

EU Transition

Trade Prospects for Key Welsh Sectors

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This report was produced for Welsh Government under a project “Understanding the implications of Global Trade and Decarbonisation post Brexit.” It was completed by Melissa Dickenson, Tara Hipwood, Calvin Jones, Max Munday, Annette Roberts & Rachel Williams of the Welsh Economy Research Unit



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Summary

Research issues

This report was produced for Welsh Government as part of a project “Understanding the implications of Global Trade and Decarbonisation post Brexit.” Understanding the risks and opportunities for Welsh trade during the EU transition implementation period and in the period that follows is vital to inform Welsh Government’s discussions with the UK Government. Changes to Welsh trade patterns could also impact on greenhouse gas emissions, and consequently on Welsh Government’s duty towards sustainable development. This report aims:

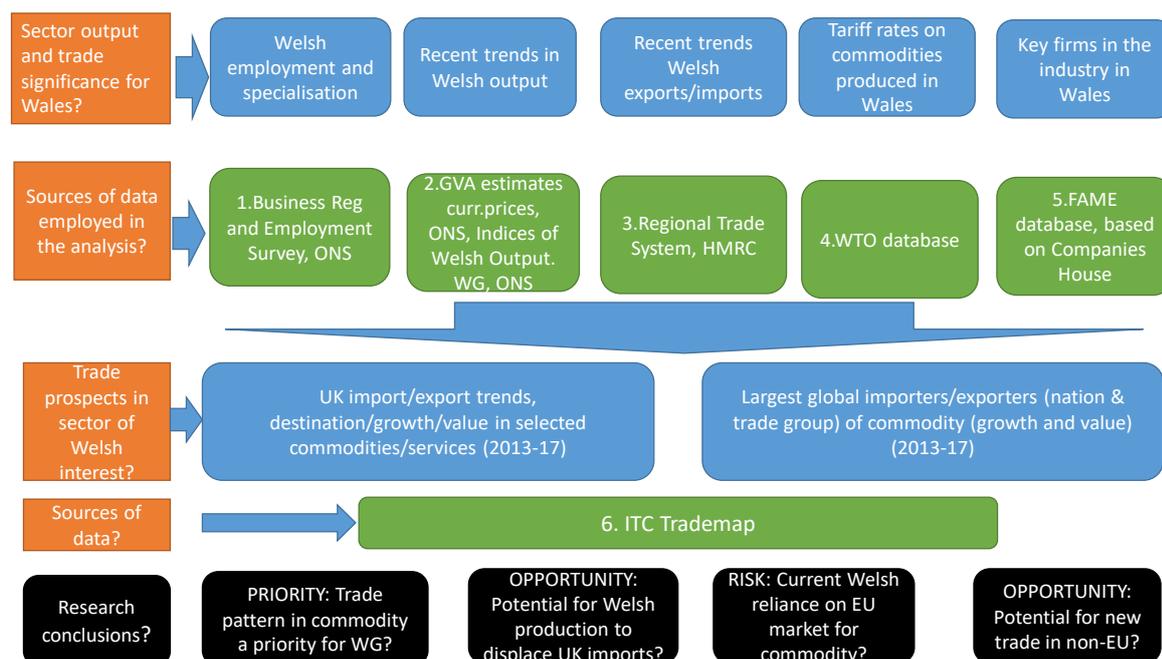
- To summarise trends in key global markets for commodities produced in Wales.
- To examine whether Welsh industries could be affected by new trade deals signed by the UK Government.
- To examine the impacts on Welsh industries of changes in trading relationships with key countries that currently have a trade deal with the EU.
- To explore the extent to which output from Welsh industries may be used to substitute for imports from the EU post Brexit.
- To explore whether there might be new trade opportunities for Welsh industries in the medium to long term following EU transition.
- To understand how changes in regional output following Brexit could affect production point greenhouse gas emissions in Wales.

Caution should then be exercised when using the findings of this report to form complete policy responses. It is important to recognise a vast number of commodities are produced by Welsh firms, and these are already destined for many hundreds of overseas markets. However the commodity codes examined in this report are necessarily broad, and the conclusions made on these broad individual commodity and service codes might not apply to every individual commodity contained within the broad group. Moreover, in addressing the possible impact on Wales of potential new trade deals, and changes to existing trade deals, the analysis is focused on examining the trade advantages of competitors as summarised in revealed trade balances and shares of world exports trade in value terms. Finally, this report focuses on overseas exports and firms in Wales face threats (and indeed opportunities) through trade with other UK regions.

Approach and Data Sources

The data employed in the analysis is summarised below. In addition to this, expected growth trends by key overseas markets for Welsh goods and services were informed from the OECD Gross Domestic Product data set i.e. examining recent and projected growth of key existing and potential trading partners. ¹

Summary of approach



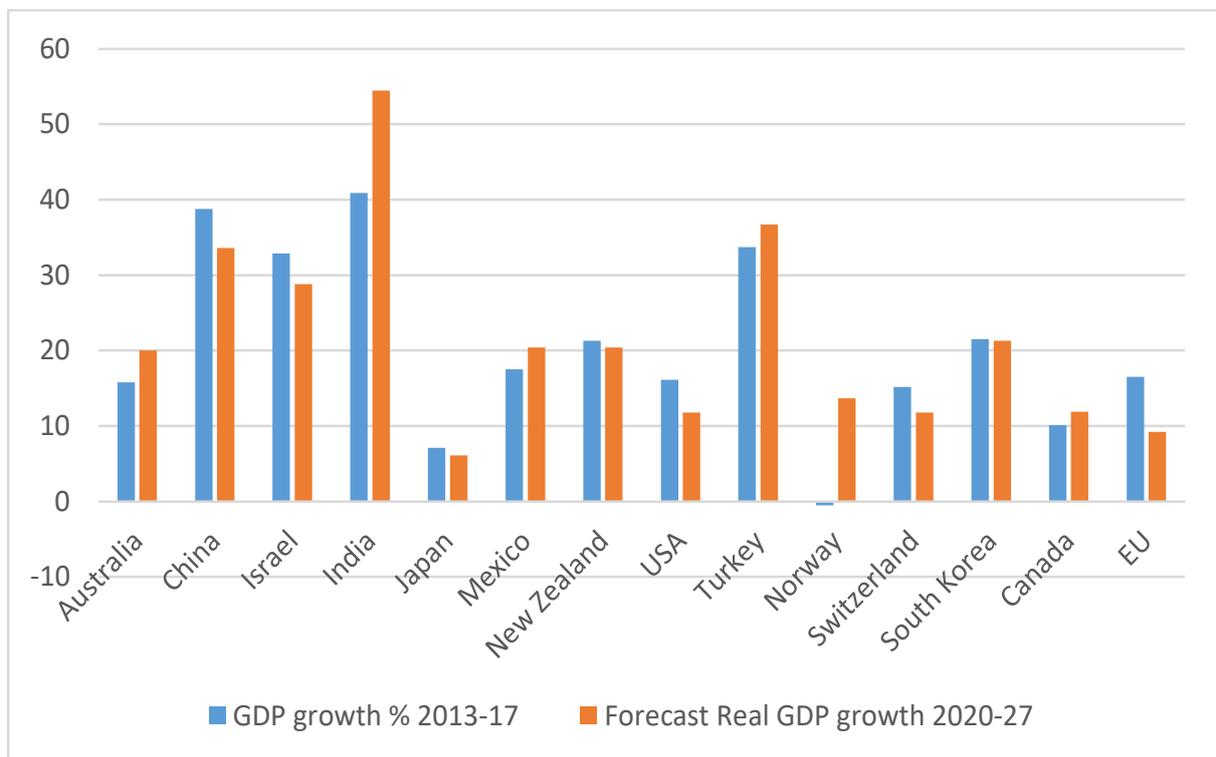
Growth trends in key global markets

The Figure below summarises recent growth trends in selected key markets served by Welsh exporters. The first (blue) bar is an estimate of GDP growth in each state/area for the period 2013-17. While UK GDP grew (in current terms) by 21.1% over this period, much faster growth was observed in China (38.8%), India (40.9%) and Turkey (33.7%). The EU-28 GDP grew by an estimated 16.5% over this period.

¹ See for example <https://data.oecd.org/gdp/real-gdp-long-term-forecast.htm#indicator-chart>

To identify possible future growth in key markets, the second (orange) bar shows OECD forecasts of real GDP growth 2020-2027. Clearly this is only one set of forecasts, which relies upon a number of assumptions. However, there are expectations that the fastest growing parts of the world economy will be India (54.5% real GDP growth forecast 2020-27), China (33.6%) and Turkey (36.7%). The Euro area (EU-16 here in the forecast data) is expected to see real GDP growth of just 9.2% over this period, and the UK 12.7%.

Recent and Forecast GDP Growth in Key Overseas Markets for Wales

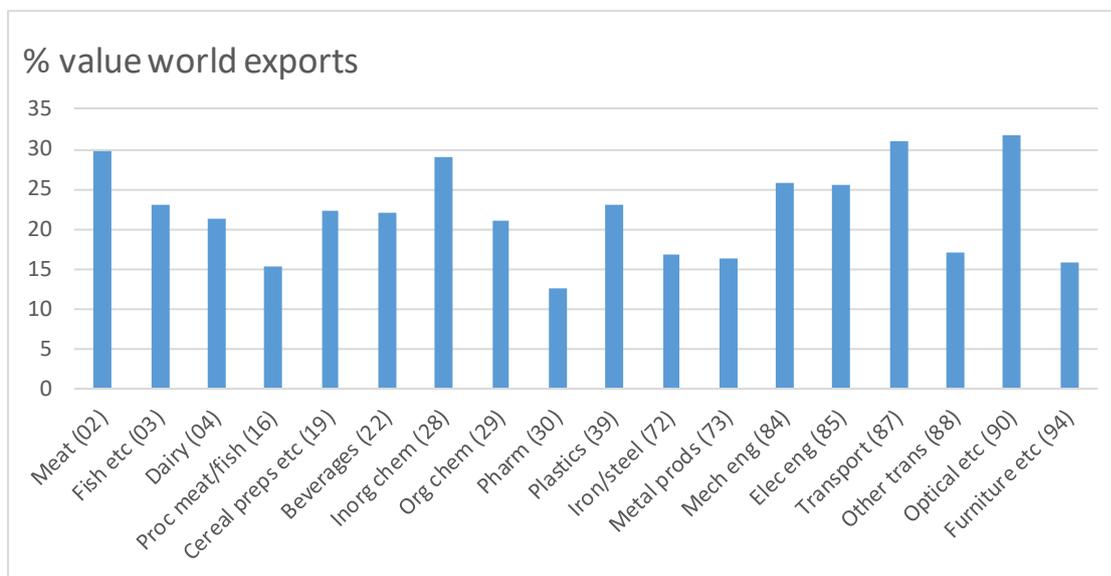


Priority trade deals and effects on Welsh industries

UK Government is believed to be considering the USA, New Zealand and Australia, together with the Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP) countries for priority trade deals. The CPTPP includes Australia, Brunei, Canada, Chile, Japan, Malaysia, Mexico, New Zealand, Peru, Singapore, and Vietnam.

These new trade deals may affect prospects for domestic Welsh firms. It is unlikely that the volume and value of trade with these states would replace the amounts of trade currently undertaken by Wales with the EU. Particularly considering goods sectors, across the commodities examined in this report, there could be more impact on Welsh industries in commodity groups where USA and the CPTPP countries appear to have comparative advantage in production, coupled with an existing strong presence in international markets (here examined in terms of export value). For the USA and CPTPP block as a whole (excluding Brunei here) the figure below reveals that these countries accounted for over 20% of world exports in 2017 in a large number of sectors where Wales has significant economic activity.

Percentage of 2017 World export value of selected commodities accounted for by USA and CPTPP Block



Note: HS is harmonised system codes for commodity groups. Source: Derived from ITC Trademap

In this respect, the analysis reveals:

- USA, Canada, Australia and New Zealand have strong trade surpluses in Meat and meat offal products (HS02) and together accounted for around 27% of global exports in 2017. USA, Australia and New Zealand also have trade surpluses in dairy sectors (HS04), accounting for nearly 20% of global exports in the Dairy commodity group in 2017. Where a trade deal improves access for these states to UK markets, or affects quota levels, negative impacts on Welsh producers would be expected.
- USA has a strong presence in world export markets in Inorganic and Organic chemicals, Pharmaceuticals, Plastics, Mechanical engineering, Transport, and Optical products. In each case its share of world export markets in 2017 was between 9% and 14%. Each of these sectors supports significant Welsh employment which could therefore face negative impacts.

- Japan has trade surpluses in sectors such as Plastics, Iron and steel, Metal products, Mechanical engineering, Electrical engineering, Transport and Optical products. Mexico also has trade surpluses in Transportation (HS87). There is a new trade partnership operational between the EU and Japan that became effective in February 2019. Whether or not the UK (following an EU transition process) develops a deal with Japan, the existence of the EU-Japan framework could have (and arguably has already had) negative consequences for economic activity in these commodity groups in Wales.

Trade agreements that UK Government is attempting to transition

There are a number of trade agreements held by the EU with third countries that the UK Government is seeking to transition. Here we summarise whether changes in trading relationships with these states could affect Welsh industries. Among those expected to be most significant for Welsh trade are those with South Korea, Turkey, Norway, Switzerland, Canada and Japan. In terms of potential to affect prospects in Welsh goods sectors any changes in trade relationships with these states can be partially understood in terms of the export strengths of these economies and where they currently enjoy strong trade surpluses in selected commodities. The analysis suggests that for 2017:

- South Korea accounted for more than 4% of world exports, and had a strong trade surplus, in commodities such as Organic chemicals, Plastics, Iron and steel, Metal products, Electrical engineering, and Optical products. In each of the sectors producing these commodities, this report reveals that Wales has significant economic activity which could be impacted by the trade agreement. It is also noteworthy that South Korea is an important market for Welsh shellfish.
- Turkey is expected to be one of the fastest growth economies in this group, has trade surpluses in all of the food commodity groups examined in this report, as well as in sectors such as Iron and steel (HS72) and Furniture (HS94). The report reveals that there is significant economic activity in the sectors producing these commodities in Wales.
- Norway while a small player on the global stage outside of oil and gas exports, accounted for over 9% of world exports in the Fish/fish processing commodity group in 2017 (HS3). It is unlikely that changes to a trade deal with Norway would have any marked effects on Welsh goods sectors.
- Switzerland had strong trade surpluses and relatively high levels of exports in Organic chemicals and Pharmaceuticals. Indeed in the latter category Switzerland accounted for 13% of world exports in 2017. It is unlikely in specific commodities in question here that Swiss companies compete directly with goods currently made in Wales – particularly in the Pharmaceuticals sector.
- Canada accounted for over 4% of the value of world exports in Meat/meat offal (HS02), Fish processing (HS03), and Cereal preparations (HS16) in 2017 and also had trade surpluses in each of these commodity groups. Canada was also the source of over 4% of world exports in transport and other transport, although this was not primarily automotive. Any improved

market access given to Canadian producers of food commodities could have negative impacts on Welsh producers.

- Japan was considered above but with changing trade relationships expected to have marked effects on both the steel sector in Wales, and automotive components production.

Industry level analysis of priorities, potential opportunities and risks

The report then provides a more specific examination of defined industry-level trade activity to reveal:

- **Priorities** in terms of the significance of current trade patterns for short term Welsh economic prospects;
- **Opportunities** (i) **Potential for Welsh-based production to displace EU-imports to the UK;** (ii) **Potential for Welsh-based exporting in non-EU markets;**
- **Risks** to Welsh-based production in terms of sector exposure to EU markets;
- **Environmental effects** in terms of the scale of potential production point greenhouse gas effects from industry production changes.

Priorities, opportunities, risks and effects were rated as High, Medium or Low. The ranking is subjective but provides a means of summarising where the main industry opportunities and risks could be.

Key messages include:

- **Risks:** Some sectors of Welsh manufacturing are at more risk in terms of loss of EU markets than others. Sectors rated at high risk include Food manufacturing, Chemicals and pharmaceuticals, Iron & steel, Electrical engineering, and Transport equipment. Unfortunately in these sectors opportunities in non-EU markets and opportunities in terms of potential import displacement are rated as low.
- **Risks:** The quantity and quality of data available for service sector exports from Wales is currently limited. It is therefore difficult to form robust conclusions at this time. However, higher levels of risk in terms of EU market exposure were found in Transport & travel and ICT & creative. Analysis suggests that outside of ICT & creative there are limited opportunities in Welsh services sectors to displace EU imports to the UK. For Welsh-based services sectors, prospects for exports are rated as no more than medium in non-EU markets, with many tight interconnections with UK services sectors
- **Opportunities:** There may be some limited potential opportunities for Welsh manufacturing in non-EU markets in the cases of Metal products (particularly in the USA and Japan) and Furniture (particularly USA and China). There were few cases where the outputs of Welsh manufacturing could serve to displace imports to the UK from the EU. Possible exceptions are in the case of Food manufacturing, with commodities here carrying relatively high WTO tariffs. More limited opportunities for import displacement could occur in sectors such as Iron & steel, Metal products, Transport and Furniture. In other sectors sustained opportunities for import displacement are rated as low.

- **Priorities** The analysis suggests that Welsh Government interventions to encourage and develop trade should focus particularly on sectors such as Food manufacturing, Chemicals and pharmaceuticals, Electrical engineering, Transport and Other transport. Changes in activity in these sectors could have marked impacts on the Welsh economy. For services, in terms of overseas trade patterns, Welsh Government might consider focusing special attention on the area of Manufacturing services.

Key messages on individual goods sectors

- **Food** sector trade patterns suggest that that this sector should be rated as a high priority for Welsh Government. In selected parts of food, Wales has high levels of specialisation compared with the rest of the UK. There are some opportunities for EU import displacement; but the sector is relatively exposed to loss of EU markets. Sector activity is prone to relatively high value added tariffs in a “no deal” trade environment.
- **Beverages** makes up a small proportion of Welsh exports. The nature of commodities produced in Wales (mineral waters and beer) places limits on opportunities in non-EU markets, although some overseas interest in Welsh craft beers and whisky is noted.
- **Chemicals and pharmaceuticals** is a major contributor to Welsh overseas goods exports and any loss of international trade opportunities in this sector would have serious repercussions for Welsh production. Non-tariff barriers have particularly serious consequences here, and market prospects outside of the EU are very dependent on the individual commodity group in question.
- In **Plastics** there are limited opportunities to displace EU imports, with around one third of Welsh sector activity seen to be dependent on overseas exports. Given the importance of EU trade, opportunities in distant non-EU markets are limited in most commodities in the group and with states such as China and other parts of Asia having strong advantages in production of plastic products.
- **Iron and steel** is rated high in terms of trade priority. The sector is exposed to EU demands both directly and indirectly, but with limited opportunities for the sector to displace EU imports. Non-EU opportunities are constrained by growing trade pressure, and the presence of cheaper basic steel producers in Asia-Pacific Trade Agreement (APTA)² states.
- **Metal products** were identified as one where there could be strong opportunities in non-EU markets, particularly in activity linked to structural metal products and construction engineering.

² Asia-Pacific Trade Agreement (**APTA**) states are: Bangladesh, China, India, Lao PDR, Mongolia, Republic of Korea, and Sri Lanka. Association of Southeast Asian Nations (**ASEAN**) comprises Brunei, Cambodia, Indonesia, Laos, Malaysia, Myanmar, Philippines, Singapore, Thailand, and Vietnam; Papua New Guinea is an observer. The North American Free Trade Agreement (**NAFTA**) was signed by Canada, Mexico, and the United States.

- **Electrical engineering** is a sector exposed to EU market threats with limited opportunities to displace imports. APTA and ASEAN states already account for significant UK imports in the sector, and these are more likely to displace any EU imports in the future. While the sector is vulnerable to EU transition processes, there are limited opportunities in non-EU markets because of the strong competition from APTA and ASEAN states, although in parts of the Welsh sector linked to instrument engineering there could be stronger prospects in non-EU markets such as China and Singapore.
- In **Mechanical engineering** there are expected to be limited opportunities to displace EU imports, and indeed only around half of UK imports into the sector come from the EU. The sector is rather less exposed to the EU market and the sector already trades extensively in non-EU destinations including NAFTA states.
- Trade in **Transport equipment** is considered a priority. The sector is very exposed to the EU market through its supply chain. Non-EU opportunities are limited here with much of Welsh production focused within UK or EU facing value chains.
- **Other transport equipment**, the nature of the sector in Wales makes it unlikely that EU imports to the UK in this sector would be displaced.
- **Furniture** contributes only a small proportion of Welsh exports with much of the sector's overseas exports heading for destinations other than the EU. Prospects in non-EU markets are then stronger in parts of this sector.

Summary of goods sector findings

Sector	Trade patterns PRIORITY CONCERN for Wales	OPPORTUNITY: Import displacement and Welsh Production increase	RISK: EU market exposure and Welsh Production	OPPORTUNITY: Prospects non-EU markets	ENV. EFFECT: Output change and Welsh emissions
Food	High	High	High	Medium	High
Drink	Low	Low	Low	Low	Low
Petroleum	Low	Low	Low	Medium	High
Chems. & pharms.	High	Low	High	Medium	Medium
Plastics	Medium	Low	Medium	Low	Medium
Iron and Steel	High	Medium	High	Low	High
Metal products	Medium	Medium	Medium	High	Low
Electrical Eng.	High	Low	High	Low	Low
Mech. Eng.	Medium	Low	Low	Medium	Low
Transport	High	Medium	High	Medium	Low
Other Transport	High	Low	Medium	Low	Low
Furniture	Low	Medium	Low	High	Low

Key messages on individual services sectors

- **Manufacturing services** should be a priority for Welsh Government in terms of trade patterns, with relatively high export intensity, and high sector specialisation. The sector exports extensively to markets outside of the EU.

- **Transport and travel** is relatively exposed to EU export markets, and with limited trade possibilities in new markets.
- **Insurance and pensions.** The UK had a trade surplus in this activity in 2017, and there could be some potential for Welsh based sector activity to link in with this UK trading. Globally there may be some opportunities in the USA and Gulf states that are currently significant importers of these services. At a UK level, imports are very low, so there would be limited growth opportunities in substituting for services currently imported to the UK in this sector.

Summary of services findings

Sector	Trade patterns PRIORITY CONCERN for Wales	OPPORTUNITY: Import displacement and Welsh Production increase	RISK: EU market exposure and Welsh Production levels	OPPORTUNITY: Prospects non- EU markets	ENVIRONMENTAL EFFECT: Output change and Welsh emissions
Manufacturing	High	Low	Medium	Medium	Low/Medium
Transport & travel	Medium	Low/Medium	High	Low/Medium	High
Insurance & pension	Medium	Low	Low/Medium	Low/Medium	Low/Medium
Financial	Low	Low	Medium	Medium	Low
ICT & creative	Low/medium	Medium	High/Medium	Medium	Low

- Welsh **Financial services** have relatively high exports, but Wales-based activities in this sector are closely linked with those in the UK. Consequently, there is some exposure to EU markets post Brexit, but also some possibilities for Welsh based firms to benefit from the already significant trading activities with countries outside of the EU by the UK sector particularly in North American and Asian markets.
- **ICT and creative** services in Wales have experienced significant growth; whilst exports from Wales are below those in other service sectors, global imports of these services are relatively high, and there may be some future potential to displace some EU imports to the UK post Brexit, and to develop activity in other global markets including the NAFTA, APTA and ASEAN areas.³

High level messages - greenhouse gas (GHG) emissions

Emissions are typically considered at the production point; were EU transition to lead to some sectors reducing output then production point emissions in Wales might fall, but if Wales' imports then increase because consumers purchase overseas goods then global emissions levels might be little changed.

³ See previous footnote for definitions.

- Key direct contributors to greenhouse gas emissions are Iron & steel, Refining and Transport services, together responsible for over 80% of direct emissions. The picture was replicated for total Welsh emissions (i.e. including emissions in Wales that are created in the regional supply chain of these sectors, for example, in terms of electricity production) but Food also features, driven by its energy and agricultural purchases in Wales. Were Brexit to lead to reduced output in these sectors production point emissions would **fall sharply**. However other factors are likely to be more important in determining output trends in Wales' major process sectors.
- Any reduction in economic activity following EU transition, were it to occur, would have minimal impacts on household emissions: or rather, any economic effects are likely to be outweighed by other factors (such as regulatory changes) and hence hard to discern. The exception could be recession-consequent reductions in private vehicle travel.
- In moving to improve the estimation of consumption-based emissions for Wales, much better data is required in respect of the origins (UK and overseas) of goods and services used in Wales by industry and households.

1 Introduction

1.1 Background

The need for a trade-based analysis of regional economic prospects was highlighted in the Welsh Government's February 2018 *Trade Paper*,⁴ and this issue was also noted in linked Cardiff Business School research⁵ on the challenges facing large and medium sized firms in Wales in the wake of the EU transition process.

1.2 Cardiff Business School research in 2017

The initial research by Cardiff Business School examined the following questions:

- How post Brexit options would affect large and medium sized firms in Wales, and which sectors could be most vulnerable to the EU transition process?
- What might EU transition processes mean for inward investment and trade in sectors?
- What would a change in investment levels or output mean for other parts of the regional economy (i.e. supply chain and household effects)?

The research focus was on a series of components of risk that faced selected sectors.

The risk components considered included:

- The expected effects of tariffs on export trade directly and indirectly.
- The effects of tariffs on firm inputs.
- The effects of non-tariff barriers on sector trade and activity.
- Labour market risks, and the effects on the Welsh economy of changes in sector activity.
- Effects linked to loss/reduced access to EU networks and institutions.
- Risk associated with sector susceptibility to investment cycles and Welsh firm positioning in corporate networks.

Larger firms in Wales cited a variety of mechanisms whereby Brexit could impact their business in Wales. In summary the report found:

- A hard Brexit resulting in EU tariff barriers, in terms of inputs, final products or both, would reduce the competitiveness of Welsh products in selected sectors.

⁴ See Trade Policy the Issues for Wales. <https://beta.gov.wales/sites/default/files/2018-01/180202-trade-policy-the-issues-for-wales.PDF>

⁵ EU Transition and Economic Prospects for Large and Medium Sized Firms in Wales. See <https://gov.wales/docs/det/publications/180202-eu-transition-and-economic-prospects-for-large-and-medium-sized-firms-in-wales-en.pdf>

- Were the UK to find itself outside the Single Market and associated regulatory regime, there were ways in which non-tariff barriers would impact Welsh firms' cost, competitiveness and exports, but with these barriers varying widely between sectors.
- Lower levels of concern on labour market impacts of Brexit. Where this was a problem, it related to both the availability of un/low skilled workers (e.g. Food and drink) *and* the ability for highly skilled non-UK resident technical staff to travel and work within multinational plants in the UK.

Potential company responses to a (hard) Brexit were very varied and linked to firm-, sector- and plant-specific issues. The initial Cardiff Business School report suggested that:

- The plants in Wales most vulnerable to a 'hard' Brexit were typically branch plants of multinationals with production options elsewhere in Europe, where intra-firm investment is subject to rounds of internal competition, and where new products or investment decisions are imminent.
- A number of these firms were in the Aerospace, Automotive and transportation, and Electrical engineering etc. sectors and were amongst Wales' largest private sector employers, and had very significant indirect economic contributions.
- Firms in sectors such as Steel, and Chemicals may face similar pressures but in some cases have high levels of sunk regional costs which makes disinvestment more difficult.

On balance the report argued that non-tariff barriers may be the most problematic for firms wishing to trade with the EU following a hard Brexit. However, tariff barriers (and related international competition) are not insignificant, and are especially of concern for sectors such as Food and drink.

The associated statistical analysis showed Wales to be particularly dependent on trade links with the EU both directly, and indirectly (as Welsh produced goods are also used as inputs into goods made in the wider UK which are subsequently exported).

These conclusions are expected to be exacerbated in the case of some sectors such as Advanced materials and manufacturing, Aerospace, Steel and Electrical engineering, where firms are often part of larger groups, or form part of global supply chains.

1.3 This report

In informing Welsh Government collaborations with the UK Government during the EU transition period, and in the period that follows, there is a need for a framework to both understand and summarise trade-related risk, but also to show where new opportunities might be available for more at-risk sectors of the regional economy.

There are also a series of issues over how far changes in Welsh trade could have impacts in terms of environmental emissions, and with these issues important given Welsh Government's sustainable development duty. For example, Brexit processes could work to displace some parts of the Welsh economy that are relatively emissions intensive, hence reducing *production point* emissions from Wales. However, this could result in an increase in *consumption-based* emissions (depending on the emissions content of industrial imports). With the Welsh Government's sustainable development duties embracing consumption as well as production accounting of environmental externalities, such changes in industrial activity have important potential consequences.

1.4 The research aims and challenges

In summary, an analysis of Welsh international trade is needed to help identify new opportunities, particularly for those sectors deemed to be at highest risk from both EU transition, and the nature of possible free trade agreements signed after transition. The research aims are as follows:

- To summarise trends in key global markets for commodities produced in Wales.
- To examine whether Welsh industries could be affected by new trade deals signed by the UK Government.
- To examine the impacts on Welsh industries of changes in trading relationships with key countries that currently have a trade deal with the EU.
- To explore the extent to which output from Welsh industries may be used to substitute for imports from the EU post Brexit.
- To explore whether there might be new trade opportunities for Welsh industries in the medium to long term following EU transition.
- To understand how changes in regional output following Brexit could affect production point greenhouse gas emissions in Wales.

The analysis seeks to identify areas where there could be new markets for the most 'at-risk' sectors, or where existing markets might be further developed. This required the development of a basic framework in which to understand the strength of demands in key areas, and potentials for trade. The main components of the research then required secondary data analysis as opposed to primary analysis with the main challenges being to:

- Design a common framework in which to consider the threats and opportunities from trade changes for the defined sectors, and that reveals new potential market areas for Welsh goods and services.
- Provide results in a concise manner to show where new opportunities could be, and then why trade from some states post Brexit could pose a threat.
- Identifying coherent up-to-date data sources on trade flows to minimise analytical time.

There are very specific problems with the type of analysis being undertaken in this report. The policy interest tends to be in terms of industries, but firms in similar industry groups can produce very different sets of commodities. Trade statistics are presented in terms of commodities and matching these with industries of interest in Wales is difficult. Were the analysis to cover all commodities of potential interest the results would be very complex. Consequently assumptions had to be made about industries and commodity groups within these industries to be included in the analysis.

In addition, there is a challenge in respect of patterns of Welsh trade with rest of UK firms that subsequently export – these themes were noted in the Cardiff Business School (2017) report. With present data limitations it is very difficult to identify this trade, such that the focus in this report is more in terms of direct international trade. However, the nature of trade between Welsh firms and rest of UK firms remains a research priority.

1.5 Structure of the report

The remainder of the report is structured as follows. The second section sets out the approach adopted to answer the research questions set out earlier, and the information that was collected to summarise trade and economic activity for each industry sector of interest.

The third section reports the findings for Welsh goods manufacturing sectors, and the fourth sets out findings for Welsh services sectors. The fifth section focuses on how changes in industry structure following EU transition, particularly in terms of trading propensity, could impact on production point carbon emissions in Wales. The final section seeks to bring together the main themes from the analysis, and seeks to answer the main research questions, and explains both the needs for further research, and issues to be considered in interpreting the findings of this report.

2 Approach

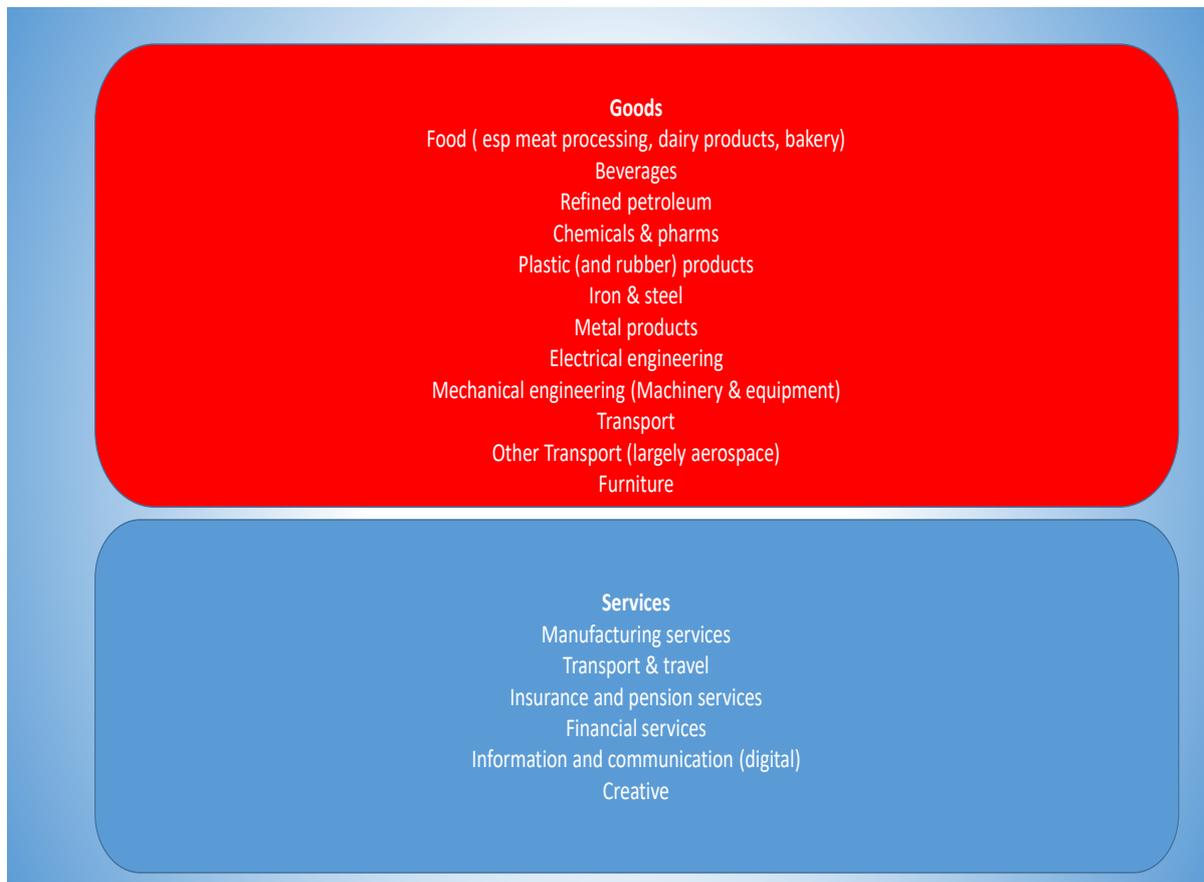
2.1 Introduction

This section of the report focuses on the approach used to answer the research questions set out in section 1.4. This part of the report also examines the key data sources. Note that it is not possible to include all the data used in this section and associated appendices in full due to the volume of information accessed. However, web-links are provided for the main data sources used in the analysis at the end of the section.

2.2 Industries examined

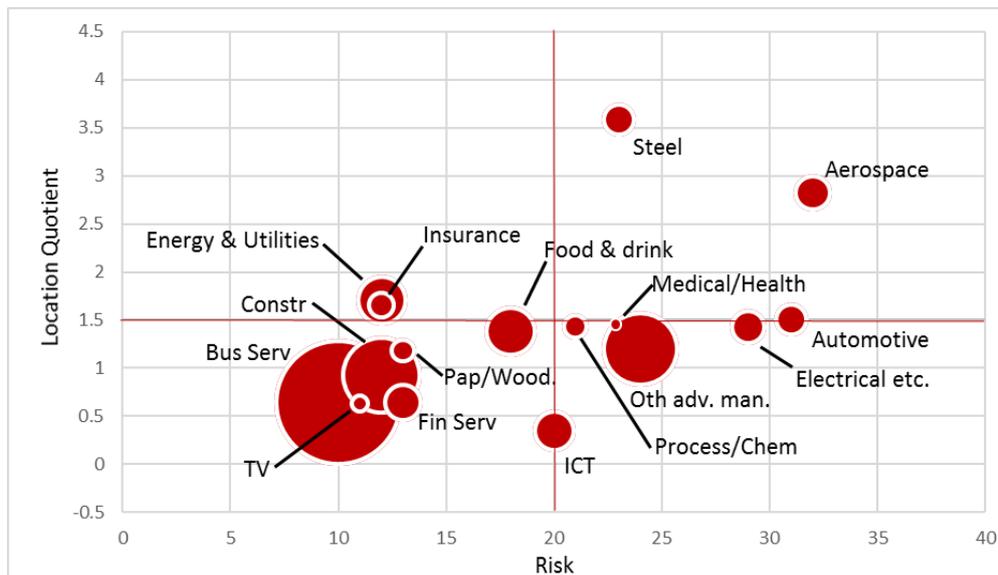
Figure 2.1 shows the industries that are considered in this report. Appendix 1 shows how these industries are classified in terms of Standard Industrial Classification (2007), and then harmonized commodity system (HS) codes. The report covers both manufacturing and services sectors. Figure 2.1 reveals that many of the companies that are included in the Anchor Companies and Regionally Important Companies classifications adopted by Welsh Government would be within these defined industries. The industries in Figure 2.1 also embrace Wales' largest exporting firms, and also those industries that were identified as being most at risk from different categories of EU transition risk (see Figure 2.2) in the August 2017 Cardiff Business School research (see earlier).

Figure 2.1 Summary of industries covered in the report (also see Appendix 1 for definitions)



The approach adopted was to deal with the reference industry groups one at a time. The main difficulty faced was in terms of the level of aggregation for the reporting. For example, a sector such as Chemicals and pharmaceuticals embraces many sub sectors defined in terms of standard industrial classification (SIC, for example, organic, inorganic, fertilisers, dyes etc.), but also with the industry producing a vast array of different commodities on which tariff codes tend to be based. Moreover the defined sector here only includes parts of the Life Sciences sector which is an area which embraces a number of SIC codes. Within the timeframe of the research, full coverage of all the commodities or services produced by the industries in Figure 2.1 was not possible and would have created a massive analytical dataset from which useful conclusions could not be drawn.

Figure 2.2 Summary of Cardiff Business School (2017) report examining Risks facing Welsh Anchor and RICs Firms (see footnote 4)



Given this issue, an approach was developed based on a series of stages for each industry group (but with some modifications for the services sectors) and with the approach leading to an analysis of a standard compendium of information from which a commentary on each sector was based. The information considered for each industry comprised two main groups of data. The first data group summarised regional information on the industry i.e.

- Welsh activity in the industry (and sub-sectors) in terms of employment, industrial output and gross value added (GVA).
- How far Wales has a specialisation in the industry compared to other parts of the UK, and with this measured by an employment location quotient (see Appendix 2).
- The current scale of industry exports from Wales, and main destination (i.e. EU versus non-EU exports).
- Estimated WTO tariff lines for commodities produced by the industry.
- The location and scale of the main firms involved in the industry in Wales.
- An estimate of the production point carbon emissions of the industry, and emissions per £1m of GVA in the industry.

The second group of data considered focused on international trading patterns of the industry and key commodities produced in Wales and included:

- Information on UK imports/exports of goods and services currently produced in Wales, and the main markets served.

- Information on total global imports and exports of selected goods and services produced in Wales, and markets seeing the largest growth of imports and with a focus here on key non-EU trading blocs such as the Asia-Pacific Trade Agreement (APTA), Association of Southeast Asian Nations (ASEAN), Gulf Cooperation Council (GCC), and North American Free Trade Agreement (NAFTA) (see Appendix 6).

It is noted that information on the above with respect to services sectors is far more limited. The following sections contain more detail on each stage of the analysis.

2.3 Identifying Welsh industry specialisation by industries/commodity groups

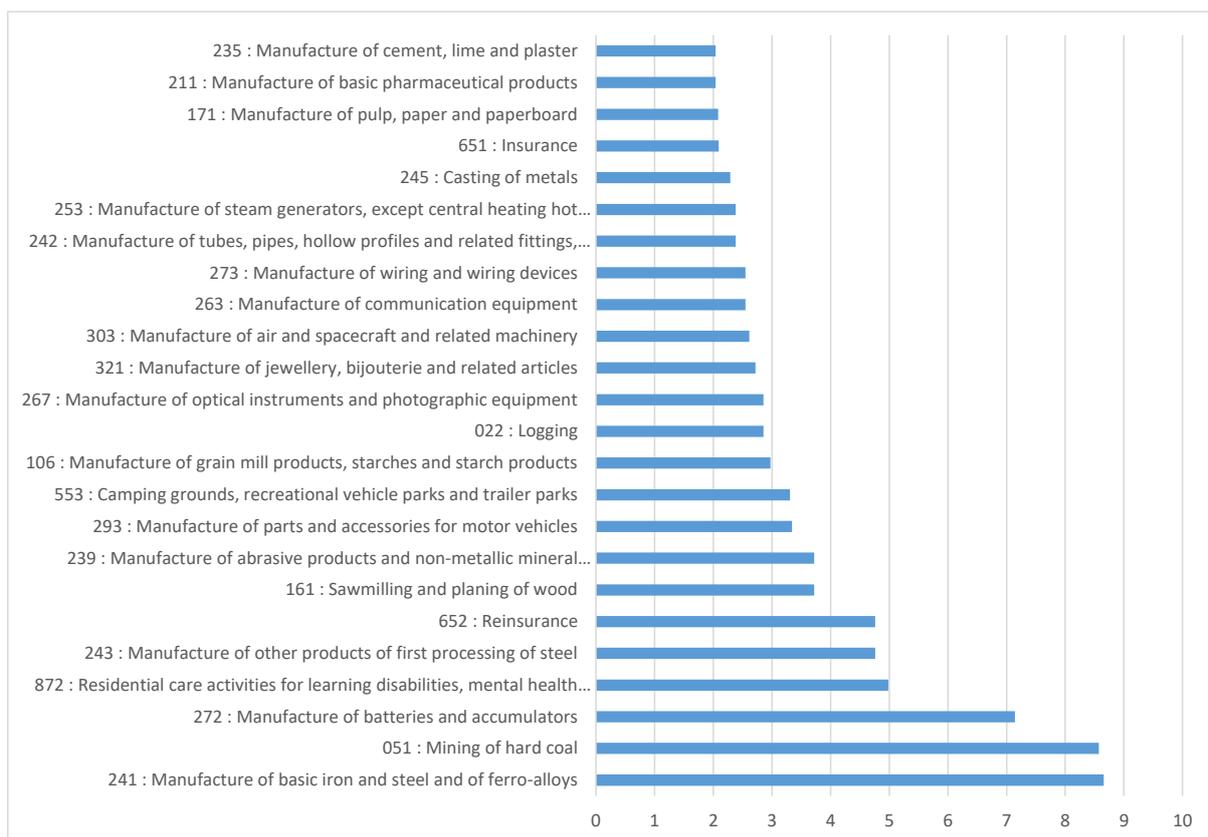
This part of the analysis included two stages. First, for each Welsh industry the ONS Business Register and Employment Survey (BRES) was used to identify broad areas of activity in each industry (SIC (2007) level). Then, for example, in a sector such as Chemicals & pharmaceuticals there are some parts of the industry that are missing in Wales or perhaps employ relatively few people. It is noted, however, that even when an analysis is based upon fairly disaggregated employment information, it can still be difficult to tie this into specific commodities on which trade information is held.

The second stage of the analysis involved the estimation of a simple employment-based location quotient for the industry, to show how far Wales is specialised in the activity in comparison to other parts of the UK. A location quotient in excess of 1 might suggest Wales has a relative specialisation in the sector in question.⁶

⁶ LQ is a ratio used to determine the concentration of an industry in a region in comparison to a larger reference region (e.g. a nation). It is normally used to compare an industry's share of regional employment, however it can also be used for other economic measures, such as value added, imports or exports.

For illustration Figure 2.3 reveals Welsh industries defined at three digit SIC level with the largest employment-based location quotients, and with this revealing sectors in which Wales is most specialised. For example in sector 241, Manufacture of basic iron and steel, the LQ figure is over 8 in Figure 2.3. This reflects the fact that Welsh employment in this sector is around 40% of total UK employment in this sector, but that Wales only has around 4.5% of UK employment, so therefore has a relatively high share of employment in this sector. Note that LQs are not always an ideal measure of specialisation in a sector, and vary according to geographical scale and the level of industrial disaggregation used. However, they represent a rough guide to sector specialisation in a region. A longer listing of SIC 3 digit LQs for Wales is provided in Appendix 2.

Figure 2.3 Selected location quotients for Welsh industries (2017, SIC 3 digit level)



Source: Derived from BRES, NOMIS, (ONS)

2.4 Gross value added and output trends in the industry in Wales

The analysis then examined information on the GVA (in current prices) of the reference industry in Wales. Once again this gives some guide as to the relative size of the industry. This information was derived for the period 2012 to 2016 from the Office for National Statistics.⁷

Also examined was information on more recent trends in overall industry output. This information was derived from the short term output indicators series from Welsh Government (i.e. indices of manufacturing industries, market services etc.). The trends in sector output in the last three years are of particular interest, but a longer time series was examined to show how far industry activity is growing or declining in the long run in Wales (and here with a comparison to UK trends).

2.5 Regional exports (imports) of the industry

An important element of the analysis was to explore the level of overseas exports of each industry from Wales. For the industries there was interest in the share of Welsh exports in 2017 that were destined for the EU. Then data on Welsh overseas exports was examined for three years (2015-2017) to explore recent trends. The broad destination of industry trade (EU, non-EU) was examined together with the WTO tariffs that could be levered on the commodities of the each industry. The information on exports is derived from the Regional Trade Statistics (RTS) from HMRC.⁸ Information on tariff lines is from the World Trade Organisation website. The wider analysis also considers imports into Wales from overseas, although this is not explored in detail but rather cases of significant levels of imports into Wales in selected commodity groups are highlighted in the text (in Section 3). Appendix 4a provides a summary of the Welsh overseas export data, and Appendix 4b provides a summary of overseas imports into the Welsh economy (separated by EU or non-EU origins).

⁷ See GVA estimates current prices for Wales 2012-16, ONS
<https://www.ons.gov.uk/economy/grossvalueaddedgva/datasets/nominalandrealregionalgrossvalueaddedbalancedbyindustry>

⁸ See <https://www.uktradeinfo.com/Statistics/BuildYourOwnTables/Pages/Table.aspx>

Data on exports of services from Wales is far more limited in its availability. The information used here is from ONS experimental data on regional contributions to services trade for the period 2011-16.⁹

2.6 Key players in the industry

The analysis considered the location and scale (employment and sales) of the main players in the industry in Wales. In more high risk sectors this reveals where employment might be lost in Wales were these firms to be adversely affected during the EU transition process. This analysis was informed by the Welsh Government listing of Anchor and Regional Important Companies (RICs), but with the FAME database of Companies House information also providing details of selected large firms in each industry.

2.7 Emissions information

The final element of the analysis estimated the greenhouse gas emissions associated with the industry. The Welsh Government has a sustainable development duty and has targets for the reduction of carbon emissions originating in Wales through production activity. Initial research completed on the Anchor and RICs companies in Wales, and responses to EU transition processes, suggested that some of the sectors at most risk are also those associated with significant levels of greenhouse gas emissions in Wales. The analysis seeks to explore whether a decrease or increase in activity in the wake of EU transition might have a role in reducing/increasing production point emissions in the region, albeit with the prospect that the consumption carbon footprint associated with Welsh household and industry consumption could actually increase as production point emissions reduce (and vice versa).

⁹ See for estimates

<https://www.ons.gov.uk/businessindustryandtrade/internationaltrade/datasets/regionalisedestimatesofukserviceexports>

This is a necessary step in the analysis because changes in international trade impact on domestic emissions generation. In Wales any emissions generated in producing goods and services to meet export demands are added to the domestic emissions account. Pollution generation in Wales is therefore partly driven by consumption decisions in other states. A corollary of this is that where EU transition processes could work to reduce output in some of Wales' more polluting sectors, then production point emissions could fall.

However, under new trading conditions there needs to be an understanding of the levels of emissions produced globally to meet consumption demand within the Welsh economy. Where there is pollution embodied in trade flows, through emissions generated in one region or nation to meet consumption demand in another, a foreign 'trade balance' in pollution will exist in terms of the difference between total emissions estimated on the basis of the production and consumption accounting principles, or more simply, the difference between the pollution embodied in exports and the pollution embodied in imports. The analysis will enable some conclusions to be drawn on how trade threats and opportunities might work to change Wales' trade balance in pollution, and with this understanding important in the context of Welsh Government's sustainable development duty.

The analysis here worked with estimates of direct and indirect carbon emissions associated with Welsh production in each reference industry, and with data from the UK Industry Carbon Inventory, together with information contained within the Input-Output tables for Wales. Further details of this process are provided in Section 5 of the report.

2.8 International Trade Focus

2.8.1 Goods sectors

The second part of the analysis switched to international trade in commodities produced in Wales. Information was derived from the International Trade Centre (ITC) database¹⁰, and with value figures reported in US Dollars. Note here that the analysis of the ITC database was undertaken in June/July 2018 and with an update undertaken in November 2018. Figures here are subject to regular revision.

An initial issue here was the identification of commodities of interest in each industry group. Once again the process could quickly become intractable such that the focus is on some key commodities for each industry. Then the ITC database reveals a great deal of detail but again to make this a tractable problem information is provided at the broad commodity level. ITC uses Harmonized System (HS) products codes. In the analysis that follows the two digit HS code level is used (although noting that the classification of commodities does vary between databases).

Firstly, UK imports/exports of the selected commodities were examined. The analysis, for example, examined the total value of identified UK import/export trade in 2017, then the overseas origins of these imports/exports, and their share in UK imports of each selected commodity. This allowed some analysis later in the report of where there might be opportunities for Welsh firms to displace imports, and this type of information hints at flows that could be changed as a result of EU transition.

However, this is complex, in that these flows change in respect of many different variables, and these flows in value terms may not reflect underlying volumes, but rather exchange rate changes. This does, however, provide an indication of the international competition faced by Welsh firms in the sector (although again conclusions will vary with the level of disaggregation of commodities studied). Main export destinations in the industries of Welsh interest were examined, together with the fastest growing export markets 2013-17 in terms of value (but again noting the issues with respect of volume considered above).

¹⁰ See for example, <http://www.intracen.org/itc/market-info-tools/statistics/>

Second, in examining where there might be new opportunities for Welsh firms in each industry, there was consideration given to the main global importers in the selected commodities, and the growth of imports in these markets over the period 2013-2017.

Third, there was an examination of the commodity trade balances of selected states where changes in trade deals might have impacts for Welsh sectors producing those same commodities.

2.8.2 Trade in services

Information in respect of trade in services is more limited on the ITC database. The focus here was on UK imports and exports in the services group in question (see Appendix 1 for definitions of the services sectors), and then the largest importing countries of the services group in question. The focus here is on major trading groups (APTA, NAFTA, ASEAN, EU28 and GCC, see Appendix 6). However, individual state data on selected services imports by country is available from OECD sources.¹¹

2.9 Conclusions

Figure 2.4 summarises the data sources and approach selected to answer the research questions set out in Section 1 of this report.

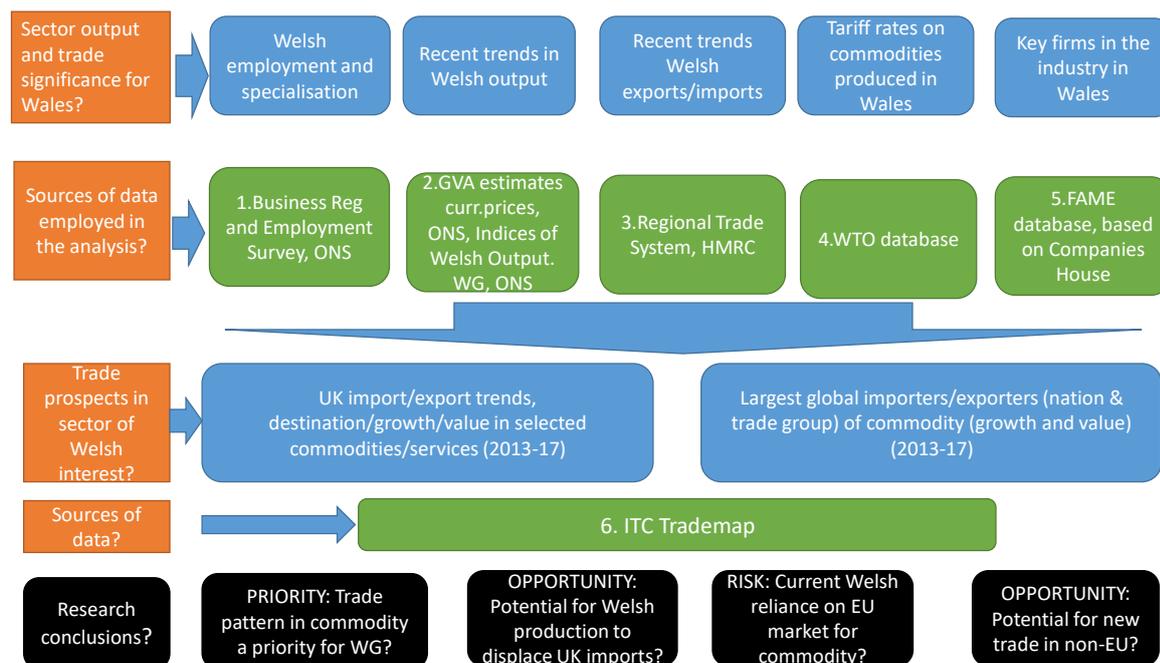
It is important to recognise that the approach being adopted here provides something of a 'guide' to the trade prospects question for Wales in the wake of the EU transition process. At the time of writing the precise nature of the UK's trading relationship with the EU is still unknown, and with this having obvious ramifications for any conclusions deriving from the analysis.

Also it is important to reiterate the prior point that the main analysis was undertaken in June and July 2018 and with some data (particularly relating to Welsh and UK exports) subject to regular revisions. Some updating was undertaken during November 2018.

¹¹ See https://read.oecd-ilibrary.org/trade/oecd-statistics-on-international-trade-in-services-volume-2017-issue-2_sits-v2017-2-en#page17

The next section presents summary findings for the Welsh goods manufacturing industries, and associated commentary. Selected figures from the analysis are included within the main text.

Figure 2.4 Summary of Approach and Data Sources



Note: Key data sources identified in Figure 2.4

1. BRES accessed through NOMISWEB open access see <https://www.nomisweb.co.uk/>
2. GVA estimates current prices for Wales 2012-16, ONS see <https://www.ons.gov.uk/economy/grossvalueaddedgva/datasets/nominalandrealregionalgrossvalueaddedbalancedbyindustry>
3. Regional Trade System, HMRC, Analysis using SITC codes. see <https://www.uktradeinfo.com/Statistics/BuildYourOwnTables/Pages/Table.aspx>
4. World Trade Organisation, WTO tariff lines, accessed through WTO website https://www.wto.org/english/tratop_e/tariffs_e/tariff_data_e.htm
5. FAME database. Bureau van Dijk. Accessed through Cardiff University portal.
6. International Trade Centre (ITC) Trademap. Analysis within the Trademap system. Based on HS two digit codes. See <https://www.trademap.org/Index.aspx>

3 Manufacturing goods sectors: analysis

3.1 Introduction

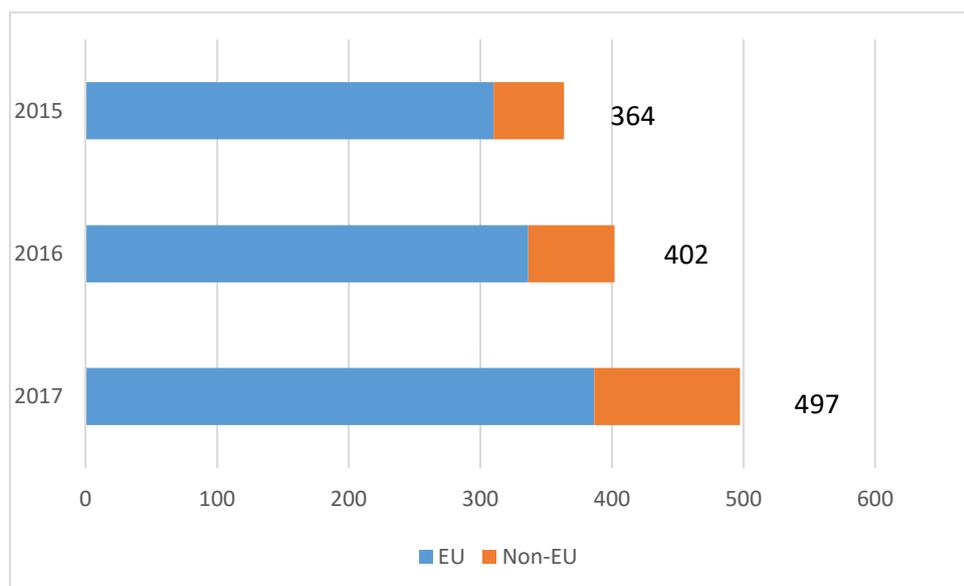
In this section of the report the focus is on the review of the manufacturing sectors considered in section 2 above. Here the focus is on key points from the analyses of the sources discussed in Section 2 of this report. Section 6 of the report summarises the conclusions from the analysis in terms of opportunities (and threats) for Welsh industry. **Note that in this section when we comment on Welsh trade, figures are in sterling, but when the analysis moves to consider UK and international trade we use data from international sources which are denominated in US dollars.**

3.2 Food

Food is a broad sector in Wales with thousands of individual commodities. Around 22,100 people were employed in this sector in 2017, but with additional linkages back to primary farming and aquaculture in Wales. However, the focus here is on the manufacturing as opposed to primary production elements. The analysis revealed the following:

- The main employing food sectors in Wales comprise activity such as processing and preserving of meat and meat product production employing close to 5,000 people in 2017, manufacture of dairy products employing 1,500 people, grain mill products around 1,250 people, bakery and biscuit products 6,000 people, but then with a large other food products sector (including cocoa, sugar and confectionary) employing 7,000 people. Location quotients for selected parts of the sector are well in excess of 1.5 indicating a relative specialisation in the industry activity.
- In 2016 GVA was £1.14bn having grown by 6.5% over 2015, and being 20% above the 2012 GVA value. Figure 3.1 shows that sector exports in 2017 were around £497m (estimated imports were £621m). Within this total figure Meat & meat preparation accounted for 22% of the value of exports, and Dairy products and eggs accounted for a further 24%. The volume of food (and live animal) exports in Wales peaked most recently in 2015 at close to 181,000 tonnes. Between 2015 and 2017 export volumes have fallen by around 9.4% while value has increased by 37%; and with this increase in value seen in most of the commodity groups within the Food sector.

Figure 3.1 Welsh exports 2015-17 in all food commodities (£m)



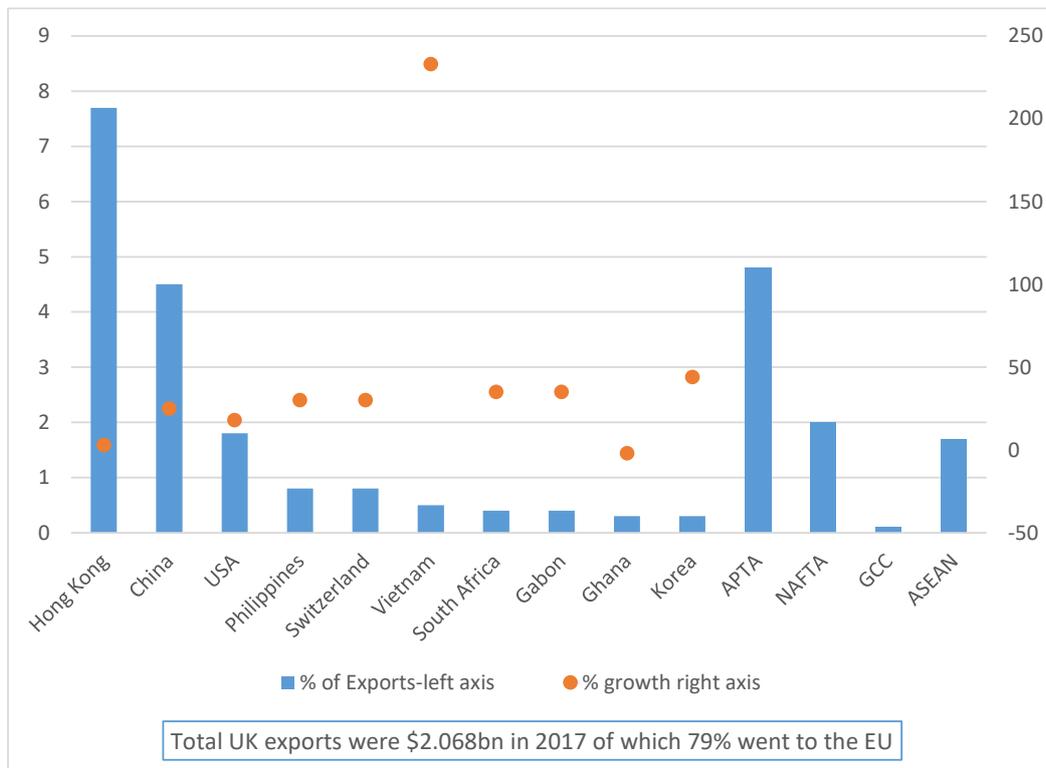
Source: Derived from Regional Trade System, HMRC.

- Food is one of the larger Welsh sectors in terms of its greenhouse gas emissions contribution. While the sector directly only accounted for around 1.7% of greenhouse gas emissions in 2016, this increases to around 10% when greenhouse gas emissions in the sector supply chain are accounted, and with this including primary production of meat in Welsh agriculture. Then in 2016 it is estimated that direct and indirect greenhouse gas emissions per £1m of direct GVA generated in the food sector were 2.52 tCO₂e.
- WTO tariffs on some processed food items are very high.

UK trade highlights in food products sector:

- In Meat & edible offal (HS02) total UK imports in 2017 were \$5.53bn and with 87% coming from the EU, and with much of the remainder accounted for by New Zealand (6.5%) and parts of South America. Figure 3.2 shows that UK exports in Meat and edible offal were \$2.07bn and with nearly 79% going to the EU. Of the remainder China (including Hong Kong, China) accounted for 12.3% and the USA 1.8%. In value terms a number of non-EU destinations for UK exports of Meat and edible offal have seen strong annual growth in the period 2013-2017; particularly noticeable are potentially large markets in the US, China and parts of East Asia. The APTA area accounted for 4.8% of UK exports in Meat and edible offal in 2017.

Figure 3.2 Summary - % UK exports Meat and edible offal (HS02) to non-EU destinations 2017 and growth in exported value %pa 2013-17



Source: Derived from analysis of ITC Trademap see Figure 2.4

- In Dairy produce etc. (HS04) UK imports in 2017 of \$3.91bn were almost wholly from the EU, and of UK exports of \$2.15bn, 74% were destined to the EU in 2017. Important non-EU destinations in 2017 included China 5.7%, and with the NAFTA group taking close to 4% of UK exports. In value terms the fastest export growth in important non-EU destinations in the period 2013-17 occurred in China, US, UAE, Canada and Australia.
- In Food & meat preparations (HS16) the EU accounted for 63% of the \$4.56bn of imports into the UK in 2017. Thailand is shown to be an important non-EU exporter to the UK, and with prepared shellfish an important value component here. UK exports in Meat preparations were \$0.46bn with around 84% destined for the EU in 2017. Markets in the APTA group accounted for 7% of UK exports in this sector.
- In preparations of Cereals and flour etc. (HS19) UK imports of \$4.03bn in 2017 were dominated with goods from the EU (around 91%). Of UK exports of \$2.15bn, 65.5% were destined for the EU in 2017. Of non-EU markets strong growth in the value of exports 2013-17 was found in China (17% pa growth 2013-17), Australia (8%) and the US (5%). In this sector 6.7% of UK exports were destined for the NAFTA group in 2017 and 7.8% for Gulf Cooperation Council areas.

Key global importers of food products:

In the wake of the EU transition process there have been concerns about new markets for Welsh produced meat. The analysis showed that:

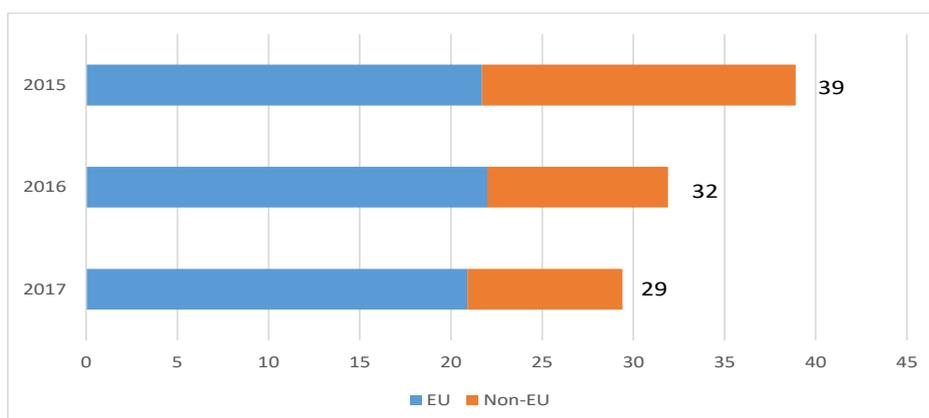
- The main global importers of Meat & edible meat offal (HS02) in 2017 - while the EU28 accounts for 36.7% of global imports by value, other key importers are Japan (8.4%), China & HKC (13.6%), and USA (6.8%). The fastest growth of imports of Meat and edible meat offal in the period 2013-17 have been seen in China (16% annual growth in value of imports 2013-17), South Korea (12%) and USA (6%). Selected of these states apply tariffs of over 20% to imported meat and offal.
- In the case of sheep meat the EU28 accounts for 34.6% of world imports, USA (14.2%) and China (12.7%). The annual growth of value in the US of sheep meat imports was 8%pa 2013-17, but -8% in the China case. It is noted here that Saudi Arabia and Malaysia are important markets for sheep meat.

3.3 Beverages

The beverages sector in Wales employed around 1,750 people in Wales in 2017, with much of the employment in the manufacture of beer, followed by soft drinks and mineral waters. The analysis revealed the following:

- The sector as a whole in Wales contributed an estimated £410m of GVA 2016 (up from £245m in 2012). Figure 3.3 shows that Welsh overseas exports of the sector in 2017 were £29.2m¹². Export trade volumes in 2017 were around 20% above levels in 2013. Volumes reached a recent peak in 2015 at a little under 42,000 tonnes (2017, 36,550 tonnes).

Figure 3.3 Wales overseas exports of Beverages 2015-17 (by value, £m)



Source: Derived from Regional Trade System, HMRC.

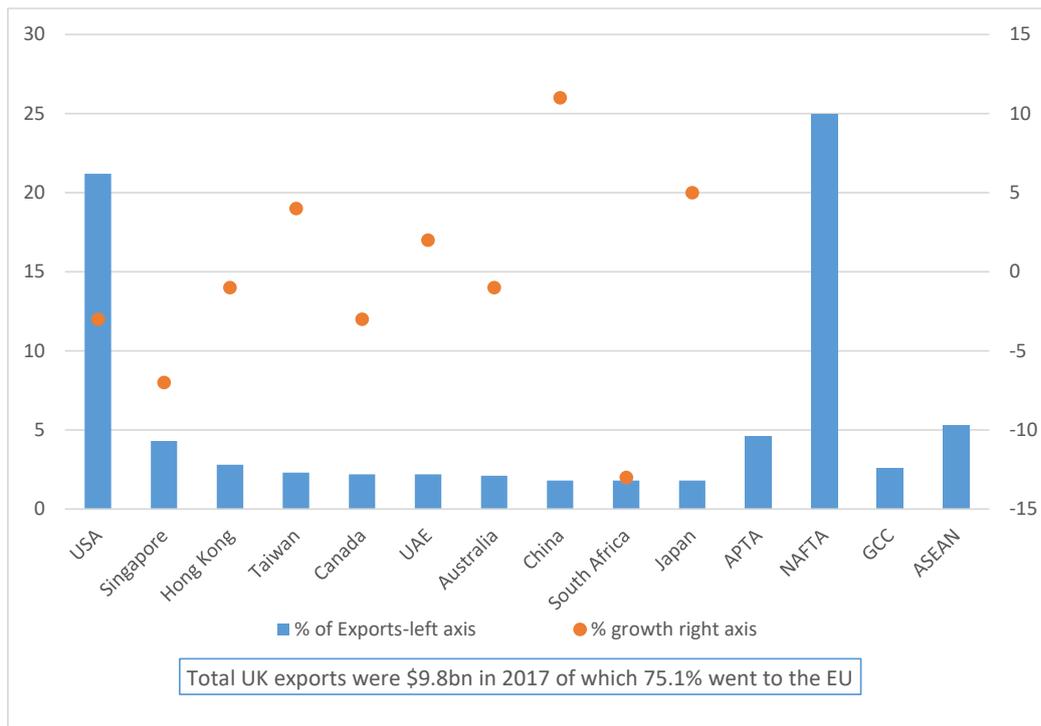
¹² <https://www.uktradeinfo.com/Statistics/BuildYourOwnTables/Pages/Table.aspx>

- Welsh imports in the Beverages sector were £119.9m in 2017, up from £91.5m in 2015.
- The Beverages sector is identified as a relatively low producer of greenhouse gas emissions. Directly and indirectly it is estimated that the sector produces 286 ktCO₂e or 0.70 tCO₂e directly and indirectly per £1m of sector GVA. Much of the greenhouse gas emissions connected with the sector activity are within the Welsh supply chain as opposed to being created in the production of beverages themselves.

UK trade in the Beverages sector:

- UK imports in Beverages: imports as a whole of Beverages, spirits and vinegar – (HS22) - were \$7.8bn in 2017, with the EU28 accounting for 75% of imports, and then with US, Australia and New Zealand also featuring because of wine exports from these markets.
- UK exports in 2017 were an estimated \$9.8bn and with 59% destined for non-EU states (Figure 3.4). Distilled spirits are an important element in the value of these exports. In the wider commodity group the US, Singapore, and China are also shown to be important markets, and with the mainland Chinese market revealing strong relative growth for UK exports.

Figure 3.4 Summary - % UK exports of Beverages, spirits and vinegars (HS22) to non-EU destinations 2017 and growth in exported value %pa 2013-17



Source: Derived from analysis of ITC Trademap see Figure 2.4

- Countries within NAFTA made up a quarter of UK exports in the Beverages, spirits commodity group in 2017.

- Beverages, spirits and vinegar is a broad sector but with current Welsh activity focused in beer and bottled waters. UK imports of mineral and natural waters (whether sweetened or not) are small in value terms (around \$1.3bn in 2017) when compared to total beer, spirits and vinegar (\$7.8bn), and with this linked to the cost of transporting such products in relation to their retail sales value. Where bottled waters (sweetened, natural, aerated etc.)¹³ are imported it is generally from the EU28, and with France, Italy and Switzerland key exporters here – but with these exports expected to come under pressure as a result of packaging concerns. In mineral and waters with sweeteners there has been some strong growth in imports between 2013-17 from USA, Philippines, Sri Lanka, Indonesia, Japan and Turkey, but in each of these cases from a very small base.
- Opportunities for Welsh producers of bottled waters are more likely to link to environmental concerns over transporting water long distances, and with increasing market knowledge of the quality of the Welsh product. So there is likely to be some potential for displacing EU28 imports of bottled waters by Welsh production.
- In terms of beer made from malt, UK imported values in 2017 were \$628m, and with the EU28 accounting for 73%, and with Mexico and the US accounting for a further 23%. Mexico is the largest global exporter of beer. The imported value of beer from Mexico and the US has increased annually 2013-17 by an average of 17% and 38% respectively.

Key global importers of bottled waters, and beer made from malt:

- For natural and aerated waters the EU28 accounted for just over one third of global imports, and for sweetened waters 41%.
- The value of bottled water imports (sweetened or otherwise) increased by 3% on average per year between 2013 and 2017.
- For Welsh producers, given transport costs, expanding opportunities in the EU28 market could be a possibility, particularly if the environmental considerations of transport, packaging can be met.
- For beer made from malt the EU28 and US combined account for nearly two thirds of global imports, and with US imports here showing annual growth in value of 8% between 2013 and 2017. Other strong growth markets are appearing in China and Korea.
- A key issue here will be whether Welsh producers of beer have the scale to reach these markets that are further afield.

¹³ <https://www.foreign-trade.com/reference/hocode.htm?cat=3>

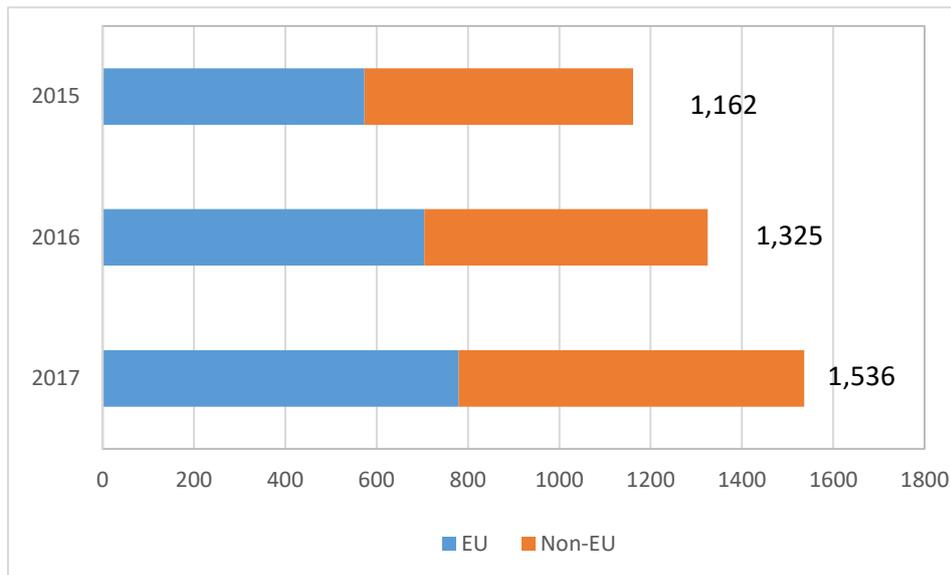
3.4 Chemicals & pharmaceuticals

The Chemicals & pharmaceuticals industry (SIC 20 and 21) in Wales employed around 6,300 people in 2017. While there are more employees overall in 'Chemicals' compared with 'Pharmaceuticals', the defined 'pharmaceutical preparations' sub-sector accounts for 2,250 employees, with a further approximately 600 in basic pharmaceuticals, and with both of these sectors relatively specialised in Wales, with high location quotients, particularly for basic pharmaceuticals. It is important to recognise here, as revealed earlier, that the definition misses parts of the Life Sciences sector. For example, elements of medical technology activities are within engineering and/or services sectors.

The analysis for this sector revealed:

- GVA in the whole of the Chemicals & pharmaceuticals sector in 2016 was £1.49bn, but with this also including some exports from the oil refining sector. GVA in the manufacture of pharmaceuticals alone was £497m in 2016, and with the GVA largely maintained in the period 2012-16.
- Chemicals & pharmaceuticals is one of Wales' larger exporting sectors (Figure 3.5). In 2017 exports in this sector were around £1.54bn (excluding plastic in primary and non-primary forms). Large elements of total exports were organic chemicals (£248m exports from Wales in 2017), and medicinal and pharmacy products (£733m in 2017). Overall the Chemicals & pharmaceuticals (excluding plastics) sector accounted for just over 9% of the value of Welsh exports of goods in 2017.
- Total Welsh imports of Chemicals & pharmaceuticals were around £1.7bn in 2017, but this also included elements of plastics production discussed elsewhere in this section.

Figure 3.5 Welsh exports of chemicals and pharmaceuticals (excluding plastics) £m 2015-17



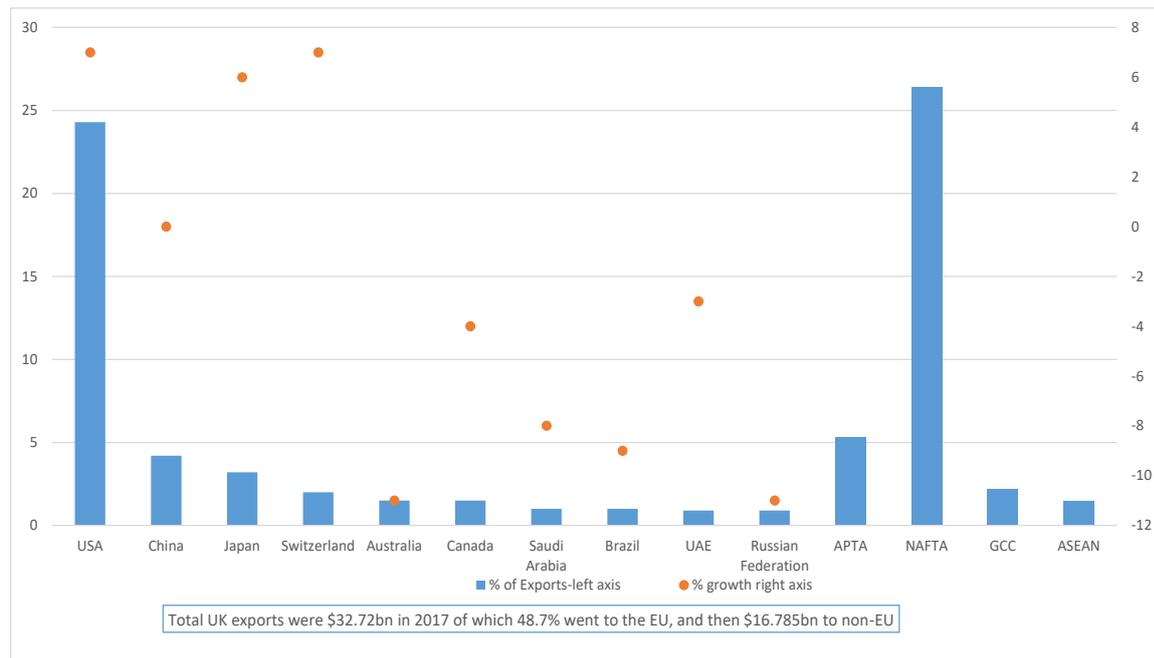
Source: Derived from Regional Trade System, HMRC.

- The Chemicals & pharmaceuticals sector (SIC 20-21) was estimated to produce 1.28 tCO₂e per £1m of sector GVA in 2016, and with this including direct and indirect emissions supported in the Welsh supply chain.
- The previous Cardiff Business School 2017 report (see earlier) identified firms in Chemicals & pharmaceuticals to be at high risk in relation to loss of access to EU knowledge and innovation networks and frameworks. Direct and indirect tariffs were considered to be less of a risk. Commodities classified as pharmaceuticals have a zero tariff although for some parts of this sector non-tariff barriers (for example, REACH regulations) that could be faced post Brexit are a serious concern. Companies in the Chemicals sector are considered more at risk from tariffs, due to relatively high exports with more significant tariffs ranging up to 5.5%.

UK trade in pharmaceutical products:

- UK imports of Pharmaceutical products (HS 30) were over \$33bn in 2017, and this value has grown by 3%pa in the period 2013-17.
- Of UK exports of pharmaceutical products of \$32.7bn around 49% were destined for the EU in 2017. Other key markets (see Figure 3.6) are USA (24.3%) China (4.2%) and Japan (3.2%), and with the value of exports to these markets seeing persistent annual growth in the period 2013-17. Some 26.4% of UK exports in pharmaceutical products were destined for states within NAFTA, and 5.3% to the APTA group.

Figure 3.6 Summary- % UK exports of Pharmaceutical products (HS30) to non-EU destinations 2017 and growth in exported value %pa 2013-17



Source: Derived from analysis of ITC Trademap see Figure 2.4

UK trade in selected Chemicals sectors:

- In terms of UK exports of inorganic, organic chemicals, soaps and essential oils the EU accounts for between 55% and 66% of the value of UK exports depending on product.
- Countries within the NAFTA grouping accounted for 8% of UK inorganic chemical exports, 26% of organic chemicals exports, 10% essential oils exports, and 7% of soaps exports.
- The APTA grouping accounts for 14% of the value of UK exports in the inorganic chemicals sector.

Global imports for Chemicals & pharmaceuticals i.e. potential in existing and new markets:

- Within the sector Chemical and pharmaceutical group of commodities, Pharmaceutical products (HS30) and Organic chemicals (HS29) have the highest world import values in 2017, at over \$560bn and \$412bn respectively.
- For Organic chemicals (HS 29), there has been a decline in the value of world imports over the 2013-17 period of an average of -5%pa (although with positive growth during 2016-17), compared with an average annual 2013-17 growth in world imports of Pharmaceutical products of 2%.
- The EU28, USA and China dominate in terms of global imports of Chemicals and pharmaceuticals.

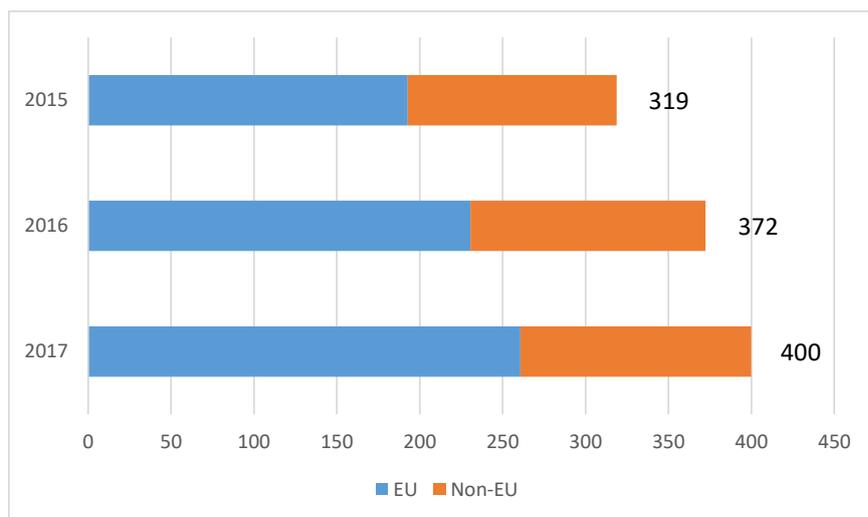
- The UK, with imports of over \$33bn accounts for almost 6% of global imports of Pharmaceutical products, with a higher import value than China. The assumption here is that with relatively low imports, China is producing Pharmaceuticals for its own domestic consumption.
- The growth in imports in Pharmaceutical products has been strong in some world economies, for example, annual average growth of between 11% in the USA and 13% in China over the period 2013-17, and growth of an average of 6% in imports into Switzerland. In Canada, Russia, Australia and Brazil, there have been declines in the growth of imports. Imports into Korea have increased by an annual average of 7% between 2013 and 2017.

3.5 Plastics (and rubber)

The plastics manufacturing sector (in Wales largely SIC 222) employed around 10,000 people in 2017, up from 7,000 people in 2016. The sector overall is relatively specialised in Wales with an LQ of 1.55. The sector is dominated by medium sized employers in Wales, with companies producing plastic products including packaging, components for the automotive industry, doors and windows and precision moulded products. The analysis revealed the following:

- Welsh GVA in Plastic & rubber products was £538m in 2016 but with the vast majority of this accounted by plastics and opposed to rubber goods. Sector GVA in Wales grew by 12.8% between 2014 and 2016.
- Welsh exports in Plastics include plastic in primary, and then non-primary forms (SITC 57 and 58). Total exports in 2017 were around £400.0m (see Figure 3.7), representing 131.5m tonnes in volume terms. Trade volumes from Wales in this sector show some variability over the period 2013-2017, peaking at 142.7m tonnes in 2015. The WTO average tariff for plastics range from 5.8%-6.5%.
- The plastics sector in Wales tends to feature low 'within' industry emissions but because it purchases from industries that are relatively high emitters of greenhouse gases such as electricity production, its total emissions (i.e. direct and indirect) are over six times its direct sector emissions. In 2016 the sector's total emissions were 500 ktCO₂e or 0.93 tCO₂e per £1m of sector GVA.

Figure 3.7 Welsh exports of plastic products (2015-17 £m)

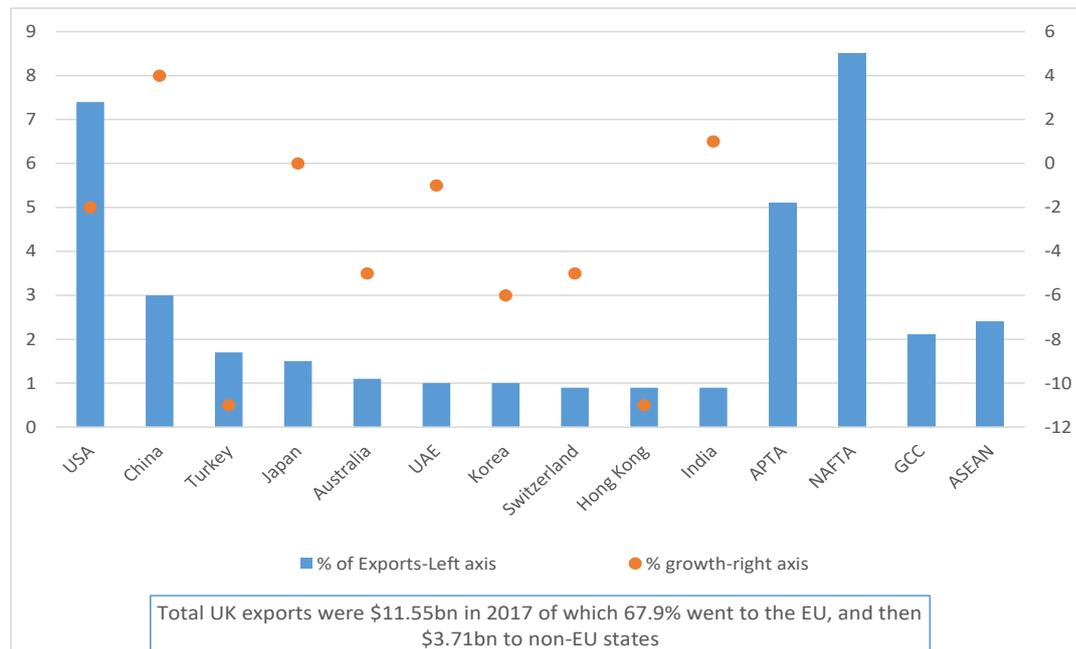


Source: Derived from Regional Trade System, HMRC.

UK trade in the Plastics sector:

- In 2017 total UK imports in Plastics and articles thereof (HS39) were \$18.4bn and with around 70% of the value of these imports coming from the EU; a further 17% of UK imports came from the USA and China. UK exports were \$11.6bn in 2017 and with 67.9% of these exports destined for the EU. The largest non-EU market for plastics and articles thereof was the USA (7.4% of UK exports), followed by China (3%). NAFTA and APTA states between them received over 13% of UK exports of plastics and articles thereof (Figure 3.8).

Figure 3.8 % UK exports of Plastics and articles (HS39) thereof to non-EU destinations 2017 and growth in exported value %pa 2013-17



Source: Derived from analysis of ITC Trademap see Figure 2.4

Key global importers of plastics:

- The EU28, China and North America are key importers of plastics and articles thereof.

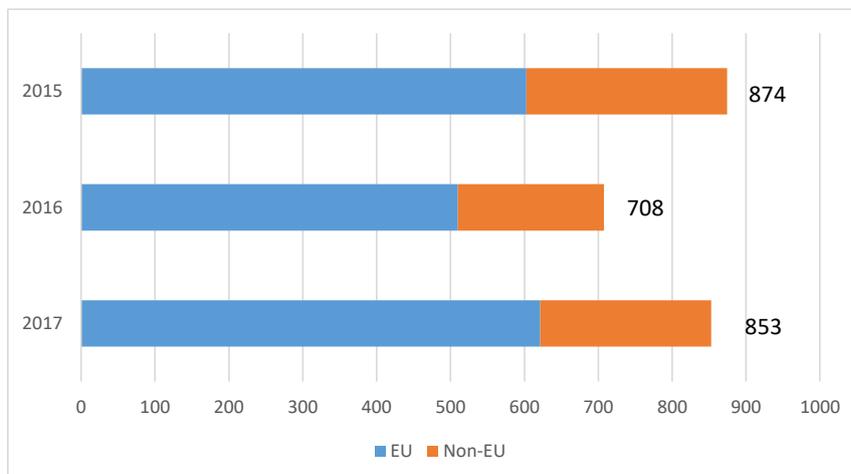
3.6 Iron & steel (basic metal production)

Employment in the sector is dominated by steel manufacturing at Tata’s Port Talbot site, and its other steel processing operations in Wales, although with significant employment at Celsa in Cardiff and then some smaller companies employing hundreds rather than thousands of workers. Sector specialisation is very high in Wales especially for Iron and steel production. Selected parts of the sector which are much smaller in terms of employment also feature high levels of sector specialisation, including cold forming or folding and casting of other non-ferrous metals. Importantly some elements of this sector are strongly interlinked; any loss of basic metals heavy production would impact on the viability of linked processing activity.

The analysis of this sector revealed:

- Welsh GVA in manufacture of basic metals (and including here any first processing of metals into tubes, profiles etc.) was £454m in 2016, down from £522m in 2015. Overall sector output with respect to the index of basic metals production has been relatively strong compared with the UK, although there has been some decline in output in Wales since 2017Q3, with the index falling below its 2016 base year level in the first quarter of 2018.
- In 2017 the value of Welsh overseas exports of Iron & steel (SITC 67) was £853m (Figure 3.9) and with this related to 1.29m tonnes of output exported. Between 2016-2017 the value of Iron and steel exports increased by around 20%, while volumes in tonnes fell by around 10%. However, the long term trend over 2013-17 has been a steady reduction in the volumes exported overseas from this sector. Imports of Iron and steel to Wales were £415.2m in 2017.
- As highlighted above the focus of this section is on Iron and steel production where much of the employment in metals production resides in Wales. However, it is important to note that Wales exported over £360m of non-ferrous metals in 2017, and that this sector employed around 800 people.

Figure 3.9 Welsh exports by value of Iron and steel (£m)



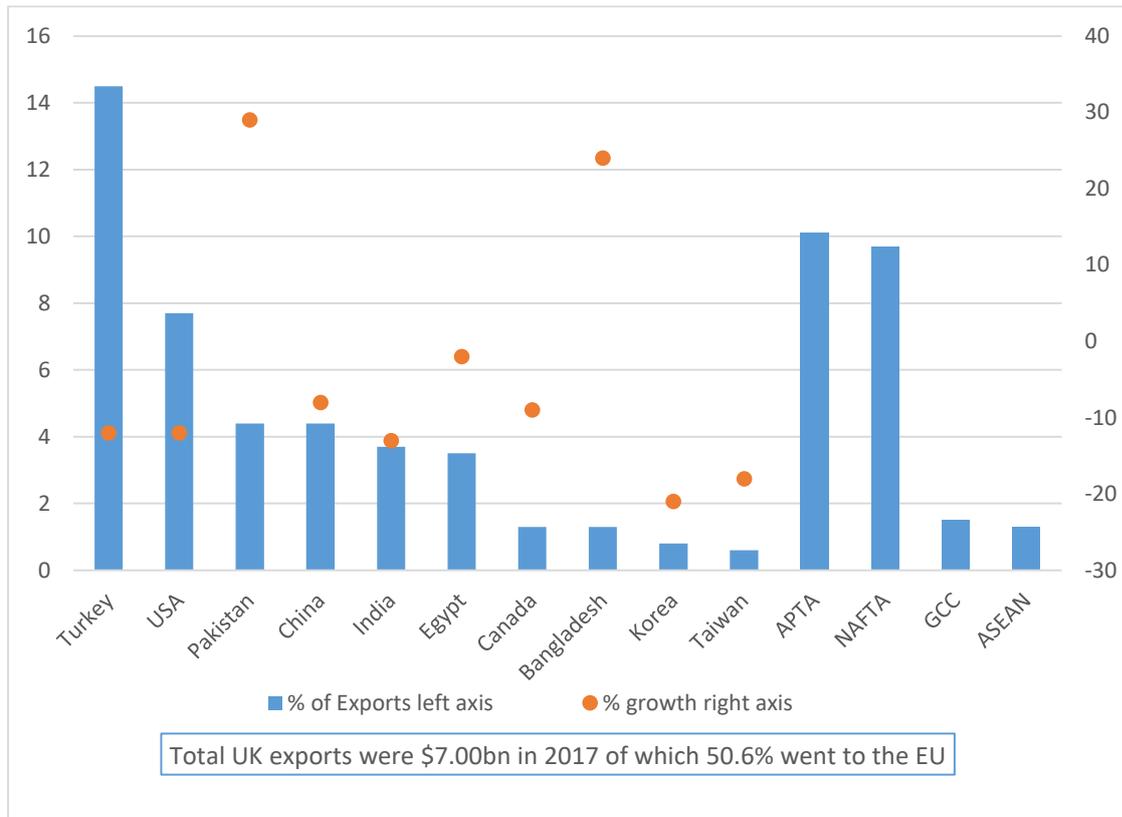
Source: Derived from Regional Trade System, HMRC.

- Despite the recent Tata joint venture with Thyssenkrupp, the sector in Wales is still vulnerable. The Port Talbot site imports most of its raw materials, and energy costs are considered to be relatively high. In addition the joint venture includes the much larger Tata facility in the Netherlands. Some Brexit risks may be diversified following the joint venture. In relation to domestic market opportunities, some of the particular types of steel used in construction and in parts of the automotive sector are not produced in Wales and are currently imported. Indeed some of the sectors which are users of Welsh made steel face Brexit risks which may then indirectly impact on steel making in Wales. There are potential opportunities with the Zodiac line at Llanwern which has developed additional capacity and could gain additional UK business were tariffs to be placed on imported steels.
- The previous Cardiff Business School report (see earlier) considered this sector to be high risk in terms of direct and indirect tariffs (due to the scale of exports).
- In terms of greenhouse gas emissions steel production is the largest point source emitter and unlike many other sectors in the region, most of the emissions are direct as opposed to within other elements of the supply chain in Wales. Direct emissions in 2016 were estimated at 5,313 ktCO₂e growing to 6,953 ktCO₂e once account is taken of emissions in the Welsh supply chain to the industry. In summary this means that the steel production sector direct and indirectly produces a large 15.32 tCO₂e emissions per £1m of GVA.

UK trade patterns in Iron and steel:

- In 2017 around 71% of UK Iron and steel (HS72) imports came from the EU, and then with China, Turkey, Ukraine and Korea making up a further 15% of total imports. However, of UK exports of close to \$7bn in 2017, just half were destined for the EU, and with Turkey (14.5%) and USA (7.7%) being the most important non-EU markets in terms of value (Figure 3.10).

Figure 3.10 % UK exports of iron and steel (HS72) to non-EU destinations 2017 and growth in exported value %pa 2013-17



Source: Derived from analysis of ITC Trademap see Figure 2.4

- In terms of broader trade areas NAFTA and APTA accounted for around 10% each of the value of 2017 UK exports of Iron and steel. In many of the main non-EU markets for UK iron and steel, the value of exports has fallen sharply in the period 2013-17 i.e. by 12% pa 2013-17 in the case of the USA.

Key global importers of Iron and steel:

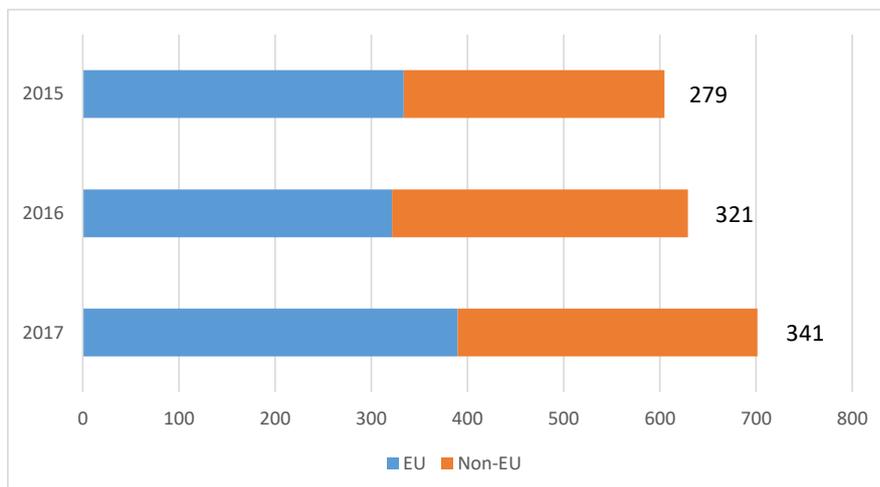
- Total global imports of Iron and steel (HS 72) were \$383bn in 2017 and with the largest imports being taken by US (7.6% of the value of world imports in 2017), China (5.6%), Turkey (4.4%) and South Korea (4.3%). The EU as a whole accounted for around 38% of the value of world Iron and steel imports in 2017. A number of states in the Gulf, South America and Asia also feature as important import markets, and with this typically revealing the absence of a domestic scale steel making sector in selected of these states.

3.7 Fabricated Metal Products

Welsh employment in Fabricated metal products is dominated by firms in the machining and metal structures sub-sectors, together accounting for more than half of the approximately 15,900 people employed in the sector in 2017, down from just under 21,000 in 2016. In most parts of this sector Wales has high location quotients (see Appendix 2) and with this reflecting a long historical specialisation in elements of metal products. The analysis revealed the following:

- Welsh GVA in SIC 25 (Manufacture of fabricated metal products) was £813m in 2016, down from £854m in 2015.
- In terms of Welsh exports, the manufactures of metal (SITC 69) sector exported £341m of goods in 2017 (imported £385.6m). Volumes of metal products exported from Wales have remained fairly steady between 2013 and 2017, varying between 74-80,000 tonnes over this period. The tariff range for goods produced in this sector is higher than for basic metals, ranging from 2.5 – 3.1%.
- Total greenhouse gas emissions of this sector in Wales were estimated as 810 ktCO₂e in 2016 with just 17% of this being direct sector emissions. The sector purchases goods from sectors in Wales which are relatively emissions intensive including the Iron & steel and Electricity sector. Total (direct and indirect) emissions per £1m GVA were an estimated 1.00 tCO₂e in 2016, compared to 15.32 tCO₂e in the Iron & steel sector.

Figure 3.11 Welsh exports of Metal products 2015 – 2017, £m

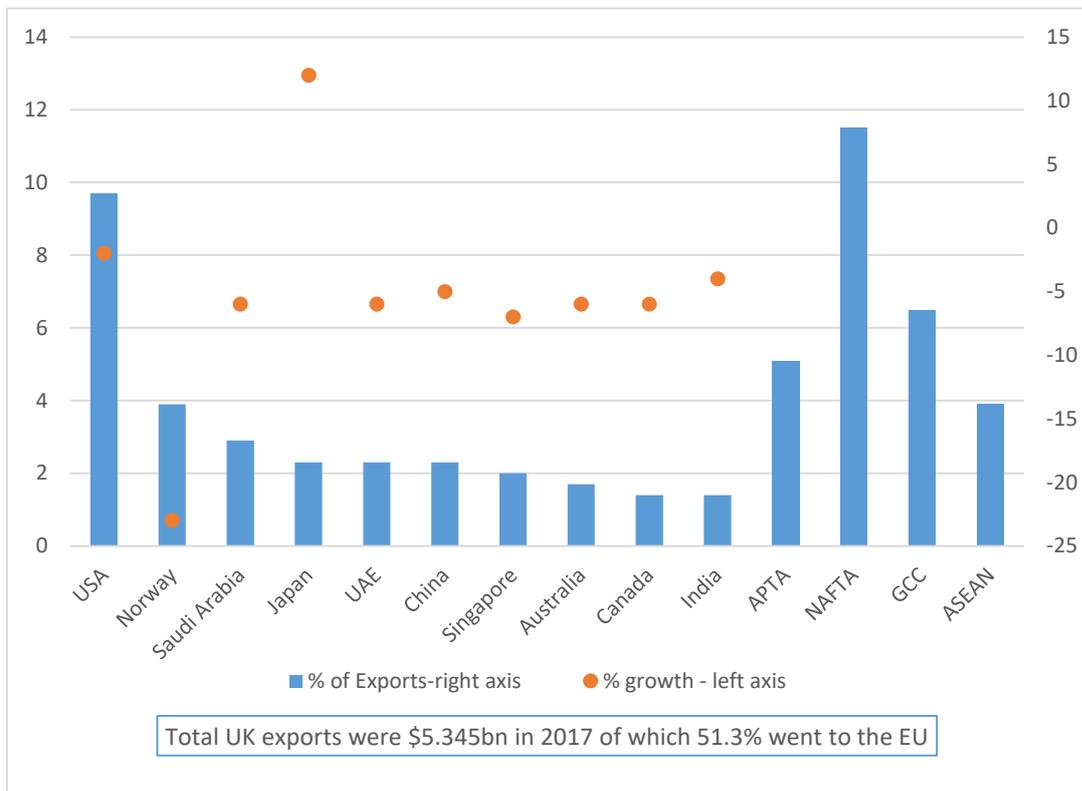


Source: Derived from Regional Trade System, HMRC.

UK trade in Metal products:

- UK international trade in Articles of iron and steel (HS73) is dominated by total imports of \$8.99bn in 2017 with around 59% coming from the EU. Much of the remaining imports into the UK in 2017 in Articles of iron and steel came from China, Turkey and the USA, together accounting for around 28% of the value of UK imports in 2017.
- Of UK exports in 2017 of \$5.35bn, around 51% were destined for the EU. Of the remaining half a large number of overseas markets feature (Figure 3.12), the largest of which is the USA which accounted for 9.7% of the value of UK exports of Articles of iron and steel in 2017.
- In terms of trade areas outside of the EU, APTA countries accounted for 5.1% of the value of UK exports in 2017, NAFTA, 11.5% and Gulf Cooperation Council 6.5%. In most of the major non-EU overseas markets the value of overseas exports from the UK in the period 2013-17 has fallen.

Figure 3.12 % UK exports of Articles of iron and steel (HS73) to non-EU destinations 2017 and growth in exported value %pa 2013-17



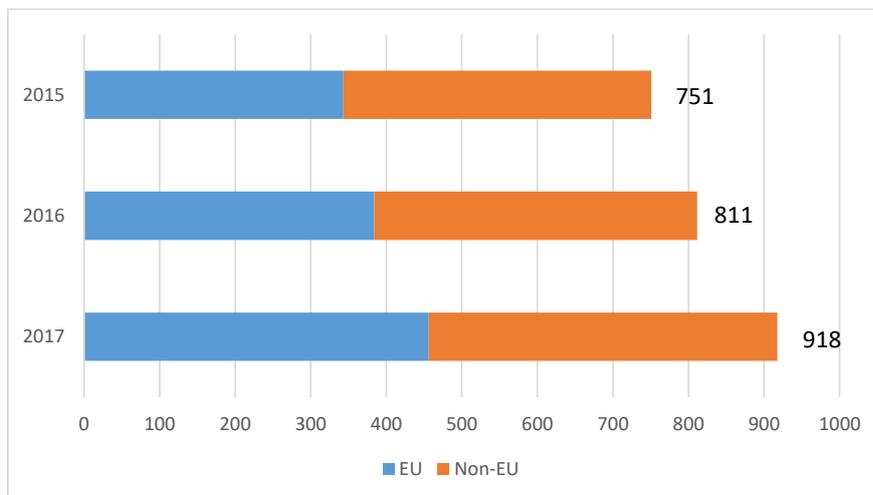
Source: Derived from analysis of ITC Trademap see Figure 2.4

3.8 Electrical engineering and equipment

There were around 10,800 employees in the defined Electrical engineering and equipment sector in Wales (defined as SIC 26 - Manufacture of computer, electronic and optical products (around 6,000 employees), and SIC 27 - Manufacture of electrical equipment, (around 5,000 employees)). Higher employing sub-sectors include instruments/appliances for measuring testing and navigation, communication equipment, electronic components and boards, manufacture of wiring devices, and domestic appliances. The analysis revealed that:

- GVA for the sector in Wales was almost £800m in 2016. Economic activity appears to have grown faster in Computer, electronic and optical products in the period 2014-2016 with GVA growing from £361m in 2014 to £497m in 2016. In Manufacture of electrical equipment GVA has varied in current prices between just £291m and £304m for the whole of the period 2012-16. The index of production for the computer and electronic products sector shows an increase in output since 2012, with the latest information showing that output increased by 5% in 2017, and with a further small increase in output in the first quarter of 2018.
- In parts of this sector there is strong Welsh specialisation. For example with respect to SIC 26 location quotients exceed 1.5 in sectors including electronic components, communication equipment, electro-medical equipment, wiring devices, batteries and optical instruments.
- The Electrical machinery, apparatus etc. (SITC 77) sector (that includes IQE and IR Newport) exported goods to the value of £786m in 2017 (imports of £910m), and with the value of exports in this sector up almost 18% on 2015 values, although there was an estimated 12% fall in trade volumes in Electrical machinery etc. between 2015-17.
- Welsh exports in telecommunications equipment and related (SITC 76) increased by 56% between 2015 and 2017 to £131.7m. The WTO tariff range is moderate on these products, ranging from 1.8%-2.8%. However parts of this sector were considered to be particularly at risk from tariffs on exports and imports in the previous Cardiff Business School (2017) report (see earlier).

Figure 3.13 Welsh exports Electrical engineering (SITC 76 & 77) 2015-2017, £m



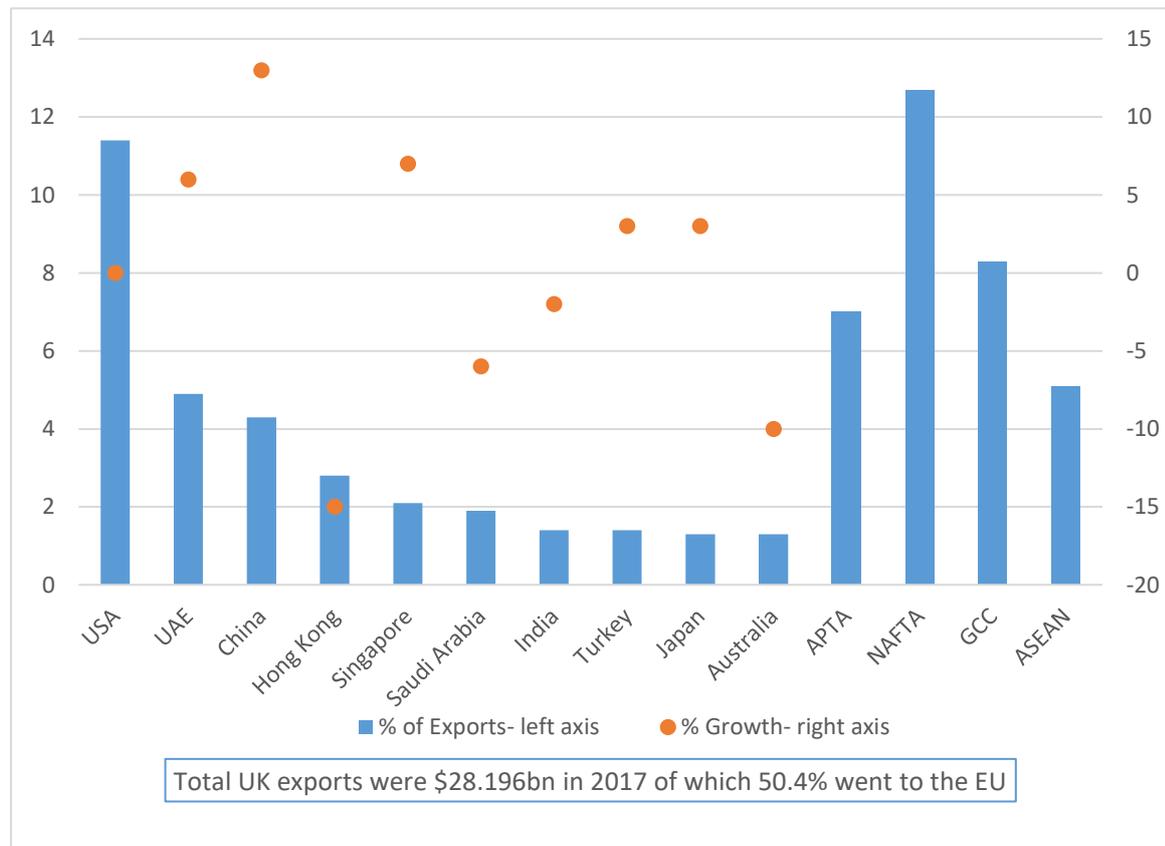
Source: Derived from Regional Trade System, HMRC.

- For the faster growing part of the sector i.e. SIC 26 Computer, electronic and optical products, direct greenhouse gas emissions were 98 ktCO₂e in 2016, and with this growing to 459 ktCO₂e once account was taken of indirect emissions in other parts of the economy that support operations in the sector – this latter figure equated to a total of 0.92 tCO₂e greenhouse gas emissions per £1m GVA generated in the sector in 2016.

UK trade in electrical engineering and equipment:

- In the case of Electrical machinery (HS85) total UK imports by value were \$59.9bn in 2017, with 49.5% originating in the EU, but then with a further 31.3% originating in China and the US. Half of UK exports of \$28.2bn in 2017 were destined for the EU, but then with 11.3% of UK exports going to the US, and around 7.0% to China. APTA states received around 7% of UK exports in 2017, and NAFTA almost 12.6%.

Figure 3.14 UK % exports of Electrical machinery (HS85) to non-EU destinations 2017 and growth in exported value %pa 2013-17



Source: Derived from analysis of ITC Trademap see Figure 2.4

- In Optical equipment etc. (HS90) UK imports in 2017 were \$17.7bn with 59% coming from the EU. The US, China and Japan together accounted for a further 28% of UK imports in 2017. Of around \$18bn of UK exports just 40% went to the EU, with 20.2% to the US, and with China and Japan combined accounting for a further 11.4%. States within the NAFTA grouping accounted for around 22% of UK exports, while APTA states accounted for a further 10%.

Global importers of electrical engineering and equipment

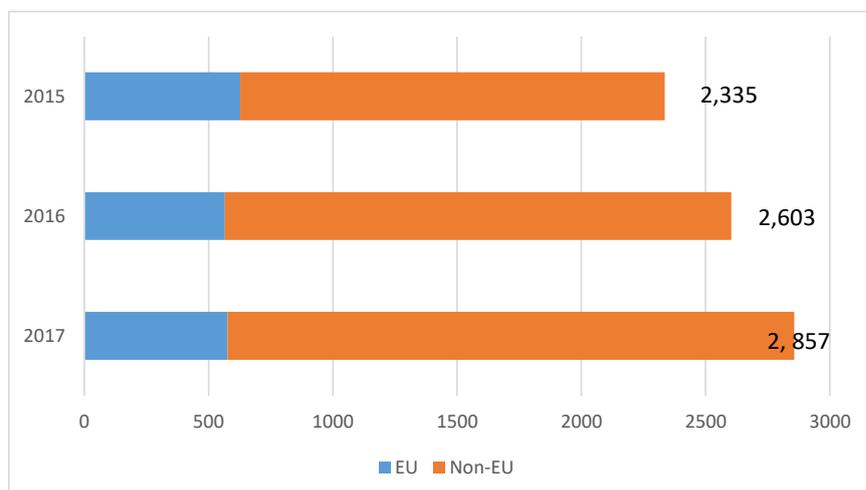
- The leading world market import markets for Electrical machinery etc. (HS 85) outside of the EU28 grouping are China and the US which together accounted for close to 41% of the \$2.74trillion of world imports in this commodity group. Japan, Singapore and Mexico combined accounted for a further 10% of the global value of imports in 2017.
- In Optical equipment etc. total world imports in 2017 were \$573bn, and with China and the US accounting for around one third of the value of world imports in this commodity group (EU, 29.6%). Japan and Korea accounted for a further 8% of the value of world imports in 2017.

3.9 Mechanical engineering (Machinery and equipment nes)

The Mechanical engineering sector (SIC 28) in Wales is relatively small in terms of employment, with around 4,800 employees in 2017. Welsh earnings in this sector are high, and the sector includes some large inward investment firms. The analysis revealed the following:

- Welsh GVA in the sector was £230m in 2016 down 5.3% on 2015.
- The sector has performed strongly after 2016, with the index of production for machinery output growing by 30% during 2017 (compared with around 9% growth in the UK). There has been some reversal in this growth in the early part of 2018, but output is still well above 2016 (base year) levels.
- Welsh exports (Figure 3.15) of the sector are made up of power generating machinery and related equipment, specialised industry machinery, metalworking machinery and then general industrial and office machinery (i.e. SITC 71-75). Total exports in SITC 71-75 from Wales were valued at £2.86bn in 2017 (imports £3.17bn) and dominated by power generating machinery and equipment, where exports exceeded £2bn in 2017, up from around £1.83bn in 2016, and with the strength of exports in the sector being partly reflected in the strong growth of the Welsh index of machinery and equipment in 2016-17.

Figure 3.15 Welsh exports in Mechanical engineering £m



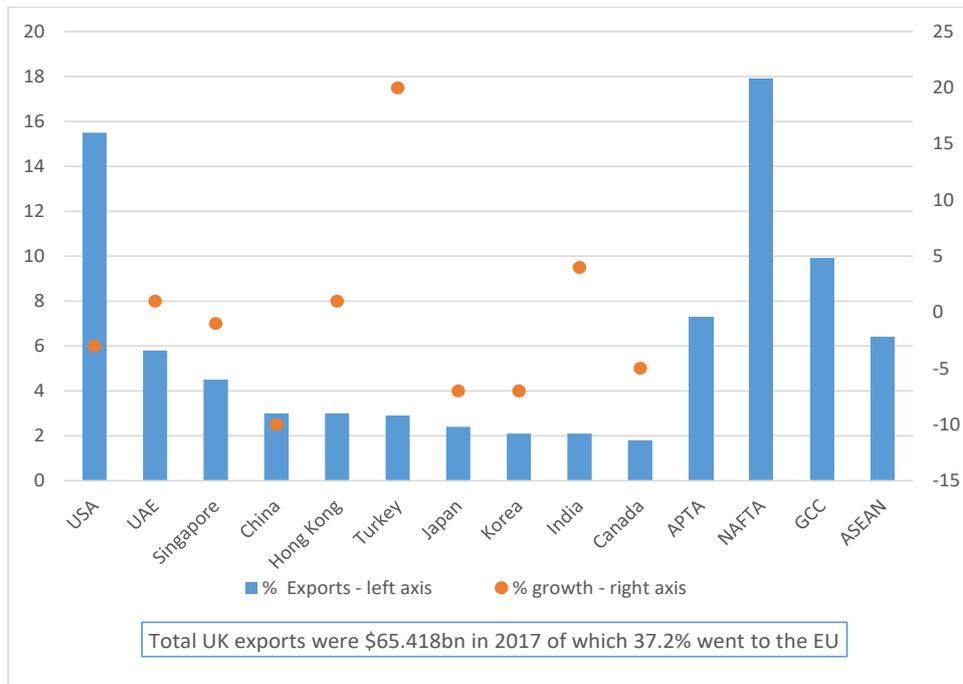
Source: Derived from Regional Trade System, HMRC.

UK trade in Mechanical engineering

- UK imports of Mechanical engineering (HS84, \$80.0bn) in 2017 were dominated by the EU which accounted for 52% of the value of these imports. Key non-EU sources of imports include the USA (22% of imports by value) and then China (12%).

- Some 37% of UK exports in 2017 of \$65.4bn went to EU destinations. Other key markets (Figure 3.16) are the USA (15.5% of the value of 2017 exports), and UAE and Singapore (5.8% and 4.5% respectively). In terms of trade area APTA and NAFTA states together accounted for around one quarter of the value of UK exports in 2017.

Figure 3.16 % UK exports of Mechanical engineering (HS84) to non-EU destinations 2017 and growth in exported value %pa 2013-17



Source: Derived from analysis of ITC Trademap see Figure 2.4

Global importers of mechanical engineering:

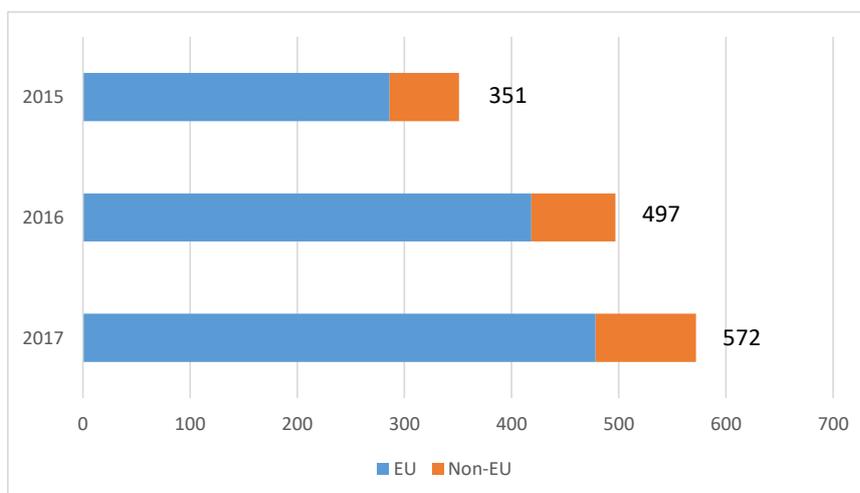
- The main global importers of the Mechanical engineering commodity groups are the EU28 (31.5% of world imports of \$2.14tr in 2017) followed by the US (16.3%), China (10.8%) and then with Mexico, Japan and Canada together making up a further 9.4%.

3.10 Transport (Motor vehicles and accessories)

Motor vehicle components is a key sector of the Welsh economy, and with much of the production in Wales part of global value chains. According to the Business Register and Employment Survey (BRES) total employment in the sector was around 9,000 people in 2016, growing to 11,300 in 2017. However, this is likely to be an underestimate with an element of activity in Welsh mechanical engineering, electrical engineering etc. also linked closely to providing parts for the motor industry. BRES also identifies over 2,500 people (in 2017) involved in the manufacture of motor vehicles but again this is in large measure components production with very few people in Wales engaged in motor vehicle manufacture. The analysis revealed:

- Welsh GVA in motor vehicles and parts (SIC 29) grew from £460m in 2012 to £813m in 2014. It is unclear what precisely contributed to this significant increase in the period. Latest figures for 2016 revealed that GVA was £828m. The treatment of motor vehicle parts in terms of SITC codes used by HMRC is a little unclear and with some expectation that motor vehicle parts are included in the exports of other machinery sectors.
- Overseas exports figures for Wales do not include the large flows of motor vehicle components that flow from Wales to the rest of the UK, and which are then included in completed vehicles for export.
- Welsh overseas exports in Motor vehicles (SITC 78) in 2017 were £572m, up from £394m in 2013 (imports in 2017 were £1.59bn). Over the period 2013-17 volumes of export trade in the sector grew from 75,646 to 110,626 tonnes. The strength of overseas exports in this sector is one contributory factor explaining growth in the index of transport equipment production in Wales with fairly sustained growth after 2012.

Figure 3.17 Welsh exports of Motor vehicles, 2015-2017, £m.



Source: Derived from Regional Trade System, HMRC.

- Within the prior analysis of risks facing Welsh Anchor and RICs companies the automotive components sector was identified as high risk because of both tariff and non-tariff barriers, but also because of the age and structure of sector assets in the region, and the effects of any change in activity on the regional economy. There are potential opportunities in Welsh automotive were UK producers needing to increase local inputs to meet rules of origin regulations post Brexit i.e. some import substitution possibilities.
- Direct greenhouse gas emissions attributable to sector activity in Wales are fairly low (121 ktCO₂e), however, the sector purchases extensively from relatively high emissions sectors in the metals and electricity generation sector such that total estimated emissions (including direct and indirect effects) are 1074 ktCO₂e. Then for every £1m of sector GVA in Wales there are 1.30 tCO₂e of emissions placing motor vehicle components as one of the more emissions intensive sectors in Wales.

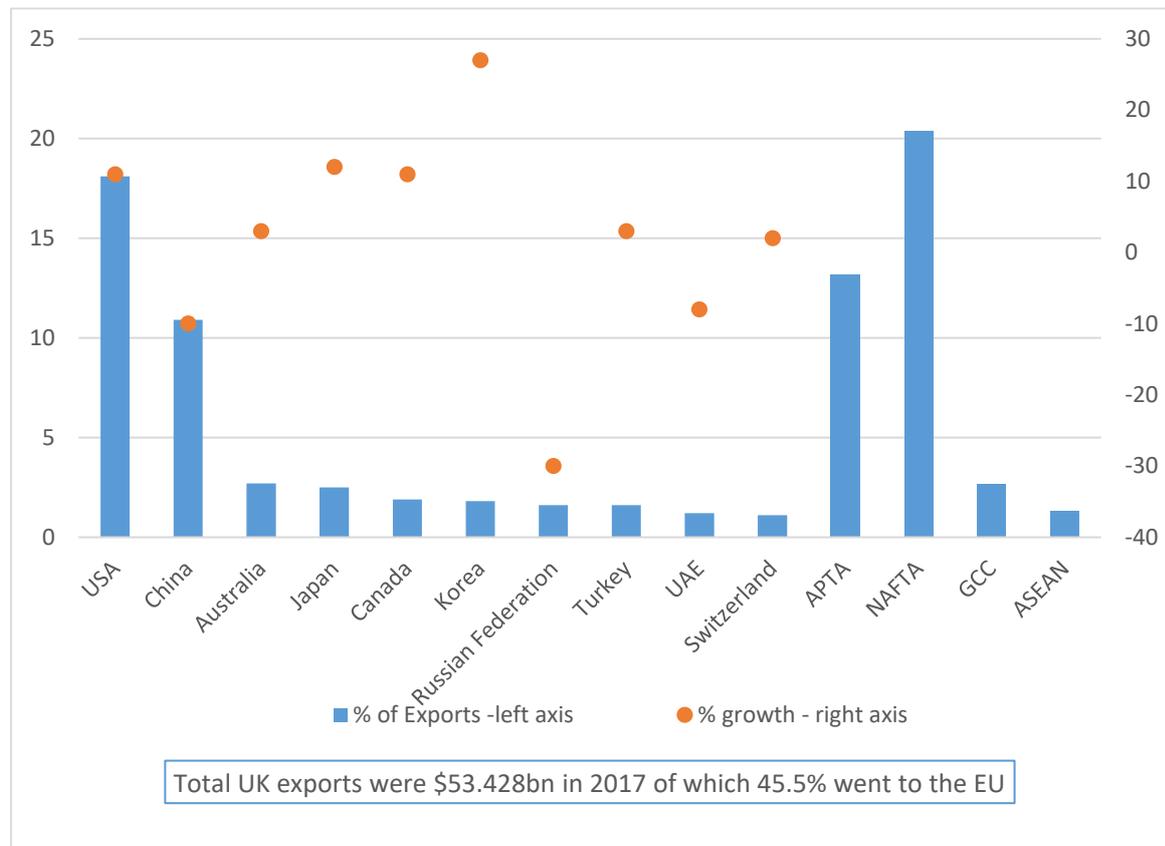
UK trade patterns in Transport (motor vehicles and accessories):

- Within the broad commodity group of Motor vehicles some 83% of UK imports originate in the EU, with much of the remainder originating from Japan, Turkey, Korea and China.
- In terms of exports the picture is quite different (Figure 3.18). Of \$53.4bn of UK exports in 2017 just 45.5% went to EU destinations. Countries within the NAFTA grouping accounted for 20.4% of exports, while APTA states accounted for 13.2% of exports in 2017.
- Large individual markets are the US and China together accounting for around 29% of sector exports in 2017. Clearly, this reflects completed vehicles in the main, but with much of the sector in Wales indirectly and intrinsically linked to these trade patterns and their development.

Global importers of Transport (motor vehicles and accessories):

- The focus here is on the world's largest import markets in this sector and their average annual growth in period 2013-17. Outside of the EU28, the USA accounted for just over one fifth of the value of world imports in motor vehicles in 2017, followed by China (5.4%), Canada (5.1%) and Mexico (2.9%). Then the NAFTA area as a whole accounted for around 28% of the value of world imports in 2017.

Figure 3.18 % UK exports of Vehicles (HS87) to non-EU destinations 2017 and growth in exported value %pa 2013-17



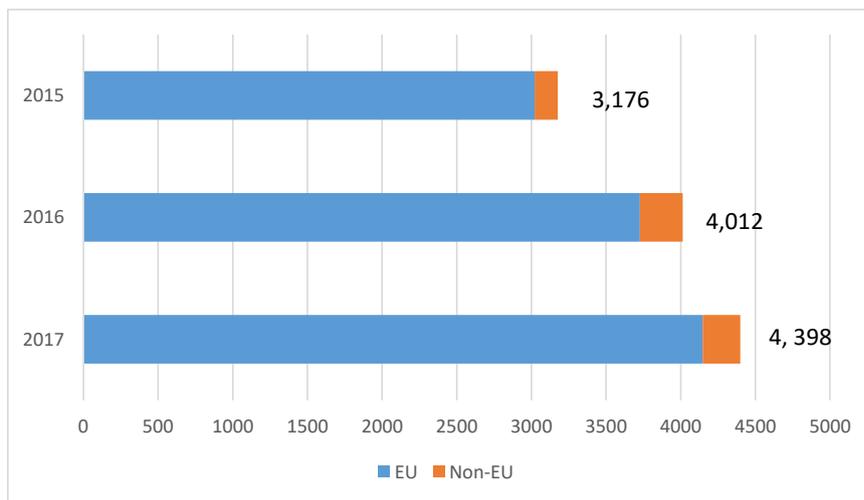
Source: Derived from analysis of ITC Trademap see Figure 2.4

3.11 Other transport equipment

The Other transport equipment sector in Wales is fairly diverse. The sector as a whole in Wales employs around 9,800 (2017) and with the aerospace sector predominating. This involves firms such as Airbus, Zodiac and General Dynamics, and arguably General Electric at Caerphilly, but with this sector usually classified as maintenance services as opposed to manufacturing. Smaller amounts of activity are found in shipping and floating structures, railways and other transport equipment. While rail is a sector with major opportunities for Wales these opportunities are almost exclusively in connection with UK projects. However, the main overseas trading occurs in the aerospace sector. In summary, the analysis revealed:

- Welsh GVA in this sector increased from £559m in 2012 to £1.1bn in 2016, and with a very large proportion of Welsh exports destined for the EU. The rapid growth in sector GVA is also reflected in the value of exports from the sector in Wales which have grown from £2.3bn in 2013, to £4.4bn in 2017 (91% increase). Imports in 2017 were £692.1m. Over the period between 2013 and 2017 the volume of exports in the sector grew by 38%.

Figure 3.19 Other Transport exports from Wales 2017 (£m)



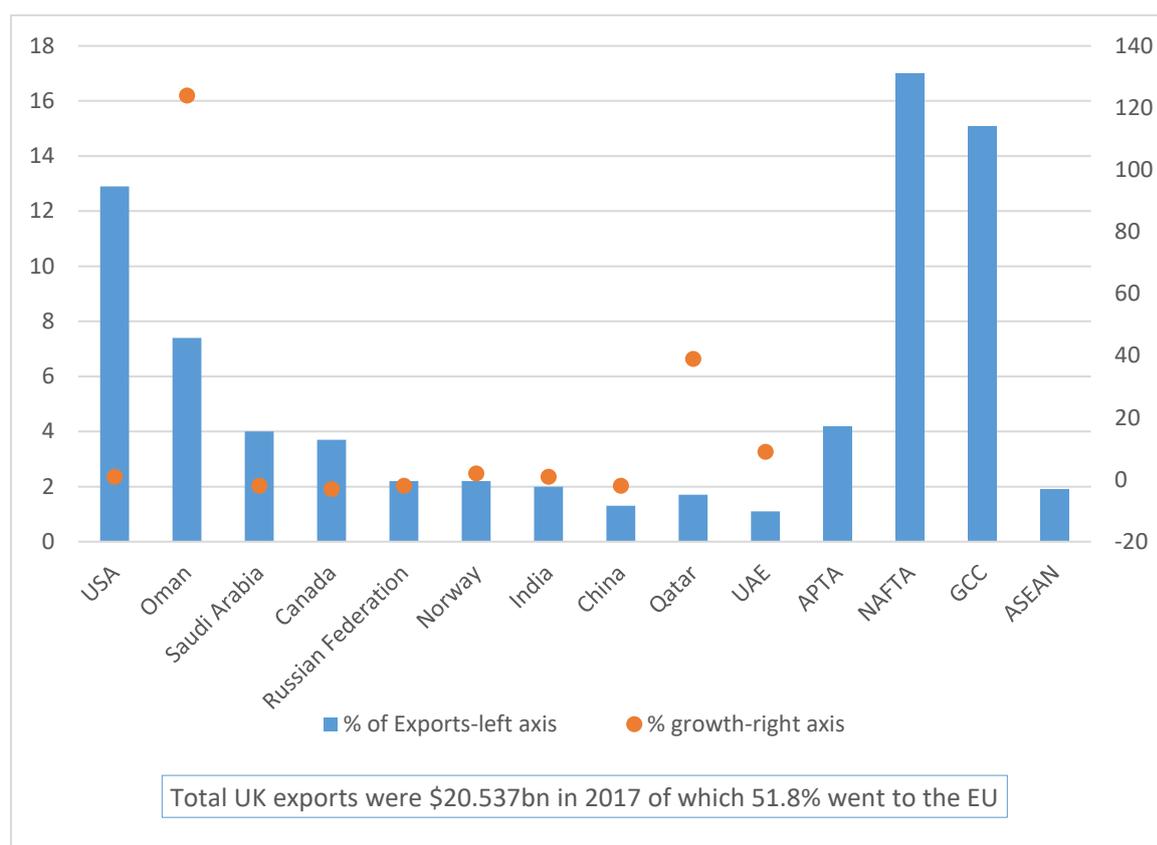
Source: Derived from Regional Trade System, HMRC.

- Aerospace systems and related products was identified in the prior Cardiff Business School analysis as one of the Welsh goods sectors facing the highest risks as a result of the EU transition process; this prior analysis identified specific sector risks in terms of non-tariff barriers, potential loss of access to EU knowledge and innovation networks, and with any reduction in sector activity expected to have relatively large multiplier effects in the region, both through supply chain effects but also through reduced household incomes with this sector offering some of the highest earnings in Welsh manufacturing.
- For aerospace the UK is a signatory to a pluri-lateral agreement on civilian aerospace parts and aircraft such that tariffs are not a significant area for concern i.e. with the UK a signatory and member in its own right and not because of EU membership. Key concerns are membership of European Aviation Safety Agency (EASA) which will not only have an effect on trade with the EU but also countries outside of the EU which recognise EASA as the required standard for trade in aerospace parts. Were the UK to cease membership of EASA or were transition to affect status within EASA this would have serious implications for the industry.
- The estimated direct sector greenhouse gas emissions directly associated with this sector were 113 ktCO₂e in 2016 or 0.10 tCO₂e per £1m of sector GVA in Wales. However, once account is taken of the indirect emissions supported in Wales through the supply chain then the total emissions per £1m GVA grow to an estimated 0.67 tCO₂e. As with many Welsh sectors, directly attributable emissions to sector output are much lower than indirect emissions in the supply chain.

UK trade in Aerospace:

- In terms of UK international trade the focus here is on the aerospace sector which includes the majority of Welsh trade in the other transport equipment sector. Clearly care is needed in interpreting trade numbers in aerospace with individual nation figures sometimes dominated by individual contracts, and significant one-off trade flows.
- Aerospace is a goods sector where the UK enjoys a healthy trade surplus. UK imports were \$14.6bn in 2017, and with just 37% coming from the EU. The US and Canada combined accounted for around 54% of UK imports.
- In export terms the UK sold \$20.54bn of aerospace-related goods overseas in 2017 of which 51.8% went through to EU markets. Other important markets are the USA (12.9% of UK export value in 2017). In total, states within the NAFTA trade framework accounted for 17% of the value of UK exports in Aerospace in 2017, and Gulf Cooperation Council states a further 15.1%. The high average annual growth in value figures for some states shown in Figure 3.20 reflect, in part, individual contracts in the defence sector.

Figure 3.20 % UK exports of Aircraft, etc. (HS88) to non-EU destinations 2017 and growth in exported value %pa 2013-17



Source: Derived from analysis of ITC Trademap see Figure 2.4

Global import markets in aerospace:

- In 2017 world imports in Aerospace and parts thereof were valued at \$241.2bn and with the world's largest non-EU importers being the US (12.8% of world import value in 2017), and China (11.5%). The APTA area as a whole accounted for 13.4% of the value of world imports in 2017, and NAFTA 16.1%.

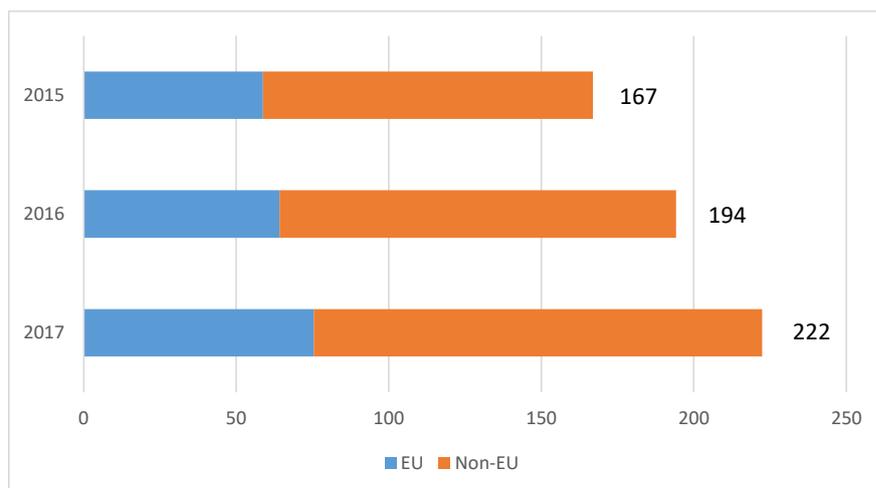
3.12 Furniture

The Furniture sector in Wales as a whole employed around 4,000 people in 2017, with the bulk of the employment focused in 'Manufacture of other furniture' and 'Manufacturing of office and shop furniture'. Historically this was an important sector in areas around Bridgend, but with the sector as a whole in the 1980s and 1990s gradually becoming prone to competition from the Far East. In parts of the sector employment location quotients are high indicating strong specialisation in the sector in Wales. The analysis of this sector revealed in summary that:

- Welsh GVA in the sector was around £186m in 2016 little changed on 2015, but with the sector as a whole seeing GVA growth of around 48% (current price terms) between 2012-16 (all Wales average GVA growth was 14.3% over the same period).
- Growth in sector GVA and the maintenance of employment in parts of the Furniture sector is reflected in strong export growth. Exports (Figure 3.21) reached just over £222m in 2017 up from £194m in 2016 (and growing in volume terms by 4% 2016-17), and with this reflecting wider recent UK growth in furniture exports, and with Wales well represented in parts of the sector where UK export growth has been strongest.¹⁴ The UK as a whole has seen growth in EU and non-EU markets for furniture. Average WTO value added tariffs on furniture are typically less than 3%.
- Welsh imports in Furniture were £188.0m in 2017.

¹⁴ <https://www.furniturenews.net/news/articles/2017/03/1725768491-british-exports-rise-says-bfm>

Figure 3.21 Furniture exports from Wales 2015-17 by Value (£m)



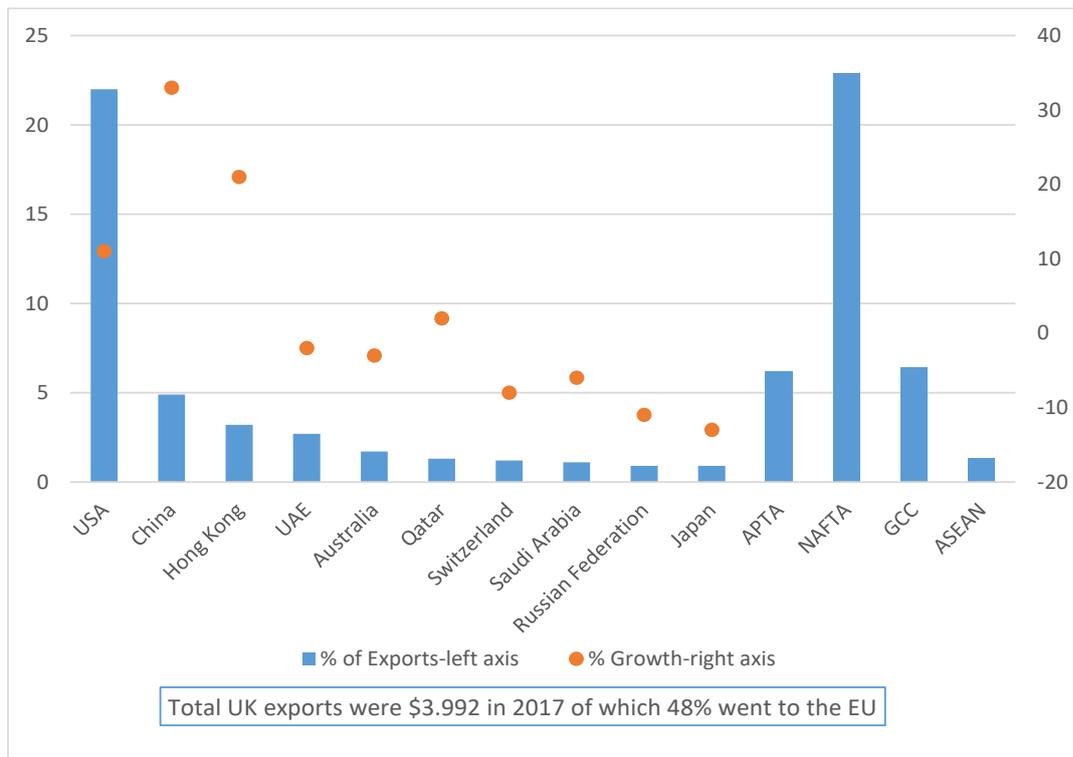
Source: Derived from Regional Trade System, HMRC.

- Furniture is shown to be one of the lower producers of greenhouse gas emissions in Wales with direct and indirect emissions of an estimated 52 (ktCO₂e) in 2016 or around 0.28 tCO₂e per £1m GVA.

UK trade in Furniture:

- Total UK imports of Furniture were around \$11.6bn in 2017 and with 44% of the value of these imports coming from the EU. Outside of the EU the main sources of imports are shown to be China, USA and Vietnam. China is by far the largest exporter to the UK of products in this area.
- UK exports in this commodity area in 2017 were close to \$4.0bn and with 48% of these exports destined for the EU. However, outside of the EU, important markets (Figure 3.22) were the US (22% of export value in 2017), and then with China (including Hong Kong) accounting for a further 8%. Among these non-EU export markets the USA and China reveal the strongest growth in value over the period 2013 to 2017.

Figure 3.22% UK exports of Furniture, bedding etc. (HS94) to non-EU destinations 2017 and growth in exported value %pa 2013-17



Source: Derived from analysis of ITC Trademap see Figure 2.4

Global importers of furniture:

- The US accounted for 28.7% of the value of world imports in of \$234.1bn in 2017. The next largest non-EU market was Canada (4.0% of world imports). In furniture commodities where Wales has production capacity, the overall pattern is for EU28 and USA to be the main importing groups typically accounting for 60-70% of world imports and with Canada and Japan also featuring.
- Perhaps more important is the growth of imports into selected states which may signal new opportunities for Welsh businesses. For example, for selected commodities here imports have grown strongly in South Korea (seat & parts, furniture & parts and mattresses), China (mattresses), and Vietnam (lamps & light fittings).

3.13 Petroleum refining

Activity in this sector is focused around the operations of Valero at Pembroke Dock, although a number of smaller firms are classified under other petroleum products. In large measure this sector was included here for completeness because of the size of sector exports in comparison to the Welsh total. While the value of exports from this sector is high as a proportion of total Welsh exports, its contribution to regional gross value added and employment is smaller. However, the sector represents one of the largest point producers of greenhouse gas emissions in Wales. Changes to the output of the sector are more likely to be impacted by factors other than EU transition processes.

Figure 3.23 Oil refining: Direct and indirect greenhouse gas emissions, 2016



4 Services

4.1 Introduction

This section provides some commentary on selected services sectors in terms of their scale and significance in Wales, as well as their exporting performance and recent sector trends. The trading performance of these sectors at the UK level will also be explored, together with global importing activity.

As noted in Section 2 there is more limited international trade information available for services sectors compared with goods sectors. Information on service sector exports from Wales published by the ONS is more aggregated and experimental with the latest data relating to 2016¹⁵.

Data on trade in services at the UK and global level is also more limited for services than for goods sectors. UK data is available from ONS through the Balance of Payments accounts, the Pink Book¹⁶, with a geographical analysis of UK trade provided for some services sectors¹⁷. In addition, the ONS has recently published experimental quarterly data for UK trade in services to a wider range of partner countries¹⁸.

Trade in services data is compiled according to the IMF's Balance of Payments Manual (BPM). These statistics contain twelve main services categories (codes) and the level of detail provided varies between countries, depending on their national collection systems. Some further disaggregation is possible within the categories, although in many cases data is incomplete.

¹⁵ <https://www.ons.gov.uk/businessindustryandtrade/internationaltrade/datasets/regionalisedestimatesofukserviceexports> and <https://www.ons.gov.uk/businessindustryandtrade/internationaltrade/datasets/regionalisedestimatesofukserviceexportsbyproducts2016>

¹⁶ <https://www.ons.gov.uk/economy/nationalaccounts/balanceofpayments/datasets/3tradeinservicesthepinkbook2016>

¹⁷ <https://www.ons.gov.uk/economy/nationalaccounts/balanceofpayments/datasets/9geographicalbreakdownofthecurrentaccountthepinkbook2016>

¹⁸ https://www.ons.gov.uk/releases/internationaltradeinservicesbypartnercountryapriltojune2018?utm_source=govdelivery&utm_medium=email

Detailed information on the coverage, collection and compilation of statistics on international trade in services is available from the United Nations Department of Economic and Social affairs¹⁹ and from ITC Trademap database²⁰. The ITC database is the main source of information used to analyse global imports of services in this section.

4.2 Manufacturing services

The Manufacturing services sector²¹ employed around 6,350 people in Wales in 2017. The main employing part of this sector is repair of fabricated metal products, machinery and equipment (SIC 331). Within this category, repair and maintenance of aircraft and spacecraft (SIC 3316) is the largest subsector with this activity being highly specialised in Wales.

Table 4.1 provides some summary information relating to the Welsh based activities of each of the selected service sectors. The table shows estimated employment in the sector, and employment growth between 2015 and 2017. The table also provides some indication of any parts of the sectors that may have some specialisation in Wales, i.e. high LQ values. In addition, the table shows exports from Wales for each sector (by functional category, see Table 4.1 note 3), and total emissions per £1m of GVA.

The analysis of the Manufacturing services sector revealed that:

- Welsh GVA in this sector has increased steadily since 2012, and was an estimated £1.3bn in 2016.
- Over the period 2015-2017 employment declined by an estimated 16%, suggesting some potential productivity improvement in this sector.
- Exports of Manufacturing services from Wales were over £1.1bn in 2016, accounting for just over 20% of total services exports from Wales in 2016.

¹⁹ <https://unstats.un.org/unsd/tradeserv/TFSITS/manual.htm>

²⁰ <https://www.trademap.org/stFAQ.aspx?nvpm=1||||||||||||||#li Answer5 1>

²¹ For the analysis of employment, GVA and emissions, this report defines the 'sector' as SIC 33. Whilst much of the activity is likely to be captured within this SIC code, the Manufacturing services 'functional category' used by the ONS in estimating exports covers all of manufacturing. See <https://www.ons.gov.uk/businessindustryandtrade/internationaltrade/articles/estimatingthevalueofserviceexportsabroadfromdif ferentpartsoftheuk/24october2018>, section 8 for definitions.

Table 4.1: Service sectors in Wales, summary characteristics.

Sector	Est. empl. 2017 ¹	Est. empl. growth 2015-17 (%) ¹	Selected sector specialisations, 2017 ²	GVA 2016 (£m) ¹	Welsh exports 2016 (£m) ³	Est tCO2e emissions (direct & supply chain) per £1m GVA, 2016 ⁴
Manufacturing	6,350	-16	Repair and maintenance of aircraft and spacecraft.	1,278	1,171	0.73
Transport & travel (ex. postal)	32,195	-6	Sea and coastal pass water trans.	1,404	1,286	3.67
Insurance and pension	11,400	5	Life ins, Non-life ins, Reinsurance, Risk and damage evaluation.	1,142 ⁵	1,445	0.72
Financial	18,695	11	Other credit granting.	1,388 ⁶	1,012	0.31
ICT & creative	51,650 ⁷	163 ⁷	Newspapers, TV programming and broadcasting.	1,667	271	0.43

1. Source: Nomis web. <https://www.nomisweb.co.uk/> See also footnote 7 below.

2. See footnote 4, section 2.3.

3. ONS.

<https://www.ons.gov.uk/businessindustryandtrade/internationaltrade/datasets/regionalisedestimatesofukserviceexports>

This data is by 'functional category', which is a hybrid of products and the UK Standard Industrial Classification 2007 classifications (see also footnote 17 in the text). Export information is also available by product, but this data covers less than 40% of exports of services from Wales, see

<https://www.ons.gov.uk/businessindustryandtrade/internationaltrade/datasets/regionalisedestimatesofukserviceexportsbyproducts2016>

4. See section 5 (Table 5.1).

5. Includes an estimate for SIC 662.

6. Includes an estimate for SIC 661 and 663.

7. Data via Nomis web (see footnote 1), derived from BRES. Downloaded on 9/11/18. Some significant annual changes in reported counts in specific SIC codes can be observed in this data. Whilst this data is published and publically available, this information should be treated with caution.

In addition to total estimated exports by functional categories, the ONS further provides information on the destination of exports for selected sectors, which includes Manufacturing services and Information & communication services. Destination of exports data is not available for the other service sectors included in this report, and is only available for 2015, with 2016 data expected during 2019.

Table 4.2: Exports from Wales of Manufacturing services by destination, %.

	%
European Union	33
Rest of Europe	4
Americas	48
Asia	13
Africa	1
Australasia, Oceania and Rest of the World	1
Total	100

Source: ONS, based on 2015 data,

<https://www.ons.gov.uk/businessindustryandtrade/internationaltrade/articles/estimatingthevalueofserviceexportsabroadfromdifferentpartsoftheuk/2015>

For Manufacturing services:

- Table 4.2 shows that the Americas (almost all by the USA) was the largest export market for Manufacturing services from Wales, accounting for almost half of exports from this sector.
- The EU was the other main market, with the majority of exports to the EU going to the Netherlands and to Germany.
- Direct greenhouse gas emissions in this sector in 2016 were 0.16 tCO₂e per £1m of GVA, increasing to 0.73 tCO₂e per £1m of GVA once account is taken of indirect/supply chain impacts.
- Outside of the Transport & travel sector, Manufacturing services had the highest levels of direct and total emissions of the service sectors included within this report.

The trade data for Manufacturing Services is split into two different codes in the BPM categorisation, Manufacturing services on physical inputs owned by others, and Maintenance and repair services not included elsewhere (n.i.e). The UK trade values for exports and imports for all the service sectors included in this report, by category, are shown in Table 4.3.

UK trade in Manufacturing services:

- Both Manufacturing services categories have a significant trade surplus. For example in Manufacturing services on physical inputs owned by others, UK imports were £1.2bn in 2017, compared with exports from the UK of over £2.6bn.

Table 4.3: UK Imports and exports of selected services, 2017, £m

Service	Imports	Exports
Manufacturing on physical inputs owned by others	1,201	2,643
Maintenance and repair	530	1,171
Transport	22,056	30,071
Travel	55,500	39,791
Insurance and pension services	1,827	18,329
Financial	15,256	59,624
Telecommunication, computer and information services	11,524	20,189
Personal, cultural and recreational services	3,278	3,807

Source: ONS

<https://www.ons.gov.uk/economy/nationalaccounts/balanceofpayments/datasets/3tradeinservicesthepinkbook2016>

Note: The categories used in Table 4.3 (products) do not translate directly to all those in Table 4.1 (which provides export data by functional category).

The global imported value (in US\$bn, and from the ITC database) for each of the selected service sectors is shown later in Table 4.4, whilst Table 4.5 shows imports by country groups.

Global importers of Manufacturing services:

- The global imported value of Manufacturing services was almost \$120bn in 2017 (approximately \$65bn of Manufacturing services on physical inputs, and almost \$55m of Maintenance and repair services).
- There is no data available for some of the country groups in terms of Manufacturing services on physical inputs owned by others. The data that is available shows the EU28 accounted for almost \$34bn (over half) of world imports of this service in 2017, mostly by France (\$7.8bn), Germany (\$5.8bn), and the Netherlands (\$4.8bn).
- The APTA country group imported over \$9bn of manufacturing services in 2017, with most of this by South Korea.
- For Maintenance and repair services n.i.e., the EU28 is again a main importer, accounting for more than \$26bn (almost half) of world imports in 2017. In this case Germany was the largest importer (\$10bn), followed by France (\$5.3bn) and the Netherlands (\$2.2bn).
- NAFTA was the next largest country grouping in terms of imports of Maintenance and repair services n.i.e., with \$9.55bn of imports, mostly by the USA, with APTA accounting for over \$3bn of imports, mostly by China.

4.3 Transport & travel services

Transport & travel is a large service sector in Wales, employing over 32,000 people (excluding postal services) in 2017. Large employing parts of the sector include Freight transport by road (SIC 4941), and Warehousing and storage (SIC 5210). However the majority of the larger employing sectors within Transport & travel do not have any significant level of specialisation. Those sectors with some specialisation, for example, the Sea and coastal passenger water transport sector (SIC 5010) are significantly smaller in employment terms.

The analysis of the Transport and travel sector revealed that:

- Welsh GVA in the defined sector (excluding postal services) was just over £1.4bn in 2016. GVA in the sector increased in the period 2012 to 2014, but for each of the main subsectors of Transport and travel GVA has fallen between 2014 and 2016. Employment in the sector fell by an estimated 6% between 2012 and 2016.
- In terms of direct greenhouse gas emissions, the Transport & travel sector is in the top three sectors included in this report, exceeded only by two manufacturing sectors (Refined petroleum, and Iron and steel).
- Indirect Emissions (in the supply chain) are also significant, bringing total estimated emissions of Transport and travel to more than 5,000tCO₂e in 2016.
- Transport and Travel are separately reported in the ONS's experimental exports of services data. In 2016, Transport services accounted for an estimated £577m of exports from Wales, with Travel accounting for a further £709m of exports.
- Whilst some of these exports will be derived from firms serving overseas based customers, for example, the transport services associated with product movements, some of the export earnings of the sector will be supported by tourism related demands, for example, overseas visitors' travel and transport spend in Wales. (Note that this will only account for part of tourism demand, which will impact across many sectors of the economy. Tourism is not separately considered in this report).
- This sector therefore has an indirect importance in terms of trade, with the sector facilitating goods movements, principally by road, but with Welsh ports also supporting trade, and potentially facing significant impacts post Brexit.

UK trade in Transport and travel:

- UK exports of Transport & travel were almost £70bn in 2017, with imports valued at almost £78bn, giving the UK an overall trade deficit in these services, (but with Transport having a surplus, and Travel a deficit).
- The geographical details of these UK trade flows are incomplete (with significant trade values not allocated to countries), but data suggests that the EU export market is much more important for Travel than for Transport.

Global importers of Transport and travel services:

- The global import value is higher for Travel, at \$1,254bn, compared with just over \$1,051 for Transport (Table 4.4). These values far exceed any other services sector included in this report.

Table 4.4: Global import values of selected services, 2017, US\$bn

Code	Service	Imported value
1	Manu. services on physical inputs owned by others	64.55
2	Maintenance and repair services n.i.e.	54.67
3	Transport	1051.40
4	Travel	1253.81
6	Insurance and pension services	204.14
7	Financial services	222.84
9	Telecommunications, computer, and information services	316.23
11	Personal, cultural, and recreational services	48.29

Source: https://www.trademap.org/Service_SelService_TS.aspx?nvpm=1|||||S00|1|3|1|1|2|1|5|1|1

- Global imports of both Transport & travel were dominated by the EU28 country group in 2017 (Table 4.5), with the largest shares accounted for by Germany, the UK and France. APTA is the second highest global importing country group, with \$190bn imports of Transport and \$306bn of imports of Travel.
- For both services, China was the most significant importer, accounting for almost \$255bn of Travel imports, and almost \$93bn of Transport imports in 2017.
- The NAFTA country group imported almost \$138bn of Transport services, and almost \$178bn of Travel in 2017.
- Singapore was the largest importer of Transport & travel services of the ASEAN countries. The GCC countries imported \$57bn of travel services and \$46bn of transport services in 2017.

4.4 Financial services

Almost 19,000 people were employed in the defined Financial services sector in Wales in 2017. Most of these employees (around 10,000) were in Monetary intermediation (SIC 641). This includes employment in the main retail banks and building societies. The only part of the sector with some limited specialisation (LQ of 1.16) is Other financial service activities, which employed around 4,500 people in Wales in 2016, and includes the activities of mortgage finance and other loan companies (not banks). Between 2015 and 2017 employment increased by an estimated 11% in the sector in Wales. The analysis of the Financial services sector revealed that:

- Welsh GVA in the sector was an estimated £1.4bn in 2016.
- Direct greenhouse gas emissions in this sector, in relation to the value of GVA, are the lowest of all sectors covered in the report, with absolute direct emissions of an estimated 53 ktCO₂e in 2016.
- Exports from Wales of Financial services were just over £1bn in 2016. This represents around 18% of services exports from Wales.

UK trade in Financial services:

- Exports of Financial services from the UK (almost £60bn) far exceed imports (£15.3bn), giving a significant trade surplus in this activity.
- Whilst there is some incomplete data in the Pink Book, this shows that just over 40% of UK Exports of Financial services were to the EU, and that around 34% of imports into the UK were from the EU, with importing countries from outside the EU including the USA, Japan and Hong Kong.
- The city of London and the large financial services institutions will account for a significant share of export activity, although some of these institutions will support employment in Wales.

Global importers of Financial services:

- Global import values for Financial services were almost \$223bn in 2017.
- Imports are dominated by the EU28 country group (see Table 4.5), which accounts for almost 60% of imports. Within this group, imports by Luxembourg of \$42.5bn far exceed any other country, with the UK being the next highest European importer of financial services, followed by Germany and Ireland.
- The NAFTA country group imported almost \$39bn of financial services in 2017, with around \$29bn of this by the USA.
- Imports by APTA were \$10.6bn, with almost \$6bn imported by India.

- Of the ASEAN countries, Singapore had the highest Financial services imports of almost \$4.5bn.
- Imports into GCC countries were relatively small, with Saudi Arabia accounting for almost 63% of Financial services imports for this group of countries.

Table 4.5: Import values of services by selected country group, 2017, US\$bn

BPM Code	1	2	3	4	6	7	9	11
	Manu servs. on inputs owned by others	Maint. and repair servs.	Transport	Travel	Insurance & pension	Financial	Telecomm, computer, & info	Personal, cultural, & rec.
APTA	9.17	3.27	190.03	306.01	17.75	10.60	29.00	5.63
ASEAN	0.07	1.67	99.68	70.87	13.54	7.65	19.60	1.72
EU28	33.88	26.08	347.56	370.30	41.33	128.58	151.95	26.34
GCC	na	0.07	45.91	56.67	46.18	2.37	9.27	1.74
NAFTA	na	9.55	137.83	177.98	57.76	38.95	45.40	2.37
Total	43.12	40.64	821.01	981.83	176.56	188.15	255.22	37.80
Global import value	64.55	54.67	1051.40	1253.81	204.14	222.84	316.23	48.29

Source: https://www.trademap.org/Service_SelService_TS.aspx?nvpm=1|||||S00|1|3|1|1|2|1|5|1|1

4.5 Insurance and pensions

Around 11,400 people were employed in Insurance, reinsurance and pension activities in Wales in 2016. The main employing parts of this sector are Insurance and reinsurance (SIC 65), with each component of this sub-section relatively specialised in Wales. Reinsurance activities (SIC 652) had the highest LQ at almost 5, however this sector only employed around 400 people in Wales in 2017. Employment in the Insurance and pension sector increased by an estimated 5% in Wales between 2015 and 2017.

The analysis of the Insurance and pension services sector revealed that:

- Welsh GVA in the sector was an estimated £1.14bn in 2016. There was some increase in GVA in 2013, but in general, GVA has remained fairly stable in the period since 2012.

- Whilst the greenhouse gas emissions for services are generally lower than for the goods sectors, emissions per unit of GVA are higher for insurance than for a number of other service sectors in Wales. At 0.72 total tCO₂e per £1m GVA in 2016 this is comparable to the total emissions per £1m GVA for manufacturing services.
- In 2016, Wales was the only UK region where Insurance and pension services accounted for the largest share of services exports, at £1.45bn.

UK Trade in Insurance and pension services:

- UK exports of Insurance and pension services were over £18bn in 2017, far exceeding the relatively small value of imports into the UK, which were less than £2bn.
- Less than 40% of UK exports were to the EU, but there is limited information available on the destinations of non-EU exports.

Global importers of Insurance and pension services:

- Global imports of Insurance and pension services were \$204bn in 2017. Of the selected country groups, NAFTA accounted for the largest share of imports at almost \$58bn, with the USA accounting for around \$50bn of this total.
- The GCC accounted for more than \$46bn of imports, with most of this by the UAE.
- Of the \$41bn of imports to the EU28 around \$10bn were by France, \$7bn by Ireland and \$3bn by Germany.
- APTA and ASEAN country groups account for a smaller share of world imports of Insurance & pension services. Key importing countries in these groups include China (\$10.4bn), India (\$6.3bn), and Singapore (\$7bn).

4.6 ICT and Creative

The ICT and creative sector is the largest defined sector included in this report in terms of both employment and GVA. Almost 52,000 people were employed in this sector in Wales in 2017, including Publishing (mostly in publishing of newspapers), TV Programming and broadcasting, Other telecommunications activities, and Computer programming, consultancy and related activities. In this latter group, employment, as reported by ONS, has grown significantly between 2015 and 2017 (see Table 4.1, footnote 7). Despite the large number of people employed in this sector, there is only very limited relative specialisation in Wales i.e. in the publishing of newspapers, and in television programming and broadcasting activities.

The analysis of this sector revealed that:

- Welsh GVA was £1.7bn in 2016, of which approximately 45% was in SIC 61 (telecommunications). GVA in telecommunications increased sharply between 2012 and 2013, with smaller increases since then, but with a marginal decline in GVA from 2016 to 2017.
- Direct greenhouse gas emissions by the sector were an estimated 125 ktCO₂e in 2016, these increase to over 700 ktCO₂e when accounting for the emissions from supply chain purchases, partly related to relatively high reported electricity purchases within the ICT sector. Due to the high GVA in the sector, emissions per £1m GVA are relatively low.
- Firms in the Information and communication functional category exported just over £270m of services from Wales in 2016.
- Further information is available from ONS regarding the destination of exports for this functional category. Table 4.6 shows that the EU accounted for around half of exports, with the Netherlands and France being the largest EU importers of these services.

Table 4.6: Exports from Wales of Information and communications services, %.

	£m
European Union	49
Rest of Europe	11
Americas	17
Asia	14
Africa	4
Australasia, Oceania and Rest of the World	4
Total	100¹

1. Total does not sum to 100 due to rounding.

Source: ONS, based on 2015 data,

<https://www.ons.gov.uk/businessindustryandtrade/internationaltrade/articles/estimatingthevalueofserviceexportsabroadfromdif ferentpartsoftheuk/2015>

UK trade in ICT and creative services:

- The trading activities of this sector are recorded under two separate codes in the BPM system, Telecommunications, computer and information services, and Personal, cultural and recreational services.
- Of these two sectors, Telecommunications etc. is significantly larger than Personal, cultural and recreational services for both UK imports and exports.
- UK imports of telecommunications etc. were just over £11.5bn, with exports of over £20bn, whilst imports and exports of Personal, cultural and recreational services etc. were both less than £4bn.
- Around 45% of UK exports of Telecommunications etc. were to the EU, with approximately 55% of UK imports coming from the EU.

Global importers of ICT and creative services:

- Global import values of Telecommunications etc. (over \$316bn) also far exceed those of Personal, cultural and recreational services (just over \$48bn).

- The main importers of telecommunications services are the EU28, accounting for almost half of global imports. The main EU importing countries were Germany (approximately \$33bn), France (around \$18bn) and the Netherlands (approximately \$17bn).
- The NAFTA country group imported over \$45bn of Telecommunications services, with the USA accounting for almost 90% of this total.
- The APTA country group imported almost \$30bn of Telecommunication services, \$19bn of which was by China.
- ASEAN countries imported almost \$20bn of Telecommunication services, with Singapore being the largest importer in this country group, with almost \$13bn of imports.
- In terms of Personal, cultural and recreational services trade, the EU28 again is the largest importer, accounting for over half of global imports. Imports to the EU are more evenly spread, with the UK being the largest importer in this group, followed by France, Luxembourg and the Netherlands.

5 Greenhouse Gas Emissions

5.1 Introduction

This section examines the potential impact on Greenhouse Gas (GHG) emissions in Wales were selected industries to change capacity in the wake of the EU transition process. At the outset it is important to understand that emissions are typically dealt with at the production point. Consequently, were EU transition to lead to some sectors reducing output then production point emissions in Wales might fall, but if Wales' imports then increased because consumers purchased overseas goods then global emissions levels might be little changed.

In what follows key industrial sectors are analysed in terms of their direct and indirect emissions. The section then moves to a more general discussion of potential impacts on GHG emissions in Wales via consumption – primarily transport and residential.

This is a contingent exercise. A level of Brexit impact on industrial sectors has to be assumed, and for reasons of technical approach and resource, abstract from several complexities including, for example, activity substitutions and timescales.

5.2 Methodology

An environmentally extended input-output approach is used to assess the direct and indirect impact of a notional 10% reduction in economic activity (here gross value added, GVA) across identified industrial sectors. The 2007 Input Output Tables for Wales are used as the basis for this analysis (Jones et al 2010 and see Appendix 5 which presents the emissions coefficients in detail).²²

More recent estimates of GHG emissions per unit of industrial sector output are available, or at least achievable. However the older Welsh data is used here for two reasons. Firstly the time and resource involved in deriving more recent output/GHG coefficients would be considerable; and second updated coefficients would then relate to the UK, potentially raising a number of inaccuracies when applied to Wales.

²² Jones, C., Bryan, J., Munday, M., & Roberts, A. (2010). Input-Output Tables for Wales 2007. Cardiff University, Cardiff. See http://business.cardiff.ac.uk/sites/default/files/IO_2007_Final_30_6.pdf

In this respect consider for example the 'UK average' GHG emissions per unit output for the UK for motor vehicles, including by new(er) inward investment capital making finished cars at Sunderland, Oxford and Reading applied to the Welsh context where (in terms of OEMs) Ford and Toyota make engines and gearboxes.

The estimates then are based on actual estimates of emissions from Wales' major and minor industrial firms, using (then relevant) Kyoto recording protocols. Although there have been a number of investments in capital over the subsequent decade which render the estimates less than ideal, this leads to lower likely error than the alternative, UK-average approach²³.

In summary then, direct emissions-to-GVA ratios for 2007 are developed and then applied to ONS experimental 'balanced' GVA estimates for Wales in 2016²⁴. A small amount of adjustment is needed to align the Input-Output sectors with ONS published (SIC 2 digit sector) GVA but this is of a minor nature. Additional, minor adjustments are made where better and more recent data are available for Wales²⁵. For agriculture specifically, and following dialogue with Welsh Government, output and GHG estimates are available for 2016 and the estimates of GHG arising in food processing as a result of agricultural processes have been adjusted.

Following this estimate of direct emissions for sectors, the approach applies GHG multipliers to assess the indirect (supply chain) impact of industrial activity on climate emissions from territorial Wales. This is important as, unlike for economic multipliers (for employment or output) GHG multipliers are typically larger than 2 and often much larger: i.e. for most sectors, carbon emissions are dominated by supply-chain, not direct impacts. To aid the analysis, industry emissions are compared with employment supported to achieve an estimate of GHG emissions (direct and total) per FTE employee.

²³ The fairly static position of Welsh business emissions 2007-14 is notable here.

²⁴ <https://www.ons.gov.uk/economy/grossvalueaddedgva/datasets/nominalandrealregionalgrossvalueaddedbalancedbyindustry>
Several alternative approaches were attempted and discarded.

²⁵ e.g. for Iron and Steel combustion; http://naei.beis.gov.uk/reports/reports?report_id=958

The assessment of indirect greenhouse gas emissions is undertaken using a 'Leontief Inverse' transformation whereby the output of each (of 88) sectors in Wales is assessed within the Input-Output Table – the picture of Welsh sales and purchases between industries – in terms of the within-Wales intermediate inputs used in its production. For example, a food product worth £10 might require £4 of agricultural output in its production; this £4 of agricultural output then has 'backward linkages' that stretch into the agricultural supply chain. The overall input requirements (notionally to infinite rounds of purchases) can be calculated to give an output multiplier. At the end of this process, the input requirements for each of the 88 sectors can be estimated in terms of the inputs from the other 87 sectors in Wales (and from itself) in terms of those sectors' output. Each sector will create GHG emissions in response to this (here food) sector demand, and thus the overall GHG emissions created in Wales consequent on a specific sectors' output (or part of) can be calculated with reference to the ratio between output and GHG in each of 88 sectors achieved by reconciliation of the output of the IO sectors and GHG emissions inventories for Wales²⁶. These ratio estimates are presented in Appendix 5 and more detail on the process is available, for tourism in Wales, in Jones (2013)²⁷.

As noted earlier, the quantitative impact analysis assumes a 10% reduction in regional economic activity. This level of impact was chosen for simplicity of presentation and because it (roughly) matches 'no deal' estimates of medium term Brexit impacts on the UK and Welsh economies²⁸. The estimates can be adjusted downward (e.g. to a 5% or 2.5% loss of activity) in a linear fashion.

The impact on emissions of such a scenario is presented – although here with the caveat that inter-industry dynamic effects cannot be modelled, and that a linear relationship between output, GVA, emissions etc. is assumed.

The second part of this section presents a narrative analysis of the potential impact of Brexit on Welsh consumption emissions, largely channelled through the residential and transport sectors.

²⁶ Albeit with some uncertainty over allocation, and typically as noted only for 2007 due to the lack of more recent IO Tables.

²⁷ Jones, C. (2013). Scenarios for greenhouse gas emissions reduction from tourism: an extended tourism satellite account approach in a regional setting. *Journal of Sustainable Tourism*, 21(3), 458-472.

²⁸ <https://www.lse.ac.uk/europeanInstitute/LSE-Commission/Hearing-11---The-impact-of-Brexit-on-jobs-and-economic-growth-summary.pdf> <https://news.sky.com/story/hit-to-northern-ireland-and-north-east-england-gdp-revealed-in-new-brexit-impact-papers-leak-11240254>

Here it is assumed that Brexit causes a significant downturn in Welsh and UK economic activity and a consequent recession. Responses to the 2007/8 financial crisis and consequent economic downturn are used to assess likely future response.

Readers should note that due to the way this report has been constructed, and the different methodological requirements of different sections, numbers (e.g. for GVA and employment) quoted in this section may not exactly match those quoted elsewhere in the report.

5.3 Industrial Sectors Emissions Estimates

Table 5.1 shows the GVA and emissions created in Wales in the identified sectors. These sectors contributed over £14bn of GVA in 2016 according to the ONS. The largest sector as defined is Creative and ICT at £1.67bn although this is an amalgam over a number of 2-digit SIC2007 codes.

Key contributors to industrial greenhouse gas emissions were Iron and steel (5.3m tonnes), Oil refining (4.9m tonnes) and Transport services (3.2m tonnes). Together these three sectors are responsible for over 80% of direct emissions from the selected sectors. All other sectors created less than 300,000 tonnes of direct emissions in Wales.

The picture in terms of the 'big three' sectors was replicated for total Welsh emissions (i.e. including supply chain emissions in Wales) but here Food becomes a GHG-notable sector, driven by its high level of energy and agricultural purchases in Wales – both being very high GHG-emitting sectors (but not included in this current analysis). Most service sectors have significantly higher indirect emissions compared to direct, and these largely arise via the purchase of electricity.

Table 5.1 Direct and indirect emissions: Wales selected sectors

Sector (SIC 2007)	GVA2016 £m (ONS Balanced estimate)	Estimated Emissions 2016 Direct (ktCO2e)	Estimated Emissions 2016 Total (ktCO2e)	tCO2e Emissions per £1m GVA Direct (2016)	tCO2e Emissions per £1m GVA Total (2016)	Notes
Food (10)	1137	256	2005	0.23	1.76	Low direct emissions/unit GVA but purchases from very high GHG agriculture
Drink (11)	410	72	286	0.18	0.70	
Refined petroleum (19)	996	4912	6404	4.93	6.43	High within-industry emissions but raw materials sourced from o/s Wales so most indirect emissions excluded here. CO2e and other GHG additional at time of combustion
Chemicals & pharms (20-21)	497	98	637	0.20	1.28	
Plastics (222, and rubber)	538	98	500	0.18	0.93	Low within industry emissions but purchases from higher emitting industries (incl. electricity)
Iron and Steel (24, esp. 241)	454	5313	6953	11.70	15.32	High within-industry emissions, including some electricity generation & production of coke
Metal products (25, esp. 251 & 256)	813	138	810	0.17	1.00	Indirect emissions largely arising in basic metals & electricity
Elec Eng. (26 esp. 263, 265, 267)	497	98	459	0.20	0.92	
Mechanical engineering (28)	230	35	188	0.15	0.82	
Transport (largely auto components) (29 esp. 291 & 293)	828	121	1074	0.15	1.30	Indirect emissions largely arising in metals & electricity
Other transport equipment (30)	1101	113	735	0.10	0.67	Indirect emissions high - purchases of raw & intermediate materials. Strong output growth since 2007
Furniture (31 esp. 310)	186	13	52	0.07	0.28	
Manu services (repair, main & installation) (33)	1278	204	931	0.16	0.73	
Transport services (49-52)	1404	3158	5158	2.25	3.67	High direct emissions from fuel burn
Insurance (65, not 662)	1048	176	751	0.17	0.72	
Finance (64 661 663, and 662)	1521	53	464	0.03	0.31	Higher reported electricity purchases
ICT and creative (58 – 61; 62-63)	1667	125	710	0.07	0.43	Higher reported electricity purchases (ICT)
All Selected Sectors	14605	14982	28978	1.03	1.98	

Further analysis (Table 5.2) then estimates the potential impact of output change (some of which could result from Brexit) on industrial emissions in Wales, following the notional 10% activity reduction. If this impact were to be considered for only the selected sectors, it would result in a 3m tonne reduction in CO2 equivalent GHG emissions²⁹. This is around 8% of industrial and transport emissions in Wales (but note the denominator is not fully comparable due to differing treatment of, for example private transport). Some 45% of this reduction is due to the loss of output in Oil refining and in Iron and steel: in reality resulting from output changes in a very small number of firms. Note that the table reports emission reductions *due to* output loss in a sector not *within* that sector. Thus the emissions reductions reported for most sectors (and especially Food) will occur in other sectors not reported here – mostly Electricity supply and Agriculture³⁰.

The above analysis shows the sectors which contribute considerably to gross GHG emissions. Here, Oil refining is by far the highest GHG emitter per FTE employee in Wales, creating a similar level of emissions as the Iron and steel industry but with only 600 employees. Other sectors, notably Transport services, create fewer emissions per employee compared to overall impact; i.e. it employs many more people per unit of GHG emissions compared to Oil and Iron and steel (Table 5.3).

²⁹ Excluding substitution and dynamic effects.

³⁰ It is not possible to be definitive here without a much fuller analysis.

Table 5.2 Impact of sector output change (10%) on industrial emissions and employment (selected sectors)

Sector (SIC 2007)	Reduction in Emissions kT CO2e (Total)	Loss of FTE Employees (Direct+Indirect)	Emissions Reductions as % of Business + Trans. Emissions in Wales 2014 (35.9MTCO2e)	Reduction in FTE Employees as a % of Wales 2016
Food (10)	201	4850	0.6%	0.47%
Beverages (11)	29	390	0.1%	0.04%
Refined petroleum (19)	640	150	1.8%	0.01%
Chemicals & pharms (20-21)	64	1100	0.2%	0.11%
Plastics (222 & rubber)	50	1600	0.1%	0.15%
Iron & Steel (24, esp. 241)	695	2000	1.9%	0.19%
Metal products (25, esp 251/256)	81	600	0.2%	0.06%
Elec Eng. (26 esp. 263, 265, 267)	46	1000	0.1%	0.10%
Mechanical engineering (28)	19	550	0.1%	0.05%
Transport (29 esp. 291 & 293)	107	1700	0.3%	0.16%
Other transport equipment (30)	74	1800	0.2%	0.17%
Furniture (31 esp. 310)	5	1500	0.0%	0.15%
Manu services (33)	93	600	0.3%	0.06%
Transport services (49-52)	516	3800	1.4%	0.37%
Insurance (65, not 662)	75	1800	0.2%	0.17%
Finance (64 661 663, and 662)	46	2250	0.1%	0.22%
ICT and creative (58 – 61; 62-63)	71	3350	0.2%	0.32%
All Selected Sectors	2812	29040	7.8%	2.81%

Table 5.3 Greenhouse gas intensity of employment in Wales 2016 (selected sectors)

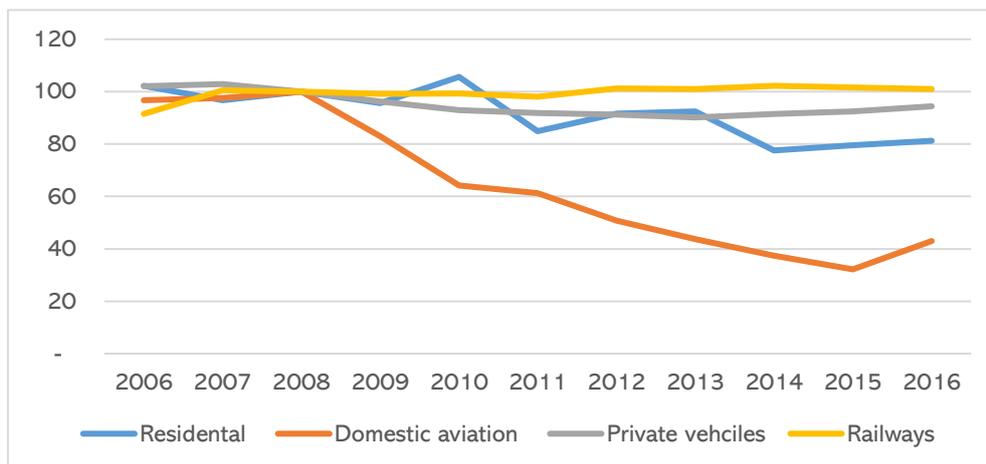
Sector (SIC 2007)	FTE Employment (2016) (ONS BRES)	Direct tCO ₂ e per FTE (direct) 2016	Total tCO ₂ e per FTE (direct) 2016	GVA2016 £m (ONS Balanced estimate)	tCO ₂ e Emissions per £1m GVA Direct (2016)
Food	17500	15	160	1137	0.23
Drink (11)	1300	56	220	410	0.18
Refined petroleum (19)	600	8187	10670	996	4.93
Chemicals & pharms (20-21)	7200	14	90	497	0.20
(rubber and) Plastics (222)	8300	12	60	538	0.18
Iron and Steel (24, esp. 241)	11000	482	630	454	11.70
Metal products (25, esp. 251 and 256)	21300	6	40	813	0.17
Elec Eng. (26 esp. 263, 265, 267)	7300	13	60	497	0.20
Mechanical engineering (28)	4100	8	50	230	0.15
Transport (largely auto components) (29 esp. 291 & 293)	9100	13	120	828	0.15
Other transport equipment (30)	10100	11	70	1101	0.10
Furniture (31 esp. 310)	9600	1	10	186	0.07
Manu services (repair, main & installation 33)	4600	44	200	1278	0.16
Transport services (49-52)	26400	119	200	1404	2.25
Insurance (65, not 662)	6300	28	120	1048	0.17
Finance (64 661 663, and 662)	17500	3	30	1521	0.03
ICT and creative (58 – 61; 62-63)	26700	5	30	1667	0.07
All Selected Sectors	188800	79	150	14605	1.03

5.4 The Impact of Brexit on Consumption Emissions in Wales

Assessing the impact of shocks such as EU transition on the emissions of households is extremely difficult. In part this is because impacts will be indirect (for example should workers lose jobs or be wary of such and hence reduce expenditure and emissions), but also because some elements of relevant emissions are on a downward trend (e.g. from waste), or are more strongly affected by exogenous factors (e.g. the weather).

Some inference might be gleaned from the recession which affected the UK following the 2007/8 financial crisis. Experimental ONS real GVA estimates suggest Wales probably suffered a loss of at least 14-15%, cumulatively, in GVA over the period 2008-2013³¹. However, as Figure 5.1 shows, even such a precipitate decline in economic activity is hard to assess in terms of household emissions.

Figure 5.1 Household GHG emissions 2006 - 2016 (2008=100)



Residential emissions, dominated by gas burn for heating and other use³² shows no clear relationship with economic conditions, being more related to weather conditions³³, but with a medium term decreasing trend.

The significant drop in domestic aviation (within-UK destinations) is directly related to the trails (and recent recovery) of Cardiff Airport over this period. Other issues of note include relative pricing of travel mode (and cost of travel overall) which will impact choice. For example, motoring became relatively cheaper after the recession due to a fall in forecourt prices³⁴.

At the same time, Welsh railway emissions show little change – remaining flat over the period, but of course with trains (more or less fixed in number and distance by franchise agreements) potentially less full. Here, if there is any effect at all of the recession it is that it *may* have somewhat slowed passenger growth³⁵.

³¹ <https://www.ons.gov.uk/economy/grossvalueaddedgva/datasets/nominalandrealregionalgrossvalueaddedbalancedbyindustry>

³² Electricity emissions are reported elsewhere in this dataset.

³³ https://en.wikipedia.org/wiki/Winter_of_2010-11_in_Great_Britain_and_Ireland

³⁴ https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/489894/tsqb-2015.pdf

³⁵ <https://gov.wales/docs/statistics/2018/180328-rail-transport-2016-17-en.pdf>

The recession is evident in the use of private cars. Emissions drop by 10% per annum between 2008 and 2013. Private Vehicle kilometres actually declined by only 4.2% per annum between 2007 and 2012 indicating a move to more efficient/smaller cars³⁶. Notably, vehicle distances recovered to surpass its former 2007 high in 2016, with annual private vehicle emissions rising 5% between 2013 and 2016 (but not to their former high).

This analysis suggests that any recession following EU transition, were it to occur, would have minimal impacts on household emissions: or rather, that any economic effects are likely to be swamped by other factors and hence hard to discern (even in retrospect, let alone in advance).

The exception here is for private vehicle travel, where a recession might be expected to reduce private vehicle use. The reduction in this regard was greatest in 2013, 500kt of CO₂e in that year compared to the 2007 peak. The cumulative CO₂e savings are extremely difficult to judge against the backdrop of a general reduction in emissions from the private fleet.

In summary then, the impact of any EU transition related recession on household emissions is extremely difficult to judge, but not likely to be significant, with the exception of recession-consequent reductions in private vehicle travel. It may be that the regulatory and more general policy aspects of Brexit will be more important here.

5.5 Brexit and Greenhouse Gas Emissions in Wales: Wider Issues

This report has so far reported on Welsh *territorial* emissions of GHG. However, this 'production' approach ignores two very specific issues that should be considered for a fuller understanding of regional contribution to climate change:

- Firstly, some of the commodities produced in Wales will be exported to the rest of the UK or world rather than consumed regionally, meaning they might be discounted from Wales' carbon attribution. High carbon industries in Wales such as Food, Iron and steel, Petroleum refining and Chemicals, as well as Energy and Agriculture tend to have high levels of exports;
- Secondly, and obversely, people in Wales consume goods produced elsewhere that have caused emissions to be created in their production. This 'embodied' carbon should properly be added to Wales' carbon attribution.

³⁶ <https://gov.wales/docs/statistics/2017/171108-road-traffic-2016-en.pdf>

Prior work suggests that a production-based approach overestimates Wales' carbon footprint due to the high carbon intensity of exports³⁷. Given more recent data that suggested that in 2016, 48% of Welsh produced electricity was exported to England, a far higher proportion than earlier estimates, this overestimation is likely to be significant.

In terms of Brexit this raises the question of how far Brexit might cause Wales-based production facilities to move overseas rather than close. In the former case this 'carbon leakage' may result in a lower level of carbon emissions from Wales but make minimal difference in terms of climate change impacts if the new facilities elsewhere were of a similar nature to those that might have been built (or continued) in Wales. Indeed, the overall level of global emissions might worsen if there are additional energy costs involved in the move of production³⁸. Table 5.5 provides some examples of the issues.

In Wales' case there are a number of facilities that might relocate due to Brexit, either in terms of the plant 'as a piece' or parts of the production therein. Whilst it is not possible to model the impact of specific business decisions within this report, or be definitive or holistic in the analysis, there are a number of cases where some contextual information can be presented that might help understand issues around Brexit-related carbon leakage. In order to aid this analysis, the IPCC estimates of carbon intensity are used for electricity grids by country and region for 2014, assuming that this is a good indicator of overall GHG intensity per unit of production for that area³⁹.

³⁷ See Turner et al (no date) *Submission to Review of role of Consumption Based Emissions reporting* Energy and Climate Change Committee <https://s3-eu-west-1.amazonaws.com/esrc-files/outputs/snsRQ8NvuUOHrkAKBO7AtQ/mBBgUC-avUipSw96yHGY0g.pdf>

³⁸ Babiker, M. H. (2005). Climate change policy, market structure, and carbon leakage. *Journal of International Economics*, 65(2), 421-445.

³⁹ <https://www.ipcc.ch/pdf/special-reports/sroc/Tables/t0305.pdf> and see http://www.gh.undp.org/content/dam/ghana/docs/Doc/Susdev/UNDP_GH_SUSDEV_2010GHGInventory_PDF.pdf for missing countries

Table 5.5. Examples: Brexit and carbon leakage

Sector	Notes
Oil Refining	Exports to continental Europe and Ireland ⁴⁰ . Europe has a longstanding excess capacity in refining and faces difficult competition from non-OECD developments (Middle East, India, China) ⁴¹ . Already led to closure of Murco. Loss of remaining refinery likely to lead to replacement of product by other extant refineries in UK, EU and beyond rather than a replacement plant. Overall impact on GHG uncertain.
Iron & Steel	Exports 90%+ of finished products outside Wales. Hard Brexit against background of longer term oversupply and rationalisation of EU steel may see production relocated ⁴² . Given the similarity of carbon intensity per kWh of electricity in key alternative production territories such as the Netherlands and the UK, and the inherent CO ₂ -intensity of the steelmaking process, a transfer of production would have likely very little net impact on GHG emissions (aside from any consequences linked to the remediation of PT).
Motor vehicles & assoc.	Overproduction continues in Europe. Any ultimate closures in Wales might then result in decrease in surplus production rather than replacement elsewhere. Any new (e.g. electric) propulsion/engine would likely require a brand-new plants outside EU such as where existing facilities exist: e.g. US (grid Co ₂ e per kWh +20% compared to UK), Turkey (-12%), Brazil (-83%), China (+105%), Mexico (+40%); Romania (-20%).
Aerospace	For example production possibilities in France and use of nuclear electricity (-85%), Germany with no change (-) or to a non-EU location such as US (+20%) or China (+105%).

Any Brexit-recession in Wales would also see a reduction in household spending, resulting in lower GHG emissions in embodied imports (i.e. additional to those already counted in the analysis above). During the last recession, between 2007 and 2014 consumer spending reduced by (approximately) 15-20% compared to the 2007 base year before recovering to its former level⁴³

An estimate is that consumer spending, excluding heating and travel already accounted for above, totalled around 12.3mt of carbon per annum⁴⁴. A recession of a similar scale to that experienced following the financial crises might, then, result in a reduction in GHG emissions of 1.8 – 2.5 million tonnes of CO₂e, with this spread over a number of years (with this adding to additional savings via reduction in private transport kilometres).

⁴⁰ <https://www.bizjournals.com/sanantonio/news/2016/06/24/how-brexit-could-affect-valeros-refinery-in-the-uk.html>

⁴¹ <https://www.bmiresearch.com/articles/refining-capacity-to-outpace-demand-by-2018>

⁴² <https://www.theguardian.com/business/2017/sep/20/tata-steel-merge-thyssenkrupp-job-losses-port-talbot>

⁴³ <https://tradingeconomics.com/united-kingdom/consumer-spending> - note it is impossible to be definitive due the impact of inflation etc.

⁴⁴ <https://gov.wales/docs/desh/publications/150724-ecological-footprint-of-wales-report-en.pdf>

6 Conclusions

6.1 Introduction

This part of the report summarises the findings from Sections 3 and 4. In particular, some broad conclusions are provided on:

- Trends in key global markets for commodities produced in Wales.
- Welsh industries that could be affected by new trade deals signed by the UK Government.
- The impacts ON Welsh industries of changes in trading relationships with key countries that currently have a trade deal with the EU.
- The extent to which output from Welsh industries may be used to substitute for imports from the EU post Brexit.
- Whether there might be new trade opportunities for Welsh industries in the medium to long term following EU transition.
- How changes in regional output following Brexit could affect production point greenhouse gas emissions in Wales.

6.2 Some issues

Before proceeding there are some notes of caution that have arisen from the preceding analysis, and the need for care in terms of how findings are used in any Welsh Government responses.

First, the findings are indicative. For example, the report is framed around broad industry definitions, and then with an attempt to link these key Welsh industries through to commodity groups. This process is fraught with difficulty. At one level there are real problems seeking to match up the activities of industries in terms of standard industrial classifications, with commodity classifications (SITCs) employed by HMRC, and then Harmonized System (HS) codes commonly used on the world stage to explore trends in commodity flows.

The analysis of industries has identified some activities in Wales that could easily be included under a series of different standard industrial classifications. These problems are acute in sectors such as Automotive components, Aerospace, Mechanical and Electrical engineering. Moreover, there is the associated issue that some firms (and industries) produce more than one commodity. Then the ways in which industry activity is reported in Wales are not particularly conducive to an analysis of their trade prospects. In the broad reporting structure in what follows this means that any conclusions on future trading propensity might be more relevant to some parts of an industry rather than to others.

Second, there is a need to recall a conclusion from earlier research undertaken by Cardiff Business School (2017) on Welsh key sector prospects in Anchor and RICs companies. In this research it was noted that very little was known on how Welsh industries link with firms in the rest of the UK that subsequently export. The example often quoted in the press in this respect is the automotive components sector, but this issue is also relevant for many other manufacturing operations in Wales. While this problem places boundaries on a full understanding of Welsh industry exposure to EU transition processes, this also creates problems in understanding where future opportunities might be. For example, there could be UK firms with significant non-EU export opportunities which will need to purchase inputs from the Welsh goods and services sectors. Indeed there will already be cases where Welsh firms in sectors such as Mechanical engineering may show low EU and non-EU exports, but that form key parts of growing global value chains through their links with rest of UK firms.

From this perspective, this report once again highlights a need for more consideration to be given to work to develop an intra-regional trade matrix for the UK, and indeed for a structured update of the Welsh Input-Output tables such that these more fine-grained intra-regional trade patterns can be understood.

Third, the focus of this report has been on the goods sectors, and there is some justification for this. Selected goods exporting sectors provide relatively well paid Welsh employment, and in some of the largest Welsh firms. These same sectors are also among some of the more productive elements of the regional economy, and with strong exports a partial evidence of this. However, the proportion of total Welsh employment that is in manufacturing sectors is steadily falling.

While the goods sectors examined presented a series of published data challenges, the issues with Welsh services were rather more basic in terms of more limited data on Welsh overseas exports of service beyond experimental data for the period 2011-16. While an argument could be made in the Welsh case that large parts of the output of the sector are not traded internationally, the 2016 estimates reveal that perhaps £5.6bn of Great Britain service exports are attributable to Wales. This regional export activity remains poorly understood. While key elements of this regional services export activity is in respect of manufacturing services, finance and insurance, it also reflects activity in potentially faster growth sectors such as ICT and Professional and Scientific services. Without knowing more on regional services exports it is difficult to be prescriptive on the impacts of EU transition which will be more pronounced in those Welsh services sectors more dependent on overseas demands.

Table 6.1 Welsh Goods sector estimates of exports and total sales 2016

	Est Exports 2016 £m	% Welsh exports	Exports/sector sales (est. %)	Sector sales £m	Sector GVA £m
Food (10)	402	2.7	10.7	3752	1085
Drink (11)	32	0.2	3.9	815	366
Refined petroleum (19)	1280	8.7	54.6	<i>2343</i>	<i>176</i>
Chems. & pharms. (20-21)	1325	9.1	62.4	2124	661
Plastics & rubber (22)	372	2.5	31.7	1175	459
Iron and Steel (24)	708	4.8	22.3	3171	349
Metal products (25)	321	2.2	23.2	1381	626
Elec Eng. & related (26-27)	811	5.5	36.2	2244	1027
Mech. engineering (28)	2603	17.8	279.3*	932	433
Transport (29)	497	3.4	12.9	3859	499
Other trans eqmt. (30)	4012	27.4	120.5*	3330	<i>1266</i>
Furniture (31)	194	1.3	59.8	325	114
Other production (not covered in this report)	2072	14.2	11.2	<i>18543</i>	<i>6326</i>
Total	14629	100.0		25451	7061

Source: Derived from ONS, Annual Business Survey, and HMRC data from the Regional Trade System. Note figures in italics are estimated.

* Figures in excess of 100% suggest potential problems in matching up SIC and SITC codes. In the case of Mechanical engineering there is some expectation that exports partly relate to Manufacturing services and not just to the manufacturing of goods.

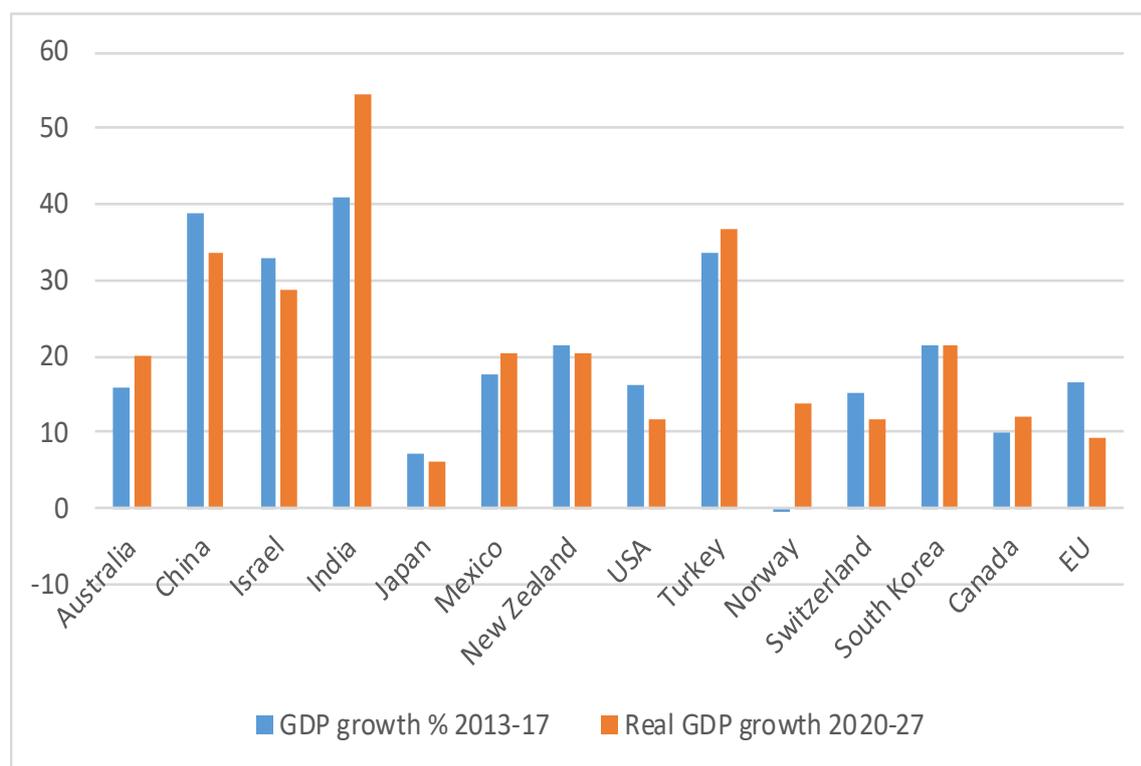
Fourth, and linked to the above, the sectors chosen for the focus of this report do not embrace all of Welsh industrial activity. The selected goods sector in this report would have accounted for an estimated 86% of Welsh goods exports in 2016 (Table 6.1) and an estimated 58% of the output of the production sector in the regional economy. Rather the analysis focuses on established activity, and with some of this activity featuring ageing assets and producing goods very much at mature end of their respective product life cycles. Then little account is taken of activity in sectors poorly understood and including services activity linked to the gig economy (i.e. generally understood as a free market system where temporary positions are commonplace and organizations/firms contract with independent workers for short-term engagements).

6.3 Growth trends in key global markets

Figure 6.1 below summarises recent growth trends in selected key markets served by Welsh exporters. The first bar is an estimate of GDP growth in each state/area for the period 2013-17. While UK GDP grew (in current terms) by 21.1% over this period, much faster growth was observed in China (38.8%), India (40.9%) and Turkey (33.7%). The EU-28 GDP grew by an estimated 16.5% over this period.

To identify possible future growth in key markets, the second bar shows OECD forecasts of real GDP growth 2020-2027. Clearly this is only one set of forecasts which relies upon a number of assumptions. However, there are expectations that the fastest growing parts of the world economy will be India (54.5% real GDP growth forecast 2020-27), China (33.6%) and Turkey (36.7%). The Euro area (EU-16 here in the forecast data) is expected to see real GDP growth of just 9.2% over this period, and the UK 12.7%.

Figure 6.1 Recent and Forecast GDP Growth in Key Overseas Markets for Wales



6.4 Priority trade deals and effects on Welsh industries

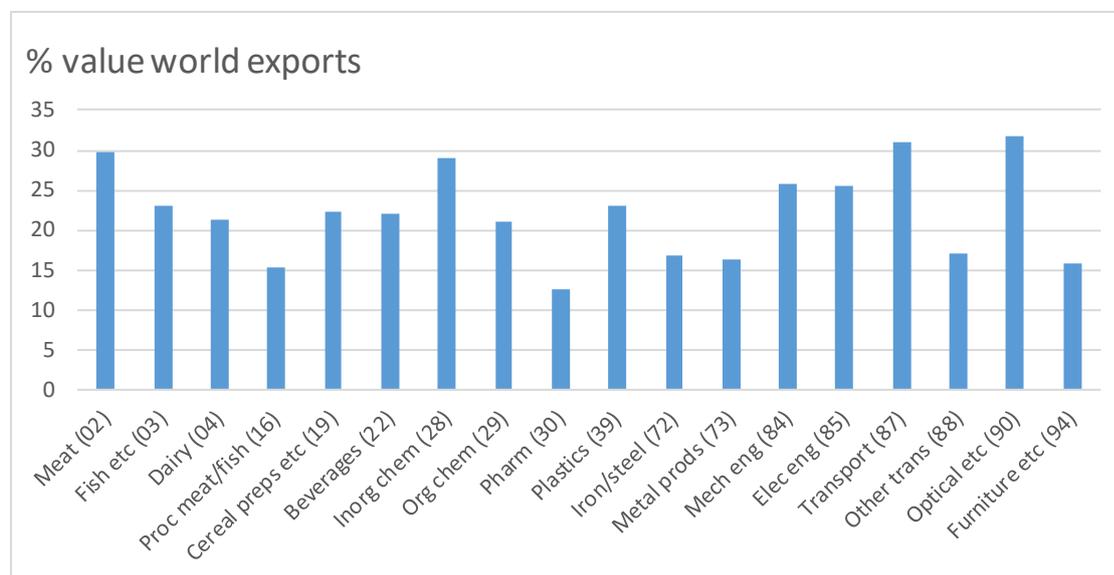
UK Government is believed to be considering the USA, New Zealand and Australia, together with the Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP) countries for priority trade deals. The CPTPP includes Australia, Brunei, Canada, Chile, Japan, Malaysia, Mexico, New Zealand, Peru, Singapore, and Vietnam.

These new trade deals may affect prospects for domestic Welsh firms. Particularly considering goods sectors, across the commodities examined in this report, there could be more impact on Welsh industries in commodity groups where USA and the CPTPP countries appear to have comparative advantage in production, coupled with an existing strong presence in international markets (here examined in terms of export value).

Appendix 7 provides some of the analysis that was used to inform conclusions in this section, summarising for individual commodities (examined in Section 3 of the report) the importance of selected states in terms of the value of global exports and with the colour coding simply revealing whether the state in question had a trade surplus in the commodity in question in 2017.

For the USA and CPTPP block as a whole (excluding Brunei here) Figure 6.2 below reveals that these countries accounted for over 20% of world exports in 2017 in a large number of sectors where Wales has significant economic activity.

Figure 6.2 Percentage of 2017 World export value of selected commodities accounted for by USA and CPTPP Block



Note: HS is harmonised system codes for commodity groups. Source: Derived from ITC Trademap

In this respect, the analysis (and see Appendix 7) revealed:

- USA, Canada, Australia and New Zealand have strong trade surpluses in Meat and meat offal products (HS02) and together accounted for around 27% of global exports in 2017. USA, Australia and New Zealand also have trade surpluses in Dairy sectors (HS04), accounting for nearly 20% of global exports in the dairy commodity group in 2017. Where a trade deal improves access for these states to UK markets, or affects quota levels, negative impacts on Welsh producers would be expected.
- USA has a strong presence in world export markets in Inorganic and Organic chemicals, Pharmaceuticals, Plastics, Mechanical engineering, Transport, and Optical products. In each case its share of world export markets in 2017 was between 9% and 14%. Each of these sectors supports significant Welsh employment which could therefore face negative impacts
- Japan has trade surpluses in sectors such as Plastics, Iron and steel, Metal products, Mechanical engineering, Electrical engineering, Transport and Optical products. Mexico also has trade surpluses in Transportation (HS87). There is a new trade partnership operational

between the EU and Japan that became effective in February 2019. Whether or not the UK (following an EU transition process) develops a deal with Japan, the existence of the EU-Japan framework could have (and arguably has already had) negative consequences for economic activity in these commodity groups in Wales.

6.5 Trade agreements that UK Government is attempting to transition

There are a number of trade agreements held by the EU with third countries that the UK Government is seeking to transition. Among those expected to be most significant for Welsh trade are those with South Korea, Turkey, Norway, Switzerland, Canada and Japan. In terms of potential to affect prospects in Welsh goods sectors any changes in trade relationships with these states can be partially understood in terms of the export strengths of these economies and where they currently enjoy strong trade surpluses in selected commodities. The analysis suggests that for 2017:

- South Korea accounted for more than 4% of world exports, and had a strong trade surplus, in commodities such as organic chemicals, plastics, iron and steel, metal products, electrical engineering, and optical products. In each of the sectors producing these commodities, this report reveals that Wales has significant economic activity which could be impacted by the trade agreement.
- Turkey is expected to be one of the fastest growth economies in this group, has trade surpluses in all of the food commodity groups examined in this report, as well as in sectors such as Iron and steel (HS72) and Furniture (HS94). The report reveals that there is significant economic activity in the sectors producing these commodities in Wales.
- Norway while a small player on the global stage outside of oil and gas exports, accounted for over 9% of world exports in the Fish/fish processing commodity group in 2017 (HS3). It is unlikely that changes to a trade deal with Norway would have any marked effects on Welsh goods sectors.
- Switzerland had strong trade surpluses and relatively high levels of exports in Organic chemicals and Pharmaceuticals. Indeed in the latter category Switzerland accounted for 13% of world exports in 2017. It is unlikely in specific commodities in question here that Swiss companies compete directly with goods currently made in Wales – particularly in the pharmaceuticals sector.
- Canada accounted for over 4% of the value of world exports in meat/meat offal (HS02), fish processing (HS03), and cereal preparations (HS16) in 2017 and also had trade surpluses in each of these commodity groups. Canada was also the source of over 4% of world exports in transport and other transport, although this was not primarily automotive. Any improved market access given to Canadian producers of food commodities could have negative impacts on Welsh producers.
- Japan was considered above but with changing trade relationships expected to have marked effects on both the steel sector in Wales, and automotive components production.

6.6 Overall goods sectors conclusions

In the tables that follow in this section information is brought together from the commentary in Sections 3 and 4, and the analysis of greenhouse gas emissions in Section 5, to summarise the scale of opportunity/problem in answer to the questions in Section 6.1. These can be understood broadly in terms of: **priority** in terms of the significance of current trade patterns for short term Welsh economic prospects; **opportunities** for EU import displacement from Welsh based production; **risk** of sector exposure to EU markets; **opportunity** in sector potential in non-EU markets; and then **environmental effect** in terms of scale of potential production point greenhouse gas effects from production changes. In each case the priority, opportunities, risks and effects are rated as High, Medium or Low. This ranking is subjective, but provides a means of summarising and identifying the main opportunities and risks.

Table 6.2 summarises the conclusions for goods sectors while Table 6.3 provides more detail to justify the goods sector ratings given. These tables are best used as a starting point for discussion and other readers might have different standpoints on the material presented.

Table 6.2 and 6.3 reveals that the Food sector trade patterns are rated as a high priority for Welsh concerns. In selected parts of the food manufacturing sector Wales has relatively high levels of specialisation. At one level there are potential opportunities for import displacement; but at the same time the sector is relatively exposed to EU markets. Any change in Welsh production in the sector would also have a relatively large effect in terms of production point emissions.

Clearly food exports only made up around 2.7% on Welsh goods exports in 2016 (note in Table 6.1 we employ 2016 Welsh goods exports figures here rather than 2017 in order to compare overseas exports with overall sector sales –this is an approximation with problems matching some SIC industry codes to SITC commodity codes; in 2017 food exports were 3.0% of the total goods exports), but 2016 export sales of £402m represent an estimated 11% of industry sales, and with this sector activity prone to relatively high value added tariffs in a WTO trade environment.

For Beverages Table 6.2 shows that this sector makes up a very small proportion of Welsh exports, and with overseas exports accounting for less than 4% of industry sales in 2016. The nature of commodities produced in Wales (mineral waters, beer) places some limits on opportunities in non-EU markets, although overseas interest in Welsh craft beers and whisky is noted.

Refined petroleum relates largely to the activity of one firm. The output figures reported in Table 6.1 are estimated (estimating output and GVA based on Welsh share of sector employment in the UK). However, while the sector made up close to 9% of Welsh exports in 2016 and 2017, this may be associated with relatively small amounts of GVA generation in Wales. Any future changes in Welsh production in this sector are more tangentially linked to EU transition processes.

Chemicals & pharmaceuticals is a major contributor to Welsh overseas goods exports (9% of value in 2016, and 12% in 2017) and with exports estimated to represent 62% of sector sales. Given that Welsh GVA (basic prices) in the sector was £661m in 2016, any loss of international trade opportunities here would have serious repercussions for Welsh production. Non-tariff barriers have particularly serious consequences for parts of this sector. Market prospects outside of the EU are very dependent on the commodity group in question. Conclusions on emissions are assessed as medium because some process plants are large users of energy, while producers of pharmaceutical products are less so.

In the Plastics sector the general conclusion would be limited opportunities to displace imports, and with around one third of Welsh sector activity in 2016 seen to be dependent on overseas exports. Opportunities in non-EU markets are limited in most commodities in the group in which Wales has current activity in terms of employment.

Iron and steel production is rated high in terms of trade priority. While Table 6.1 suggests the sector makes up less than 5% of Welsh overseas exports in 2016 (a little over 5% in 2017), overseas exports from the sector are estimated to account for close to 32% of sector sales. The sector is exposed to EU demands both directly and indirectly, but with limited opportunities for the sector to displace imports and with non-EU opportunities constrained by growing trade pressure, and the presence of cheaper basic steel producers in APTA states. Any change in sector outputs would have very significant effects on Welsh production point emissions.

Metal products accounted for just 2.2% of Welsh exports in 2016 (2.1% 2017), but with this sector identified as one as where there could be strong opportunities in non-EU markets particularly in activity linked to structural metal products and construction engineering.

Electrical engineering is highlighted as a sector of strong potential interest because of significant employment supported in Wales, but with the sector exposed to EU market threats, and with limited opportunities to displace imports, and with APTA and ASEAN states already accounting for significant UK imports in the sector, and with these more likely to displace any EU imports in the future. While the sector is vulnerable to EU transition processes, there are limited opportunities in non-EU markets because of the competition from APTA and ASEAN states, although in parts of the Welsh sector linked to instrument engineering there could be stronger prospects in non-EU markets.

In Mechanical engineering Welsh exports made up nearly 18% of total of Welsh goods exports in 2016 (17% 2017) but it is likely a considerable part of sector exports linked to power generation equipment would be better understood as exports from the manufacturing services sector (i.e. engine and turbine maintenance). The conclusion from Section 3 of the report here is for limited opportunities to displace EU imports, and indeed only around half of UK imports into the sector come from the EU. However, the sector is rather less exposed to the EU market with only 20% of Welsh Mechanical engineering exports destined for the EU, which means this is a sector which already trades extensively in non-EU destinations, and with weaker sterling, might be an avenue for further non-EU sales.

Transport equipment is revealed as a key risk sector in Tables 6.2 and 6.3. While overseas exports were only estimated to account for 13% of sector sales in Wales in 2016, the sector is very exposed through its forward supply chain. Non-EU opportunities are seen to be limited here with much of Welsh production focused within UK or EU facing value chains.

Other transport equipment is focused in on aerospace. The sector accounted for 27% of Welsh overseas exports in 2016 (and 2017). A very large proportion of the value of output in this sector is exported overseas. The nature of the production assets supporting Welsh output in the sector makes it unlikely that UK imports in this sector would be displaced, and with little short term prospect that EU trade in the sector will be impacted largely because of potential risks associated with displacing Airbus wing production, although Airbus have revealed that elements of their UK production, research and engineering activity will be hard hit by any Brexit scenario.⁴⁵

Finally here in the case of Furniture while the sector contributes only a small proportion of Welsh exports (1.3% in 2016 and 2017) some 60% of outputs are exported and with much of the sector's overseas exports heading for destinations other than the EU i.e. China and states in the NAFTA group. Prospects in non-EU markets are then stronger in parts of this sector.

Table 6.2 Summary of Goods sector findings

Sector (SIC 2007)	Trade patterns PRIORITY CONCERN for Wales	OPPORTUNITY: Import displacement and Welsh Production increase	RISK: EU market exposure and Welsh Production levels	OPPORTUNITY: Prospects non-EU markets	ENVIRONMENTAL EFFECT: Output change and Welsh emissions
Food (10)	High	High	High	Medium	High
Drink (11)	Low	Low	Low	Low	Low
Refined petroleum (19)	Low	Low	Low	Medium	High
Chemicals & pharms (20-21)	High	Low	High	Medium	Medium
Plastics & rubber (22)	Medium	Low	Medium	Low	Medium
Iron and Steel (24)	High	Medium	High	Low	High
Metal products (25)	Medium	Medium	Medium	High	Low
Elec Engineering and related (26-27)	High	Low	High	Low	Low
Mechanical engineering (28)	Medium	Low	Low	Medium	Low
Transport (29)	High	Medium	High	Medium	Low
Other transport equipment (30)	High	Low	Medium	Low	Low
Furniture (31)	Low	Medium	Low	High	Low

⁴⁵ See <https://www.airbus.com/content/dam/channel-specific/website-/company/global-presence/uk/Brexit-Risk-Assessment-21-Jun-FINAL.pdf>

Table 6.3 Welsh industry opportunities (and threats) summary

<p>PRIORITY: Trade patterns in this commodity group a priority for Wales?</p>	<p>OPPORTUNITY: Could Welsh production in the commodity group displace UK imports post Brexit?</p>	<p>RISK: Would potential changed trading relationships with EU post Brexit have impacts on Welsh production? i.e. Exposure to EU export markets</p>	<p>OPPORTUNITY: What are the prospects for new market non-EU international opportunities in commodity group in post Brexit environment? i.e. Potential for new non-EU markets</p>	<p>ENV EFFECT: How would change in sector activity affect balance between production point and consumption led emissions in Wales</p>
<p>Food High:</p> <ul style="list-style-type: none"> -Relatively high employment, and high specialisation in sectors that could attract high tariffs. -Sector accounts for around 3% Welsh exports in 2017. -Sector characterised by links back to Welsh primary production. -Sector distributed across regional economy. 	<p>High:</p> <ul style="list-style-type: none"> -Tariff and non-tariff barriers could be significant hindrances to trade post Brexit. -UK imports in sectors such as meat and edible offal, dairy produce, and cereal preparations almost wholly dominated by EU imports. -In selected sectors opportunities to displace are limited by supply side responsiveness in Wales. -In some sectors, particularly meat, non-EU producers could also work to displace EU imports post Brexit. 	<p>High:</p> <ul style="list-style-type: none"> -Around 84% of Welsh exports destined for EU in meat/preps; dairy, cereals and fish SITC codes 01—04), and total Welsh food sector exports account for an estimated 11% of Welsh sector activity (2016). -EU major destination for UK meat and processed meat exports as a whole. -EU a key destination for Welsh outputs of the food sector. -Tariff and non-tariff barriers could be high. 	<p>Medium:</p> <ul style="list-style-type: none"> -UK runs trade deficits on food commodity groups produced in Wales -Very dependent on specific commodity group. -For selected meats strong market growth in APTA and other Asian markets. -For UK dairy products China, US, Turkey, Canada and Australia take around 14% of UK exports and have seen growth in value 2013-17. 	<p>High:</p> <ul style="list-style-type: none"> -If overall sector output falls in Wales a relatively large impact of production point emissions, but with much of this in Welsh supply chain to the food sector
<p>Beverages Low:</p> <ul style="list-style-type: none"> -Low level of specialisation in sector. -Current exports in sector relatively small. -High transport costs for many commodities in Welsh production preclude exporting. 	<p>Low:</p> <ul style="list-style-type: none"> -UK imports in the commodity group do not tally well with goods produced in Wales. -Tariffs relatively low on many commodities in this group -Limited effects in terms of aerated waters imported into UK from Europe because of strength of key European mineral water brands. 	<p>Low:</p> <ul style="list-style-type: none"> -Limited Welsh beverage exports go to EU destinations in 2017 -Unlikely with much of sector output destined for domestic consumption. -Estimated less than 5% of Welsh sector output is exported. -EU exports fairly limited in sectors where Wales has specialisation 	<p>Low:</p> <ul style="list-style-type: none"> -Outside of some beers and limited whisky production low. 	<p>Low:</p> <ul style="list-style-type: none"> -Any change in sector activity limited effects on either as beverages a small contributor to production point emissions in Wales.

<p>Refined petroleum: Low</p>	<p>Low-EU imports to UK low.</p>	<p>Low- limited trade with EU on commodity group</p>	<p>Medium: sector already trades extensively to non-EU markets but prospects may be independent of EU transition scenarios</p>	<p>High: major production point emissions</p>
<p>Chemicals and pharmaceuticals High</p> <p>-Sector accounts for 12% of Welsh exports in 2017 (2016, 9%).</p> <p>-Sector features some high technology firms with high skills requirements and links in some cases through to health sciences.</p>	<p>Low</p> <p>-Low value added tariffs prevail on many commodities in the sector.</p> <p>-Limited opportunity for import displacement given low tariffs.</p>	<p>High</p> <p>-EU export intensive</p> <p>-In most commodity groups within chemicals and pharmaceuticals over 60% of goods are destined for the EU.</p> <p>-While WTO tariffs are in range 0-6.0% more concerns on nature of non-tariff barriers particularly in pharma products</p> <p>-Across the sector exports are an estimated 62% of sector output.</p>	<p>Medium:</p> <p>-Very dependent on which commodity group.</p>	<p>Medium</p> <p>-Some parts of the process chemicals sector are major production point emitters of greenhouse gases.</p> <p>-Closure of selected plants which are large uses of electricity would work to reduce production point greenhouse gas emissions in Wales.</p>
<p>Plastic (& Rubber): Medium</p> <p>-Sector accounts for around 2.4% of value of Welsh exports in 2017.</p>	<p>Low</p> <p>-For the UK as whole 70% of imports come from the EU.</p> <p>-Limits to how far states in APTA, ASEAN and NAFTA could displace EU imports were they impacted by Brexit.</p> <p>-WTO Tariff rates on plastics/products relatively low</p>	<p>Medium</p> <p>-Overseas exports of the sector estimated to account for a third of Welsh sector output in 2016, but only a proportion of this is towards EU.</p> <p>-Parts of the sector more heavily dependent on domestic demand.</p>	<p>Low</p> <p>-While accepted that some parts of sector produce complex products and components for other industries, the focus on meeting domestic demands precludes extensive non-EU export activity.</p> <p>-Overall sector is a small exporter from Wales in value terms.</p>	<p>Medium</p> <p>-Sector as a whole has low within industry emissions in Wales but purchases from high emitters such as the energy industry.</p> <p>-Displacement of more energy intensive parts of plastic production would see Welsh greenhouse gas emissions reduced.</p>
<p>Iron & steel High:</p> <p>-High employment and specialisation in sector.</p> <p>-Highly traded directly and indirectly via UK exports</p> <p>-Around 5% of value of Welsh overseas exports in 2016 and 2017.</p>	<p>Medium</p> <p>-Some prospect in selected first processed steel. Potential opportunities Zodiac line in Llanwern, if UK producers need to improve local content proportions.</p> <p>-Welsh produced basic steel, and first processed steel could be significantly cheaper than imported steel post Brexit.</p> <p>-Import steel in commodity group can have different specification to Welsh produced steel.</p>	<p>High:</p> <p>-Non EU imports into UK from China, Turkey, Ukraine and Korea with whom UK could have new trading relationships post Brexit.</p> <p>-Effects more likely to come via UK-based clients of the Welsh iron and steel sector.</p> <p>-Overseas exports as a whole around 22% (largely EU) of sector output in 2016 in Wales, but sector serves industries that are extremely export dependent.</p>	<p>Low:</p> <p>-Outside of selected first processed steels low.</p> <p>-Around one fifth of world imports to NAFTA but growing global protection trends in iron and steel.</p>	<p>High:</p> <p>-Sector estimated to produce over one third of Welsh production point emissions.</p> <p>-Reduction in capacity would have significant effects on production point emissions, and limited effects on Welsh emissions based on an analysis of consumption.</p>

<p>Metal products: Medium</p> <ul style="list-style-type: none"> -A high employment sector in Wales and with strong specialisations in metal structures. -Focus here is on metal products of iron and steel although some activity in products made from non-ferrous metals. -Manufactures of metal exported over £340m of goods in 2017 	<p>Medium</p> <ul style="list-style-type: none"> -WTO tariffs fairly low in sector -in sector UK was 59% dependent on EU imports in 2017; China, US and Turkey accounted for further 28% UK imports in 2017 -Very diversified sector in Wales and conclusions depend on precise product, but some scope for displacement in selected commodities 	<p>Medium</p> <ul style="list-style-type: none"> -Around 70% of Welsh exports go to EU states. -But direct exports in 2016 an estimated 23% of sector output. -Welsh production exposed to any potential loss of EU trade. 	<p>High</p> <ul style="list-style-type: none"> -Given diversity of products produced in sector potential opportunities to non-EU exports. -Main UK export markets for articles of iron and steel are US, Norway, Saudi Arabia, Japan and UAE, in some cases this reflects export demand for structural metal products. 	<p>Low</p> <ul style="list-style-type: none"> -Directly and indirectly sector activity in Wales in 2016 accounted for less than 3% of production point emissions.
<p>Electronic engineering: High</p> <ul style="list-style-type: none"> -Sector employs large numbers in the regional economy, and high levels of regional specialisation in parts of the sector. -Some plants vulnerable to displacement. 	<p>Low:</p> <ul style="list-style-type: none"> -Significant amounts of UK imports in electrical machinery (HS85) and optical equipment etc. (HS90) come from outside of the EU. -In larger electrical machinery sector APTA and ASEAN states account for a large proportion of UK imports. 	<p>High:</p> <ul style="list-style-type: none"> -Around 50% of Welsh exports are destined for EU markets in electrical machinery. -In selected parts of sector a very large proportion of output is destined for EU export. -Overseas exports as a whole account for close to 36% of industry activity in Wales in 2016. -Some plants vulnerable to displacement overseas which could reduce Welsh production in selected commodity groups here. 	<p>Low:</p> <ul style="list-style-type: none"> -Given stage in product cycle of electrical machinery and equipment sector unlikely that there are significant opportunities outside very selected goods. -In non-EU markets sector would face strong competition from APTA and ASEAN states. -Markets in NAFTA and APTA group account for around 40% of world imports in electrical machinery commodity group. 	<p>Low:</p> <ul style="list-style-type: none"> -Relatively small direct contributor to greenhouse gas emissions in Wales.
<p>Mechanical engineering (Machinery and equipment)</p> <p>Medium</p> <ul style="list-style-type: none"> -Low specialisation in sector but real trade opportunities in selected elements of mechanical engineering -Sector makes up 17% of Welsh overseas exports in 2017 	<p>Low</p> <ul style="list-style-type: none"> -Even under hard BREXIT and WTO framework value added tariffs would be low. -In the UK sector only around half of imports come from EU, and some possibility imports from US and Asia would displace EU imports. -Any reduction in value of sterling would make products from Wales cheaper than those from the US and Europe. 	<p>-Low</p> <ul style="list-style-type: none"> -Of total Welsh sector exports only around 20% are destined for the EU. -For the UK as a whole less than 40% of overseas exports in the sector are destined for the EU. -Together markets in NAFTA, APTA and GCC accounted for almost 35% of UK exports in 2017. 	<p>Medium</p> <ul style="list-style-type: none"> -Welsh sector already well exposed to non-EU markets -Uncertainty on whether non-EU exposure is down to the activities of relatively small number of firms. -Weaker sterling could bolster sectors exports in post Brexit time period. -States in NAFTA and APTA group account for over one third of world imports in this commodity group. 	<p>Low</p> <ul style="list-style-type: none"> -Mechanical engineering is a relatively low producer of direct greenhouse gas emissions in Wales. -Total greenhouse gas emissions (direct and indirect) per £1m GVA in Wales is relatively low.

<p>Transport equipment High:</p> <ul style="list-style-type: none"> -High levels of employment and relatively high specialisation in motor vehicle parts. -Relatively low proportion Welsh overseas exports directly (3.5%). -Any loss sector activity would hit Welsh productivity figures. 	<p>Medium</p> <ul style="list-style-type: none"> -Some prospect under selected Brexit scenarios that UK producers might seek to increase local content on cars which could benefit some Welsh firms. -UK imports in commodity group almost wholly dominated by EU -Position of Welsh suppliers in carmaker value chains on very specific commodities reduces opportunities for import displacement. 	<p>High:</p> <ul style="list-style-type: none"> -Whole sector in Wales has thrived on relatively free trade within EU. -For Welsh sector limited threats in terms of auto-components from non-EU states in short term. -Main threats in terms of auto producers in EU displacing UK purchases with EU purchases post Brexit. -Direct exports represent around 13% of sector output in 2016 <u>but</u> sector sells to sectors that are intensive exporters. -EU accounts for over 40% of world imports in this commodity group. 	<p>Medium:</p> <ul style="list-style-type: none"> -Limited to very selected commodities in the sector. -Much of the Welsh production tied into value chains of main automotive producers in UK and EU. 	<p>Low:</p> <ul style="list-style-type: none"> -Sector a relatively small contributor to direct production point emissions, but a larger contributor through demands placed on Welsh supply chain.
<p>Other transport equipment High:</p> <ul style="list-style-type: none"> -High levels of employment in components for aerospace. -Employment concentrated in a few large facilities. -A large contributor to Welsh overseas exports, and relatively high earnings in sector in Wales. -Loss of activity would hit Welsh productivity, 	<p>Low:</p> <ul style="list-style-type: none"> -Low in the parts of this sector where the bulk of Welsh production lays. -Some prospect for import displacement in other selected components, but EU only accounts just over one-third UK imports, and NAFTA around 55% of imports 	<p>Medium:</p> <ul style="list-style-type: none"> - Vast majority of Welsh exports destined for EU, and EU exports account for a very large proportion of sector output in the Welsh economy in value terms. -Significant costs and risks associated with displacing Airbus wing production in medium term. -Risks in association with EASA membership under EU transition and implications for large aerospace companies. 	<p>Low:</p> <ul style="list-style-type: none"> -Low in terms of the largest part of the sector in Wales. -Prospects stronger in other aircraft components. Around half of UK exports in commodity group already non-EU. -NAFTA and Gulf Cooperation Council account nearly one third of UK exports in sector. 	<p>Low:</p> <ul style="list-style-type: none"> -Sector a relatively small contributor to direct production point emissions, but a larger contributor through demands placed on Welsh supply chain. -Sector accounts estimated 2.5% of direct and indirect emissions.
<p>Furniture: Low</p> <ul style="list-style-type: none"> -Sector overall overseas exports are low i.e. around 1.3% Welsh exports value in 2017. -Wales has strong specialisation in some parts of the furniture sector. 	<p>Medium</p> <ul style="list-style-type: none"> -EU accounts for just 44% of value of UK imports in 2017. -Key sources of imports are China (37%) UK imports in 2017. -WTO tariffs fairly low. 	<p>Low</p> <ul style="list-style-type: none"> -In 2017 around a third of Welsh furniture products exports were destined for the EU. -Significant Welsh production is for the domestic UK market. -Exports of furniture account for an estimated 60% of Welsh output in the sector in 2016, and less than one third of this is estimated to be dependent on EU markets. 	<p>High</p> <ul style="list-style-type: none"> -Sector in Wales already sends an estimated two thirds of the value of its exports to non-EU destinations. -For UK as a whole key export markets for furniture commodities include US and China. NAFTA states account for 23% of the value of exports in 2017, and GCC and APTA together account for 12.6%. -In largest non-EU markets value of furniture exports has been growing strongly 2013-17. -NAFTA markets account for over one third of world imports in this commodity group. 	<p>Low-</p> <ul style="list-style-type: none"> -Furniture sector among lowest greenhouse gas emissions per £1m GVA.

6.7 Services sector overall conclusions

As already noted, the information on trade in services is much less complete than for goods sectors, particularly at the Welsh level. Data on exports of services from Wales is highly aggregated, with destination of exports data currently only available for some sectors. In this context, the analysis contained in Section 4 of this report, and in these conclusions, are only indicative of the main issues. Whilst exports of services from Wales are less significant in overall value terms than exports of goods, these services still provide important export earnings to the Welsh economy, with some potential for growth in selected sectors.

Table 6.4 provides a summary of some of the services sector findings, whilst more detail on each entry can be found in Table 6.5.

Of all the service sectors, only Manufacturing services was considered to be a priority for Welsh Government in terms of trade patterns. This is related to the sector's relatively high export intensity, and high sector specialisation. In addition this sector also exports extensively to markets outside of the EU, although this is likely to be linked to one large firm. Whilst this sector is certainly of interest in terms of trade patterns, it is probably the least well understood of all of the services sectors. In this report, this sector has been classified as SIC code 33 (Repair and installation of machinery and equipment), however exports of manufacturing services could be linked to activities in other sectors, such as medical testing/diagnostics etc. (see footnote 17 earlier). The separate identification, for statistical accounting purposes, of services exports linked with manufacturing activities is also likely to be difficult.

Transport and travel is also a relatively high export intensive sector, although Wales has limited specialisation in these services. This sector is considered to be relatively exposed to EU exports markets, and with limited trade possibilities in new markets. Transport and Travel is an emissions intensive sector, both directly and indirectly through supply chain purchases.

The Insurance and pension sector exported an estimated £1.45bn of services in 2016. The UK had a trade surplus in this activity in 2017, and there could be some potential for Welsh based sector activity to link in with this UK trading. Globally there may be some opportunities in the USA and Gulf states that are currently significant importers of these services. At a UK level, imports are very low, so there would be limited growth opportunities in substituting for services currently imported to the UK in this sector.

Table 6.4: Summary of Services sector findings

Sector (SIC 2007)	Trade patterns PRIORITY CONCERN for Wales	OPPORTUNITY: Import displacement and Welsh Production increase	RISK: EU market exposure and Welsh Production levels	OPPORTUNITY: Prospects non-EU markets	ENVIRONMENTAL EFFECT: Output change and Welsh emissions
Manufacturing (33)	High	Low	Medium	Medium	Low/Medium
Transport & travel (49-52)	Medium	Low/Medium	High	Low/Medium	High
Insurance & pension (65, 662)	Medium	Low	Low/Medium	Low/Medium	Low/Medium
Financial (64, 661, 663)	Low	Low	Medium	Medium	Low
ICT & creative (58- 63)	Low/medium	Medium	High/Medium	Medium	Low

Whilst the Welsh Financial services sector has relatively high exports, the local activities in this sector are closely linked with those in the UK. As a consequence there is some exposure to EU markets post Brexit, but also some possibilities for Welsh based firms to benefit from the already significant trading activities with countries outside of the EU by the UK sector.

The ICT and creative sector in Wales experienced significant growth in the period since 2012. Whilst exports from Wales are well below the other service sectors described above, global imports of these services are relatively high, and there may be some future potential to displace some EU imports to the UK post Brexit, and to develop activity in other global markets including the USA, APTA and ASEAN countries.

Table 6.5: Welsh Service industries opportunities (and threats) summary

<p>PRIORITY: Trade patterns in this commodity group a priority for Wales?</p>	<p>OPPORTUNITY: Could Welsh production in the commodity group displace UK imports post Brexit?</p>	<p>RISK: Would potential changed trading relationships with EU post Brexit have impacts on Welsh production? i.e. Exposure to EU export markets</p>	<p>OPPORTUNITY: What are the prospects for new market non-EU international opportunities in commodity group in post Brexit environment? i.e. Potential for new non-EU markets</p>	<p>ENV EFFECT: How would change in sector activity affect production point emissions in Wales</p>
<p>Manufacturing services. High:</p> <ul style="list-style-type: none"> - Relatively small sector in employment terms (SIC 33 only) but large services exporter. -High specialisation, and sector supports some high quality employment in Wales. -Likely that one large firm dominates exports – but sector not well understood. -Future research priority. 	<p>Low:</p> <ul style="list-style-type: none"> -Low UK imported value and UK a net exporter of these services. -Likely that Welsh based firms already supply UK market. 	<p>Medium:</p> <ul style="list-style-type: none"> -Around 33% of Welsh exports were estimated to be to EU in 2015. -Largest export market is USA, but with this possibly linked to one large Welsh based firm. -Until sector better understood difficult to draw firm conclusions. 	<p>Medium:</p> <ul style="list-style-type: none"> -Sector currently exports to a number of world markets outside of the EU and USA. -Global import values are relatively low for this sector, but some possibilities, for example, in APTA countries. 	<p>Low/Medium</p> <ul style="list-style-type: none"> -Sector is one of the higher emissions services and has absolute emissions totals above some of the manufacturing sectors.
<p>Transport & Travel. Medium:</p> <ul style="list-style-type: none"> -Limited specialisation in sector and relatively low productivity sector. -Exports relatively high (£1.3bn, 2016). - Linkages to goods sector exports (transport of goods). 	<p>Low/Medium:</p> <ul style="list-style-type: none"> -UK has trade surplus in Transport, and trade deficit in Travel. -A high share of imports to UK are from the EU but limited opportunities to substitute this with services from Welsh companies. -Sector components will be affected indirectly by tariff barriers if hard Brexit. 	<p>High:</p> <ul style="list-style-type: none"> -Given the generally high levels of exposure to EU exports markets for some goods made in Wales, this will translate to parts of the transport (and travel) sector. -Almost half of UK travel exports in 2017 were to EU. Linked activity in Wales and through tourism which is also potentially vulnerable. (<u>Tourism relates to a number of different sectors and is not separately considered in this report.</u>) 	<p>Low/Medium:</p> <ul style="list-style-type: none"> -Large global market in this sector, but limited possibilities in new markets for Welsh producers. 	<p>High:</p> <ul style="list-style-type: none"> -Major production point emissions from this sector in road haulage and air. -Issues over attributing emissions in parts of this sector.
<p>Insurance and Pension services: Medium</p> <ul style="list-style-type: none"> -Employment growth and some specialisation in sector. -Activity linked more to domestic markets, but largest services export sector (£1.45bn in 2016). 	<p>Low</p> <ul style="list-style-type: none"> -UK imports very low in this sector. -Limited prospects for import displacement for services produced in Wales. 	<p>Low/Medium</p> <ul style="list-style-type: none"> - Little information on destination of exports from Wales, and limited information for the UK. However there is some UK level dependence on EU export markets. -Welsh produced services more linked to domestic demand. 	<p>Low/Medium:</p> <ul style="list-style-type: none"> -Some possibilities as trade at UK level with some countries outside EU. -The USA and GCC countries are also major global importers of these services. 	<p>Low/Medium:</p> <ul style="list-style-type: none"> -Direct and indirect emissions relatively low.

-Sector in UK has trade surplus, and Welsh based firms could/are linked with this activity.				
Financial services: Low -Limited specialisation in this sector but employment growth 2015-2017. -Around 18% of services exports from Wales are in this sector. -Trading activity tightly linked to wider UK sector.	Low -The UK already imports more financial services from outside the EU than from within the EU.	Medium -EU accounted for less than half of the UK export market in 2017 but some Welsh sector exposure to EU market via UK.	Medium: -At UK level sector already trades extensively with countries outside the EU and some potential for Welsh sector to link with this.	Low: -Low total emissions from this sector.
ICT and Creative: Low/Medium - Low exports from Wales in this sector. - Large employing sector, although with limited specialisation. - But significant employment growth since 2015 and relatively high global import levels in these services.	Medium -Around 55% of UK imports in this sector are from EU. -USA is other main source country for UK imports. -Some limited potential for Welsh production to displace EU imports.	High/Medium -Almost half of Welsh exports were to the EU in 2015, and around 45% of UK exports were to the EU in 2017.	Medium -The EU28 accounts for almost half of global imports. -Some possibilities in other global markets including the USA, and in the rest of Europe, APTA and ASEAN markets where there are already limited Welsh exports.	Low -Just over 700 ktCO ₂ e total emissions, but due to the high GVA in the sector, emissions per £1m GVA are relatively low.

Appendix 1: Sector definitions used in this report

Sector (SIC 2007)	Key Employing parts of each sector in Wales	SITC codes for Welsh exports	Commodity codes (HS system) of interest
Food (10)	101 Meat processing; 105 dairy products 107 bakery products	00-09	02, 03, 04, 16,19
Drink (11)	110 Beverage manufacture; particularly 1107 soft drinks & 1105 beer	11	22
Refined petroleum (19)	192 refined petroleum products	33	2709
Chemicals & pharms (20-21)		51-56, 59	28, 29, 30, 33, 34
Plastics & rubber (22)	2221 plastic plates, sheets, profiles; 2222 packaging; 2223 builders ware; 2229 other plastic; 2219; other rubber products	57-58	39
Iron and steel (24)	241	67	72
Metal products (25)	251 structural metals; 256 treatment & coating of metals	69	73
Elec Engineering and related (26-27)	263 communications eqmt; 265 measuring inst; 267 optical instruments; 273 wiring devices	76-77	85, 90
Mechanical engineering (28)		71-75	84
Transport (29)	291 and 293 in particular and relating to components	78	87
Other transport equipment (30)	303 aerospace & related machinery	79	88
Furniture (31)	3101 office & shop furniture, 3102 kitchen furniture, 3103 mattresses & 3109 other furniture	82	94
Manu services (repair, main & installation (33)	331 Repair fabricated metals products, machinery etc.	Na	PM 1,2 on ITC Trademap
Transport and travel services (49-52)	Land transport 49, Warehousing 52, Postal 53	Na	BPM 3,4
Insurance 65 (incl. 662)	Insurance 651	Na	BPM 6
Finance 64 661 663	Monetary intermediation 641	Na	BPM 5
ICT and creative (58-63)	581 Publishing; 602 TV programming; 619 Other telecoms; 620 Computer programming	Na	BPM 9,11

Appendix 2: Selected location quotients (>1.0) for Welsh industries, 2017, SIC 3 Digit Level

Industry	GB employ	Welsh employ	LQ 2017
241 : Manufacture of basic iron and steel and of ferro-alloys	22,000	8,000	8.66
051 : Mining of hard coal	1,250	450	8.57
272 : Manufacture of batteries and accumulators	2,000	600	7.14
872 : Residential care activities for learning disabilities etc.	43,000	9,000	4.98
243 : Manufacture of other products of first processing of steel	3,000	600	4.76
652 : Reinsurance	2,000	400	4.76
161 : Sawmilling and planing of wood	8,000	1,250	3.72
239 : Manufacture of abrasive products and non-metallic mineral	8,000	1,250	3.72
293 : Manufacture of parts and accessories for motor vehicles	57,000	8,000	3.34
553 : Camping grounds, recreational vehicle parks and trailer parks	36,000	5,000	3.31
106 : Manufacture of grain mill products, starches and starch products	10,000	1,250	2.98
022 : Logging	1,250	150	2.86
267 : Manufacture of optical instruments and photographic equipment	5,000	600	2.86
321 : Manufacture of jewellery, bijouterie and related articles	7,000	800	2.72
303 : Manufacture of air and spacecraft and related machinery	82,000	9,000	2.61
263 : Manufacture of communication equipment	14,000	1,500	2.55
273 : Manufacture of wiring and wiring devices	14,000	1,500	2.55
242 : Manufacture of tubes, pipes, hollow profiles and related	7,000	700	2.38
253 : Manufacture of steam generators, except central heating boilers	2,250	225	2.38
245 : Casting of metals	13,000	1,250	2.29
651 : Insurance	91,000	8,000	2.09
171 : Manufacture of pulp, paper and paperboard	8,000	700	2.08
211 : Manufacture of basic pharmaceutical products	7,000	600	2.04
235 : Manufacture of cement, lime and plaster	1,750	150	2.04
773 : Renting and leasing of other machinery equipment	82,000	7,000	2.03
279 : Manufacture of other electrical equipment	12,000	1,000	1.98
382 : Waste treatment and disposal	48,000	4,000	1.98
843 : Compulsory social security activities	48,000	4,000	1.98
841 : Administration of the State	786,000	63,000	1.91
252 : Manufacture of tanks, reservoirs and containers of metal	10,000	800	1.90
266 : Manufacture of irradiation, electromedical equipment	5,000	400	1.90
261 : Manufacture of electronic components and boards	22,000	1,750	1.89
162 : Manufacture of products of wood, cork, straw materials	60,000	4,500	1.79
275 : Manufacture of domestic appliances	12,000	900	1.79
822 : Activities of call centres	81,000	6,000	1.76
108 : Manufacture of other food products	95,000	7,000	1.75
109 : Manufacture of prepared animal feeds	14,000	1,000	1.70
172 : Manufacture of articles of paper and paperboard	42,000	3,000	1.70
309 : Manufacture of transport equipment n.e.c.	3,500	250	1.70
383 : Materials recovery	21,000	1,500	1.70
552 : Holiday and other short stay accommodation	42,000	3,000	1.70
212 : Manufacture of pharmaceutical preparations	32,000	2,250	1.67
010 : DEFRA/Scottish Executive Agricultural Data	176,000	12,000	1.62
105 : Manufacture of dairy products	22,000	1,500	1.62

360 : Water collection, treatment and supply	37,000	2,500	1.61
081 : Quarrying of stone, sand and clay	15,000	1,000	1.59
512 : Freight air transport and space transport	2,250	150	1.59
772 : Renting and leasing of personal and household goods	19,000	1,250	1.57
101 : Processing and preserving meat and production of meat products	77,000	5,000	1.55
222 : Manufacture of plastics products	154,000	10,000	1.55
024 : Support services to forestry	3,500	225	1.53
602 : Television programming and broadcasting activities	24,000	1,500	1.49
942 : Activities of trade unions	8,000	500	1.49
107 : Manufacture of bakery and farinaceous products	98,000	6,000	1.46
855 : Other education	247,000	15,000	1.45
331 : Repair of fabricated metal products, machinery and equipment	99,000	6,000	1.44
259 : Manufacture of other fabricated metal products	50,000	3,000	1.43
501 : Sea and coastal passenger water transport	6,000	350	1.39
881 : Social work activities without accomm for the elderly and disabled	309,000	18,000	1.39
251 : Manufacture of structural metal products	71,000	4,000	1.34
021 : Silviculture and other forestry activities	8,000	450	1.34
351 : Electric power generation, transmission and distribution	89,000	5,000	1.34
152 : Manufacture of footwear	4,500	250	1.32
324 : Manufacture of games and toys	4,500	250	1.32
325 : Manufacture of medical and dental instruments and supplies	36,000	2,000	1.32
352 : Manufacture of gas; distribution of gaseous fuels through mains	45,000	2,500	1.32
475 : Retail sale of other household equipment in specialised stores	255,000	14,000	1.31
231 : Manufacture of glass and glass products	23,000	1,250	1.29
861 : Hospital activities	1,532,000	82,000	1.27
310 : Manufacture of furniture	79,000	4,000	1.21
854 : Higher education	494,000	25,000	1.20
089 : Mining and quarrying n.e.c.	2,000	100	1.19
232 : Manufacture of refractory products	2,000	100	1.19
237 : Cutting, shaping and finishing of stone	9,000	450	1.19
256 : Treatment and coating of metals; machining	120,000	6,000	1.19
292 : Manufacture of bodies (coachwork) for motor vehicles;	16,000	800	1.19
492 : Freight rail transport	6,000	300	1.19
563 : Beverage serving activities	521,000	26,000	1.19
871 : Residential nursing care activities	181,000	9,000	1.18
682 : Renting and operating of own or leased real estate	222,000	11,000	1.18
900 : Creative, arts and entertainment activities	81,000	4,000	1.18
620 : Computer programming, consultancy and related activities	734,000	36,000	1.17
472 : Retail sale of food, beverages and tobacco in specialised stores	143,000	7,000	1.17
649 : Other financial service activities, except ins and pension funding	92,000	4,500	1.16
201 : Manufacture of basic chemicals, fertilisers	31,000	1,500	1.15
873 : Residential care activities for the elderly and disabled	249,000	12,000	1.15
471 : Retail sale in non-specialised stores	1,239,000	59,000	1.13
931 : Sports activities	400,000	19,000	1.13
960 : Other personal service activities	317,000	15,000	1.13
842 : Provision of services to the community as a whole	424,000	20,000	1.12
551 : Hotels and similar accommodation	361,000	17,000	1.12
853 : Secondary education	749,000	35,000	1.11
254 : Manufacture of weapons and ammunition	13,000	600	1.10

412 : Construction of residential and non-residential buildings	348,000	16,000	1.09
869 : Other human health activities	394,000	18,000	1.09
879 : Other residential care activities	241,000	11,000	1.09
429 : Construction of other civil engineering projects	132,000	6,000	1.08
221 : Manufacture of rubber products	20,000	900	1.07
323 : Manufacture of sports goods	5,000	225	1.07
204 : Manufacture of soap and detergents, cleaning	28,000	1,250	1.06
889 : Other social work activities without accommodation	609,000	27,000	1.06
381 : Waste collection	68,000	3,000	1.05
151 : Tanning and dressing of leather;	4,000	175	1.04
454 : Sale, maintenance and repair of motorcycles and related parts	8,000	350	1.04
711 : Architectural and engineering activities and related	439,000	19,000	1.03
852 : Primary education	1,040,000	45,000	1.03
432 : Electrical, plumbing and other construction installation activities	371,000	16,000	1.03
099 : Support activities for other mining and quarrying	350	15	1.02
478 : Retail sale via stalls and markets	7,000	300	1.02
110 : Manufacture of beverages	41,000	1,750	1.02
467 : Other specialised wholesale	261,000	11,000	1.00
477 : Retail sale of other goods in specialised stores	813,000	34,000	1.00

Appendix 3: Trade profiles of selected states

This appendix contains some basic trade indicator information from the ITC Trademap database for selected countries and trade areas (US, Australia, New Zealand and Asia Pacific Economic Cooperation area). This illustrates the nature of selected information on the database, but also highlights some key figures on key UK trade partners.

In the case of the US, Australia and New Zealand the data links to products (not services) and summarises the value, growth, and tariffs applied to imports from these countries to the UK, and then UK exports to these same states. In each case the largest commodity groups traded are identified, and with an indicator of how important the UK as a whole to US, Australia and New Zealand imports and exports.

The final tables in this appendix relate to UK trade in commodities with the larger Asia Pacific Economic Cooperation group which is a large group of 21 states including the US, but includes the eleven members of the Comprehensive and Progressive Agreement for Trans-Pacific Partnership, also known as TPP11 or TPP-11 i.e. a signed trade agreement pending ratification by Australia, Brunei, Canada, Chile, Japan, Malaysia, Mexico, New Zealand, Peru, Singapore and Vietnam. Here the focus is on selected largest product commodity flows in the period 2015 to 2017.

Bilateral trade between United States of America and United Kingdom in 2017 (USA imports from UK)

		United States of America's imports from United Kingdom			
		Value in 2017, USD thousand	Annual growth in value between 2013-2017, %, p.a.	Share in United States of America's imports, %	Equivalent ad valorem tariff applied by United States of America
TOTAL	All products	54090529	0	2	
'87	Vehicles other than railway or tramway rolling stock, and parts and accessories thereof	9769254	13	3	3
'84	Machinery, mechanical appliances, nuclear reactors, boilers; parts thereof	7711492	-5	2	1
'99	Commodities not elsewhere specified	5523507	6	6	
'30	Pharmaceutical products	4342746	11	5	0
'90	Optical, photographic, cinematographic, measuring, checking, precision, medical or surgical ...	3349803	1	4	1
'27	Mineral fuels, mineral oils and products of their distillation; bituminous substances; mineral ...	3069112	-21	2	2
'85	Electrical machinery and equipment and parts thereof; sound recorders and reproducers, television ...	2584946	0	1	1
'22	Beverages, spirits and vinegar	2081273	1	8	2
'97	Works of art, collectors' pieces and antiques	1862960	1	18	0
'29	Organic chemicals	1847928	-3	4	3
'88	Aircraft, spacecraft, and parts thereof	1486871	1	5	0
'71	Natural or cultured pearls, precious or semi-precious stones, precious metals, metals clad ...	1259674	4	2	1
'38	Miscellaneous chemical products	1002513	6	7	3
'39	Plastics and articles thereof	929080	-1	2	5
'94	Furniture; bedding, mattresses, mattress supports, cushions and similar stuffed furnishings; ...	770275	7	1	1
'72	Iron and steel	621544	-10	2	0

Bilateral trade between United States of America and United Kingdom in 2017

		United States of America's exports to United Kingdom			
		Value in 2017, USD thousand	Annual growth in value between 2013-2017, %, p.a.	Share in United States of America's exports, %	Equivalent ad valorem tariff faced by United States of America
TOTAL	All products	56328789	4	4	
'99	Commodities not elsewhere specified	11695038	71	7	
'71	Natural or cultured pearls, precious or semi-precious stones, precious metals, metals clad ...	6628518	12	11	0
'84	Machinery, mechanical appliances, nuclear reactors, boilers; parts thereof	5909791	0	3	1
'85	Electrical machinery and equipment and parts thereof; sound recorders and reproducers, television ...	4016858	4	2	2
'27	Mineral fuels, mineral oils and products of their distillation; bituminous substances; mineral ...	3534911	4	3	0
'97	Works of art, collectors' pieces and antiques	3306920	6	28	0
'30	Pharmaceutical products	3126373	9	7	0
'87	Vehicles other than railway or tramway rolling stock, and parts and accessories thereof	2786846	8	2	8
'90	Optical, photographic, cinematographic, measuring, checking, precision, medical or surgical ...	2609217	-2	3	1
'39	Plastics and articles thereof	1217846	0	2	6
'33	Essential oils and resinoids; perfumery, cosmetic or toilet preparations	903848	5	7	2
'29	Organic chemicals	882967	-9	2	4
'44	Wood and articles of wood; wood charcoal	732430	12	8	2
'38	Miscellaneous chemical products	712782	1	3	5
'49	Printed books, newspapers, pictures and other products of the printing industry; manuscripts, ...	579152	-6	13	0
'73	Articles of iron or steel	481010	-2	3	2

Bilateral trade between Australia and United Kingdom in 2017

		Australia's imports from United Kingdom			
		Value in 2017, USD thousand	Annual growth in value between 2013-2017, %, p.a.	Share in Australia's imports, %	Equivalent ad valorem tariff applied by Australia
TOTAL	All products	5249212	-3	2	
'87	Vehicles other than railway or tramway rolling stock, and parts and accessories thereof	1346655	3	5	10
'84	Machinery, mechanical appliances, nuclear reactors, boilers; parts thereof	812094	-6	3	3
'30	Pharmaceutical products	470605	-15	6	1
'85	Electrical machinery and equipment and parts thereof; sound recorders and reproducers, television ...	354075	-8	2	2
'90	Optical, photographic, cinematographic, measuring, checking, precision, medical or surgical ...	308645	-6	4	1
'22	Beverages, spirits and vinegar	207434	-3	12	4
'49	Printed books, newspapers, pictures and other products of the printing industry; manuscripts, ...	191244	-7	25	2
'29	Organic chemicals	150415	31	7	1
'39	Plastics and articles thereof	120023	-6	2	5
'19	Preparations of cereals, flour, starch or milk; pastrycooks' products	90749	6	7	4
'33	Essential oils and resinoids; perfumery, cosmetic or toilet preparations	89348	-4	5	5
'73	Articles of iron or steel	82659	-9	2	5
'38	Miscellaneous chemical products	73322	-1	4	3
'94	Furniture; bedding, mattresses, mattress supports, cushions and similar stuffed furnishings; ...	58892	1	1	5

Bilateral trade between Australia and United Kingdom in 2017

		Australia's exports to United Kingdom			
		Value in 2017, USD thousand	Annual growth in value between 2013-2017, %, p.a.	Share in Australia's exports, %	Equivalent ad valorem tariff faced by Australia
TOTAL	All products	4554081	14	2	
'71	Natural or cultured pearls, precious or semi-precious stones, precious metals, metals clad ...	2630678	38	17	0
'78	Lead and articles thereof	360040	5	38	2
'22	Beverages, spirits and vinegar	282662	-7	12	4
'90	Optical, photographic, cinematographic, measuring, checking, precision, medical or surgical ...	217424	-7	7	1
'27	Mineral fuels, mineral oils and products of their distillation; bituminous substances; mineral ...	139619	-24	0	0
'85	Electrical machinery and equipment and parts thereof; sound recorders and reproducers, television ...	134300	5	4	2
'02	Meat and edible meat offal	130126	-11	1	25
'84	Machinery, mechanical appliances, nuclear reactors, boilers; parts thereof	102988	-7	2	1
'30	Pharmaceutical products	74240	-2	3	0
'88	Aircraft, spacecraft, and parts thereof	59965	3	4	1
'39	Plastics and articles thereof	48846	42	5	6
'33	Essential oils and resinoids; perfumery, cosmetic or toilet preparations	40866	8	5	2
'87	Vehicles other than railway or tramway rolling stock, and parts and accessories thereof	39121	-13	2	8

Bilateral trade between New Zealand and United Kingdom in 2017

		New Zealand's imports from United Kingdom			
		Value in 2017, USD thousand	Annual growth in value between 2013-2017, % p.a.	Share in New Zealand's imports, %	Equivalent ad valorem tariff applied by New Zealand
TOTAL	All products	1234073	3	3	
'87	Vehicles other than railway or tramway rolling stock, and parts and accessories thereof	389971	10	6	4
'84	Machinery, mechanical appliances, nuclear reactors, boilers; parts thereof	322137	10	6	2
'85	Electrical machinery and equipment and parts thereof; sound recorders and reproducers, television ...	55493	-4	2	2
'90	Optical, photographic, cinematographic, measuring, checking, precision, medical or surgical ...	42013	-3	3	1
'30	Pharmaceutical products	41541	-9	4	0
'49	Printed books, newspapers, pictures and other products of the printing industry; manuscripts, ...	37133	-9	16	0
'22	Beverages, spirits and vinegar	36022	1	9	2
'39	Plastics and articles thereof	33783	-6	2	2
'38	Miscellaneous chemical products	24437	-3	6	1
'33	Essential oils and resinoids; perfumery, cosmetic or toilet preparations	19384	-1	5	4
'73	Articles of iron or steel	19319	-2	2	4
'48	Paper and paperboard; articles of paper pulp, of paper or of paperboard	15894	7	2	0
'94	Furniture; bedding, mattresses, mattress supports, cushions and similar stuffed furnishings; ...	13334	0	2	5
'21	Miscellaneous edible preparations	12364	-2	2	3
'70	Glass and glassware	10371	30	4	2

Bilateral trade between New Zealand and United Kingdom in 2017

		New Zealand's exports to United Kingdom			
		Value in 2017, USD thousand	Annual growth in value between 2013-2017, % p.a.	Share in New Zealand's exports, %	Equivalent ad valorem tariff faced by New Zealand
TOTAL	All products	1028108	-4	3	
'02	Meat and edible meat offal	340093	-10	7	25
'22	Beverages, spirits and vinegar	275911	3	20	4
'08	Edible fruit and nuts; peel of citrus fruit or melons	66676	8	4	10
'04	Dairy produce; birds' eggs; natural honey; edible products of animal origin, not elsewhere ...	41944	-10	0	31
'84	Machinery, mechanical appliances, nuclear reactors, boilers; parts thereof	37819	-2	3	1
'51	Wool, fine or coarse animal hair; horsehair yarn and woven fabric	31093	-5	8	3
'90	Optical, photographic, cinematographic, measuring, checking, precision, medical or surgical ...	27809	-4	4	1
'85	Electrical machinery and equipment and parts thereof; sound recorders and reproducers, television ...	24299	-4	3	2
'39	Plastics and articles thereof	22705	7	6	6
'30	Pharmaceutical products	18964	8	6	0
'87	Vehicles other than railway or tramway rolling stock, and parts and accessories thereof	12375	11	7	8
'03	Fish and crustaceans, molluscs and other aquatic invertebrates	9889	-5	1	10
'76	Aluminium and articles thereof	8311	-32	1	5
'72	Iron and steel	7923	88	3	0
'89	Ships, boats and floating structures	7849	26	6	1

Bilateral trade between United Kingdom and Asia-Pacific Economic Cooperation (APEC)

Product code	Product label	United Kingdom's imports from Asia-Pacific Economic Cooperation (APEC)		
		Value in 2015	Value in 2016	Value in 2017
TOTAL	All products	185624376	193826726	195047251
'84	Machinery, mechanical appliances, nuclear reactors, boilers; parts thereof	31927378	32630907	34961803
'85	Electrical machinery and equipment and parts thereof; sound recorders and reproducers, television ...	26479208	25806625	27504376
'71	Natural or cultured pearls, precious or semi-precious stones, precious metals, metals clad ...	13896209	30570444	27475425
'88	Aircraft, spacecraft, and parts thereof	9694362	11251855	8954235
'27	Mineral fuels, mineral oils and products of their distillation; bituminous substances; mineral ...	8809531	6043840	8634895
'87	Vehicles other than railway or tramway rolling stock, and parts and accessories thereof	8183142	8266347	8384993
'90	Optical, photographic, cinematographic, measuring, checking, precision, medical or surgical ...	6676595	6493190	6353231
'94	Furniture; bedding, mattresses, mattress supports, cushions and similar stuffed furnishings; ...	5900051	5704563	5894334
'95	Toys, games and sports requisites; parts and accessories thereof	4938841	4619426	4629689
'39	Plastics and articles thereof	4353836	4133981	4394403
'62	Articles of apparel and clothing accessories, not knitted or crocheted	4605495	3929915	3562263
'61	Articles of apparel and clothing accessories, knitted or crocheted	4261283	3676850	3389954
'30	Pharmaceutical products	3530213	3257044	3017941
'73	Articles of iron or steel	3038861	2770236	2793234
'64	Footwear, gaiters and the like; parts of such articles	3545979	2985424	2771458
'44	Wood and articles of wood; wood charcoal	2703365	2630268	2627214
'29	Organic chemicals	2433133	1916905	2382929
'40	Rubber and articles thereof	1885600	1732763	1817709
'33	Essential oils and resinoids; perfumery, cosmetic or toilet preparations	1578919	1521440	1666174
'22	Beverages, spirits and vinegar	1634020	1444108	1568907

Bilateral trade between United Kingdom and Asia-Pacific Economic Cooperation (APEC)

Product code	Product label	United Kingdom's exports to Asia-Pacific Economic Cooperation (APEC)		
		Value in 2015	Value in 2016	Value in 2017
TOTAL	All products	154486194	132650372	138156860
'84	Machinery, mechanical appliances, nuclear reactors, boilers; parts thereof	25976577	23331442	24917762
'87	Vehicles other than railway or tramway rolling stock, and parts and accessories thereof	20886238	21300364	23054147
'30	Pharmaceutical products	16783052	13294480	12959096
'27	Mineral fuels, mineral oils and products of their distillation; bituminous substances; mineral ...	6676760	6642382	10370146
'85	Electrical machinery and equipment and parts thereof; sound recorders and reproducers, television ...	8819960	8074385	8483053
'90	Optical, photographic, cinematographic, measuring, checking, precision, medical or surgical ...	7568854	7045810	7562637
'71	Natural or cultured pearls, precious or semi-precious stones, precious metals, metals clad ...	17929493	7276956	6264504
'88	Aircraft, spacecraft, and parts thereof	4910454	6370345	5417822
'97	Works of art, collectors' pieces and antiques	6980218	5698011	4615311
'22	Beverages, spirits and vinegar	4358893	4253964	4270902
'29	Organic chemicals	7003435	3963357	3491513
'39	Plastics and articles thereof	2500523	2190904	2424167
'38	Miscellaneous chemical products	1784813	1706108	1838034
'94	Furniture; bedding, mattresses, mattress supports, cushions and similar stuffed furnishings; ...	1194057	1215550	1472715
'49	Printed books, newspapers, pictures and other products of the printing industry; manuscripts, ...	1361804	1281001	1370324
'73	Articles of iron or steel	1465574	1206030	1308107
'72	Iron and steel	1501959	936135	1255009
'33	Essential oils and resinoids; perfumery, cosmetic or toilet preparations	1091204	1125052	1186238
'74	Copper and articles thereof	615260	614171	748181
'62	Articles of apparel and clothing accessories, not knitted or crocheted	1035256	824409	745186

Appendix 4a: Exports of goods from Wales: Values £000s and Volumes (tonnes) (2016-17) Source: see Appendix 4b

SITC2 Code	2017		2016	
	Value (£000's)	Net mass (tonnes)	Value (£000's)	Net mass (tonnes)
00 - Live animals other than animals of division 03	39536	339	20507	499
01 - Meat & meat preparations	107642	40242	101629	39199
02 - Dairy products & birds' eggs	120484	37092	89069	41405
03 - Fish, crustaceans, molluscs & aq. inverts & preps thereof	31939	9569	27483	7279
04 - Cereals & cereal preparations	67342	25188	56121	20527
05 - Vegetables & fruit	7843	3919	7262	3911
06 - Sugar, sugar preparations & honey	8456	8165	8606	10819
07 - Coffee, tea, cocoa, spices & manufactures thereof	12523	2291	9311	1832
08 - Feeding stuff for animals (not inc. unmilled cereals)	28011	20737	20736	20183
09 - Miscellaneous edible products & preparations	73454	16288	61213	17029
total	497230	163830	401937	162683
11 - Beverages	29234	36515	31902	39059
12 - Tobacco & tobacco manufactures	163	17	28	0
total	29397	36532	31930	39059
21 - Hides, skins & furskins, raw	6920	6006	7869	8184
22 - Oil seeds & oleaginous fruits	38	15	57	29
23 - Crude rubber (including synthetic & reclaimed)	1440	629	4362	2700
24 - Cork & wood	1606	9975	1129	13391
25 - Pulp & waste paper	6659	37379	2174	11525
26 - Textile fibres not manufactured & their waste etc	5434	4757	3437	3017
27 - Crude fertilizers & crude minerals (exc fuels etc)	4163	130210	3606	121950
28 - Metalliferous ores & metal scrap	187223	345136	153381	296236
29 - Crude animal & vegetable materials n.e.s.	5399	2896	6527	2408
total	218882	537003	182542	459440
32 - Coal, coke & briquettes	7499	73951	9810	106963
33 - Petroleum, petroleum products & related materials	1556044	3920475	1279474	4112620
34 - Gas, natural & manufactured	23493	73880	21450	99130
35 - Electric current	26428	0	19595	0
total	1613464	4068306	1330329	4318713
41 - Animal oils & fats	1160	461	750	563
42 - Fixed vegetable fats & oils, crude, refined, fractionated	1031	546	916	579
43 - Animal or vegetable fats & oils, processed, & waxes	280	177	373	452
total	2471	1184	2039	1594
51 - Organic chemicals	247556	237393	248819	264567
52 - Inorganic chemicals	34667	20834	32664	14695
53 - Dyeing, tanning & colouring materials	87906	20503	69118	20096
54 - Medicinal & pharmaceutical products	733251	4786	589648	3462
55 - Essential oils & perfume materials; toilet preps etc	161653	39351	141368	38218
56 - Fertilizers (other than those of group 272)	7266	6047	3783	3435
57 - Plastics in primary forms	223086	102608	219195	110219
58 - Plastics in non-primary forms	176668	28847	153098	25870
59 - Chemical materials & products n.e.s.	264007	50988	239636	63512
total	1936060	511357	1697329	544074
61 - Leather, leather manufactures n.e.s & dressed furskins	1433	155	683	52
62 - Rubber manufactures n.e.s.	141330	50706	124798	47671
63 - Cork & wood manufactures (excluding furniture)	10344	14266	8802	14164
64 - Paper, paperboard & manufactures thereof	128519	68600	132678	74060
65 - Textile yarn, fabrics, made up articles etc	50538	8517	38811	6123
66 - Non-metallic mineral manufactures n.e.s.	153868	100378	129261	85654
67 - Iron & steel	852925	1291932	707499	1429857
68 - Non-ferrous metals	360259	89410	308291	81473
69 - Manufactures of metal n.e.s.	341266	74308	320924	79644
total	2040482	1698272	1771747	1818698
71 - Power generating machinery & equipment	2051063	37675	1825668	42534
72 - Machinery specialized for particular industries	314071	22244	314885	22641
73 - Metalworking machinery	40171	1415	36540	1285
74 - General industrial machinery & eqp. & machine pt. n.e.s.	277424	24483	247757	23766
75 - Office machines & adp machines	173856	2344	177920	2246
76 - Telecomms & sound recording & reproducing app. & eqp.	131755	1563	105856	1617
77 - Ele machinery, app & appliances & ele pt thereof n.e.s.	785770	58647	705521	62389
78 - Road vehicles (including air cushion vehicles)	571957	110626	497006	110502
79 - Other transport equipment	4397957	12738	4012364	14645
total	8744024	271735	7923517	281625
81 - P/fab buildings; sanit., plumbing, heating & lighting fixt.	31137	15623	28119	14924
82 - Furniture & parts thereof; bedding, mattresses etc	222370	14121	194167	13600
83 - Travel goods, handbags & similar containers	15578	727	10861	625
84 - Articles of apparel & clothing accessories	117954	8781	104347	6933
85 - Footwear	29926	1249	25653	1052
87 - Professional, scientific & controlling ins & app n.e.s.	392523	3682	377197	3661
88 - Photographic & optical goods, n.e.s.; watches & clocks	64595	297	48969	299
89 - Miscellaneous manufactured articles n.e.s.	438957	74111	411764	63791
total	1313040	118591	1201077	104885
93 - Special transactions and commodities not classified according to kind	70020	107599	60615	115231
96 - Coin (other than gold coin), not being of legal tender	7129	175	5076	13
98 - Military arms and ammunition	6498	41	21162	75
total	83647	107815	86853	115319
grand total	16478697	7514625	14629300	7846090

Appendix 4b: Imports of goods to Wales, 2015-17, £m

The Table below shows imports to Wales by 1 digit SITC code between 2015 and 2017. The table also shows the source of imports in terms of EU or Non-EU countries.

More detailed information on imports to Wales (for example by 2 digit SITC code, and by volume (in net mass (tonnes)) is available from HMRC Regional Trade Statistics.

Imports to Wales by SITC section and % EU/Non-EU, 2015-2017, £m

SITC Section	2015	2016	2017
0 Food and Live Animals	584.18	602.09	621.43
1 Beverages and Tobacco	91.69	121.09	120.46
2 Crude Materials	754.28	792.56	894.90
3 Mineral Fuels	2,668.10	2,015.70	3,534.30
4 Animal and Vegetable Oils	13.85	15.85	16.91
5 Chemicals	1,366.95	1,449.88	1,697.30
6 Manufactured Goods	1,698.85	1,783.65	2,106.92
7 Machinery and Transport	5,762.35	6,584.12	6,867.96
8 Miscellaneous Manufactures	1,352.09	1,540.56	1,711.61
9 Other commodities nes	13.85	31.02	40.82
Total Imports	14,306.19	14,936.50	17,612.61
<i>% From EU</i>			
0 Food and Live Animals	84	85	85
1 Beverages and Tobacco	71	70	64
2 Crude Materials	36	45	43
3 Mineral Fuels	8	11	10
4 Animal and Vegetable Oils	83	78	82
5 Chemicals	64	67	64
6 Manufactured Goods	57	60	62
7 Machinery and Transport	47	46	43
8 Miscellaneous Manufactures	30	33	37
9 Other commodities nes	81	84	93
Total EU Imports %	42	45	42
<i>% From non-EU</i>			
0 Food and Live Animals	16	15	15
1 Beverages and Tobacco	29	30	36
2 Crude Materials	64	55	57
3 Mineral Fuels	92	89	90
4 Animal and Vegetable Oils	17	22	18
5 Chemicals	36	33	36
6 Manufactured Goods	43	40	38
7 Machinery and Transport	53	54	57
8 Miscellaneous Manufactures	70	67	63
9 Other commodities nes	19	16	7
Total non-EU Imports %	58	55	58

Source: HMRC, RTS.

Appendix 5: Emissions of greenhouse gases by territorial industry, Wales 2007

Input-Output Sector	kT CO2e 2007	Output 2007 (£m)	kT CO2e/£m
Agriculture & fish	5995.5	1307.3	4.6
Forestry	-1335.3	97.8	-13.6
Coal & other primary extraction	440.5	94.6	4.7
Other mining & quarrying	40.8	235.6	0.2
Meat	58.9	961.2	0.1
Dairy	31.4	513.5	0.1
Fish products, vegetables, grain mill products	19.4	265.2	0.1
Bread & biscuits	35.0	449.0	0.1
Miscellaneous Foods	25.6	366.0	0.1
Confectionery	3.1	52.1	0.1
Drinks and Tobacco	30.5	432.8	0.1
Textiles	21.0	221.7	0.1
Clothing	2.0	52.5	0.0
Wood Products	31.9	492.1	0.1
Paper and Pulps	41.3	877.2	0.0
Publishing	28.2	551.9	0.1
Oil Processing	3733.9	5135.1	0.7
Chemicals	143.8	2077.7	0.1
Pharmaceutical	13.6	245.4	0.1
Soaps	163.9	457.7	0.4
Rubber products	6.5	71.3	0.1
Plastics	76.8	1134.5	0.1
Glass and Ceramics	24.4	212.9	0.1
Cement/plaster	1298.6	450.6	2.9
Iron and Steel	7761.0	3811.0	2.0
Aluminium & non-ferrous metals	260.7	690.4	0.4
Forging/pressing	77.0	1308.3	0.1
Structural metals	63.1	739.8	0.1
Machinery	62.9	1093.2	0.1
Domestic appliances	15.2	319.1	0.0
Office machinery	1.3	54.9	0.0
Electrical motors and transformers	19.5	405.9	0.0
Wires and Cables	8.8	159.9	0.1
Industrial electrical equipment	21.7	484.0	0.0
Electronic Components	59.6	457.1	0.1
TVs	7.4	295.7	0.0
Control equipment	106.0	582.9	0.2
Motor Vehicles	68.7	2454.8	0.0
Other Vehicles	81.9	2262.3	0.0
Furniture	27.2	921.0	0.0
Other manufacturing	34.6	523.8	0.1
Electricity - Coal	4785.0	414.6	11.5
Electricity - Gas	6596.2	493.5	13.4

Electricity - Nuclear	4.1	369.6	0.0
Electricity - Hydro	8.9	194.9	0.0
Electricity - Other Renewables	4.3	35.3	0.1
Electricity - Transmission, Distribution & Supply	13.3	1608.6	0.0
Gas	289.4	901.3	0.3
Water	31.1	697.8	0.0
Construction	1941.1	5099.2	0.4
Distribution and Repairs	167.2	1471.0	0.1
Wholesale	144.0	2607.1	0.1
Retail	208.7	4503.2	0.0
Large Hotels	25.6	600.2	0.0
Small Hotels	11.6	261.0	0.0
B&B and Guest House	3.9	102.1	0.0
Self-catering	10.0	148.3	0.1
Other Accommodation	6.4	119.6	0.1
Restaurants etc.	60.2	1393.9	0.0
Railways	428.1	324.7	1.3
Road transport	964.1	1153.8	0.8
Sea and Air transport	518.8	213.2	2.4
Transport services	213.8	1858.9	0.1
Travel Agents	8.7	103.9	0.1
Postal services	23.5	453.5	0.1
Telecommunications	31.2	1084.0	0.0
Banking and Finance	39.5	2644.0	0.0
Insurance	22.2	445.4	0.0
Other Financial services	19.0	810.3	0.0
Real estate	21.5	1704.9	0.0
Ownership & Rental of Dwellings	45.0	5643.5	0.0
Renting of movables	152.1	426.1	0.4
Legal services	21.8	811.4	0.0
Accountancy services	9.0	408.9	0.0
Computer and related activities	12.9	582.5	0.0
R&D	2.5	82.6	0.0
Market research, advertising	14.5	731.3	0.0
Other business services	29.8	1389.6	0.0
Other professional Services	50.3	771.0	0.1
Public Admin	618.3	6346.8	0.1
Education	201.2	3652.1	0.1
Health and social work	308.2	8162.2	0.0
Museums & Galleries	1.8	84.5	0.0
Attractions, Gardens & other entertainment nec.	1.2	93.3	0.0
Theme parks and stadia	2.2	96.4	0.0
Other Recreation, media & film	51.5	1120.9	0.0
Sanitary Services	1391.9	1262.9	1.1
Other Services	52.0	699.4	0.1

Appendix 6: Global trade areas/agreements

The North American Free Trade Agreement (NAFTA) was signed by Canada, Mexico, and the United States. It came into being in 1994.

The Asia-Pacific Trade Agreement (APTA) is the oldest trade agreement between countries in the Asia-Pacific region. The seven party states are: Bangladesh, China, India, Lao PDR, Mongolia, Republic of Korea, and Sri Lanka.

The Association of Southeast Asian Nations (ASEAN) comprises ten Southeast Asian states that promotes intergovernmental cooperation and facilitates economic, political, security, military, educational, and sociocultural integration amongst its members and other Asian states. The 10 members are Brunei, Cambodia, Indonesia, Laos, Malaysia, Myanmar, Philippines, Singapore, Thailand, and Vietnam; Papua New Guinea is an observer.

The Gulf Cooperation Council (GCC) is a political and economic alliance of six countries in the Arabian Peninsula: Bahrain, Kuwait, Oman, Qatar, Saudi Arabia and the United Arab Emirates.

Total goods trade major world trading blocs 2017 \$m

	Total imports US\$m2017	Total exports US\$m 2017
APTA	2,842,453	3,189,734
ASEAN	1,289,765	1,369,787
GCC	489,848	685,937
NAFTA	3,261,250	2,736,356
EU28	5,640,801	5,718,659

Appendix 7 Trading Bloc Shares in Global Exports 2017

The table below shows the percentage share of 2017 global exports by each state and or trading block of states. The states marked in yellow are the Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP) states. The row in yellow represents the total global exports percentage accounted for by the USA and the CPTPP states. All data here are from the ITC Trademap database. Note the blue cells reveal whether the state in question has a trade surplus in the commodity in question, while the brown shading reveals that the state had a trade deficit in 2017.

State/Trading Block Shares in Global Exports Value in 2017

	Meat (02)	Fish etc (03)	Dairy (04)	Prc.meat etc (16)	Cereal etc (19)	Beverages (22)	Inorg chem (28)	Org chem (29)	Pharm (30)	Plastics (39)	Iron/steel (72)	Metal prods (73)	Mech eng (84)	Elec eng (85)	Transport (87)	Other trans (88)	Optical etc (90)	Furniture etc (94)
States with whom the UK is seeking Priority Trade Deals (see Section 6.4 of the report)																		
USA	13.2	4.5	5.2	4.4	5.7	7.2	11.2	9.6	8.5	10.4	4.3	6.5	9.8	6.9	9.0	4.9	14.4	4.5
Australia	7.3	0.9	2.1	0.3	1.4	2.1	5.6	0.1	0.5	0.2	0.3	na	0.2	na	0.1	0.7	0.5	0.1
NZ	2.8	1.0	11.8	0.5	1.5	1.2	0.0	0.0	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.1	0.1	0.0
Canada	4.0	4.0	0.5	1.9	4.7	0.8	3.1	0.9	1.2	2.1	1.8	1.8	1.6	0.5	4.3	4.8	1.2	2.4
Japan	0.2	1.2	0.0	1.2	0.8	0.6	4.2	4.7	0.9	4.2	7.5	3.5	6.7	4.2	10.1	2.0	6.9	0.5
Chile	0.7	4.4	0.2	0.8	0.3	1.8	1.6	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0
Malaysia	0.0	0.0	0.5	0.6	1.9	0.7	0.8	1.0	0.0	1.3	0.6	0.7	1.1	2.7	0.1	0.9	1.4	1.1
Mexico	1.4	0.9	0.4	0.5	2.8	4.9	0.9	0.5	0.3	1.5	0.7	2.1	3.2	3.2	7.0	0.3	3.0	4.4
Peru	0.0	0.7	0.1	0.5	0.2	0.1	0.3	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Singapore	0.1	0.2	0.4	0.2	2.1	2.3	0.4	4.1	1.1	2.5	0.4	0.7	2.5	4.9	0.2	3.2	3.0	0.1
Vietnam	0.1	5.1	0.1	4.4	0.9	0.2	0.8	0.1	0.0	0.5	0.9	0.8	0.5	3.0	0.2	0.2	1.3	2.7
All USA/CPTPP	29.8	22.9	21.3	15.3	22.3	21.9	28.9	21.0	12.6	23.0	16.7	16.3	25.7	25.4	31.1	17.1	31.8	15.8
Major states and trading blocks of interest (see Section 6 of the report)																		
China	0.7	11.1	0.7	18.6	2.3	1.9	13.6	13.1	1.4	11.8	11.6	20.1	18.5	23.7	4.6	1.8	12.2	37.1
India	3.5	5.6	0.4	0.8	0.7	0.3	1.5	3.6	2.4	1.0	3.1	2.4	0.8	0.3	1.1	1.1	0.5	0.6
EU-28	43.0	21.8	63.2	35.3	57.7	61.5	27.1	37.3	65.3	40.0	37.9	42.0	38.7	20.5	49.4	67.8	37.0	38.0
GCC	0.2	0.4	2.4	0.7	1.3	0.6	1.6	3.7	0.3	4.3	0.9	1.3	0.9	1.0	1.0	1.9	0.4	0.5
Andean	0.1	3.5	0.2	2.9	0.4	0.1	0.4	0.0	0.1	0.3	0.2	0.1	0.0	0.0	0.0	0.1	0.0	0.1
States with whom the UK is seeking to transition EU trade agreements but which are of interest for Welsh trade (see Section 6.5 of the report)																		
South Korea	0.0	1.2	0.1	0.5	1.3	0.7	4.0	6.0	0.5	5.3	6.0	4.6	3.4	6.5	4.3	1.2	5.0	0.7
Turkey	0.4	0.7	0.8	0.2	2.3	0.3	1.2	0.2	0.2	0.9	2.2	2.0	0.7	0.3	1.7	0.7	0.1	1.2
Norway	0.0	9.2	0.1	0.0	0.1	0.1	0.6	0.3	0.1	0.1	0.3	0.3	0.2	0.1	0.1	0.3	0.2	0.2
Switzerland	0.1	0.0	0.8	0.0	1.1	1.7	0.5	5.2	13.3	0.9	0.3	1.1	1.1	0.5	0.2	0.9	2.8	0.3
Canada	4.0	4.0	0.5	1.9	4.7	0.8	3.1	0.9	1.2	2.1	1.8	1.8	1.6	0.5	4.3	4.8	1.2	2.4
Japan	0.2	1.2	0.0	1.2	0.8	0.6	4.2	4.7	0.9	4.2	7.5	3.5	6.7	4.2	10.1	2.0	6.9	0.5