments (Hutton et al., 2001). Brexit, unlike the overwhelming majority of situations leading to crisis management, which generally relate to one individual or business or organisation, is something that will affect every individual and firm doing business in - or with - the UK. Thus, it thus lies even further outside of the ability of corporate communications units to manage expectations on, arising from macro-level (that is, above the level of the organisation) issues.

Having somewhat discounted the notion then that customer communications in the context of Brexit should be about reputational issues, we are left with retracting to more fundamental principles of communication – and hence, the importance of regular dialogue with stakeholders. As such, the basic principles of crisis management and communications with customers would apply for automotive firms in the UK (to the extent that manufacturers can distinguish the particularities of “known unknowns” vis-à-vis “unknown unknowns” arising from Brexit). Very simply put, the process of crisis management can be considered as to:

“begin by telling stakeholders what to do to protect themselves from the crisis (instructing information) and to help them cope psychologically with the crisis (adjusting information). The next step is to address the reputational threat posed by the crisis....” (Coombs and Holladay, 2008: 252).

In the context of an automotive value chain then, the “instructing information” aspect of crisis management will be intimately linked with the need to ensure compliance and preparedness for any new documentation procedures that would arise in the event of a “hard” Brexit.

2.6 Summary of findings

Whilst there is substantial understanding of the ways in which Brexit might affect the automotive sector, a review of the literature exposes key areas in which the impact has not been studied in as much depth. Specifically, we have considerably less knowledge of the impact further up the supply chain, most notably above tier-one suppliers. As a result, we outline a methodology that allows interpretation of detailed interviews with key players in the industry in order to ascertain what actions are being taken in order to mitigate the potential impacts of Brexit.

Section 3: Methodology

The preceding discussion has supposed in effect that companies are actively evaluating their supply chain options and considering the impact of likely post-Brexit trade scenarios upon the functional areas of business just described. Indeed, it is widely assumed – particularly in UK Government circles that companies *are* preparing for Brexit as part of normal risk management and contingency planning exercises. However, it is equally possible that (resource-constrained) companies could find that acting in the face of “unknown unknowns” arising from Brexit is problematic, due to the inability to assign probabilities to unquantifiable scenarios. It is perhaps this that has seen the continued calls from businesses and peak organisations such as the British Chambers of Commerce, for “clarity” by the UK Government to negotiating an exit from the EU. Hence, in the sections that follow, we seek to evaluate the supply chain management strategies of firms in the automotive sectors, by specifically asking the following research questions:

- What is the potential impact of Brexit on operation and supply chains, HR, Compliance and Customer Communications;
- Are companies undertaking measures to be “prepared” for Brexit, and;
- What mitigating strategies, if any, do they have in place?

Given the focus of the study on the automotive sector, a case study research strategy was adopted consisting of a mixed-methods research approach (interviews and desktop analysis). Semi-structured interviews of approximately 30 minutes to an hour’s duration were conducted between June and September 2018 with 9 senior managers in automotive firms based predominantly in the West Midlands of the UK. These individuals consisted of a mix of functional areas (procurement, operations, finance etc.) but the key criterion for interview selection was that these people in some sense “owned” the issue of Brexit in their organisation. The interview questions covered five themes related to the perceived potential impact of Brexit on the company respondents worked for: supply chain management; purchasing; legal and compliance; human resources, and; customer service and communications.

Within these envelopes, the aim of the interviews was to understand to what extent managers across these functional areas understood the exposure of their sector to Brexit, what range of options were available in terms of adjusting their business model, and what strategies – if any – they had in place to try and mitigate the potential impact of different Brexit scenarios (i.e., hard Brexit with new visa requirements and trade barriers, or soft Brexit). Interview participants were provided with prior information about the purposes of the research so as to ensure fully-informed consent, and the interviews were conducted in accordance with the strict ethical tenets of voluntary participation, anonymity, confidentiality and non-disclosure where requested. The interviews recorded on digital recording software and transcribed using the services of a professional transcription firm. Data was kept on secure services and all name and subject identifiers were destroyed upon the conclusion of the research.

In the sections that follow, we detail the findings of the research in accordance with the themes denoted above. Given the relatively small size of the interview sample, the findings should be considered as indicative rather than necessarily representative, so some degree of caution is necessary in terms of generalising the findings.

Section 4: Findings

We now present the findings of the research. In the discussion that follows, a majority of the emphasis is placed on supply chain management.

4.1 Brexit and the Supply Chain

On the potential impact of Brexit

The supply chain for a majority of companies within the auto industry is not just a domestic phenomenon; supply chains extend across national boundaries, imposing challenges of globalisation on decision makers who are responsible for designing the supply chain for existing and new product lines (Meixell and Gargeya, 2005). With this level of integration across international boundaries, Brexit brings “waste” back into the process with the possibility of new border rules and tariffs on parts as they cross borders before being inserted into cars. In this context, one manager from an automotive OEM referred to Brexit as;

“a disaster for the economy and for the country and for our business. As a company, we are very much UK concentrated in terms of our geographical, manufacturing and other supporting services footprint. But we are very international in our sales outlet. So, for us as a company, we bring in lots of things to the UK, people, parts... other stuff. Make them into cars and then export that. So, we are affected for things on the way in and on the way out”.

A tier 1 supplier to the automotive industry noted that on the “negative side it’s likely to increase the amount of administration and paperwork that’s involved in dealing with EU companies whatever the outcome.”

In addition to this, one of the tier 1 suppliers was concerned with the idea of stockpiling of products in the UK to mitigate for a Brexit, an aspect that contradicts the attributes associated with just-in-time philosophy, in adding costs (Chopra and Sodhi, 2004) to the business.

On Brexit “preparedness”

With reference to the preparedness of companies to Brexit, an increasing number of companies appear to be worried about the impact of the UK leaving the EU, but there remains little planning and most businesses are unaware of how to tackle this issue. As noted, businesses continue to call for “clarity” from the UK Government in its negotiating objectives, despite the fact that the Government has released “no deal scenario” (a scenario where the UK leaves the EU without any agreement) advice⁵. A manager at a tier 1 supplier emphasised that:

“For us, we can understand Brexit at a functional level, but to understand it at an enterprise level means combining... individual views. And, what one means for the next and what that means for the next and what that means for the next, is very difficult and it’s trying to join up the dots and make sure that there aren’t contradictions - that’s a real operational challenge”.

Another manager at an OEM in the same context mentioned that:

“only last year did it become apparent that..., time was ticking faster than one would have hoped. And consequently one needed to look at the impacts. I think there was a belief that A) it wouldn’t... happen and B) it would happen in a much subtler form, but obviously that didn’t quite occur”.

In contrast, another manager from an OEM confirmed two scenario planning options into which they had invested resources, a “base scenario” and an “alternative scenario”. The base scenario was that

⁵ UK government Brexit advice, <https://www.gov.uk/government/brexit> [accessed 16 October, 2018]

of a Canada – EU style free trade agreement; i.e., that the UK would leave the EU, leave the Single Market, leave the customs union, and freedom of movement with EU countries would end. As such, the Jurisdiction of the Court of Justice of the European Union would end pretty much in line with the UK Government’s “red lines” but that the UK would negotiate a tariff free trade agreement with the EU. The alternative scenario that was considered was exactly the same, except there would be tariffs; so, a WTO-style scenario.

Although this company looked at and considered the likelihood that all the different models that exist, so the Norway model, the Switzerland model, the Ukraine model, the Turkey model, the Canada model, WTO model may be applicable. But the company believes that based on prudent and probabilistic assessment of scenarios, either of the two; a Canada-EU style agreement, or default to WTO trade conventions might be the most likely outcome. Although they have invested resources in planning for these two scenarios, they also have worked to make sure that the whole business is using the exactly same set of scenarios. In addition the company is working on an exercise to consider how they would cope with a no deal outcome. The manager in this context of no deal scenario between the UK and the EU went on to say *“although my guidance to the business is this is a very low probability scenario, it’s **not** zero probability because it’s very low probability. We have been exercised to consider it in all seriousness”* (our emphasis).

Mitigating strategies: Understanding the supply chain?

A majority of people are familiar with large UK-based OEM brands such as Jaguar Land Rover, Rolls-Royce and GKN. However, the multitude of suppliers and partners that make these companies’ final products possible often go unrecognised (APMG, 2015). This aspect of the supply chain is missed and ignored to the detriment of the UK’s entire industrial base. Evidence suggest that the UK Government had been supportive of reshoring production and increasing the scope of the local supply chain. However, this was before the Brexit referendum result in 2016. The concept of on shoring suppliers was one of the options suggested by a manager of an OEM to mitigate the risk of disruption that might be caused in the supply chain.

In light of evidence from the industry, the possibility of reshoring suppliers would mitigate potential tariffs on traded car components. Stojanovic and Rutter (2018) suggest that on finished cars there could be a potential 10% tariff (at WTO thresholds) within the automotive sector, so that finished cars would suffer a 10% tariff in addition to car components’ tariffs ranging from 2.5 to 4.5%. However, the sector also depends on intermediate inputs that cross borders many times – and so costs could accumulate in the supply chain. Further to this, the existence of sunk costs in the form of existing contracts with suppliers could also act to limit flexibility to respond quickly to Brexit, with one manager in a tier 1 supplier commenting that they would not change suppliers in the short term. Indeed, in the short-term, it could be that companies will simply have to devote additional resources to managing any increased documentation requirements related to rules of origin and diagonal cumulation, so as to ensure (as best as possible) frictionless movement of supplies cross border to avoid delays and stockpiling in order to fulfil current orders.

Hence, in the context of the inevitable lag times to affecting any changes to supply chain management procedures, the proposed transition period to the end of 2020 (at the time of writing) was regarded with a high degree of scepticism by our respondents. As such, a manager from a tier 1 supplier stated that:

“Okay, so we have a two year transition period agreed. But, our own Government studies show that we need five to ten years to put some sort of system in place. So what do we do for the three to eight

years in-between that? Who collects these customs? Who actually does all of this stuff that we've cooked up? So the practicalities as well as the legalities I don't.... really....understand..."

OEMs are also appear to be examining the added costs and the contribution from suppliers in meeting these costs. An issue that will need to be dealt with individual suppliers.

Finally, our research suggests that OEMs might not fully aware of the lower tiers in their supply chain and the effects of Brexit on suppliers lower down the chain will have an impact on any - or all - of the suppliers in the upper tiers of the supply chain, for example:

"We have a very strong understanding of who our suppliers are at Tier 1 and then direct to Tier 2, and visibility.... that means we worked with that supplier for the engineering, but we don't own the commercial relationship, it goes through a Tier 1. Beyond that, we don't really have much knowledge of who our suppliers are and where the parts come from, and therefore, we don't particularly have a working group at the moment with our suppliers, it's all kind of like every person for themselves".

Similarly, concerns were echoed that smaller suppliers in tier 3 or 4 had very little understanding of the wider supply chain they were situated in:

"many of them are quite small business with very limited resources, and don't really think through the strategies in in much depth, I mean, they just know that somebody gives them an order and they fulfil it... and some of them are very simple businesses and many of them aren't even on, you know, on shore in the UK they...they will be simple businesses all over the world."

4.2 Operations and Logistics

Key to concerns of operations and logistics was the overall smooth running of the supply chain. In this regard, an important feature was that the industry had widely embraced just-in-time (JIT) methods of distribution and hence any disruption to this would be inimical to efficiency:

"look, the industry has spent 40 years driving continuous reduction in cycle time, continuous reduction in inventories and per second the processes which have taken 40 years to do. The automotive industry has trained Britain to be a just-in-time society when you think about supermarkets and all sorts of product flows, so disruption to that is unpredictable, I mean it's it's...are the trucks going to get through Dover? If they do, we survive, if one truck gets stuck and all of them back up...?"

Moreover:

"You know, if you get any single item stuck on a truck that is part of a manufactured process that whole manufactured process is that the manufacturing process is then brought to a halt, and the only counter-measure to it is to put massive inventories in everywhere and candidly there isn't the space to do it or the capital."

4.3 Human Resources and Talent Management

We now consider the potential impact of a future UK immigration policy that did not distinguish between EU nationals and those from the rest of the world, such as that recently proposed by the Government's Migration Advisory Committee. A typical view here was that this would adversely affect costs; such as this comment by one of our respondents from an OEM: *"our fall-back assumption is, what applies to the rest of the world now, will apply to EU nationals. And, that could potentially present a substantial increase in cost and reduction and availability of workers and increase in our own operating costs."*

For other respondents, the prospect of skills shortages meant a renewed focus on training, for example, by backfilling a number of apprenticeship roles and filling these internally. There was a recognition of the need to bring more (young) people through the door, for example, this comment from one tier1 supplier: *“There are skill gaps. We will have a general issue because we have a relatively old workforce in relative terms. So they’re all going to go with lots of experience, we’ve got lots of people that have been there for 20 odd years.”*

Another interesting area was in the potential impact of Brexit on the future thrust of employment regulation, as per this comment from one tier 1 supplier:

“So there’s lots of implication there that, I mean if you look at us as an employer where do you then go? Or as an employee you know what six months ago we voted out of the European Convention of Human Rights, now we’re back in it. Who only knows what we will be. So if we haven’t got European Human Rights maintained who wants to talk to me about a Worker Directive? It is rubbish.”

4.4 Regulation and Compliance

One of the key concerns around regulation and compliance by manufacturers was around “vehicle type approval” – essentially either for whole vehicles, or vehicle parts. Currently the requisite UK agency can approve vehicles for sale in the entire EU-28. However, in a post-Brexit environment vehicles made in the UK would need to be type-approved by the other EU-27, which could result in a situation whereby models for export to the EU would have to be shipped to an EU country for certification. Suffice to say, this could have significant cost implications depending on the scale of the operations, as this comment from a respondent in an OEM detailed:

“One problem is that all historic approvals from this UK agency will no longer be valid. Much like with medicines and other areas, for a car that’s on the road today, that’s going to be fine. But, we might not be able to sell a single other one, because this certificate of conformity, their one saying it meets safety standards is now from an agency that no longer exists.

So, there is a process being set up that we can transfer our existing type approvals from the UK agency to an EU one, but that takes time. So, there’s one concern there that there might be a period where it hasn’t happened. There is also the consideration that we have absolutely no idea what the UK future regulatory position will be, around type approval. It could allow the EU approvals in, it could go down its own route. Effectively any change could increase costs for us.”

Other concerns expressed included the implications of leaving the EU for REACH provisions, as per the transporting of paints and sprays to dealers under relevant regulations for the movement of chemicals. Concerns around potential changes to environmental standards were also expressed, relating to greenhouse gas emissions, for example: *“to what extent will the EU continue to treat the UK as part of its CO2 coverage. So, for example, as a company, [we get] exemption, because we’re a small company from the legislation, it’s called derogation; the formal term for letting us off”.*

Finally, concerns were expressed around the need to comply with relevant VAT provisions, for example, this comment from one tier 1 supplier:

“The UK government already isn’t making it very easy to do export, we have issues with you know the...there ought to be a...there needs to be a simplification of the import duties and VAT suspension for small businesses like ours. There’s a 17-page document, which you have to fill in and then two appendixes, which include a guarantee from the directors that they will cover any VAT liability.”

4.5 Customer Communications

Somewhat surprisingly, respondents struggled to articulate anything under this category, so we confine our comments to the discussion section.

4.6 Summary

A final point related to the limited capacity of companies to actually engage in activities related to planning for Brexit. This was particularly pertinent for smaller operators, who lacked the manpower to allocate to such purposes (but even OEMs in our sample argued that they were “resource constrained”). For SMEs in particular, time was a factor that simply prevented them from engaging in this regard:

*“you could attend a conference by the Chamber of Commerce. A three-day conference on scenario planning for Brexit. Three days. Who in a small business like ours is going to spend three days planning for things, **which may or may not happen** (our emphasis)? Working in a small business you have to work on things, which are more tangible and short-term and impactful on the business.”*

And indeed, this was the point – a general climate of uncertainty had discouraged companies from allocating resources to areas which might not in the end, need resourcing. This only serves to reiterate the message that despite businesses saying that they were planning for Brexit, the notion of wanting “clarity” from the UK Government still seemed pervasive. In the next section, we explore some of the implications of our findings, and then conclude with our recommendations.

Section 5: Discussion

In this section, we now consider the implications of the findings above, and use these to derive recommendations for businesses in adjusting to Brexit. Below we outline these in terms of the five functional areas referred to earlier.

5.1 Supply Chain Management

Our findings have highlighted questions of disparity in Brexit readiness levels amongst the OEMs and tier 1 companies whose representatives we interviewed. At one end of the spectrum are companies with no or minimum understanding of readiness to Brexit, whilst on the other are companies that have thought through and may even be prepared to mitigate the impact of Brexit. To reiterate, this disparity amongst the sample might not be generalisable across the population, but is certainly indicative of the work and input required to ensure “frictionless supply chains” in the advent of a hard Brexit, in managing the complications and obstacles that the UK as a constituent nation in a trade block could face after a significant political shift to the status of being a third-party country to the EU.

As such, major OEMs and tier-one suppliers will need to work much more closely with companies further down their supply chains in order to help them mitigate the risks faced, particularly in terms of timely deliveries. Warehousing might also need to be considered in some scenarios, but this will vary by component and site. Therefore, companies need to have a further understanding of Lean and implement it in a deeper level, e.g., apply a lean philosophy on more operations processes rather than just pure manufacturing processes. For example, this could consist of extending lean manufacturing to a lean supply chain. In order to do this, companies need to map their value stream in a deep detail and re-evaluate and optimise by a lean philosophy annually (Wee and Wu, 2009). In this way, business operation processes could become simpler and smoother; presuming higher efficiency, so as to help achieving a lower total cost.

5.2 Operations and Logistics

Key here is the need for enhanced enterprise information management systems to be put in place. For manufacturers then, there is a clear incentive to embrace new technology, and systems to streamline documentation and compliance (see Section 5.5) CBS Visiting Industry Fellow, Nigel Taylor, has written (Taylor, 2018) about the potential for technology to assist with “frictionless” trade, and he highlights the potential (and limitations) surrounding the use of technologies such as block-chain, robotic process automation (RPA) and point of origin-calculating software. We argue that companies seeking to facilitate smooth operations against the disruptive impact of a hard Brexit should seriously consider using these sorts of technologies. Related to this is the use of pre-clearance and digitalising Advanced Shipping Notices (ASNs) and risk-assessment of goods prior to entry.

In turning to logistics, the prospect of a hard Brexit points to significant disruption and probably re-configuration of supply-chains, with the use of Eurotunnel and particular ports (namely, Dover and Hollyhead) raising issues in terms of their manifest lack of capacity to cope with (additional) customs infrastructure. There is a distinct possibility here that hold-ups arising from customs clearance etc. could mean shifting modes of transport, for example, with the recent coverage of Aston-Martin considering air-freighting in parts post-Brexit in order to avoid customs port bottlenecks (Wilde, 2018). As such, we could see ports such as Dover fall into abeyance, and an increased use of ports such as Southampton or Felixstowe or Harwich – again, depending on geographical proximity, connectivity and individual company logistics.

5.3 Human Resources and Talent Management

The prospect of maintaining freedom of movement of people until the end of the transition period (Peyton, 2018) has offered businesses some time and space to evaluate their current positions. Employers are encouraged to avoid a “wait and see” approach and instead use the time to effectively prepare for Brexit through workforce planning. Businesses should begin with a risk analysis to determine the number of workers who have accumulated rights to remain and work in the UK/EU and to assess which positions are at high risk and hence could leave businesses in a vulnerable position. It may make sense to start replacing EU workers now with UK nationals, however two key obstacles prevent this from being viable. Firstly during the transition period we are still subject to EU and domestic employment rights and such an approach may give rise to discrimination claims unless they can objectively justify such decisions. (Peyton, 2018). Secondly the shortage of talent within the UK has continually been identified as one of the main motives for going abroad to meet recruitment needs, (CIPD, 2018) which suggests a more clear strategy on workforce development needs to be given priority.

The CBI (2018) has recently reported on the issue of recruitment and how this has already started to have an impact on the car manufacturing sector. Such insights simply reinforce concerns around attraction and retention, which are likely to become a prime focus for HR professionals. From the CBI survey (2018) one car manufacturer explains the position:

“Over the summer we suspend our production line to allow holidays and many of our EU nationals go home for a short period. This autumn a far higher amount than usually chose not to return. From the exit interviews the primary reasons were: increasing uncertainty about their right to remain, experiencing increased levels of xenophobia and their earnings going not going as far due to the exchange rate” - international car manufacturer.

Source: CBI, 2018

Such findings emphasise the need to reaffirm commitments to equality and diversity, which have largely emerged due to the rising tide of anti-immigration voices and fuelling populism following the Brexit result. In times of the “Brexit” and “America First” policies, several industrialized countries' governments are turning toward more national-oriented migration policies. Simultaneously, societal aversion to immigration is growing. Both trends are sending negative signals to highly skilled employees and making immigrants feel that they are no longer welcome. Consequently, international careers are becoming uncertain, risky, and unpredictable. This new reality in industrialized knowledge-based economies may affect firms' talent pool and the skill set available to a country (Horak et al., 2017). Therefore the need to promote employee engagement and communication emerge as relevant areas of concern for the HR community. Although an agreement to retain free movement for all EU nationals during a transitional period is positive news, sentiments expressed above may have already damaged the attraction of UK as an employer of choice.

However in terms of preparing for a post Brexit world this requires a more effective and alternative approach to recruitment strategies being employed. In order to address some of these challenges it is important to know and understand what skilled workers are looking for from employers. The Business Leaders industry report 2018, suggests engaging with engineers and suggests they are seeking an opportunity to travel, location and the desire to upskill as relevant factors when looking for a new job. Such responses point to an increased emphasis on developing a learning culture and continued investment in employee's career in order to retain and attract the required candidates. Clearly the importance of the global workforce shouldn't be underestimated, and figures suggest

global workers in 2005 stand at 70 million workers; by 2039 this is forecasted to fall to 30 million a year (Holbeche, 2016).

Therefore, the message is loud and clear, demanding effective developmental strategies to retain and attract talent. Although initiatives taken via the Automotive Industry Partnership for Skills and investment in supporting more engineering apprenticeships is a step in the right direction in the long term, in the short term they are unlikely to fill the gap (House of Commons, 2018). Finally, better use of an ageing workforce and reviewing more flexible working practices could contribute to maintaining skills and knowledge, which could then in turn be used to develop new emerging talent entering the workforce. However working conditions that older workers are seeking are different from ones they were used to or have tolerated in the past. As a result, organizations must respond with the appropriate human resource policies to entice older workers to stay. These would include such things as customized flexible work arrangements, retraining, and offering rewards and benefits that older workers find attractive (Burke and Ng, 2006).

5.4 Regulation and Compliance

Our research has suggested that significant issues remain in terms of overall supply chain governance, in so far as the companies we examined could not be clear that all firms within their supply chain network would be Brexit-ready to cope with any new documentation and compliance procedures. Indeed, apparent from some respondents was an admission that the OEMs they worked for were not necessarily aware of all the tiered suppliers within their network at any given point. OEMs generally knew their tier 1 and tier 2 suppliers, but struggled beyond this. We argue that this is problematic because it is the smaller suppliers at tier 3 and tier 4 that are less likely to be aware of the need to understand any new compliance requirements – indeed, it is highly likely that some of these smaller firms are not even aware of the full extent (i.e., multinational) supply chain that they operate within. Such findings mirror the fact that small firms are generally more likely to be unaware of wider regulatory issues that pertain to them, to begin with (Betton et al., 2018).

Going forward, for those manufacturers that wish to pursue a “frictionless trading relationship” (as far as this will be possible) with the EU, attaining the status of Authorised Economic Operator (AEO) will be vitally important. In essence, this is a scheme whereby traders “*who voluntarily meet a wide range of criteria work in close cooperation with customs authorities to assure the common objective of supply chain security and are entitled to enjoy benefits throughout the EU*” (European Commission, 2018a). The EU currently has “Mutual Recognition” of AEO programmes with Switzerland, Norway, Japan, Andorra, China and the US. As a current member of the EU, it should therefore be a simple matter the UK Government to effect a mutual recognition agreement between it and the EU relatively quickly before the expiration of the *status quo ante* period of EU membership and a probable transition agreement, should the UK leave the EEA and Customs Union.

As such, the benefits of being an AEO include:

- Fewer security and safety related controls
- Recognition of business partners during the application process
- Priority treatment at customs clearance, and
- Business continuity mechanism

In turn, to reiterate, the attainment of AEO status is underpinned by having robust systems in place, which reiterates the importance of sound Enterprise Information Management practices (the criticism that AEO status favours larger companies notwithstanding). Key here (reproduced/quoted

from European Commission, 2018) is that AEO status is underpinned by meeting the following criteria:

- Compliance with customs legislation and taxation rules and absence of criminal offences related to the economic activity
- Appropriate record keeping
- Financial solvency
- Proven practical standards of competence or professional qualifications, and
- Appropriate security and safety measures.

5.5 Customer Communications

Finally, in considering the implications of our findings for Customer Communications (but also B2B Communications), imperative is that in the remaining Pre-Brexit period, there is a particular responsibility on OEMs (and to some degree, tier 1 supplier firms) to keep their clients informed of any changes they intend to make pre-Brexit. This information should be based on business' Brexit scenario planning and any changes they have agreed to make in order to help them during the initial weeks and months following Brexit. Our work suggests that information to clients should not be exhaustive (that is to say every single thing should not be communicated), but rather just the points that will have a visible direct effect on operations and customer relationships; and any calls to action they may need their client to make in order to continue the smooth running of their B2C relationship. Information overload would have a counterproductive effect, so messages must necessarily be brief and to the point.

Our work also suggests that on March 29th 2019 ("Brexit Day") and the immediate days following, reassurance should be given to the market, and that any planned disruptions (e.g., those mentioned already by BMW for example with its planned two-week shutdown) should have been communicated well in advance. That is, that OEMs are handling Brexit well and that their day to day good customer service will continue (this is especially pertinent in the "No Deal" scenario, whereby the UK fails to secure a transition period). Any problems that do occur should be communicated to the client as soon as possible and they should be made aware of any potential knock on effect in the days following, so that problems/ challenges do not come as a shock and they are able to (where possible) prepare themselves.

Finally, in the Post-Brexit period, manufacturers should continue to inform their customers and suppliers of any 'need to know' information in terms of just the information they need. This is also a good time for reflection and feedback should be sought from customers and suppliers. This will show all those involved in the supply chain (B2B and B2C) that automotive manufacturers consider their relationships with customers and suppliers to be important and hence any remaining issues can be addressed at this time.

Section 6: Conclusion and Recommendations

This report has explored the potential impacts of Brexit on the automotive sector supply chain. Brexit in the words of industry experts means considerable amounts of increase in waste (Lean philosophy), which the automotive industry has tried to reduce over time. The automotive supply chain would incur sudden increased costs, increased inventory costs for both supplies and complete products causing delays (Bailey and De Propriis, 2017) and reduced productivity.

It is evident from our study that almost all the automotive companies have no plan to mitigate the challenges which will be brought by Brexit to their supply chain. A few of the companies (specifically OEMs and tier 1 suppliers) with disposable resources have planned and might be ready, but they have not published details of any actions that they might take and as of yet no action has been taken. This could also be due to the fact that companies haven't been able to fully identify the threats posed by a Hard Brexit (back to our "unknown unknowns"). Companies agree that there is very little things they can do now, and that the automotive industry is waiting for Government to publish definitive directions.

In addition, companies have considered more local sourcing and reshoring, but might relocate their existing plants as well. This means the supply chain base /network/ configuration may be re-mapped post-Brexit. This can also be referred to as opportunities that might arise to be ceased by the companies, such as access to other global markets. It can be confirmed that some companies have dedicated teams to specifically manage Brexit issues. However, our evidence to date suggests that these teams appear not to connect and communicate with the rest of their organisation and are primarily working in a silo, with very little strategic output to direct the focus of their company.

From a company perspective, Brexit remains highly uncertain and raises key risk management issues. At the time of writing a Withdrawal Agreement has been negotiated, to be ratified by both sides. In the event of this being approved by both parties, we will have a transition period where the end outcome remains highly uncertain. In the event of the Withdrawal Agreement not being approved, there is a significant risk of a "cliff edge" Brexit in which the UK immediately reverts to WTO status (with all the tariff and non-tariff barriers this would entail) and loses membership of key regulatory agencies. In summary, it is likely that Brexit will cause disruption and delays to automotive supply chains and all of these will be transferred as a financial cost, which could be millions of pounds per hour. Companies can expect new regulations and new partnerships and well as changes to existing relationships.

In such times of change and disruption companies should make more use of technology to assist them to address new challenges as well as streamline their existing operations both in house and within their supply chain. It's possible to mitigate for some of the challenges and pressures that lie ahead by adopting a digital approach to their business that improves productivity and efficiency in the areas of information governance, talent management, customer communications, and delivery of goods.

Whatever the outcome of Brexit, technology is going to play an integral part to ensuring the goal of frictionless trade. Good information governance solutions and services are designed to meet regulatory compliance, optimize customer experiences, improve employee engagement, simplify asset utilization and increase supply chain efficiency. Further research is needed to boost our understanding in this regard.

This report therefore recommends that:

- ***Automotive manufacturers will need to have good enterprise information management policies in place for managing and reporting on contracts to implement changes and mitigate risks.***

Managing information such as contracts digitally helps establish governance processes that will help amend existing contracts and generate new contracts as the details of Brexit become law.

- ***Automotive manufacturers will need to have a strong information governance strategy in place to ensure compliance with any new regulatory requirements or checks.***

Getting control over the acquisition, management, retention and disposal of all the information within a business means, no matter what the impact of Brexit, businesses will be better prepared.

A good use case here (namely for larger companies) would be to use information management to assist in attaining the status of Authorised Economic Operator (AEO).

- ***More emphasis on workforce planning and skills development is needed in the likelihood that Brexit further restricts the supply of immigrant labour.***

Human Resource Managers will most likely face a different talent market post March 2019 and should consider transforming employee information such that it is easily accessible particularly relating to employee skills and training needs that support them through any transition needs.

Recruitment teams would benefit from a digital support environment aligned to the needs of the business in recruiting missing skills.

- ***Communication and collaboration between automotive manufacturers, partners and customers will be more important than ever.***

Digital technology can be implemented such that information exchange is transacted and communicated in an efficient and consistent manner. The OEM can react quickly to supply chain changes and communicate those changes in a way that's personalised to the business needs of each partner will be essential.

- ***Automotive manufacturers need to have an improved understanding of their supply chain, particularly relevant for any new documentation and compliance requirements that might be put in place.***

New supplier relationships and possible change to existing relationships are inevitable. Companies would benefit from a fully digitized supply chain particularly for visibility and engagement of lower tier suppliers.

Companies should consider adopting a managed services approach to assist the onboarding and transactions management of both existing and new suppliers because of any changes. This approach moves towards digitizing the supply chain while at the same time freeing up internal resources to focus on other priorities.

Companies should review their current processes for the delivery of good and customs procedures and adapt where applicable. Particularly they should look to achieving as frictionless trade as possible by providing good connection to customs requirements and the use of pre-clearance and digital documentation such as Advanced Shipping Notices (ASN) to support risk-assessment of goods prior to entry.

Manufacturing companies face a gauntlet of challenges and success is largely contingent upon being able to adapt and overcome. The Automotive industry has been using digital technology to innovate the industry for many years. Often justification in such investment requires a compelling event to trigger change. As one of the biggest events in economic history – for the UK, EU and beyond - Brexit is such a compelling event.

Appendix 1: Desktop Research

Brexit has led to much research being published, and this section offers a quick summary in relevant areas for the research note. It then focus on the costs and benefits of EU membership in terms of trade, investment, immigration, jobs, trade deals, trading options, regulations, fiscal consequences and comments on the relationship between the UK automotive sector and aspects of the Single Market.

A1.1 Overview of single market

“The single market now consists of 31 countries with more than 500 million people, comprising the largest economy in the world” (Dahlberg, 2015, p. 8). The European Commission (2018b) defines the single market as one territory without any internal borders or regulatory obstacles to the free movement of goods and services, with the aim of: stimulating trade, innovation and technological development, raising standards and reducing prices. Over the last decades the EU has taken many steps of integration, including the introduction of a single currency for some members of the EU.

Table 2 - List of member states

Euro-area Member States	Non-euro area Member	Members States with an opt-out
Belgium	Bulgaria	Denmark
Germany	Czech Republic	United Kingdom
Ireland	Hungary	
Greece	Poland	
Spain	Romania	
France	Sweden	
Italy	Croatia	
Cyprus		
Luxembourg		
Malta		
The Netherlands		
Austria		
Portugal		
Slovenia		
Slovakia		
Finland		
Estonia		
Latvia		
Lithuania		

A1.2 Nature of economic Integration

Economic integration can be defined as “a state of affairs or a process which involves the amalgamation of separate economies into larger free trading regions” (El-Agraa, 2011, p. 1). As such, economic integration can be split into five categories, as adapted from El-Agraa (2011).

1. Free trade areas (FTA), where participating members remove all tariff barriers amongst themselves but maintain independent external trade policies. Agreements can also (but do not necessarily) contain provisions relating to bilateral investment and some non-tariff barriers.
 2. Customs union (CU), where members participate in an FTA but also adopt a common external tariff vis-à-vis non-members.
 3. Common markets, which allow free trade and free movement of factors across borders. This generally pertains to the four freedoms: freedom of movement for goods, services, capital and labour. Some argue that common markets also involve a customs union (see, for example, El-Agraa (2011)). However, this does not necessarily need to be the case: Norway is in a “common market” with the EU but is not part of a customs union with it.
 4. Complete economic unions involve both a common market and a customs union in addition to adopting common monetary and fiscal policies. The exact extent and nature of the commonality of these policies is debatable: some degree of fiscal autonomy is surely acceptable as States in the US have this.
 5. A political union, where participating members become one state with institutions to match.
- The EU is *both* a common market *and* a customs union and there is significant (and growing) commonality of policy across a variety of other economic issues. Indeed, the Eurozone (as a subset of EU states) would certainly qualify at least as a partial “economic union”, although it lacks a common fiscal policy at present. It has evolved substantially over the past 70 years.

Key Treaties and Events

1951	Treaty of Paris establishes the European Coal and Steel Community
1957	Treaties of Rome establish the European Economic Community and the European Atomic Energy Community
1968	Completion of the customs union
1973	Accession of the UK, Ireland and Denmark
1979	Launch of the European Parliament with the first direct elections
1979	Launch of the European Monetary System
1986	The Single European Act launches the single-market program
1989	Extension of Commission responsibility for competition policy
1992	The Treaty on European Union (Maastricht Treaty) was signed, establishing the modern EU with its “3 pillar” structure and ultimately leading to the creation the economic and monetary union (EMU).
1997	The Treaty of Amsterdam extends Community competence over certain aspects of justice and home affairs and enacting the common foreign and security policy.
1999	Launch of a common monetary policy and a single currency (the euro)
2001	The Nice Treaty reforms the EU’s institutions and decision making procedures, changing voting powers in the European Council in order to accommodate the accession of new members.

2004 Major enlargement, including accession of many Eastern European states. Bulgaria and Romania joined later in 2007, with Croatia joining in 2013.

2005 Treaty establishing a Constitution for Europe rejected in referenda in France and the Netherlands.

2009 Treaty of Lisbon comes into force, amending existing treaties. This increased the power of the EU parliament, made the Charter of Fundamental Rights binding and established the formal procedure to leave the EU (the now infamous Article 50).

At every stage of development of the EU, member states have given up some form of national sovereignty, in return for further integration. The problem arises for the UK as many proponents of Brexit have campaigned for an increase in national sovereignty, even at the expense of increased trade barriers: under an extreme interpretation of this the UK will resort to trading under WTO rules. So the question arises as to what trade deal does the UK government want? The current alternative models discussed below all have their trade-offs and all existing models have costs associated with them, ranging from financial contributions to giving up some form of national sovereignty. The UK will almost certainly need to comprise in some form or another, in order to gain any form of preferential access to the single market.

A1.3 Brexit

Under former Prime Minister David Cameron, The UK opted for a referendum on its membership of the EU. A divisive referendum campaign exposed substantial divisions in British society, few of which appear to have been healed since (De Ruyter, 2018).

Globalisation has seen increasing interdependence amongst nations, driven by increased trade flows, FDI and technological development. This has seen global value chains lengthening and deepening, leading to increased efficiency but also greater fragility with domestic economies becoming sensitive to disruptions in transnational supply chains (Rosecrance et al., 1977).

A number of commentators have argued that UK membership of the EU has burdened businesses with additional regulatory burdens. The overwhelming consensus amongst economists, however, is that Brexit will lead to slower economic growth in the medium term and a permanent hit to UK residents' standard of living (Haan, Ilzetzki, Ellison, & McMahon, 2016). Indeed, the Institute for Fiscal Studies compiled an overview of several studies on Brexit, 6 of which estimated a negative impact on GDP by 2030, one which estimated a broadly neutral impact and only one of which implied a positive effect (Emmerson, Johnson, Mitchell, & Phillips, 2016).

GDP CHANGE	
(%)	
CEP	
<i>Dynamic EEA/FTA</i>	-7.9
<i>Static WTO</i>	-2.6
<i>Static EEA</i>	-1.3

HM Treasury		
	<i>WTO</i>	-7.5
	<i>FTA</i>	-6.2
	<i>EEA</i>	-3.8
NIESR		
	<i>WTO+</i>	-7.8
	<i>WTO</i>	-3.2
	<i>FTA</i>	-2.1
	<i>EEA</i>	-1.8
OCED		-5.1
PWC/CBI		
	<i>WTO</i>	-3.5
	<i>FTA</i>	-1.2
Oxford Economics		-2.0
Open Europe		-0.8 to +0.6
Economists for Brexit		+4.0

Adapted from Emmerson et al. (2016)

The fundamental economic logic behind most of these economic projections is that leaving the EU will lead to greater trade frictions and impediments to the free movement of factors. Whilst it is certainly possible to partially offset some of these effects by entering into free trade agreements with other trade partners, the EU is (by far) the UK's largest market and the largest source of imports. British automotive manufacturers are heavily integrated into European supply chains.

A1.4 Trade Patterns

The EU is currently the largest trading bloc in the world, but also the UK largest trading partner accounting for 44.5% of all UK exports and 53.1% of imports in 2017 (Office for National Statistics, 2018d). Whilst many commentators argue that this exaggerates the importance of EU trade due to the "Rotterdam effect", even completely excluding the Netherlands from the figures (as done by Webb and Keep (2016)) implies that the EU accounts for some 40% of UK exports and 50% of imports. Moreover, this excludes the European Economic Area (whose countries are members of the EU Single Market), Switzerland and Turkey, all of whom have substantial portions of trade-related regulations dictated by the EU.

Access to the single market is crucial for UK businesses: UK exports to the EU are equivalent in magnitude to 15% of GDP (Ottaviano, Pessoa, Sampson, & Reenen, 2014). Crafts (2016) argues that EU membership has increased UK GDP per capita by 8.6% to 10.6%, whilst others put the figure at an astonishing 23.7% (Campos & Coricelli, 2017). Whilst these figures are highly uncertain⁶, it is

⁶ Coutts, Gudgin, and Buchanan (2018) argue against such an effect at all.

incontrovertible that the high level of integration of member states has resulted in businesses becoming increasingly reliant of access to the single market due to the complexity of European supply chains.

Trade balance between UK and EU 2017

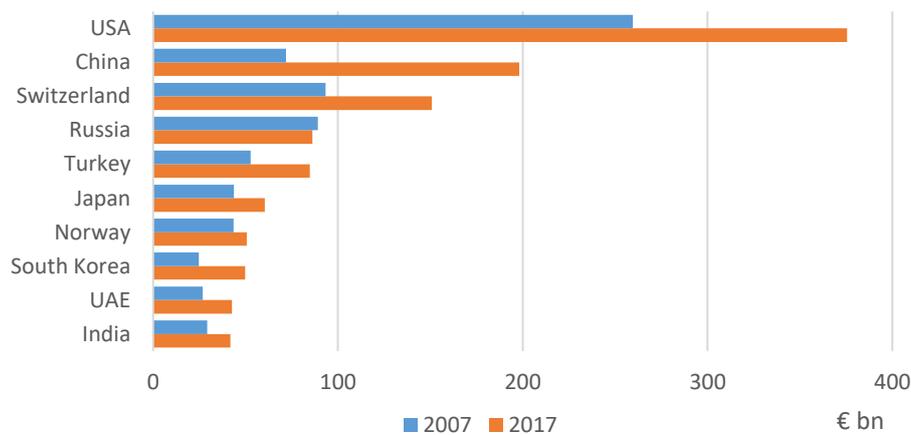
UK		
2016	Goods £bn	Services £bn
Exports to EU	164	110
Imports from EU	259	82
Balance with EU	-95	28

Source: ONS Pink Book (Office for National Statistics, 2018d)

The UK is the largest single market for EU products accounting for 17.1% of total exports from the rest of the EU (Booth, Howarth, Persson, Ruparel, & Swidlicki, 2015). Nevertheless, in practical terms the UK is less crucial as a trading partner for most European countries as this figure excludes intra-EU trade. As a result, the UK under 7% of all exports from EU countries go to the UK.

EU Exports by Trade Partner

Source: Eurostat Database - Extra-EU Trade by Partner



In 2017, approximately 44.5% of all UK exports were to the EU, down from 54% in 2002 (Office for National Statistics, 2018d). In part this appears to be due to an increase in exports to fast-growing economies, particularly in East Asia. It is likely that currency fluctuations and relative economic growth have played also a major part in this. Moreover, substantial trade is done with countries that adhere to most EU regulations and/or are members of the Single Market. As the following figure demonstrates, there are clear differences across regions in the UK in terms of exports.

	2014	2015	2016	2017 ^P
Value of exports to EU (£m)				
North East	7,145	6,786	7,251	7,613
North West	13,690	12,157	13,279	14,165

Yorkshire and The Humber	8,759	7,965	8,289	9,697
East Midlands	8,600	8,417	9,118	10,712
West Midlands	10,833	11,134	12,871	14,695
East of England	13,481	12,997	14,135	15,248
London	14,967	12,499	13,542	15,181
South East	18,801	18,668	20,271	22,400
South West	7,191	7,331	7,952	9,254
Wales	8,314	7,997	8,852	9,963
Scotland	17,399	12,486	11,364	13,987
Proportion of exports going to EU (%)				
North East	57.2	56.1	60.6	59.0
North West	50.0	45.0	47.8	49.3
Yorkshire and The Humber	57.0	54.6	56.2	57.7
East Midlands	49.0	49.7	51.4	52.1
West Midlands	40.8	42.2	43.3	43.9
East of England	55.6	53.8	53.0	52.7
London	48.7	40.8	42.7	41.9
South East	50.9	47.8	49.7	49.4
South West	43.6	44.6	43.7	45.3
Wales	58.8	60.3	60.5	60.5
Scotland	57.3	52.3	47.0	48.8

Source: HMRC Regional Trade Statistics (Her Majesty's Revenue and Customs, 2017, 2018a)

Of course, gross exports can dramatically understate the importance of EU trade as they ignore the importance of supply chains. A car manufactured in the West Midlands may be exported to the USA or China, but the supply of specialist components from Germany is crucial to ensure a competitive product. This point is illustrated by Chen et al. (2018), who use the World Input-Output Database to examine the exposure of regions to European trade in terms of the value-added component of output in the region.

Both this and a related recent academic paper (Los, McCann, Springford, & Thissen, 2017) are important first steps in helping us to map the potential impact of Brexit. Quantifying exposure is, clearly, necessary if one wishes to delineate the expected impact of various alternative trading regimes but on its own is not a sufficient condition to do so. Regions with a high exposure may nevertheless exhibit resilience through adaptability. Other channels of potential economic impact also need to be addressed (with exposure to migrant labour and skills a particularly noteworthy area). For many sectors (health and education in particular, which together make up around 13% of

the UK economy), the curtailment of migration and access to skilled labour is the *primary* mechanism whereby their economic performance will be affected.

Agriculture, hospitality and construction are all highly exposed to these non-trade factors, for example. In addition, even for sectors such as manufacturing where trade is the primary impact channel, for many businesses secondary channels will continue to be important. In practical terms, for many manufacturing sectors, the impact of reduced FDI is likely to be at least as important as trade (although the two are intrinsically linked), particularly in order to understand the dynamics of the process.

Similarly, the substitutability of components is an important issue. If a company is easily able to source components locally (or from outside the EU) at limited extra cost then a small exchange rate movement might enable that company to remain competitive. In contrast, many components have only a limited number of suppliers worldwide. Further questions need to be asked – how long might any delays in shipping components *inter alia* be in practice and what would the costs of mitigating this be?

A hard Brexit with no free trade agreement with the EU would see the UK facing increase in trade barriers resulting in increased costs for UK exporters, potentially leading to a reduction in trade with Europe (International Monetary Fund, 2016). An increase in trade barriers is also likely to have a knock on effect on inward FDI, as EU market restrictions may lower returns on investment (International Monetary Fund, 2016).

A1.5 Investment

The UK currently has the third largest stock of inward FDI in the world, with EU members accounting for 48% of this FDI stock, amounting to almost half-a-trillion pounds of investment (Webb & Keep, 2016). FDI flows into the UK raise national productivity and output, increasing national wages (Dhingra, Ottaviano, Sampson, & Reenen, 2016). The uncertainties around the terms of Brexit are likely to reduce foreign investment in the short term with uncertainty described as akin to a poison for investment (Gale, 2016). The political and economic uncertainty has also increased financial market and exchange rate volatility. There is a risk that this may impact both business confidence and the cost of credit.

Driffield and Karoglou (2016) have argued that an increase in economic uncertainty and currency fluctuations, resulting in the appreciation or depreciations of the sterling can both promote and deter inward FDI. The UK saw Sterling drop to a three decade low of 1.32 USD after the announcement of a leave vote on the 23rd of June 2016, incurring heavy losses for European equity markets, as investors sought refuge in the form of gold, yen and USD, resulting in the UK sovereign credit rating dropping from triple A to AA (Shellock, 2016). Since then Sterling has traded in a range well below pre-referendum levels.

Sterling-Euro Exchange Rate

Source: Bank of England



Blackrock (2016) argued that Brexit could mean that the UK, will no longer be able to attract the current level of FDI flows, as the UK will no longer be seen as favourable gateway into Europe. Thus far, FDI flows into the UK remain relatively healthy although these can be skewed by mergers and acquisitions. It remains to be seen whether so-called “greenfield” FDI will remain at present levels post-Brexit.

While Brexit creates great uncertainty in the short term, the longer-term consequences of a UK withdrawal from the EU are extremely difficult to quantify. The decision to invest in the UK is motivated by a number of factors, including its legal system and the status of the English language.

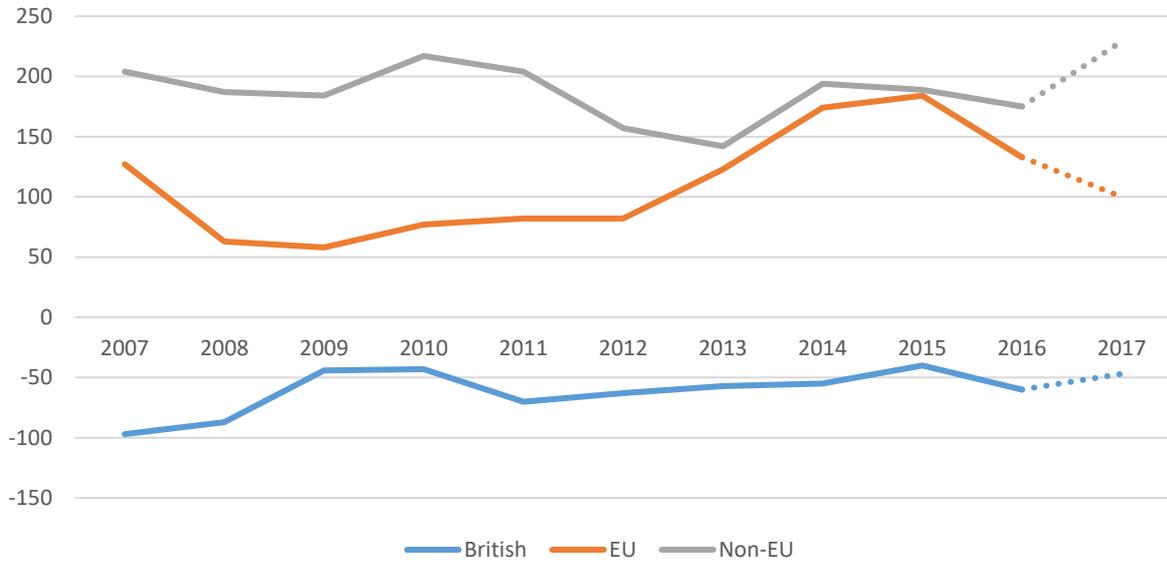
Driffield and Karoglou (2016, p. 22) suggest that, “[p]erhaps the greatest effect of BrExit [sic] in terms of the impact on inward FDI, is not BrExit [sic] itself, but what it implies.” Brexit could, for example, lead to the UK government, pursuing policies designed to improve UK cost competitiveness through reforms such as further increases in labour market flexibility, reductions in employment protection and greater trade with low cost locations such as Asia, which in part have been a major driver of FDI into the UK in the past (Driffield & Karoglou, 2016). Equally, there are likely to be diminishing returns to a policy of reducing employment protections and even less clear whether this would come close to offsetting the additional trade frictions generated by such a policy. In any event, the current UK government appears committed to upholding such standards, at least in the short term.

A1.6 Immigration

The ‘free movement of labour’ is one of the four fundamental freedoms of the Single Market. Over the last few years immigration has been at the forefront of the leave campaign. Nevertheless, since the Brexit vote, net migration from the EU has already fallen substantially, from 189,000 in the 12 months to June 2016 to 100,000 in the 12 months to December 2017 (Office for National Statistics, 2018e). These figures have substantial room for error as they are largely based on passenger surveys.

Net Migration to the UK by Citizenship

Source: ONS Long Term International Migration statistics

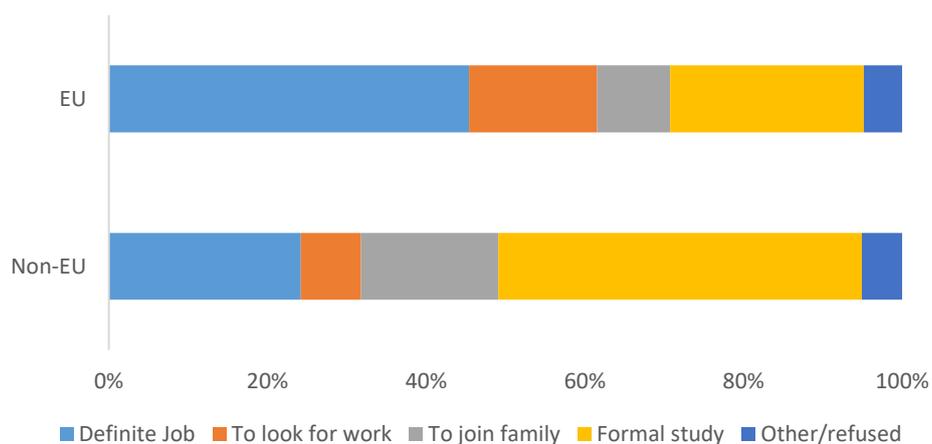


2017 figures are provisional.

Source: ONS Long Term International Migration statistics (2018c)

The latest research indicates that by far the largest reason for EU nationals to migrate to the UK was to take up definite jobs (Office for National Statistics, 2018e). Whilst previously migration in search of employment was a close second, this has tailed off dramatically since the EU referendum (although this will also have been affected by a strengthening Eurozone economy and the precipitous fall in Sterling). Study has now overtaken this as the second most important driver of EU inward migration to the UK (Office for National Statistics, 2018e), although it should be noted that many students return to their country of origin once their studies are complete. In any event, immigrants from EU countries are far more likely to move to the UK for job-related reasons than immigrants from non-EU countries. In part this is due to the impact of students, but a high proportion of non-EU migrants are accompanying family members. This is much less true of EU nationals, perhaps because of the comparative ease of travel.

Reason for Moving to the UK



Source: ONS International Passenger Survey (2018e)

EU Nationals Employed by Industry

	Number Employed (000s)	% of total employment in sector
Manufacturing	313	11%
Construction	162	7%
Services	1,556	6%
<i>Of which:</i>		
Accommodation & food services	218	13%
Admin & support services	152	10%
Transport & storage	128	13%
Professional, scientific & technical	131	6%
Wholesale & retail	242	6%
Finance & insurance	69	6%
Information & communication	90	7%
Health & social work	228	6%
Other services	53	6%

Education	150	5%
Public admin & defence	50	3%
Total	2,087	7%

(House of Commons 2016)

Whilst a majority of authors maintain that migration has had no adverse effect on native wages, the topic has been the subject of lively debate in the academic literature. Deriving reliable estimates of the true impact of migration on wages is challenging, with econometric issues rife. Dustmann, Frattini, and Preston (2013) argue that whilst immigration boosts the wages of those near the middle of the income distribution, it has had a small depressing effect on the lowest paid UK workers.

Some academics have concluded that new immigrants tend to be closer substitutes for previous immigrants than they are for UK born workers (Manacorda, Manning, & Wadsworth, 2012). The UK commission for employment and skills found that migrant workers were more flexible in meeting employer needs, willing to work longer and unsocial hours and where willing to take more temporary jobs compared to UK born workers (Atfield, Green, Purcell, Staniewicz, & Owen, 2011).

The impact of the recent EU immigration from A8 countries on public finances has yet to fully surface due to the time frame of immigration and the age structure of the relative groups. Dustmann and Frattini (2014) suggest that over a period of 1995 to 2011 EEA immigrants contributed more to public finances than they received in the form of benefits, particularly in comparison to both natives and non-EEA migrants. Once again, one must be cautious in interpreting these effects: it is naturally impossible to ascertain the whole-life impact of EEA immigrants on public finances as they are, on the whole, considerably younger than the population at large.

A minority of economists (e.g. Ashton, MacKinnon, and Minford (2016)) have argued that ending free movement of people could benefit the exchequer by allowing the UK government to permit only those workers who would make a positive fiscal contribution into the UK. In practice, this is far from certain: there is a non-trivial cost to employers (particularly smaller firms) in adhering to the more stringent requirements for non-EEA nationals to move to the UK. Moreover, the UK appears likely to benefit from migration in general since migrants are brought up and educated abroad (at considerable cost to their country of origin), whilst the UK benefits from their working years. In any event, if the UK aims to gain favourable access to the single market, as in the Swiss and Norwegian models it would most likely be obliged to accept the free movement of people as a principle.

A1.7 Jobs

A substantial number of jobs in the UK are dependent on trade, and membership of the EU facilitates aspects of this trade (Sheppard, 2016), although clearly adherence to EU regulations does entail costs, as does the common external tariff. Trade will, of course, continue post-Brexit and the demand for British goods by EU consumers will not disappear overnight, although some jobs are unusually vulnerable to Brexit. Determining how many jobs can be attributed to EU membership is difficult. A common approach used by academics and researchers is to calculate how many jobs are related to EU exports. The UK Government estimates that 3.3 million jobs could be related to exports to EU countries (Webb & Keep, 2016). Nevertheless, this is clearly a proxy measure for the

number of jobs actually dependent upon various facets of EU membership. It fails to account for either potential alternative export markets or the possibility that the goods would be bought by EU partners even if the UK was outside the Single Market.

Nevertheless, there is a near-consensus amongst many academics that Brexit will lead to a slowdown in economic activity, with some estimating that leaving the EU could lead to around 550,000 fewer jobs than would otherwise be the case by 2020 (Sheppard, 2016). Of course, such estimates are vulnerable both to the uncertainties inherent in forecasting and changes in circumstances. The projected figures, for example, did not take into account the possibility of a transition deal and appear to have been predicated on a complete break with the EU (i.e. leaving the EEA and not having any customs union or FTA).

Fewer jobs do not necessarily imply higher unemployment: a smaller workforce (perhaps due to lower levels of immigration) can have the same effect. In the longer term, rates of employment and unemployment are almost entirely determined by domestic policy. Insofar as job losses induced by exiting the EU are permanent, the likely outcome is that workers will rotate into lower-skilled (and hence lower-paid) roles and that the UK will be a less attractive place to seek work (resulting in increased emigration of Britons and reduced immigration). In other words, the long-term impacts will, as with the financial crisis, be felt primarily in terms of living standards (lower levels of pay and profitability) rather than unemployment.

In the short term, predictions from EY suggest that over 10,000 jobs in the financial sector are at immediate risk (Chapman, 2017), with the Bank of England purportedly estimating that eventually up to 75,000 financial services jobs could be at risk (Ahmed, 2017). Nevertheless, recent evidence suggests that this may be unduly pessimistic (Jones, 2018) with perhaps as few as 5,000 to 13,000 jobs at risk across the UK.

Some argue that many small and medium sized firms which don't directly trade with the EU will be freed from EU regulations with positive economic results. This argument probably doesn't stand up to scrutiny – if the UK wanted to repeal or amend EU derived regulations it would probably face strong opposition from trade unions and the general public. Indeed, the Government have explicitly stated that they do not wish to engage in a “race to the bottom” (Davis, 2018). The major determining factor on how jobs will be affected as a result of Brexit is the nature of any trade deal the UK secures with the EU.

A1.8 Trade Deals

It is widely believed that a major economic benefit of EU membership is the combined negotiating power it brings in regards to trade deals, with non EU states (KPMG, 2014). As a collective the EU has around 22% of the world GDP (International Monetary Fund, 2017). The UK is the second largest economy in the EU (Eurostat, 2018) enabling the UK to be a major influencing and lobbying power over negotiations. In contrast, the UK accounts for a mere 3.5% of world GDP (International Monetary Fund, 2017) potentially giving it far less leverage in negotiations.

The EU has over 30 trade deals, gaining UK businesses privileged access to an enormous. The UK would struggle to negotiate deals of the same quality, due to its reduced leverage (KPMG, 2014). Post-Brexit, the UK will need to renegotiate 53 trade deals currently covered by EU agreements. This

will further raise real concerns over both additional documentation requirements and UK producers' ability to meet "rules of origin" stipulations in the absence of so-called "diagonal cumulation".

Asia is set to continue to increase its share of global GDP during the first half of the 21st century. Projections as to the purchasing power of Asian consumers are even starker: some project it will increase its share of the world's middle class from 28% in 2009 to 66% by 2030 (Dorfman, 2016), with China and India predicted to account for almost one third of global GDP by the latter date. The huge growth being experienced in these developing markets and the protectionist approaches of their governments to limit free trade poses a major obstacle for UK businesses to export and expand abroad (Hearne, De Ruyter, & Davies, forthcoming).

The UK is set to benefit if it can negotiate trade deals with these high growth economies, where the EU has failed to negotiate any deals. For instance the EU currently has no trade deal with China for vehicle exports, where a Range Rover Evoque currently attracts 25% import tariff, 17% sales tax, 9% consumption tax (Booth et al., 2015). However, the Swiss "trade deal" with China may sound a note of caution in this regard.

Appendix 2: Trading options

As the EU is the UK's largest trading partner by far, the UK is likely to attempt to negotiate some form of privileged access to the EEA. Some have argued that the UK's substantial trade deficit with both the EU and major constituent nations (particularly Germany) could act as a spur to negotiate favourable access to the single market post-Brexit. In our opinion, this is unlikely. The UK is a significant export destination for most EU partners but it is far from overwhelmingly important. There is a distinct asymmetry: whilst UK exports to the EU account for over 12% of UK GDP, UK imports from the EU27 are only around 3% of EU27 GDP⁷. There are five distinct options that represent feasible scenarios for the future relationship between the UK and EU.

A2.1 The Norwegian Model

The EEA agreement enjoyed by Norway, Iceland and Liechtenstein allows those states membership of the Single Market. All three states are also members of the European Free Trade Association (EFTA) and under the present wording of the EEA it is not possible to become part of the EEA without also being a member of either the EU or EFTA (Article 128, "Agreement on the European Economic Area," 1994). It is unclear whether, the states involved would consider amending the agreement to permit UK membership *without* also being a member of EFTA, although Norway has registered concerns about the UK (re)joining the latter (Wintour, 2016).

The principles of the European Single Market are the 'four EU freedoms', namely the freedom of movement of goods, services, capital and people. Freedom of movement of goods, a condition that appears highly valued by a number of British businesses, naturally entails equivalent regulations. The same is clearly true for the freedom to sell services across borders. As a result, Norway has to comply with much of the *acquis communautaire*.

Under the Norwegian model Norway is free to conduct its own trade agreements with other states. As such, Norway is not part of the EU Customs Union. Whilst on the one hand this allows Norway to sign free trade agreements independently of the EU, on the other hand its exports to the bloc still necessitate customs checks in order to ensure compliance with the common external tariff. In addition, businesses exporting from Norway to the EU need to comply with EU "rules of origin" requirements, which limit non-European inputs. As an EU member, the UK does not currently need to comply with these. In practice, there are few industries in the UK that source sufficient inputs from outside the broader European supply chain to fall foul of this. The bigger problem is likely to be the costs of proving compliance.

More generally (and for other sectors), care would need to be taken regarding "rules of origin" in any new extra-EU trade agreements, which could be of limited value to the UK unless they contained provisions allowing cumulation with the EU. In any event, this could only really apply in cases where the countries in question also have equivalent agreements with the rest of the EU. An FTA with a third party (for example the US) that did *not* have an equivalent agreement with the EU would thus raise interesting questions for businesses based in the UK.

It is difficult to see membership of the EEA satisfying the Brexit-voting electorate. Far from "taking back control", the UK would continue to be subject to the overwhelming majority of the *acquis* without any say in the making of future regulations. In addition, membership of the EEA in its

⁷ Author's calculations

present form would necessitate acceptance of the free movement of labour. Moreover, the UK would lose membership of the Customs Union, potentially causing significant issues for the automotive sector.

Under the Norwegian alternative, the UK automotive industry will see an increase in trade barriers, although these will be substantially lower than in other scenarios. This increase in trade barriers will increase transactions costs and render supplier delivery times less certain. This will affect companies throughout the supply chain.

OEMs may seek to adopt a number of strategies to mitigate the impact on their business in both the short and medium term. Appropriate mitigation strategies might include re-analysing supply chains to ascertain plant vulnerability to customs delays. Optimisation will differ by component and plant. Whilst a 15-minute delay for certain components is likely to be critical, others may be less vulnerable to unexpected border delays. The costs and benefits of warehousing will vary by component and site. Investing in additional warehousing for compact but time-sensitive components with few alternative suppliers may be a scenario companies wish to plan for. In other cases, re-shoring the supply chain to mitigate border risk may be feasible.

Similarly, risk mitigation will vary across companies depending on their position in the supply chain. OEMs will need to be more aware of the risks their supply chains are shouldering – whilst many have significant market power, if suppliers bear excessive risk then costs will increase and will eventually end up being passed on. Major OEMs and tier-one suppliers will need to work much more closely with companies further down their supply chains in order to help them mitigate the risks faced, particularly in terms of timely deliveries. Documentation and digital strategy will be key to managing this, both in terms of tracing suppliers and facilitating interactions with customs operations to minimise disruption.

Large manufacturers are likely to want to cooperate directly with Government on behalf of their suppliers in order to best facilitate customs checks and minimise time taken. Digital tracking and optimal use of data will also be crucial in securing a competitive advantage – in this regard, Brexit should act as a spur to adopt industry best practice and move firms to the frontier of development.

Short term impacts;

- Increase in costs for UK manufacturers, to both produce and export goods. Costs will have to be absorbed by manufacturers or passed onto customers.
- Investments into automotive industry may be limited until effects surface.
- Production continues due to sunk costs.

Medium terms impacts;

- Costs for manufacturers increased, either absorbed or passed onto customers. Competitiveness decreases, deterring further investment.
- Government initiatives to strengthen domestic supply chain may yield minimal results, due to reduced inflows of FDI into automotive industry.

Long term impacts;

- UK negotiates trade deals with high growth economies, to fuel growth for automotive industry.
- Government incentives attract FDI and the availability and flexibility of the UK's workforce encourages investment.
- The dependence on EU supply chain still remains, due to 'proof of origin' clause.

- The UK's competitiveness as a base for automotive manufacturing for European markets decrease.

A2.2 The "Backstop" Option?

In the event of no future partnership a customs union with the EU will kick in as this appears to be the only way that problems with the Northern Irish border can be finessed. Whilst this has been welcomed by some business organisations, *any* divergence from EU standards could lead to checks & border delays, causing serious issues for an industry that relies very heavily on timely component deliveries. In addition, without membership of the EEA a whole host of questions are up for debate. What is the status of the UK with regard to membership of various European agencies (particularly important for the aviation industry, for example)? How easy will it be for large multinationals to transfer staff between sites in the UK and EU? If freedom of movement of labour ends, will it remain feasible to alleviate skills shortages by recruiting from the EU?

The Labour party have argued that the UK would need a "seat" in any customs negotiations in order to ensure it is not in a similar position to Turkey (the problems with which are outlined below). Unfortunately, it is unclear what incentive the EU would have to grant this wish. There is no European precedent for a non-EU member having this degree of influence on EU trade negotiations. Again, it is assumed that diagonal cumulation would apply to any FTAs but it is unclear what mechanisms can be used to ensure that third parties (e.g. South Korea) accept this. Presumably this implies following EU standards on a wide range of issues but without a say in how these standards are formulated. It is very difficult to see how this can be reconciled with a desire to "take back control". Even if the UK leaves the EU *de jure*, this approach could well entail continued *de facto* second-class membership, creating all kinds of political challenges.

Even ostensibly trivial questions such as whether the UK remains in the European Common Aviation Area (theoretically desirable to both sides) are up for discussion. Bilateral "open skies" agreements are negotiated between the EU and third parties and some have already announced their intention to downgrade links with the UK (Manson, Barker, & Powley, 2018). Similar problems appertain for freight haulage: without an additional deal *above and beyond a customs union* hauliers would be competing for a miniscule number of permits raising the spectre of goods having to change vehicles when crossing the channel. Even mutual recognition of driving licenses requires an additional agreement, with the UK scrambling to sign up to the 1968 Vienna convention as a contingency.

The point of this is not to suggest that any of these "doomsday" scenarios are likely. After all, they are clearly costly to both sides in any negotiation and all parties wish to avoid them. Rather, it is necessary to underscore that without membership of the EEA, little is automatic. Each and every one of these scenarios (and many more) requires proactive action on the part of the UK and EU in order to avoid them and even with goodwill on both sides, this will require time. Fundamentally, however, business can and must make contingency plans and take steps to minimise disruption.

Under this alternative, the industry will see an increase in trade barriers, although these will remain low. Supplier delivery times are likely to become more uncertain, although overall customs delays

will be more modest in this scenario than in any other. Re-analysing supply chains and judicious use of mitigation strategies should be sufficient to almost entirely alleviate them.

OEMs may seek to adopt a number of strategies to mitigate the impact on their business in both the short and medium term. Firms needing to make continued use of labour from the EEA will want to understand the new legal and HR situation they find themselves in. Moreover, there is likely to be a significant supply-chain impact. Suppliers may need help in navigating any new visa system that emerges, in order to ensure continued availability of key staff. Whilst long customs delays are unlikely in this scenario, firms will still want to be alive to the possibility. Moreover, any deviation from the scenario's central assumption of complete alignment with EU regulations (even those that are unrelated to the automotive sector) results in a rapidly escalating risk of supply chain disruption and customs delays. As such, we reiterate scenario planning advice from the EEA scenario to manage the risks of this possibility.

Mitigation strategies should include supply chain analysis looking at specific plant vulnerability to customs delays. The optimal strategy will vary according to component and plant location. For some components, a 15-minute delay will lead to a stoppage, whereas for others it may be possible for the workforce to complete a parallel task whilst waiting, ensuring no overall delay. Greater flexibility may be necessary. As above, the costs and benefits of warehousing will vary by component and site. Companies may at least wish to investigate the possibility of reshoring parts of their supply chain to reduce risk. Contingency planning is a sensible precaution, even in situations where some (or all) of the plans are never used.

Risks will also vary across companies depending on their position in the supply chain. Documentation and digital strategy will be key to managing this, both in terms of tracing suppliers and facilitating interactions with customs operations to minimise disruption. More broadly, documentation to ensure compliance with legal norms around HR will be critical. Digitisation and maintaining appropriate documentation will help ensure that best-practice procedures are followed. Systems that enable interaction with suppliers to enable them to make delivery without delay and at minimal cost will be fruitful.

Short term impacts;

- Significant differences between businesses that are prepared vs. those that are not:
 - Well prepared companies will see very little increase in costs. They will ensure that documentation is in place to demonstrate skills need and enable compliance with any new immigration rules. Supply chain awareness and sensible use of warehousing and plant management means that such border delays as do occur are easily managed.
 - Poorly prepared plants may see occasional stoppages due to delays of critical components at the border. Over the medium term, their lack of interaction with suppliers causes them to fall behind their counterparts who have adopted best practice. Skills shortages are beginning to emerge.
- A dip in investment is likely as a result of uncertainty. The best run companies continue to invest: they “see through” the temporary uncertainty as they have strategies in place to deal with change. They are ideally placed to take advantage of business opportunities that open up as their competitors are belatedly focussed on Brexit-related issues.

- Production continues due to sunk costs.

Medium terms impacts;

- Costs for manufacturers modestly increased due to border checks, although these are highly streamlined.
- Well prepared manufacturers have done serious work on their Brexit strategy and are now successfully implementing it. Documentation is in place ensuring that visas are granted quickly and supply chain management means that delays are very minimal. Active liaison with government ensures that personnel can be transferred between sites and paperwork associated with this is digital.
- Poorly managed manufacturers continue on an ad-hoc basis. Skills shortages are an issue as they struggle to recruit from the EEA, learning as they go. Business is not catastrophic but opportunities are lost to firms in the first category.
- Liaison with Government leads to further initiatives to continue to strengthen the domestic supply chain.

Long term impacts;

- The UK remains an attractive place to do business. However, political risk emerges as politicians and sections of the press agitate against a deal that involves major curtailment of the UK's sovereignty.
 - Dependence on EU supply chain remains and customs procedures are highly streamlined to the point of being minimal.
 - The UK's competitiveness as a base for automotive manufacturing continues.
-

A2.3 The Turkish Model

In this case, the UK would remain in a customs union with the EU but leave the EEA. The UK would, in essence, forego the right to an independent trade policy in order to reduce frictions at the border. As outlined above, checks would still need to occur and a large number of issues would need to be resolved by negotiation. The UK would be unable to sign a free trade agreement with third countries independently of the EU. Turkey has to accept certain rulings of the CJEU and elements of the EU *acquis* (most notably with regard to industrial standards) and the UK might be expected to do likewise, although this is not a pre-requisite of customs unions *per se*. The UK would not face any tariff barriers when exporting to the EU but could face substantial non-tariff barriers as a result of being outside the Single Market.

More generally, the Turkish customs union with the EU is quite partial. It covers industrial goods but does not apply to agriculture. There are no provisions regarding the freedom to trade services, nor

does the customs union cover additional areas such as procurement as in both cases these are associated with the Single Market (EEA). One are that a customs union (even a relatively partial customs union such as that enjoyed by Turkey) removes many of the requirements that countries such as Norway face regarding the need to demonstrate exports to the EU respect “rules of origin”. Whilst the probable impact on the tariffs faced by British industry would be minimal, the reduced need for compliance would be a non-trivial cost saving for smaller companies.

Problematically, free trade agreements signed by the EU would not automatically apply to the UK, just as is now the case for Turkey. Thus, for example, as a result of Mexico and the EU signing a free trade agreement, many goods from Mexico can be imported into Turkey tariff-free (Turkey needs to maintain the same tariffs as the EU). However, Mexico can levy tariffs on imports from Turkey as the two do not have a free trade agreement (even though the EU-Mexican trade agreement means that it cannot levy the same tariffs on the same goods produced in the EU). Turkey does enjoy some freedom to levy tariffs related to non-industrial goods (which are not covered by the customs union) and it does have the right to impose tariffs if the disparity between the rate enjoyed by the EU and itself is greater than 10%.

Leaving the EEA would mean that companies in the UK would lose many of the advantages associated with the four freedoms. The freedom of movement of goods and services would cease to apply. As a result, non-tariff barriers could be imposed on British exports of goods to the EU, although some of these (e.g. quotas) would still be prohibited by the customs union. In practice, because Turkey has agreed to follow EU industrial standards in many areas it faces modest barriers, although haulage permits and border frictions remain a major issue (Merrick, 2017).

At present, other EU states must, by law, treat British goods and services at least as favourably as they treat domestic goods. Leaving the EEA means forsaking this provision. The most high profile and widely discussed, but by no means only, impact of this is the end of the so-called “passporting” rights of many financial services institutions. Crucially, the right to freedom of movement of goods also implies a degree of regulatory harmonisation (in other words, if goods are saleable in the UK then they are also saleable throughout the EEA and Switzerland). Similarly, British nationals would lose the automatic right to live and work in the EU, although it seems likely that in some cases (such as highly educated and paid staff being encouraged to relocate to Paris) these rights would be extended unilaterally. British businesses would lose the automatic right to recruit workers from elsewhere on the continent. This could cause notable problems in some industries.

Under the Turkish alternative, the UK automotive industry will see an increase in trade barriers relative to both the present and other scenarios envisaged. Supplier delivery times will be subject to much greater uncertainty, more akin to supplies from outside the EU. As the UK industry sources so many parts from the EU this will prove a major challenge. Of particular concern is the fact that whilst the UK government may be able to speed customs checks for goods coming into the UK (e.g. by accepting that any goods meeting European standards automatically qualify as exceeding British ones) or implement “trusted trader schemes”, goods bound for the continent could suffer extended delays, affecting large tier-one suppliers and niche providers alike.

OEMs may seek to adopt a number of strategies to mitigate the impact on their business in both the short and medium term. Those supplying parts could end up in a much less favourable situation. When transfers are intra-company then mitigation strategies can be adopted. For companies supplying their continental peers the outlook is worse. For these firms, understanding how best to

accelerate customs clearance will be key. It is likely that the negotiations will allow sophisticated solutions to enable pre-certification of goods. Companies must adapt to this procedure and understand how best to ensure compliance (particularly documentation compliance). For many, the situation really becomes as stark as “adapt or die”. In the absence of such schemes, where supplier delivery times are crucial it may cease to be viable to export from the UK.

For larger OEMs and tier-one suppliers, mitigation strategies might include re-analysing supply chains to ascertain plant vulnerability to customs delays. Robust cost-benefit analysis will need to be carried out by component and plant. Warehousing should be carefully considered as a part of the solution but even in this scenario it is unlikely that warehousing will be necessary for all goods. Re-shoring may be feasible and more cost-effective for some components. Greater flexibility in scheduling work flows within plants will become even more important than at present.

Major OEMs and tier-one suppliers will need to work much more closely with companies further down their supply chains in order to help them mitigate the risks faced, particularly in terms of timely deliveries. Documentation and digital strategy will be key to managing this, both in terms of tracing suppliers and facilitating interactions with customs operations to minimise disruption. This is every bit as true of continental OEMs working with their British suppliers as it is the other way around.

Another potential barrier is in terms of the movement of capital. The UK automotive industry is predominantly owned by foreign companies and so is heavily reliant on inward FDI. Further difficulty would arise as cross border movement of personnel to provide services in R&D would become more costly as well the movement of capital potentially becoming more costly. The ability of the UK to negotiate its own trade deals with high growth economies will be severely limited as it must set its trade policies and external tariffs according to the EU (HM Government, 2016).

Turkish model short, medium, long term impacts on automotive industry

Short term impacts;

- Increase in costs for UK manufacturers, to both produce and export goods. Costs will have to be absorbed by manufacturers or passed onto customers.
- Investments into automotive industry may be limited until effects surface.
- Reduced investment into R&D as the movement of personnel to provide services becomes more complicated and costly.
- Production continues due to sunk costs.

Medium terms impacts;

- Costs for manufacturers increased, they would either have to be absorbed or passed onto customers, decreasing competitiveness which in turn will deter further investment.
- Government initiatives to strengthen domestic supply chain may yield minimal results, due to reduced inflows of FDI into automotive industry.
- Further reductions in R&D, as cross border service exchange becomes increasing costly.
- Further reduction in R&D, as the UK is unable to access EU funding and networks.

Long term impacts;

- UK ability to negotiate trade deals with high growth economies, to fuel growth and reduce the UK's reliance on EU trade will yield minimal fruit as its negotiating capabilities are severely restricted due to membership of the customs union.
- Government incentives attract FDI and the availability and flexibility of the UK's workforce encourages investment.
- Dependence on EU supply chain still remains, due to 'proof of origin' clause and common external tariffs and trade policies.
- The UK's competitiveness as a base for automotive manufacturing for European market decreases.
- Reduction in investment in R&D, due to increased barriers on the movement of capital and personnel.
- Reduction in investment due to the inability to access EU funding and collaborative networks.

A2.4 The Canadian Model

The Comprehensive Economic and Trade Agreement (CETA) between Canada and the EU has been approved by the European Parliament and is now subject to ratification by national legislatures in the EU. Nevertheless, as of 21st September 2017, parts of the agreement have begun to be applied on a provisional basis (European Commission, 2017). As a result, the present regime is in transition. Tariffs covering some 98% of trade will be eliminated. However, this will be done in a phased manner, with some tariffs taking up to 8 years to be completely removed ("Comprehensive Economic and Free Trade Agreement," 2017). This latter stipulation would clearly not apply to the UK in the event of a CETA-style agreement with the EU.

CETA additionally covers a wide variety of non-tariff barriers. Once again, in spite of protestations to the contrary, the UK is likely to end up with a closer deal than CETA almost by default: whilst CETA requires Canada and the EU to reduce non-tariff barriers, an equivalent deal with the UK would merely require things to stay as they are. The power of continuity is often considerable in such cases. As an example, quotas for a number of food and drink products (e.g. Cheese) will be increased and the requirement for blending imported bulk spirits with domestic spirits will be eliminated for EU countries. Similarly, changes to "cost-of-service" fees by Canadian "liquor boards" mean that exports of European alcohol will be treated in the same manner as their Canadian counterparts (specifically charging will take place by volume rather than by value, incidentally benefitting British whisky exporters). In every case, such barriers between the UK and EU are already non-existent and as a significant market for European agricultural produce the UK is in a good position to maintain these comparatively advantageous terms.

CETA also has a number of provisions that will further benefit service-sector businesses. In particular, certain exceptions notwithstanding (e.g. "cultural" services, financial services or air services), both the EU and Canada have agreed to "treatment no less favourable than that it accords, in like situations, to its own service suppliers and services" ("Comprehensive Economic and Free Trade Agreement," 2017, Article 9.3). From a business perspective, this is unambiguously less favourable than membership of the EEA, which would permit the continued "passporting" of

services, including financial and legal services. Given the heavy reliance of European industry on London-based finance, there is the possibility of negotiating at least some form of recognition of “regulatory equivalence”, but this would be subject to ongoing reassessment over time and thus lack the permanence of present “passporting” arrangements.

In practical terms, moreover, a number of restrictions remain and so it is unclear how much easier trade in services will actually become in practice. These include licensing requirements, the requirement to maintain a local address, professional membership requirements and participation in collective compensation funds (“Comprehensive Economic and Free Trade Agreement,” 2017, Article 9.4). This falls well short of even today’s incomplete single market for services: passporting eliminates the need for a local address and mutual recognition of professional membership and qualifications is much stronger within the EU.

One area in which concrete progress has been made is in the ability to transfer staff between the EU and Canada. Graduate trainees will be permitted to stay for up to a year, whilst specialists may stay for up to three, with the possibility of an 18 month extension (“Comprehensive Economic and Free Trade Agreement,” 2017, Article 10.7). This raises the intriguing possibility that the UK may seek to trade looser rules on European migration in exchange for more privileged access to the Single Market. As this is touted as one of the major benefits of CETA, it is unclear how the UK will reconcile this with a post-Brexit desire to reduce migration.

Government procurement will also be substantially liberalised under CETA, and pharmaceutical companies may benefit from the supplementary patent protection period (Department for International Trade, 2017). This holds some promise for these areas, although there are a plethora of issues that are crucial for the UK but simply don’t apply to Canada (membership of the EASA and ensuring an agreement on haulage, for example).

Much of the remainder of the document commits both parties to avoid overtly discriminatory practice and specifies investor protections, whilst also attempting to maintain labour rights, environmental standards and a variety of initiatives pertaining to energy efficiency, corporate responsibility and similar issues. In practice, overtly discriminatory practices in both Canada and the EU have become increasingly uncommon as emphasis has been put on promoting competition, maximising consumer surplus and efficient markets. As a result, the document simply codifies and guarantees these rights. What remains to be addressed are today’s more important practical barriers, including regulatory alignment, technical testing and restrictions on the provision of services. It is these areas that will also prove difficult for the UK: nobody is seriously suggesting moving to an overtly discriminatory regime (much of which would, in any case, be illegal under the WTO Technical Barriers to Trade Agreement).

Professional membership requirements or accreditation (e.g. for lawyers or accountants) are often crucially important in order to maintain standards. Negotiations will need to take place between the appropriate bodies in the EU and Canada to establish mutual recognition. Furthermore, recognition of full regulatory equivalence appears to be off the agenda for the time being. This is an area that the UK could probably substantially improve upon, although much will depend on the extent to which the UK wishes to diverge from European standards (accepting that following them without a say in how they are made necessarily entails a lack of sovereignty).

Technical testing is also left as an area for further voluntary cooperation ("Comprehensive Economic and Free Trade Agreement," 2017, Chapter 4). In practical terms, it is difficult to see how the two can ever agree to agree mutual standards for testing and certification of products because of Canada's close integration with the US economy. The UK is, in many regards, a mirror image of Canada and will look to go well beyond "voluntary cooperation" in terms of technical testing. Type approval for cars and EASA certification for aircraft and maintenance are likely to be areas that the UK wishes to maintain existing ties.

For post-Brexit Britain looking to "improve" upon CETA, this will therefore be a major issue: one is left with a binary choice – either attempt to maintain equivalence with the EU or move into the American regulatory orbit. In practice, reducing trade frictions with the US and Canada will increase them with the EEA.

The Canadian model would result in a considerable rise in trade barriers for UK automotive manufacturers. The UK would no longer enjoy the current level of access as it has. It would now face a considerable burden in terms of administrative costs complying with proof of origin requirements and customs checks. Access to finance for R&D and investment may become more difficult, as the movement of capital becomes more difficult and passporting ceases to apply. The movement of personnel and skills incurs further costs and administrative costs (HM Government 2016) which in turn could create skill shortages. The increase in uncertainty during the initial phases of discussion and implementation would likely lead to further currency volatility, undermining investment prospects.

Uncertain delays of several hours at customs increases the need for a robust supply chain within the UK. As such, UK production of some parts by OEMs and tier-one suppliers may become uneconomic. In this regard, the same issues raised by the Turkish model also apply. Supplier delivery times will be subject to much greater uncertainty, more akin to supplies from outside the EU. As the UK automotive industry is so tightly integrated with its continental suppliers this will prove a major challenge. As in the Turkish model, whilst the UK government may be able to speed customs checks for goods coming into the UK (e.g. by accepting that any goods meeting European standards automatically qualify as exceeding British ones) or implement "trusted trader schemes", goods bound for the continent could suffer extended delays.

OEMs may seek to adopt a number of strategies to mitigate the impact on their business in both the short and medium term. For larger OEMs and tier-one suppliers, mitigation strategies might include re-analysing supply chains to ascertain plant vulnerability to customs delays. Robust cost-benefit analysis will need to be carried out by component and plant. Warehousing should be carefully considered as a part of the solution but even in this scenario it is unlikely that warehousing will be necessary for all goods. Re-shoring may be feasible and more cost-effective for some components. Greater flexibility in scheduling work flows within plants will become even more important than at present. In extremis, shipping certain parts by air may become necessary, in spite of the extreme expense.

OEMs will need to be more aware of the risks their supply chains are shouldering and take steps to facilitate their mitigation of these. If suppliers bear excessive risk then costs will increase and will eventually end up being passed on. Major OEMs and tier-one suppliers will need to work much more closely with companies further down their supply chains in order to help them mitigate the risks faced, particularly in terms of timely deliveries. Documentation and digital strategy will be key to managing this, both in terms of tracing suppliers and facilitating interactions with customs

operations to minimise disruption. This is every bit as true of continental OEMs working with their British suppliers as it is the other way around.

Whilst moving production out of the UK should be a last resort (due to both the enormous capital investments and that in specialist skills) in the Canadian scenario this must be considered. Some production may cease to be economically justifiable and companies will need to clearly understand the supply chain ramifications of moving to a continental base. Volume producers such as Nissan, Toyota and Ford could look for an alternative base to manufacture cars and engines for the European market. In-depth cost benefit analysis will need to be undertaken at every stage and every company (indeed, every plant) will have a different set of issues. In every case, however, effective communication with suppliers will be critical in order to maintain production uninterrupted during the move.

Turkish model short, medium, long term impacts on automotive industry.

Short term impacts;

- Short term uncertainty as negotiations take place.
- Increase in costs for UK manufacturers, to both produce and export goods, due to uncertainty leading to volatility in exchange rate markets. Costs will have to be absorbed by manufacturers or passed onto customers.
- Increase in price of exports, although under the EU-Canada deal, the current tariff on cars would fall from an average of 11.2% over a transition period.
- Investments into automotive industry may be limited until effects surface.
- Access to finance becomes more difficult as passporting is restricted.
- Production continues due to sunk costs.

Medium terms impacts;

- Costs for manufacturers have increased; they would either have to be absorbed or passed onto customers, decreasing competitiveness which in turn will deter further investment.
- UK negotiates trade deals with high growth economies, to fuel growth and reduce the UK's reliance on EU trade. Volume producers are adversely affected as UK production facilities are aimed towards EU markets.
- Government initiatives to strengthen domestic supply chain may yield minimal results, due to reduced inflows of FDI into automotive industry.
- Further reductions in R&D, as cross border service exchange becomes increasingly costly.
- Increase in Costs deters further investments and expansions.
- Access to finance becomes increasingly difficult to fund R&D
- UK becomes increasingly less attractive as a place to manufacture vehicles for European market.
- Volume producers such as Nissan, Toyota Ford, contemplate reduction in productions, as exporting becomes increasingly costly.

Long term impacts;

- UK Governments incentives attract FDI and the availability and flexibility of the UK's workforce encourages investment.
- Dependence on EU supply chain still remains, due to 'proof of origin' clause.
- The UK's competitiveness as a base for automotive manufacturing for European market decreases.
- Reduction in investment in R&D, due to increased barriers on the movement of capital, personnel and access to finance.
- The restrictions in immigration result in a skill shortage, which deters manufacturers.
- Reduction in investment due to the inability to access EU funding and collaborative networks.
- Volume producers could phase out production from the UK, to developing European automotive industries such as Poland, Hungary and Romania, as an alternative manufacturer for the European market.

As discussed earlier in the Swiss and Turkish model, the Canadian option would not only bring short to medium term uncertainty; it would bring a prolonged period of uncertainty for the UK. The Canadian model took over 8 years to negotiate with another 7 years to fully implement ("Comprehensive Economic and Free Trade Agreement," 2017). This prolonged period of uncertainty would result in the UK automotive industry losing substantial investment into its industry, as many auto manufacturers will be making decisions on future generations and models of cars in the coming few years (Bailey & Propis, 2016). During this period of prolonged uncertainty a loss of inward FDI could result in some volume, capacity (Bailey & De Propriis 2016 & 2017) and capabilities being lost.

If the UK misses a cycle of investment, due to this heightened uncertainty, the knock on effects could also be substantial, "as supply chain investment moves with assemblers' volumes" (Bailey & De Propriis, 2017, p. 55). This loss of investment in the short and medium term as a result of uncertainty may lead to the UK automotive industry falling behind western counterparts as the industry is changing at a rapid rate, with heavy investments in R&D continually changing the industry. The UK automotive supply chain is already insufficient in meeting demands for the UK industry with the loss of further investment as a result of uncertainty, its industrial capabilities could further diminish and further fall behind many automotive manufacturing nations. The tightening of immigration and the current shortage of skill in the automotive industry will only be exacerbated as a result of limited immigration, so a major initiative which is the flexibility of the UK workforce will diminish as there may be a greater shortage of skills. Under a Canadian option the UK would gain most of what Brexit proponents have campaigned for at a considerable cost to industry.

A2.5 The No-Deal Option

In many regards, this is the "nuclear option" and would involve extensive dislocation in supply chains to an extent that has not fully been appreciated by the country at large. At present the UK is a member, although in practice its membership is managed through the EU (meaning that quotas etc. are dealt with on a pan-European level). When the UK leaves the EU, this arrangement will cease and it will need its own tariff schedules. Indeed, whilst the UK has now submitted its draft schedule

for services, that for goods remains mired in controversy (Miles, 2018), primarily due to questions over how the UK and EU will split their present “tariff-free” quotas for agricultural produce.

Nevertheless, even in the absence of agreed tariff schedules the UK should still be able to enforce its rights as a WTO member (Bar Council Brexit Working Group, 2018). Like the Canadian model, this model precludes either a customs union with the EU or membership of the EEA. However, defaulting to WTO membership also implies that talks have broken down so severely that no agreement is possible. Given the consequences for both parties, it is difficult to envisage this “worst case scenario” actually unfolding. It would cause enormous disruption to trade partners in Europe and the impact on the economies of the UK and Ireland would be severe.

No agreement would, naturally mean the imposition of tariffs although these would vary considerably across sectors. More problematic are the non-tariff barriers that businesses operating in the UK would face. All of the customs barriers associated with being outside the EEA and European Union Customs Union would remain, whilst the problem of granting hauliers reciprocal access would return with a vengeance. The much feared “tailbacks at Dover” would become a reality in this case. In the service sector, problems will arise for UK broadcasters wishing to broadcast into the EU (and who presently benefit from the EU’s Audio Visual Media Services Directive). The fall-back position involves either locating a “significant part” (this may soon be amended to mean a majority) of the broadcaster’s workforce in an EU state *or* using the Convention on Transfrontier Television. The latter dates to the 1980s, has limited enforcement mechanisms and has not even been ratified by 6 EU members.

In addition, without an agreement of any sort, the UK would lose its membership of EU agencies. The impact of this would be borderline catastrophic for many industries. The UK at present does not have the ability to take over the work of the EASA, the European Medicines Agency, the European Chemicals Agency and others. With “no deal”, the UK would no longer be a member of the European Common Aviation Area. Whilst it may be “inconceivable” that air travel between the UK and EU would come to a halt (even for a short period), in order to keep planes flying some agreement would need to be negotiated, even if it were a limited “open skies” agreement of the sort the EU has with third parties. In this case, UK airlines would lose some of the access rights they currently enjoy, potentially increasing costs for travellers. More prosaically, “no deal” implies the end of mutual guarantees of rights (e.g. Britons’ rights to access state-sponsored healthcare if they fall ill whilst in the EU). For companies whose staff travel within the EU, this may increase their insurance costs.

The WTO model would see a rise in trade barriers, tariffs and administrative related costs for UK automotive manufacturers. The UK would no longer enjoy the current level of access as it has. UK exporters would also be subject to customs checks increasing further costs and delays. UK vehicle exporters could face tariffs of up to 10% on exports and further tariffs on imports increasing costs considerably for automotive manufacturers in the UK, as the UK is currently heavily reliant on foreign input into its industry and EU markets for sales (Automotive Council, 2013).

Access to finance for R&D and investment may become more difficult, as the movement of capital becomes more difficult and passporting no longer applies. The movement of personnel and skills incurs further administrative costs. Volume producers such as Nissan, Toyota and Ford could choose to look for an alternative base to manufacture cars and engines for the European market. The need

for skills will decrease along with production. Overall the UK would see a gradual decline in its automotive manufacturing industry.

WTO model short, medium, long term impacts on automotive industry.

Short term impacts;

- Short term uncertainty as negotiations take place.
- Significant increase in trade barriers and traffic and customs producers increasing costs significantly.
- Increase in costs for UK manufacturers, to both produce and export goods. Costs will have to be absorbed by manufacturers or passed onto customers.
- Investments into automotive industry may be limited until effects surface.
- Access to finance becomes more difficult.
- Production continues due to sunk costs, but volume producers look for alternative base for production for European market.

Medium terms impacts;

- Costs for manufacturers increased, costs are too great to be absorbed in long term, decreasing competitiveness which in turn will deter further investment.
- UK negotiates trade deals with high growth economies and the EU, to fuel growth and reduce the UK's reliance on EU trade.
- Government initiatives to strengthen domestic supply chain may yield minimal results, due to reduced inflows of FDI into automotive industry.
- Further reductions in R&D, as cross border service exchange becomes increasing costly.
- Increase in Costs deters further investments and expansions.
- Access to finance becomes increasingly difficult to fund R&D
- UK becomes increasingly less attractive as a place to manufacture vehicles for European market.
- Volume producers such as Nissan, Toyota Ford, reduce production and find alternative base of production for European markets.
- Luxury producers, such as range rover BMW, seek alternative bases of production for European markets.
- Need for skilled employees decreases

Long term impacts;

- UK may manage to negotiate a trade deal with EU in the long run, but terms are uncertain, prolonging uncertainty and in turn deterring investment.
- UK Government incentives attract FDI and the availability and flexibility of the UK's workforce encourages investment.

- The UK's competitiveness as a base for automotive manufacturing for European market decreases.
- Reduction in investment in R&D, due to increased barriers on the movement of capital, personnel and access to finance.
- Volume producers could no longer see the UK as base for European production.
- Volume producers move production to developing European automotive industries such as Poland, Hungary and Romania, to serve European markets or utilise spare capacity in other nations, such as Italy, Spain and France.

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Acknowledgements

The authors would like to thank OpenText for their support of this research. In addition, parts of the writing of this report have been supported by the EU Horizon 2020 project MAKERS - Smart Manufacturing for EU Growth and Prosperity, a project funded by the *Horizon 2020 Research and Innovation Staff Exchange Programme*, under the Marie Skłodowska-Curie Actions, grant agreement number 691192.