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Improving the Quality of Regional Economic Indicators in the UK: A Framework for Interregional Trade Data Collection and Estimation

Mairi Spowage and Sharada Nia Davidson

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Abstract

The UK's departure from the EU as well as increased devolution have heightened the policy requirement for data on interregional trade. This paper develops a framework for interregional trade data collection and estimation in the UK by: (i) reviewing the academic literature and current international practise, (ii) contrasting the trade surveys currently deployed by the four nations of the UK, (iii) undertaking a series of webinars and interviews to explore businesses' perceptions of trade surveys and (iv) illustrating how interregional trade statistics consistent with the national accounts can be constructed. We provide a number of recommendations for collecting interregional trade data including the introduction of a new survey or survey questions to capture trade flows between England and the remaining three nations of the UK.

Keywords: Interregional Trade Flows, Trade Surveys, Regional Supply and Use Tables, Origin Destination Data

JEL classification: C83, F15, F17, R12

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ESCOE ECONOMIC STATISTICS CENTRE OF EXCELLENCE

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Executive Summary

Devolution of new powers and Brexit have heightened the policy requirement for data on interregional trade, the internal movement of goods and services. However, the production of UK interregional trade estimates at the sectoral level by Greig, Spowage and Roy (2020) raises several issues about the collection of trade data at the national and subnational level. Across Northern Ireland, Wales, Scotland and England there are significant differences in the approach to trade data collection. These methodological differences have important repercussions when producing interregional trade estimates.

This report outlines a strategic approach to interregional trade data collection and estimation within the UK. We begin by critically reviewing the academic literature which seeks to develop and compare different methods for estimating interregional trade flows. To gain a policy perspective, we then consider current international practise, summarising the approaches adopted by foreign national statistical agencies and institutions to estimate interregional trade flows.

Focussing in on the UK, we next consider the UK data landscape and contrast the mandatory trade surveys deployed in Northern Ireland and the UK with voluntary surveys deployed in Scotland and Wales. We contrast the surveys' remit, design and methodology. We also discuss businesses' perceptions of trade surveys obtained from the Fraser of Allander Institute's Scottish Business Monitor and interactive webinars undertaken with businesses in the West Midlands and Cardiff. Additional sources of trade data are also discussed.

We also produce updated estimates of interregional trade in 2015 and review our method for interregional trade estimation.

Most importantly, we discuss our recommendations for collecting interregional trade data, providing a strategic UK-wide approach. To summarise, our recommendations involve: introducing an English trade survey, a survey of all GB reporting units, or additional questions to the ABS to capture trade flows between England and the remaining 3 nations; conducting streamlined trade surveys across the 4 nations annually with an in-depth trade collection exercise taking place every 5 years bringing the UK in line with best international practise; having consistent treatment of oil and gas extracted from the UK Continental Shelf; focussing

on gaining information on industry flows and firms' sales rather than commodity flows and firms' purchases; and the four nations adopting a consistent approach to sample size and stratification. Our recommendations also point towards leveraging additional data sources where possible and suggest that data collection exercises relating to transport data, wholesalers, and firms' service purchases may prove beneficial. We also discuss issues relating to reporting units and set out more detailed recommendations relating to this issue in Davidson, Black, Connelly and Spowage (2021) which discusses a framework for the production of supply and use tables for the four nations.

Contents

1. Introduction

There is growing policy interest in understanding linkages between different parts of the UK economy. Such linkages can occur not only between industries but also between regions. Devolution of new powers, Brexit and latterly coronavirus have heightened the policy requirement for interregional data which can help us understand differences and interdependencies between the four UK nations: Northern Ireland, Wales, Scotland and England.

The production of UK interregional trade estimates at the sectoral level by Greig, Spowage and Roy (2020) raises several issues about the collection of trade data at the national and subnational level in the UK. Across Northern Ireland, Wales, Scotland and England there are significant differences in terms of the methodological approach and data used. This, in turn, influences the interregional trade estimates which can be obtained and are needed to produce interregional Supply and Use Tables for the four nations.

In Section 2 of this report, we outline a strategic approach to interregional trade data collection and estimation within the UK, with different approaches for different sectors. In Section 2.1., we begin by critically reviewing the different methods which can be used to estimate interregional trade flows. We also review current international practise, summarising the approaches adopted by national statistical agencies and institutions in other countries. In Section 2.2., we restrict our focus to the UK, discussing the UK data landscape and contrasting the trade surveys deployed in Northern Ireland, Wales, Scotland and England. We also discuss businesses' perceptions of trade surveys obtained from the Fraser of Allander Institute's Scottish Business Monitor and interactive webinars undertaken with businesses in the West Midlands and Cardiff. In Section 2.3., we then outline our recommendations for formulating a strategic UK-wide approach. We first discuss our recommendations regarding data collection conducted via surveys. We then provide our recommendations on how trade estimates can be obtained for each sector.

In Section 3 of this report, we then provide updated interregional trade estimates for 2015 breaking our approach down into four steps. We conclude in Section 4, summarising our recommendations for interregional trade data collection.

2. Developing A Framework for Collecting Interregional Trade Data

2.1. Methods for Estimating Interregional Trade Flows

By pioneering new methods and comparing the accuracy of existing methods, academic studies allow us to gain an understanding of when it is appropriate to use a given method to estimate interregional trade flows as well as the advantages and disadvantages of each approach. They do not, however, address some of the practical and conceptual challenges policymakers face when collecting and estimating interregional trade.

In this section, we therefore begin by critically reviewing the academic literature which seeks to develop and compare different methods for estimating interregional trade flows. We do not present detailed mathematical formulae, but key equations are presented to emphasise which data sources are required. To gain a policy perspective, we then consider current international practise, summarising the approaches adopted by foreign national statistical agencies and institutions to estimate interregional trade flows. Throughout, we use the term interregional trade flows to refer to flows which take place between entities which are not legally independent. In the UK, these comprise nations and regions. Elsewhere, these can also include provinces and states.

2.1.1. A Review of the Academic Literature

The academic literature identifies three broad approaches to interregional trade estimation: (i) survey methods, (ii) non-survey methods and (iii) hybrid methods which use a combination of survey and non-survey methods. These are summarised in **Table 1**.

The survey-based approach involves collecting data on interregional trade flows via trade surveys of firms. Data can either be collected on firms' sales (i.e. regional exports) or firms' purchases (i.e. regional imports) or both. The survey-based approach is widely considered to be the most accurate, precise and reliable. However, the quality of survey data depends on the survey's design and implementation. Implementing a detailed, high-quality survey can be expensive as well as resource and time intensive. We will discuss how these difficulties have been managed by other countries and the different UK nations in subsequent sections.

Interregional trade flows can also be estimated using non-survey methods. One of the most data-driven non-survey methods uses transport statistics. Specifically, origin and destination

data obtained from surveys of firms' freight movements are used to regionalise trade flows. However, there are a number of drawbacks including: the inability to estimate trade where there is no physical movements of goods (e.g. trade in services), flows are expressed in physical units which need to be mapped to monetary values and the existence of transhipment hubs means that it is often not possible to distinguish between the intermediate and final destination of goods (Sargento et al., 2012).

A second non-survey approach which emphasises geographical factors is the gravity flow approach. A sector-specific gravity approach can be formulated as follows where interregional trade flows depend negatively on the distance between two regions and positively on the economic size of each region:

$$y_i^{rs} = \frac{(c^r)^{\beta_1}(c^s)^{\beta_2}}{(d^{rs})^{\beta_3}} e^{\beta_3} \quad (1)$$

where y_i^{rs} are trade flow of industry i from region r to s, c^r is the economic size of region r , c^s is the economic size of region s, d^{rs} is the distance between the two regions and e is a constant of proportionality. Economic size can be proxied using, for example, data on regional GVA, population density or area. Distance is typically proxied using the distance between capital cities in each region. The sector-specific sensitivity parameters β_1, β_2, β_3 are estimated outwith the model. Consequently, using the formula above (or a reparameterisation), interregional trade flows can be estimated. Another approach is to log-linearise (1) to obtain the following:

$$\ln(y_i^{rs}) = \beta_1 \ln(c^r) + \beta_2 \ln(c^s) - \beta_3 \ln(d^{rs}) + c \quad (2)$$

If some data on interregional trade flows, y_i^{rs}, are available, this means that a multiple regression model can be fitted. This was undertaken in Finland and will be discussed in the subsequent subsection.

Table 1: A Review of Existing Methods for Estimating Interregional Trade

	Hybrid Methods			
	Survey Methods	Non-Survey Methods		
	Trade Survey	Transport Statistics	Indirect Estimation	
			Sectoral Gravity Methods	Mathematical Optimisation
Description of Methods	Primary data collection through surveys of businesses' sales and purchases.	Primary data collection through surveys of freights' origin and destination of goods.	Estimate trade flows between two regions on the basis that they depend positively on the population concentration and negatively on distance factors. Matrix balancing methods (e.g. RAS) then used to produce a new matrix close as possible to the initial matrix, which satisfies national accounting identities.	Estimate interregional trade flows subject to a series of mathematical constraints which enforce national accounting identities and consistency across data sources.
Advantages and Disadvantages	Considered accurate but can be expensive and resource and time intensive. Mistakes in the sampling approach can lead to inaccuracies.	Cannot estimate trade in services, expressed in physical units not in terms of value, overestimates flows in regions with key transport hubs, does not distinguish between the intermediate and final destination of goods.	Theoretically simple, easy to implement approach which requires some additional data. Should be used when distance and adjacency of regions is believed to influence interregional trade flows.	Moderate data requirements but resulting matrix does not need to be balanced. Should be used when distance and adjacency of regions is believed to not influence interregional trade flows.

Summarised from: Round (1983), Lahr (1993), Harris and Liu (1998), Bonfiglio and Chelli (2007), Riddington et al. (2007), Sargento et al. (2012), Szabo (2015), Boero et al. (2018), Mi et al. (2018), Fournier Gabela (2020)

Notably, the gravity model approach can result in unbalanced matrices which do not conform with national accounting identities. To satisfy these constraints, matrix balancing methods such as RAS can be used. Such methods ensure that the new matrix generated is as close as possible to the original matrix.

A final key non-survey method used to estimate interregional trade flows is mathematical optimisation. This can use a range of data sources such as regional production and consumption data, national SUTs and transport statistics. Interregional trade flows can then be estimated subject to a series of mathematical constraints which enforce national accounting identities and consistency across data sources.

Where the non-survey methods described above are combined with survey data, a hybrid approach is adopted. Across the literature, it tends to be widely agreed that hybrid approaches outperform non-survey methods.

2.1.2. A Review of Current International Practise

We can now consider how the methods described in the previous section have been implemented in practise by national statistical agencies and institutions worldwide. A summary is provided in **Table 2**.

As far as we are aware, Japan and Korea are the only countries which produce survey-based interregional trade estimates on a regular basis. This is undertaken as part of their programme to produce interregional IO tables every 5 years. Presumably, the exercise is only undertaken every 5 years to reduce the cost and resource burden. The Bank of Korea does not make its methodology publicly available in English. However, there is extensive documentation on the production of the Japanese interregional IO tables (see METI, 2010 for details of how the 2005 tables are constructed). Importantly, a range of different surveys are required depending on the sector under consideration as described in **Table 2**. We also note that to capture trade in services, an even wider range of data sources are required.

Finland also produced survey-based interregional trade estimates for 1996 as part of a one-off exercise undertaken in 1997. The survey design and method are discussed extensively in Kaupilla (1999) but we summarise five important points here. First, firm feedback on the survey uncovered that firms have more knowledge of the regional distribution of their sales

(rather than purchases) and find it easier to describe the regional distribution of their total sales (rather than sales by commodity). Second, the questionnaire was sent to 55 industries out of 75 included in the regional IO table. For sectors not included in the questionnaire different approaches were taken. For trade in goods, such as forestry, data was obtained from other sources. For trade in services, in some cases these could be assumed to serve the local population. In other cases, firms were also asked about the regional distribution of their costs of purchasing main services. Third, firms were not asked to break down sales to every region. Instead, they provided their sales breakdown to: their own region; the largest Finnish region, Uusimaa; three additional regions considered important to the firm; and the rest of Finland. Trade flows to the rest of Finland were then regionalised using data on freight transport. Fourth, to gain a deeper understanding of the supply chain, a survey was also sent to a sample of wholesalers with additional questions on the main commodities sold by firms and the cost of purchasing these products in each region. This allowed the firm survey and wholesaler survey to be linked and information to be gained on regional trade margins. Fifth, in terms of survey implementation, it was found that five weeks was the optimal time in which to chase up survey responses. Non-responses to certain questions were replaced with the responses of similar units in the sample via hot deck imputation.

Turning to a hybrid approach, in Canada interprovincial SUTs and IO tables have been produced since 1997. While survey data is used to build a picture of interregional trade patterns, adjustments are then made where necessary. Unlike most other countries, Canada focusses on commodity rather than industry trade flows. The approach is well documented in Genereux and Langen (2002). Here, we summarise how Canadian survey data is augmented with data from other sources. Primary goods are covered by a variety of surveys and administrative records. The energy sector can be difficult to monitor but in the Canadian case estimates are based on provincial government data combining surveys of oil and gas pipelines, gas distributors and refineries. Importantly, this data unsuitable for deriving trade flows in oil so the flows are adjusted based on existing knowledge.

Canadian manufactured goods are covered by the Annual Survey of Manufacturers but the first destination of a good may not coincide with the final destination. This issue was alleviated using the Wholesale Trade Commodity Survey by Origin and Destination which provided data on where wholesalers purchases originate from and where their sales are

destined. While this survey is being discontinued due to its complexity, we note that Canada considers commodity rather than industry flows which may have contributed to the survey's complexity. In terms of other goods, construction and utilities tend to be consumed in the province in which they are produced. However, materials and services can move between provinces. Electricity is the only utility where trade flows are measured using published disposition tables.

As in the Finnish case, there were several instances in which it was assumed that Canadian services were consumed in the region of production. Additionally, as in the Japanese case, origin/destination data from carriers, one-off surveys on the destination of sales and the Canadian Travel Survey were used. For different types of financial services, another sector which can be difficult to analyse, a range of strategies were used. For example, depending on the service considered, domestic demand or total interregional trade flows were used as an indicator of trade patterns.

Turning to approaches which do not focus on trade surveys, both Finland and the US have constructed interregional trade estimates using transport statistics. In the US, official estimates are not produced but information obtained from the commodity flow survey (CFS) of shippers is regularly used by academics to proxy interstate trade. The data covers: the type of commodities, origin and destination, type of transport and weight. Importantly, the CFS also includes data on the value of commodities transported, an easier variable to work with than weight when deriving interregional trade flows.

Turning to the Finish case, Louhela (2006) compare the 1996 survey-based interregional trade flows discussed above with interregional flows derived using freight-and gravity-based approaches. They also produce interregional trade estimates for 2002 using the two newly introduced approaches. To produce interregional trade estimates based on freight flows, industrial output statistics (firm, product, value of good, region) are combined with data on freight flows. In comparison, for the gravity approach, they use an extended version of the specification described in equation (2). The 1996 survey data is used to fit the model together with explanatory variables on distance factors, concentration factors, productivity factors and labour market factors.

Louhela (2006) find that if the 1996 interregional trade flows are ordered from largest to smallest, the same ordering is obtained regardless of whether a survey, freight or gravity-based approach is used. If we compare the magnitude of each interregional trade flow, the gravity approach produced flows which differed most substantially from those obtained using the other two methods. In terms of the freight-based approach, the main disadvantages were: (i) trade in services could not be considered and (ii) interregional trade between small and distant regions was underestimated. Remaining differences between the survey and freight-based approaches were attributed to the fact that the value of trade flows from industrial output statistics was EUR 54.2 billion while total value of sales from the survey was more at EUR 60.5 billion. Given that trade in services could not be considered using the freight-based approach, Louhela (2006) suggests distinguishing between Helsinki-based service providers (e.g. consultancies), interregional service providers and local service providers (e.g. hair and beauty). They also suggest that further research should assess how to integrate flows so that multiple flows do not incorrectly result from the same good passing through a transhipment hub or changing mode of transport.

We now turn to cases where interregional flows are not measured using surveys. In Belgium, a non-survey approach is adopted where VAT data and international trade data at the firm level is used. Since data is not available at the local unit level, if firms have units in more than one region, flows are regionalised according to the employment share in each region.

Research undertaken by Thissen et al. (2013, 2014, 2019) at PBL Netherlands is an example of interregional trade flows produced using mathematical optimisation. National SUTs for European countries are regionalised using regional production and consumption data. Interregional trade flows are then estimated subject to a series of mathematical constraints which enforce national accounting identities and consistency across data sources including freight data. This allows for consistent estimation of interregional trade across the Nomenclature of Units for Territorial Statistics (NUTs) 2 regions across Europe. Importantly, however, such an approach sacrifices using detailed country-specific data sources in favour of granularity and consistency.

Table 2: A Review of Country-Specific Approaches for Estimating Interregional Trade

	Survey			Non-Survey or Hybrid				
	Japan	**South Korea**	**Finland**	**Finland**	**US**	**Belgium**	**Europe**	**Canada**
Led By	Research & Statistics, Ministry of Economy, Trade & Industry	Bank of Korea	Statistics Finland	Statistics Finland	US Census Bureau	Federal Planning Bureau	PBL Netherlands	Statistics Canada
Interregional Products	IO Table	IO Table	SUT	SUT	Trade	SUT and IO Tables	SUT	SUT and IO Tables
Frequency	Every 5 years since 1960	Every 5 years since 2003	1996	1996, 2002	Every 5 years since 1997	2003, 2007, 2010	2000, 2010, 2013	Annually since 1997
Goods: Surveys & Methods Used	Agriculture, forestry and fishery: meat distribution statistics, milk and dairy product statistics. Industrial production: commodity distribution surveys, regional freight movement surveys.	Not publicly available in English	One survey issued to firms and one survey issued to wholesalers	Goods only: freight flow approach using data on goods transport. Gravity model using data on distance, concentration, productivity, and labour market factors.	Commodity flow survey, covering mining, manufacturing, wholesale trade and select retail and services. Considers establishments not firms.	Firm-level VAT and international trade data was used in a bottom-up approach. For firms with local units in more than one region, values were regionalised by regional employment share.	Regional production and consumption data used to regionalise national SUTS. Interregional trade flows are constructed using freight data and mathematical optimisation.	Merchandise Trade of Canada statistics, Annual Survey of Manufacturers, Wholesale Trade Commodity Survey. Trade patterns are then reconciled so they are consistent with regional supply and demand statistics.
Services: Surveys & Methods Used	Interregional traveller fares, inter-prefectural air passengers carried, and headquarters/sales office expenses.	Not publicly available in English						Survey of Services Industries, Canadian Travel Survey. Trade patterns are then reconciled so they are consistent with regional supply and demand statistics.
Regions	9	17	20, NUTs 3	21, NUTs 3	50	3	268, NUTs 2	13
Disaggregation	53 sectors	33 sectors	55 industries	Aggregate only	Unknown	140 industries	Unknown	725 commodities

Summarised from: METI (2010), Louhela (2006), Kaupilla (1999), Piispala (2000), Louhela and Koutaniemi (2006), Van den Cruyce (2019), Généreux and Langen (2002), Thissen et al. (2013, 2014, 2019)

2.2. Collecting Interregional Trade Data in the UK: Current Practise and Discussion

We now restrict our focus to the UK, starting by discussing the interdepartmental business register (IDBR), a key feature of the UK data landscape. We then contrast trade surveys deployed in Northern Ireland, Wales, Scotland and Great Britain. We also discuss businesses' perceptions of trade surveys obtained from the Fraser of Allander's Scottish Business Monitor and interactive webinars undertaken with businesses in the West Midlands and Cardiff. Finally, we consider other data sources which may prove useful when constructing interregional trade estimates.

We will regularly use several statistical terms throughout this part of the report which we briefly define. The *sampling frame* gives a list of businesses forming a population from which a sample is taken. *Stratified sampling* occurs when we independently sample from a population which can be divided into different subpopulations or strata (e.g. businesses can be divided into groups according to sector or business size). A *sampling unit* or *reporting unit* is a single unit which provides data for a given survey. Put differently, it is the unit to which questionnaires are sent.

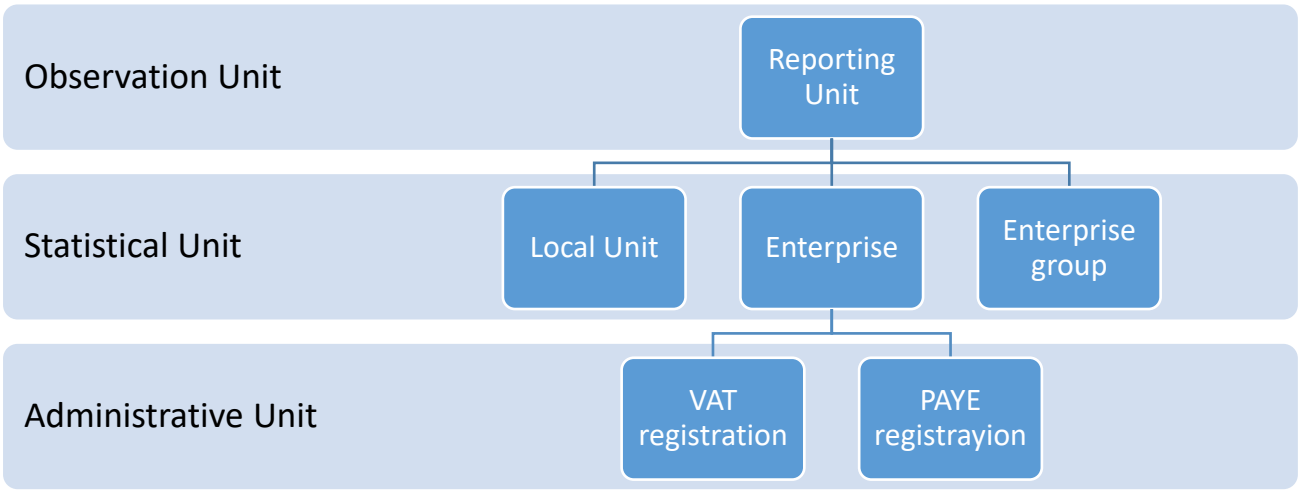
2.2.1. The Interdepartmental Business Register

Currently, estimates of trade between different parts of the UK are produced using primary data collected through surveys of businesses. The Inter-Departmental Business Register (IDBR), a comprehensive list of UK businesses introduced in 1994, is used as the sampling frame for surveys collecting trade data. These are carried out by the Office for National Statistics (ONS) for Great Britain, Scottish Government for Scotland, the Northern Ireland Statistics and Research Agency (NISRA) for Northern Ireland, and most recently by the Welsh Government for Wales. Despite using the same sampling frame, the different nations: undertake these surveys in different ways, ask different questions and face different challenges.

An important source of challenges facing the different nations when collecting trade data are the sampling units on the IDBR. The IDBR sampling units are called reporting units (RUs) and provides data on associated local units (LUs) as shown in **Figure 1**. For instance, the reporting unit for a large chain of retailers will provide data incorporating all its local units (such as

factory, stores, offices). Key business data is collected at the RU level but there are only two geographical classifications for RUs: Great Britain (GB) and Northern Ireland (NI)[2]. A GB RU can therefore have LUs in all three of Scotland, England and Wales. This poses a challenge if we wish to apportion activity out to LUs to obtain, say "Scottish" exports. In general, employment shares are used to apportion activity out to LUs to produce a publication like Scottish Annual Business Statistics[3]. While this seems like a reasonable approach for turnover, it gets a bit more difficult when we start thinking about interregional trade. However, in the absence of any other information, this is what is generally used. A further issue with the IDBR is that the LUs associated with an RU may have a different industrial classification to the RU. This is dealt with by classifying the RU based on the dominant industry by employment.

Figure 1: Sampling Units on the Interdepartmental Business Register



Adapted from: ONS

2.2.2. Comparing Trade Surveys Across the Four Nations

When collecting data on international trade between the UK and other countries, the ONS' mandatory Annual Survey of International Trade in Services (ITIS), Annual Business Survey (ABS) and Northern Ireland's Annual Business Inquiry (NI ABI) are the main surveys used. The Business Insights and Conditions Survey (BICS) is different in scope but is the main UK survey

[2] This is for historical reasons, and because mandatory business surveys in Northern Ireland are carried out through a separate Statistics of Trade Act. The ONS carries out surveys for the GB RUs, and in some cases both GB and NI RUs where agreement between ONS and NISRA is reached. However, in many cases Business Surveys of NI RUs are carried out by NISRA.

[3] https://www.gov.scot/publications/scottish-annual-business-statistics/

used to collect real-time information on trade. We will discuss how this survey could be used to consider interregional trade at the end of this section.

Since ITIS does not generate any information on interregional trade, we will only consider the ABS and the NI ABI in detail in this report. While the ABS also does not generate information on interregional trade, it is closely related to the NI ABI which does. The ABS is administered by the ONS who collect information on GB RUs while the NI ABI is administered by NISRA who collect information on NI RUs on behalf of the ONS. Since 2003, the Scottish Government has regularly administered its own voluntary trade survey, the Global Connections Survey (GCS) while the Welsh Government recently completed its pilot for the voluntary Trade Survey for Wales (TSW). In addition to collecting data on international trade between the devolved nations and other countries, the NI ABI, GCS and TSW also collect some data on interregional trade. However, due to the existence of the ABS, there is no dedicated trade survey for England. This poses a challenge for producing interregional trade estimates between the 4 nations which worsens if we wish to consider interregional trade at the NUTs 1 level.

In this section of the report we do not attempt to identify a preferred approach since each survey must balance the demands from their users for trade data. Specifically, in terms of trade, the ABS and ABI focus on developing an understanding of international UK trade. However, in Scotland the development of the GCS has been driven by "considerable demand for information on Scottish trade…this can inform strategies on trade promotion, trade development and international relationships" (Scottish Executive, 2005). Similarly, the rationale for the TSW was to better understand the "interlinkages between Welsh businesses and those in other parts of the UK and abroad" and to "assess potential impacts of the UK's proposed future trading relationships" (Welsh Government, 2020). When formulating a strategic approach to interregional trade data collection we will, however, discuss how the different trade surveys can be reconciled to provide a unified approach to collecting interregional trade data.

Table 3: Trade Surveys in the United Kingdom: Survey Remit and Design

	Great Britain	Northern Ireland	Scotland	Wales
Survey Remit				
Name	Annual Business Survey (ABS)	Northern Ireland Annual Business Inquiry (NIABI)	Global Connections Survey (GCS)	Trade Survey for Wales (TSW)
Currently conducted by	Office for National Statistics (ONS)	Northern Ireland Statistics and Research Agency (NISRA)	Scottish Government	Welsh Government (conducted by a contractor)
Statutory	Yes	Yes	No, voluntary	No, voluntary
Data first collected	2009 (for 2008), replacing Annual Business Inquiry part 2	2002 (for 2001) by Department of Enterprise, Trade & Investment in NI	2003 (for 2002)	Wave 1: Nov 2019 – Feb 2020 (for 2017 and 2018), Wave 2: Sep – Dec 2020 (for 2019)
Frequency	Annual	Annual	Annual	TBD
Survey Design				
Questionnaire Complexity	"Long" questionnaires sent to businesses with 250 or more employees and a proportion of businesses with lower employment. "Short" questionnaires sent to remaining businesses.		GCS 2018 presented as an online form divided into 6 sections and 14 questions.	TSW 2019 presented as an online form divided into 4 sections and 30+ questions.
Resource Burden	High	High	Low	Medium
Interregional trade survey questions	None	Businesses provide the value of goods and services sold to and purchased from Great Britain and Northern Ireland.	First asked to provide the value of goods and services sold to rUK and Scotland. Then asked to breakdown RUK figures into Scotland, England, Northern Ireland, and UK Continental Shelf.	First asked to provide the value of goods and services sold to and purchased from the rUK and Wales. Then asked to breakdown rUK figures into Scotland, England and Northern Ireland.
Main Areas Excluded	Crop & Animal Production, Financial Activities, Public Administration & Defence, Activities of Households as Employers, Extraterritorial Organisations & Bodies, Medical & Dental Practise Activities	Public Administration & Defence, Crop & Animal Production, Local Authority & Central Government in Education, Human Health & Social Work, Medical & Dental Practise Activities	Public Administration, Private Households with Employed Persons, Extra-territorial Organisations	Public Administration & Defence, Human Health & Social Work Activities, Activities of Households as Employers, Extraterritorial Organisations & Bodies
Response Rate	Over all sectors, the ABS response rate is consistently above 75% at the publication of results.	Over all sectors, 60% (5580 businesses) in NIABI 2018.	Over all sectors, 17% (1118 businesses) in GCS 2018.	Over all sectors, 13% (1061 businesses) in TSW 2019 (for 2017 and 2018).

Source: ONS, NISRA, Scottish Government, Welsh Government

Details of each survey's remit and design are provided in **Table 3** while interregional trade questions included in the NI ABI, GCS and TSW are extracted and included **in Appendices 6.2. – 6.4.** Importantly, all surveys are currently conducted on an annual basis, an advantage if we wish to combine data across these sources.

Turning to survey design, the ABS and NI ABI have two favourable aspects which lessen the response burden for businesses. First, they both have "long" and "short" questionnaires. The long questionnaire asks for detailed breakdowns and is sent to all businesses with 250 or more employees as well as a proportion of smaller businesses. The long questionnaire responses are then used to obtain more detailed breakdowns for the short questionnaires using a process known as expansion. Another favourable aspect of the ABS and NI ABI surveys are that they are tailored to different sectors. For instance, the ABS has 34 "long" and 14 "short" questionnaires (see **Table 4**), making it easier for businesses to complete the survey. Both the ABS and NI ABI are mandatory and therefore achieve high response rates – the ABS regularly achieves a response rate of 75% at the time of publication while the NI ABI had a response rate of 60% for the 2018 survey.

Scotland and Wales face the disadvantage that their surveys are voluntary, being unable to use the Statistics of Trade Act 1947 to mandate responses. In response, Scotland's annual GCS takes place on an annual basis but is relatively streamlined. In comparison, the TSW is much lengthier and complex. Such a survey can solicit considerable information but carries a high resource burden if conducted on an annual basis. In 2018, the GCS had a 17% response rate with 1118 businesses responding out of approximately 6580. In the 2019 pilot, the TSW had a 13% response rate with 1061 businesses responding out of approximately 8000. We can therefore see that a similar number of businesses responded in both cases, but a larger sample was required in the Welsh case to achieve this.

Let us now consider the information these surveys generate on interregional trade. As noted previously, the ABS does not collect data on interregional trade. The NI ABI, however, collects data on NI exports to and imports from GB. Similarly, the Welsh TSW also collects data on Welsh exports to and imports from the rest of the UK (rUK). The rUK figures are then broken down into Scotland, England and Northern Ireland. In Scotland, the GCS only collects data on Scottish exports to rUK. This is then broken down into Scotland, England, Northern Ireland

and the UK continental shelf. There are therefore some differences across surveys in terms of whether an import-orientated approach is also considered and how rUK figures are broken down. The surveys also differ in terms of the industries covered with the GCS covering the largest number of industries. Importantly, though, data on some industries is likely to be of lower quality. For instance, the ONS has discontinued publication of figures covering the insurance and re-insurance industries due to ongoing volatility of the estimates. It may also be possible to supplement with data collected from other sources. For instance, the Department of Agriculture, Environment and Rural Affairs in NI produces trade figures for products such as raw milk, eggs and live animals – these include trade with GB.

Table 4: List of Annual Business Survey Questionnaire Types

Title of questionnaire	
Accountancy - Long	Market research - Long
Advertising - Long	Mineral Oil - Long
Animal Husbandry and Hunting - Long	Motor Trades - Long
Architecture - Long	Motor Trades - Short
Betting and Gaming - Long	Non-Market Organisations - Long
Catering - Long	Non-Market Organisations - Short
Catering - Short	Postal Activities - Long
Commission Industry - Long	Postal Activities - Short
Commission Industry - Short	Production Standard - Long
Computer Industry - Long	Production Standard - Short
Computer Industry - Short	Property - Long
Computer Services - Long	Property - Short
Construction - Long	Retail - Long
Construction - Short	Retail - Short
Duty - Long	Services Standard - Long
Duty - Short	Services Standard - Short
Employment Agencies - Long	Shipbuilding - Long
Engineering - Long	Sports Activities/Clubs - Long
Fishing - Long	Technical testing - Long
Forestry - Long	Transport - Long
Gas and Electricity - Long	Transport - Short
Insurance Organisations - Long	Water - Long
Legal - Long	Wholesale - Long
Management consultancy - Long	Wholesale - Short

Source: ONS

Details of key aspects of each survey's methodology are provided in **Table 5**. Specifically, we focus on the treatment of RUs and LUs as well as sampling and stratification. In NI, all RUs approached are listed as NI RUs on the IDBR and fully contained within Northern Ireland. This

should make it simpler for businesses to estimate their sales to GB, given the less porous border. As discussed, the remaining IDBR RUs are GB RUs which is dealt with differently by Scotland and Wales. In Scotland, Scottish RUs are created by the Scottish Government for the purposes of building the Scottish SUT. A Scottish RU is simply the part of a GB RU which consists of Scottish LUs. For the GCS[4], the industry of the Scottish RU is then defined by the dominant Scottish LU. Sampling then takes place at RU level as is the norm with RUs providing information on the combined Scottish activity of all their LUs (see Scottish Government, 2012, pp.5-6 for an overview of issues with using LU rather than RU data). In Wales, a similar approach is taken with GB RUs providing information on the activity of their Welsh LUs. Instead of Welsh RUs being created, each RU's industry reflects the dominant activity across GB LUs rather than Welsh LUs. This means that in practise the Scottish and Welsh approaches only differ in terms of their approach to SIC classification. Both the Welsh and Scottish approaches imply that some RUs with contact addresses outside Wales and Scotland (mainly in England) will be sampled since they have LUs in Wales and Scotland.

Stratification is also treated differently across the UK. In Northern Ireland, Wales, Scotland and Great Britain the sample is stratified by the sector and number of employees. Additionally, in Wales, instead of creating Welsh RUs, stratification also takes place according to the number of Welsh local units. In Scotland, stratification also takes place according to export status to increase the chance of exporters being sampled. The history of the survey means they can then operate snowball sampling (i.e. they continue to contact businesses who have responded as being exporters in the past, and/or use previous responses to inform the estimation of exports) to maximise the chance that exporters will respond. Stratification by region is only used for the British ABS, although Scotland also stratifies according to area (Highlands & Islands/Scottish Enterprise area).

Different sample sizes are also used with the NI ABI sampling approximately 9,000 businesses, the TSW sampling approximately 8,000 businesses and the GCS sampling 6,500 businesses. In some cases, sample sizes can make it challenging to estimate full sector breakdowns (by industrial or product classifications). This is particularly relevant to Scotland, where Northern

[4] In all other cases, the industry of the Scottish RU is defined by the dominant activity across Scottish LUs which is calculated using the "top-down method" described in SIC 2007 documentation (see ONS, 2009, paragraph 40 and Scottish Government, 2012, pp.5-6).

Ireland population comprises just over 3% of Scotland's rUK population. With the current sample of 6,500 businesses, there will be difficulty in obtaining enough responses of Northern Ireland exporters to provide an industrial breakdown of Scottish exports to such a small part of the UK.

Businesses with Welsh LUs are more oversampled than any other area of the UK with all businesses of 20+ employees, or 3-19 employees but more than 1 LU in Wales included in the TSW sample. NI businesses are also oversampled with all businesses of 50+ employees, or all those with more than 20 employees but more than 1 LU included in the NI ABI sample. This contrasts with the Scottish GCS, where all businesses with 100 or more employees are included. In the British ABS all businesses with 250+ employees are included.

Table 5: Trade Surveys in the United Kingdom: Survey Methodology

Great Britain		Northern Ireland	Scotland	Wales
Survey Methodology				
Treatment of Reporting and Local Units	• Great Britain RUs exist on the IDBR. • Sampling takes place at RU level. • RUs provide information covering activities of their GB LUs.	• Northern Ireland RUs exist on the IDBR. • Sampling takes place at RU level. • RUs provide information covering activities of their Northern Irish LUs.	• Scottish RUs created by combining Scottish LUs. RU industry defined by dominant Scottish LU. • Sampling takes place at RU level. • RUs provide information covering activities of their Scottish LUs.	• Welsh RUs not created. Surveys can be sent to any RU with a Welsh LU. Some RUs in other UK nations (mainly England) will receive survey. • Sampling takes place at RU level. • RUs provide information covering activities of their Welsh LUs.
Sampling and Stratification	• IDBR sample frame. • 62,000 businesses sampled. • Stratified by SIC code, employee size-band and region.	• IDBR sample frame. • In NIABI 2018 approx. 9,200 businesses (17%) sampled from approx. 54,000 in sample frame. • Stratified by 2 digit SIC code and employee size band. • Businesses with 50+ employees, or 20+ employees and more than 1 LU included in the sample and all manufacturing businesses with 4+ employees. • Stratified random sample taken of remaining businesses.	• IDBR sample frame. • In GCS 2018 approx. 6,580 businesses sampled. • Stratified by 4 digit SIC code, employee size band, enterprise region and export status. • All businesses of 100 or more employees are included in the sample. Known and potential exporters are weighted to have a greater chance of being sampled. • Further adjustments then made to reduce the overall size of the sample.	• IDBR sample frame. • 8,000 businesses (24%) sampled from 34,000 businesses in the sample frame. • Stratified by 2 digit SIC code, employee size band and number of LUs in Wales. • All businesses of 20+ employees, or 3-19 employees but more than 1 LU in Wales included in the sample. • Stratified random sample taken on remaining businesses.

Source: ONS, NISRA, Scottish Government, Welsh Government

Before concluding this section, we also provide information on the BICS. Key details associated with the BICS are summarised in Table 6 below. Recent trade questions posed in the BICS cover exports, imports and supply chains. Such questions have focussed on the business impact of the UK's departure from the European Union (EU) and the coronavirus. While BICS itself has not focused on interregional trade, it could be used to consider how best to ask relevant questions if they were proposed. Wave 18 of the BICS was also used to develop estimates of the business impact of the coronavirus for the NUTS 1 regions. This was achieved by focussing on single site rather than multi-site businesses. The latter can have sites in all four UK countries, making it difficult to apportion responses to different countries or regions. Work undertaken in this area could be a precursor to focusing on interregional trade information.

Table 6: The Business Insights and Conditions (BICS) Survey

	BICS Survey Design, Remit and Methodology
Currently conducted by	Office for National Statistics (ONS)
Statutory	No, voluntary
Data first collected	Wave 1: March 2020
Frequency	Under regular review. In April 2021, every two weeks dispatched every other Monday
Questionnaire complexity	Under regular review. In April 2021, 75 questions covering trading status; turnover and profits; exporting and importing; supply chains; prices of materials, goods and services; stock; access to financial support; and operational performance.
Trade related questions	Of 27 questions relating to trading status, exporting, importing and supply chains, the following topics were deemed most relevant if extending BICS to consider interregional trade: • Business's trading status, location of UK sites, location of UK sites temporarily or permanently closed (location options cover NUTS 1 regions) • Whether businesses have exported in last 12 months, exporting status, export destination in last two weeks (destination options only cover EU and Non-EU), changes in export destination in the last two weeks (destination options only cover EU, Non-EU and "different" changes) • Whether businesses have exported in last 12 months and more than 12 months, origin of imports in last two weeks, (options provided only cover EU and Non-EU), changes in import origin in the last two weeks (options provided only cover EU, Non-EU and "different" changes) • Changes to supply chains (options provided include "using more UK suppliers")
Response rate	22.2% – 35.3%
Sampling and stratification	• Selection criteria: businesses from different industrial sectors and UK regions registered for Value Added Tax and/or Pay as You Earn • Population: 2,281,179 • Sample: approximately 39,000

2.2.3. Analysis of Businesses Perceptions of Trade Surveys

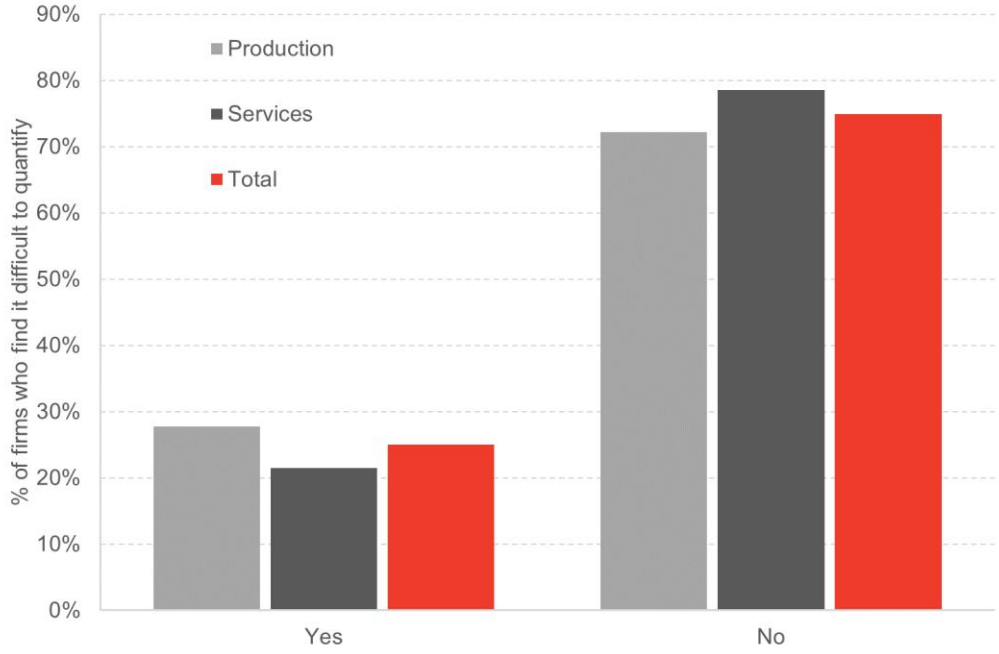
As part of our Scottish Business Monitor survey we asked 511 businesses across Scotland how well they understood their trade with the rUK. The Scottish Business Monitor surveys small and medium enterprises, with the fieldwork for this survey undertaken in December 2019 – January 2020. We sought to understand whether firms' understanding of their trade within the UK differed by the firms' sector, size (as measured by the number of employees) and whether they had offices in Scotland only. Around 34% of the sample stated that they did not sell to rUK. Unsurprisingly, the proportion was greater for smaller firms than larger firms. Having excluded firms who do not sell to rUK, we asked each firm: would your business find it difficult to quantify the proportion of your sales which go to the rest of the UK?

Including only firms that exported to rUK, around a quarter said that they would find it difficult to quantify the proportion of their sales that are destined for rUK. This was higher for production sector firms than service sector firms as shown in **Figure 2**.

When looking at firms' size, businesses with between 11-99 employees were more likely to report difficulties in quantifying their exports to rUK as shown in **Figure 3**. There could be a few reasons for this. First, perhaps it is a real feature of firm size. Very small businesses have relatively fewer sales to rUK so they understand their sales to rUK better. And, as businesses grow much larger, they may choose to allocate more resources towards understanding their trade. Whereas many businesses with 11-99 employees are stuck in a difficult spot of having more sales to rUK than they can easily recall but find it difficult to allocate more resources to understanding their trade.

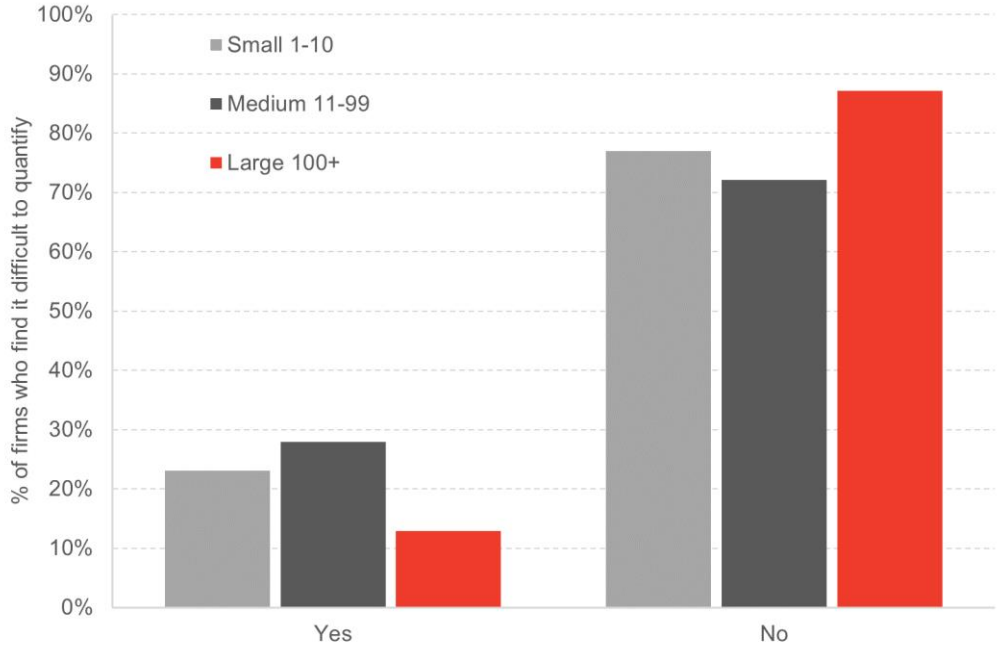
Second, selection bias could lead to fewer very small businesses stating difficulties in quantifying trade to rUK. For instance, perhaps only faster growing or better managed very small businesses export at all to rUK and therefore the fact that many of them would not find it difficult to quantify these flows should not come as a surprise. Our survey finds that roughly a similar proportion of businesses with 11-99 and 100+ employees trade with rUK, but around 5% more businesses with 1-10 employees do not sell to rUK at all.

Figure 2: Firm's Understanding of Their Trade by Sector



Source: Scottish Business Monitor

Figure 3: Firms' Understanding of their Trade by Business Size



Source: Scottish Business Monitor

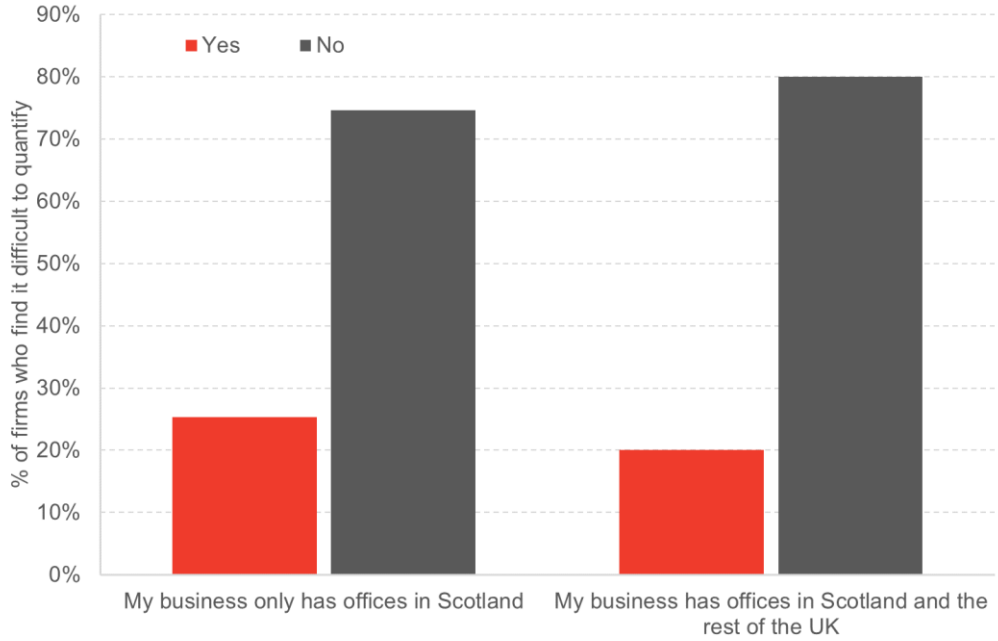
Third, whether or not a business has offices in Scotland only or also has offices in rUK could affect its understanding of trade. The vast majority of firms with less than 100 employees

had offices in Scotland only, while approximately half of businesses with over 100 employees had offices in both Scotland and the rUK. Overall, as shown in **Figure 4**, of firms who traded with rUK, firms with offices in both Scotland and rUK were more likely to be able to quantify their sales to rUK. However, this reversed when looking at businesses with more than 100 employees.

Multiple factors could be in play here. It could be that having offices in multiple nations within the UK incentivises firms to understand their trade across the UK. However, as businesses get larger it is likely that they trade significantly more around the UK, may share more inventory between offices and may be part of increasingly complex supply chains. It is important to note that this survey does not include very large businesses.

From our surveying, it appears that sector, size and the geographical spread of offices can affect firms' understanding of their trade across the UK. We expect that these differences would increase when looking at sectors more granularly and when looking at the full spectrum of business sizes.

Figure 4: Firms' Understanding of their Trade by Office Location



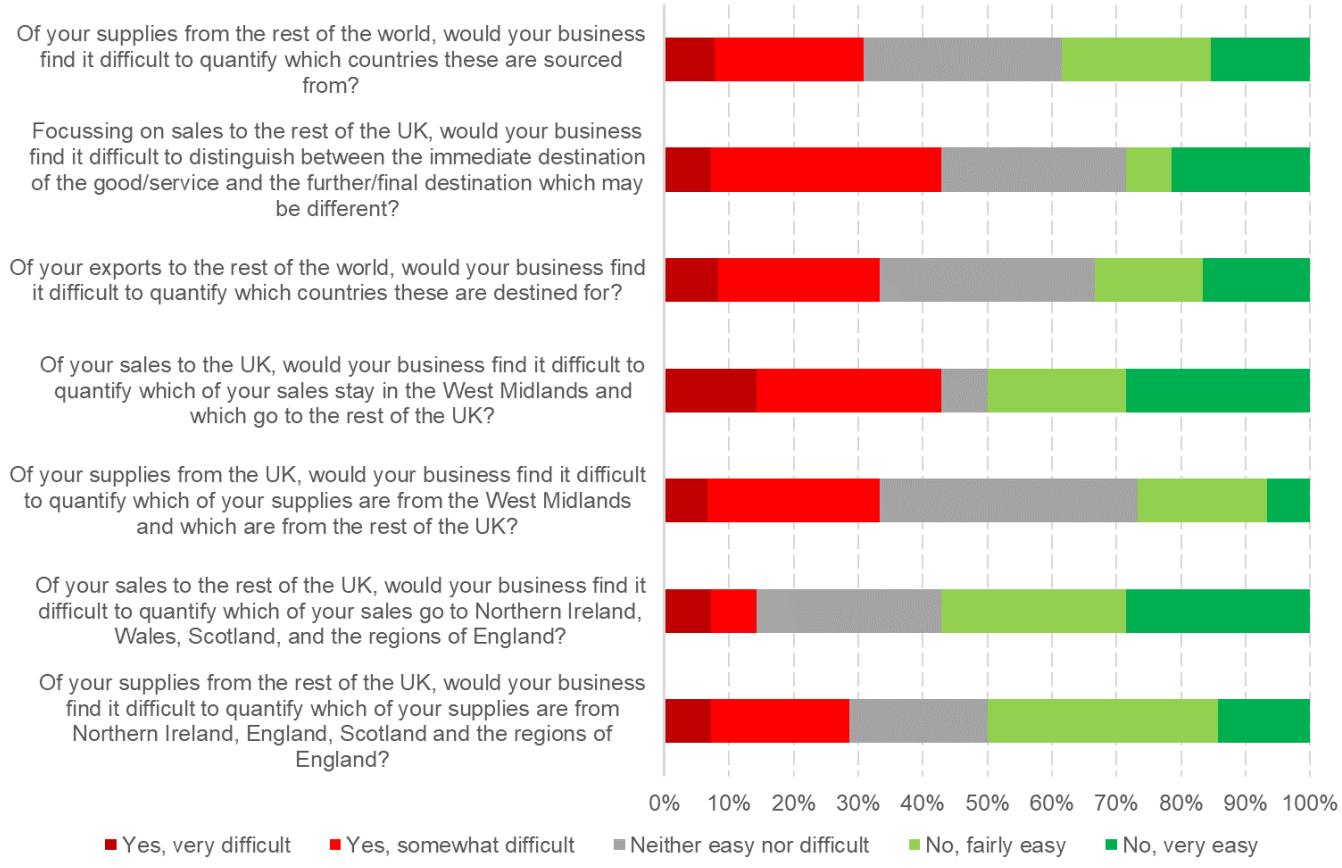
Source: Scottish Business Monitor

We also had interactive business webinars with businesses in the West Midlands and Cardiff. These were initially planned to be in person, but were delayed by the pandemic and we developed a strategy to have these virtually. We hope to continue the conversations with businesses in the coming months, to continue this qualitative research.

In order to get businesses engaged, we presented analysis on the impact of the pandemic on the area in question, and also discussed other hot topics, such as the impending end of the EU Exit Transition period. This was a successful strategy for engaging the businesses and to get them talking about their supply chains and trade. An article published on the ESCoE website on the West Midlands webinar is included in **Appendix 6.4**.

In the West Midlands webinar, we used polling to get feedback from businesses about their views on how easy it would be to provide different types of information. Information is provided in **Figure 5**.

Figure 5: Firms' views on their ability of firms to provide trade information



Source: Fraser of Allander Institute

Overall, these results are fairly positive, although it is fair to say that they are quite mixed. There is also no clear pattern in terms of the type of business, exporting status or business location. The majority of businesses though did feel is would be fairly easy or very easy to provide the location of their sales and supplies to constituent parts of the UK, which is positive for the prospects for a future survey.

The Cardiff Webinar involved a smaller group of businesses, so we took the approach of discussing the issues with them directly – below are a selection of quotes.

> *"Our supply chain is UK based and we know exactly where in the UK we receive our materials"*
>
> Manufacturer, Cardiff business webinar
>
> *"In terms of sales, we sell to a well-known distribution company therefore we do not know where the goods ultimately end up: we would find it very difficult to provide this information"*
>
> Manufacturer, Cardiff Business Webinar
>
> *"We know precisely where we sell our products and services to, and we could provide this information"*
>
> Software developer, Cardiff Business Webinar

Which again emphasises the mixed nature of the businesses who feel they would be able to respond. Overall though, the feedback from businesses was fairly positive.

2.2.4. Structured Business Interviews

To build upon this feedback from businesses, in February and March 2021 we carried out a number of confidential one-to-one interviews with businesses to explore the challenges and opportunities that exist in collecting trade data. This was both in terms of what businesses hold about sales and purchases within the UK and also what they know about international origins and destinations.

2.2.4.1. Who did we consult with?

We consulted with nine businesses, of which: five were in Services, three in Production and one in construction. Table 1 summarises the characteristics of the businesses we interviewed.

Table 7: Business Characteristics

Business	SIC (2007)	Business size	UK Offices	Operations	Part of a global group?
Production business	20 (C)	Medium (50 to 249)	2 UK regions	Whole of UK and Worldwide	Yes
Production business	24 (C)	Small (10 to 49 Employees)	1 UK region	Whole of UK and Worldwide	Yes
Production business	32 (C)	Small (10 to 49 Employees)	1 UK region	Whole of UK and Worldwide	Yes
Construction business	41-43 (F)	Large (250+ employees)	2 UK regions	Whole of UK	No
Services Business	47 (G)	Micro (0 to 9 Employees)	1 UK region	Whole of UK and Worldwide	No
Services business	52 (H)	Small (10 to 49 Employees)	1 UK region	Whole of UK and Worldwide	Yes
Services business	56 (I)	Micro (0 to 9 Employees)	1 UK region	Whole of UK and Worldwide	No
Services Business	64 (K)	Small (10 to 49 Employees)	1 UK region	Whole of UK	No
Services Business	71 (M)	Medium (50 to 249)	2 UK regions	Whole of UK and Worldwide	No

Source: Fraser of Allander Institute

2.2.4.2. Methodology

To better understand the level of detail businesses could provide regarding their sales and purchases, the institute carried out one-hour long consultations with nine businesses across the UK.

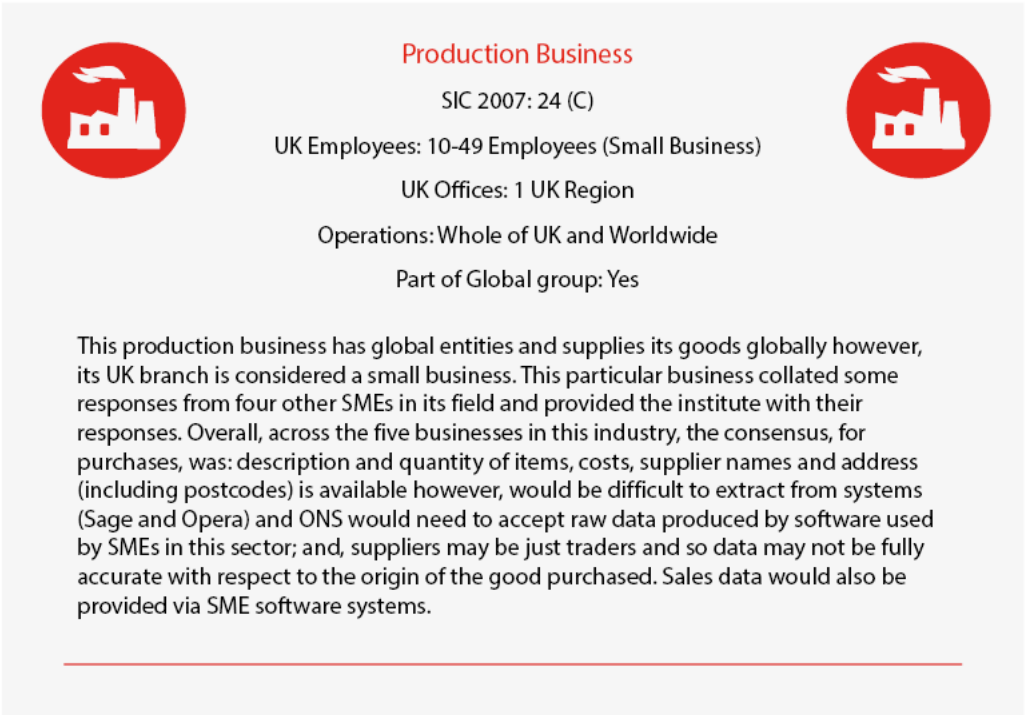
We asked businesses the following questions -

1. How many employees do you have?
2. Is your work mainly UK/EU/Rest of world based?
3. Which locations in the UK do you operate out of?
4. Are you part of a wider global company?
5. What data do you hold on the goods/services you purchase from businesses within the UK?
    a. How detailed is this data?
    b. How easy is it to identify origin location?
    c. Could you extract this easily from your system?
    d. Would you find it easier to provide postcodes or other geographic identifiers?
6. Similarly, what data do you hold on imports of goods and services?
    a. Could you easily identify the country of origin?
7. What data do you hold on the goods/services you sell to businesses within the UK?
    a. How detailed is this data?
    b. How easy is it to identify the location of your customer/ destination? Could you extract this easily from your system?
    c. Would you find it easier to provide postcodes or other geographic identifiers?
8. Similarly, what data do you hold on exports of goods and services?
    a. Could you easily identify the country of destination?

We then analysed the responses to understand the data capabilities by: industry of firm; size of the firm; and, whether or not the business is a part of a global group.

2.2.4.3. Business Profiles

The following pages outline the business profiles of the companies we consulted with for this research. These profiles highlight some challenges faced by different sized firms in various sectors.



Production Business

SIC 2007: 32 (C)

UK Employees: 10-49 Employees (Small Business)

UK Offices: 1 UK Region

Operations: Whole of UK and Worldwide

Part of Global group: Yes

This production business has global entities - across UK, Canada, Mexico, North America and Europe - and supplies its goods globally however, its UK branch is considered a small business. The UK branch has a relatively small number of suppliers (mostly gas and electricity firms) and clients domestically and worldwide and so collecting data on the flow of its inputs and goods sold domestically and internationally is straightforward. This company's European headquarters manages its supply chain and this makes tracking its flow of goods easier to do.

Construction Business

SIC 2007: 41-43 (F)

UK Employees: 250+ Employees (Large Business)

UK Offices: 2 UK Regions

Operations: Whole of UK

Part of Global group: No

This construction business is the largest employer we interviewed and had the most detailed data on their purchases and sales. This company has, over the course of a few years, developed a system of data collection which stores highly detailed information on: the postcodes of their clients and suppliers; and, the goods/services bought from suppliers and sold to clients. In terms of purchases, this business collects data on spend by: division of the firm; office location; and region of UK (including postcode). However, sales data is not as detailed/accurate as a client may not be located where the construction project is located. Therefore, this company only collects data on the project location not client location. Additionally, around 20% of this company's work is subcontracted and any data on the activities carried out by subcontractors are held with the subcontractors and are not as highly detailed.

Services Business

SIC 2007: 47 (G)

UK Employees: 0-9 Employees (Micro Business)

UK Offices: 1 UK Region

Operations: Whole of UK and Worldwide

Part of Global group: No

This retailer has a physical store in one UK region however, sells its goods domestically and internationally through online retailing. This company has data on where it delivers its goods to domestically and internationally and keeps information on all of its suppliers. However, it mostly purchases from wholesalers and so the origin of the goods it purchases is unknown to the business.

Services Business

SIC 2007: 52 (H)

UK Employees: 10-49 Employees (Small Business)

UK Offices: 1 UK Region

Operations: Whole of UK and Worldwide

Part of Global group: Yes

This international logistics company has a global presence however, its UK base is considered a small-sized business. Most of this company's costs are paid at customs and so they keep a record of all of this. Tracking sales of services is slightly more complex. This company may provide a service to an international client however, may be negotiating the price of the service with someone domestically (i.e. in London) therefore, tracking the service accurately is difficult.

Services Business

SIC 2007: 56 (I)

UK Employees: 0-9 Employees (Micro Business)

UK Offices: 1 UK Region

Operations: Whole of UK and Worldwide

Part of Global group: No

This food and beverage services company provides its services domestically however, it also sells food and beverage goods domestically and internationally. This company has data on where it delivers its goods to domestically and internationally and keeps information on all of its suppliers. However, it mostly purchases from wholesalers and so the origin of the goods it purchases is not known.

Services Business

SIC 2007: 64 (K)

UK Employees: 10-49 Employees (Small Business)

UK Offices: 1 UK Region

Operations: Whole of UK

Part of Global group: No

This financial services firm primarily provides financial advice provided by its self-employed financial advisors. Given the nature of the services provided by this firm they have highly detailed data on all of their clients (at postcode level) however, would not be willing to share information this detailed due to client confidentiality. In terms of suppliers, this firm mostly purchases goods/services from accounting and legal services and computer software companies however, they simply store the name of the firms they purchase from, as listed on invoices. Therefore, supplier data is not very detailed and although sales data is highly detailed, it is considered confidential information.

Services Business

SIC 2007: 71 (M)

UK Employees: 50-249 Employees (Medium-sized Business)

UK Offices: 2 UK Regions

Operations: Whole of UK and Worldwide

Part of Global group: No

This consultancy company primarily collects data on the sectors they work with and the services they provide to these sectors (and targets consumers within these sectors). Geography is always secondary to their analysis. Tracking the sales of this company is, like for other services firms, difficult. For example, this company has a long-standing relationship with a firm based in the EU however, most of the work that they do with them is in a country outside of the EU. All of this makes tracking the flow of services difficult. There is also difficulty in tracking purchases made by this firm; whilst the postcodes of their suppliers could be extracted from invoice information, this would take significant resources given the nature of the work.

2.2.4.4. Summary of feedback

This section summarises the findings from the business consultations. Throughout our analysis we noticed trends regarding the feasibility of collecting trade data. In particular, we found the following characteristics to influence the practicality of collecting highly detailed trade information on sales and purchases:

- The sectors the business operates in;
- The size of the business; and,
- Whether the business is a part of a larger global entity.

There are also notable challenges depending upon the characteristics of businesses.

Sectors

Across all sectors it appears common to track purchases and sales through the address attached to invoices and through the registered address – i.e. office or factory – of where the good/service ends up.

Businesses within the production and construction sectors are more likely to be able to provide highly detailed data on their purchases and sales. However, subcontracting is common in the construction sector and construction firms may not have any/detailed information on the activities of their subcontractors. Despite this challenge, businesses within the construction sector are best placed to provide highly detailed information on their trade. This is because companies in this sector typically produce a tangible good using tangible inputs; all of which makes tracking the flow of goods simpler than sectors like services.

Quote - Sector M Medium Business

"The location of our customers is a little tricky – what do you mean here? We work on lots of projects in places all over the world – although due to the nature of our business we are obviously not actually sending physical goods there. To complicate matters further, the investor is likely to be in another country still. So although we know where we are working, that might not match up to our customer or invoicing database.

"We would find it difficult to even split up activity on projects between our offices in England and Scotland: our teams work across the offices on projects depending on the expertise required.

"We now have a model where significant numbers of our staff are home based, which makes it difficult to understand where their work would be assigned: this is only going to increase as we emerge from the pandemic so might make questions like this even more complicated."

The services industry faces challenges collecting accurate, detailed data on their trade. This challenge is primarily driven by the nature of the sector. Unlike the typically tangible goods flowing through the production and construction sectors, the origin and final destination of services is hard to define.

Quote - Sector H Small Business

"We are essentially a broker, so asking us what we "purchase" and "sell" does not make sense exactly… we do know where our clients are based but this does not necessarily relate to the activity we are "making happen" with our activity."

Business size

Typically smaller firms will struggle to collect the level of detail of data that is achievable by larger businesses. High level data requires significant investment – over a significant period of time - and ongoing monitoring by a team of data analysts. While larger firms can afford to invest in this kind of data infrastructure, smaller firms cannot. However, although larger firms can afford to invest in better data, it does not mean that they have already done so or will be willing to do so in the future.

Quote - Sector F Large Business

"We have invested heavily in our understanding of our suppliers, including even in the distance of suppliers from projects and local offices… this is because it is part of our company ethos to support local jobs, and we want to be able to evidence this."

Global entity

Being a part of a larger global entity has benefits with regards to the data infrastructure within businesses. For example, supply-chain management may be carried out by larger headquarters internationally. Therefore, the burden of data collection and management may not be that of the UK business but instead of its larger entity in another country. Firms that are a part of a larger corporate body may be more able to provide highly detailed data on their purchases and sales.

Quote - Sector C Small Business

"We are part of a large global business, so we have sophisticated systems which would allow us to extract all of the information you are asking us about with regards to our site in Wales: both in terms of the customers we send our goods to and our suppliers. We are quite a specialist supplier so we benefit from only having a few main customers in the UK."

But, being a part of a global corporation does not guarantee that a business will collect high level data ready for analysis by ONS. For example, given the significant resources required to report on trade, companies may be unwilling to analyse the geographical flow of their goods and services and may only be willing to provide ONS with raw data from their systems.

Quote - Sector C Small Business

"On our systems we have the description and quantity of item, cost, supplier name and address – so yes, post codes are available. We're unsure how easily this could be extracted from our accounts system - Sage or Opera. We would be very reluctant to fill in an ONS standard date form - they would have to be able to accept raw data from the major accounting software packages used by SMEs."

Notable challenges and potential solutions

Some notable challenges in collecting/managing trade data were made apparent during our analysis.

Businesses that purchase from wholesalers, i.e. retailers, or distributors will only have data on the location of the wholesaler/distributor they purchased from. Therefore, the origin of the good they have purchased will be unknown to the business and will be knowledge held by the wholesaler/distributor.

> Quote - Sector I Micro Business
>
> "We purchase, in the main, from wholesalers… therefore, while our wine, for example, may come from many different companies, in our system it would just appear as an invoice to our wholesaler."

> Quote - Sector G Micro Business
>
> "We definitely have information from our systems about the destination of our goods, down to the postcode of the customer. In general, purchasing would be a lot more difficult to cover: we buy so much of the clothing we sell from agents and distributors that it would be difficult to get out of our system where the products originally comes from."

On the other hand, businesses that sell their products to wholesalers do not have information on the final destination of their products. Therefore, purchases and sales data is more likely to be available from businesses where goods are flowing business-to-consumer rather than business-to-business. That is, when a wholesaler/distributor is involved, tracking the flow of purchases and sales becomes extremely difficult. In our recommendations, we will discuss how other data sources, in particular a survey of wholesalers, could be leveraged to tackle this potential issue.

Quote - Sector C Medium Business

"When you are a manufacturing company you are constantly chasing raw materials so you need to know where your suppliers are in your supply chain...therefore, we have highly detailed data on our suppliers and their location. But, because we sell our goods to wholesalers we do not know where they end up."

Businesses that rely on subcontractors, i.e. construction firms, will likely not know, or have data, on the activities of its subcontractors; subcontractors can make up to around 20% of construction project costs and so this is a fifth of project activities that could be unknown. Given that the ABS allows surveys to be tailored to each sector, when issuing trade surveys for some sectors it may be worth allowing firms to leave a proportion of trade unallocated. This unallocated proportion could then be regionalised by the ONS based on the responses of businesses for which all trade can be allocated or using additional data sources.

Reporting issues associated with small businesses can be readily alleviated by adopting the existing ABS practise of issuing "long" questionnaires to businesses with 250 or more employees and a proportion of businesses with lower employment and issuing "short" questionnaires to remaining businesses. Finally, for some businesses the issue is not the availability of trade data but instead the willingness to hand over such confidential client information to ONS. Such issues may be alleviated by again adopting a sector specific approach. For services firms in particular, the ONS may not need to alter the format of the trade survey but instead develop processes which facilitate businesses extracting and anonymising data.

Quote - Sector K Small Business

"On our systems, we do have the sort of details that you are asking about for our customers – address, postcode, etc… but we would not be prepared to provide this to anyone because of confidentiality concerns"

2.2.5. Other UK Trade Data

There are several other data sources which can shed light on the nature of interregional trade in the UK and be used to begin considering the NUTs 1 regions and nations (see Greig, Lisenkova and Roy, 2018 for a UK data map). First, the Welsh Economic Research Unit (WERU) produced Input-Output tables for 2007 (Jones et al, 2010), including intermediate tables. This can be used to infer some information on the nature of Welsh-rUK trade.

Second, is the voluntary UK Innovation Survey (UKIS) which is part of the Community Innovation Survey covering EU countries. The survey has been conducted every two years since 2005. In 2019, the survey was mainly conducted using an electronic form and 30,9412 businesses with 10 or more employees were sampled. There were responses from 14,040 businesses leading to a response rate of 45%. The sample is based on the IDBR with stratification based on the NUTs 1 region, sector and business size. The key question posed relating to interregional trade flows over a three year period is "In which geographic markets did this business sell goods and/or services?" Businesses can select all that apply from the following: UK regional within approximately 100 miles of this business, UK national, European countries and All other countries. In 2013, a new question was added asking businesses to indicate their largest market in terms of turnover. UK regional was found to be the largest market (57%) followed by UK national (35%).

Third, the regional household expenditure measures compiled by the ONS in 2018. These draw on the living costs and food survey (LCF) and ABS to provide provisional estimates for the NUTs 1 countries and regions of the UK. To produce net interregional spending for the household expenditure total national expenditure (i.e. all spending by residents of a region) is subtracted from total domestic expenditure (i.e. all spending which takes place in a region). If the resulting figure is positive then the region is a net exporter of goods and services to rUK otherwise the region is a net importer.

The fourth data source are transport statistics. As noted in Greig, Spowage and Roy (2020), the continuing survey of road goods transport (CSRGT) has the most consistent data. However, there are the issues of the compatibility of physical movements of goods with the concepts in national accounting of changes in economic ownership. Moreover, the CSRGT, does not cover the full journey of goods or currently value the goods being moved. While

HMRC lookups do exist, and are used in this paper, there are clear issues with using price multipliers to infer broad commodity classifications and is unlikely to be representative of the true value of goods being transported on specific roads.

While the UKIS, LCF and CSRGT all have drawbacks, in combination, they have the potential to be utilised to develop hybrid interregional trade estimates which combine trade survey data with data from other sources.

2.3. Recommendations

In previous sections we reflected on the advantages and disadvantages of methods available to estimate interregional trade, the experiences of foreign institutions in implementing these methods, the UK nations' current approaches to trade data collection and businesses' perceptions of these trade surveys. Our business interviews also revealed that while some businesses can readily supply interregional trade data others face some challenges. Nonetheless, where businesses are able to report on their trade, data collected through surveys will yield valuable information and should be collected. Additionally, where businesses face challenges, insights from trade data collection exercises undertaken by the ONS, Scottish Government, NISRA, Welsh Government and other countries can point towards potential solutions.

While current trade surveys are driven by different users' needs, our role is to reconcile these different approaches and outline our recommendations for formulating a strategic UK-wide approach to trade data collection and estimation. Specifically, we identify how a *consistent* approach to trade estimation can be achieved across the four nations so that the collected data is comparable and compatible. Our recommendations are provided not only with a view towards producing interregional trade estimates for the four nations but with a view towards eventually producing interregional trade estimates at the NUTs 1 level between Scotland, Northern Ireland, Wales and the 9 English regions.

2.3.1. Collecting Interregional Trade Data in the UK

Our recommendations for collecting interregional trade data are grouped into three themes and, making clear when more than one option may be feasible. The first and second recommendations relate to achieving a consistent approach to survey design across the four

nations with a focus on survey frequency, complexity, and questions put to businesses on the distribution of trade flows. The third and fourth recommendations relate to achieving a consistent approach to survey methodology with a focus on the treatment of reporting units and the statistical sampling approach. The fifth and sixth recommendations examine how remaining data gaps can be accounted for and consider how other data sources could be used to supplement trade survey data.

Recommendation 1a: A Consistent Approach to Survey Frequency and Complexity

At present, the four UK nations have different approaches in terms of the frequency and complexity of their trade surveys. This is influenced by whether the survey is statutory or voluntary and whether the survey is conducted annually or on a more irregular basis.

The first option is for each nation to undertake trade surveys of moderate complexity on an annual basis. This is not problematic in the case of the statutory ABS and NI ABI with the voluntary Scottish GCS also taking place annually (we will revisit the lack of an English trade survey in recommendation 3a). However, the Welsh TSW would need to be streamlined if it were to take place annually. While undertaking annual surveys on a regular basis would generate annual survey-based interregional trade estimates and bring methodological advantages such as snowball sampling it also constrains the sophistication and complexity of the exercise. This, in turn, reduces the accuracy and precision of the interregional trade estimates produced.

The second option, which we believe is more viable, is to undertake streamlined surveys on an annual basis and then undertake an in-depth interregional trade data collection exercise every 5 years. The burden on respondents could be reduced by adopting the ABS's and NI ABI's practise of issuing "long" and "short" questionnaires, using "long" questionnaires sent to large businesses to break down "short" questionnaire totals. Estimating survey-based interregional trade flows every 5 years would bring the UK in line with Japan, South Korea and the US's Commodity Flow Survey. In practise, this would mean that the NI ABI, ABS and GCS take place annually in their current form with the TSW adopting a more streamlined format similar to the GCS. Every 5 years, the four nations could then undertake a more complicated exercise, the exact details of which we provide in the next recommendation.

We note, however, that undertaking a more extensive exercise does not prohibit producing interregional trade estimates annually. While survey-based estimates could be produced every 5 years, other methods could be used to generate interregional trade estimates in the intervening years. Where an industry is covered by trade surveys, there are a range of relevant methods. For example, as in the Finnish case, gravity-based models could be fitted using the survey data to produce annual estimates. Alternatively, again as in the Finnish case, freight-based estimates could also be produced on an annual basis as in Section 3 of this report. Where an industry is not covered by trade surveys, there are other methods which are applicable. For instance, the flows between a nation and rUK could be identified and this flow regionalised using an external data source such as regional consumption. This approach is also used in Section 3.

Recommendation 1b: A Consistent Approach to Survey Questions on Interregional Trade

The four UK nations also have different approaches in terms of the information solicited in their trade surveys. Specifically, they must choose between collecting data on: trade flows in commodities or industries; exports or imports; trade with the rest of the UK, trade with the four UK nations or trade with the 13 NUTs 1 regions. Again, this is also influenced by whether the survey is statutory or voluntary. We recommend that the questions posed by different nations should be aligned wherever possible. We delineate possible options and make recommendations below.

Throughout this report we have focused on trade flows between industries, but we wish to emphasise that this a deliberate choice. It is also possible to examine flows of commodities/products, although, when feedback was obtained on their trade survey, Finland found that businesses find it difficult to breakdown the distribution of their sales by commodity. When examining approaches adopted by other countries, it was only in Canada that individual commodity flows were examined. We therefore recommend that trade surveys continue to focus on industry flows.

It is also possible for the four nations to ask businesses about either their regional sales (exports) or their regional purchases (imports) or both sales and purchases. Currently, the NI ABI and Welsh TSW favour the last option while the Scottish GCS focus on exports alone. It is widely believed that businesses have a deeper understanding of their sales than their

purchases. This was also the conclusion reached in Finland when they asked firms for feedback on their survey. To reduce the complexity of surveys and lower the resource and respondent burden, we therefore recommend that with the exception of Northern Ireland the nations' ask businesses for the distribution of their sales (not purchases) leading to an export-orientated approach to interregional trade data collection. This seems feasible as the Whole of Scotland Economic Accounts Project reaches maturity. The experimental data currently result in very large exports of crude oil to rUK so in Greig, Spowage and Roy (2020) import-orientated methods are needed to constrain Scottish exports to Welsh and Northern Ireland imports. However, a lack of robust data on Northern Irish road freight (Greig, Spowage and Roy, 2020) may continue to pose a challenge hence the need for data on Northern Ireland's imports. An alternative approach would also be required to produce retail trade estimates which, as shown in Section 3, currently use an import-oriented approach. Data collected from wholesalers would provide an alternative avenue.

A final important decision must be taken on how the distribution of sales are broken down. There are four alternatives. First, businesses can simply be asked to break down their sales to the rest of the UK and the resulting rUK flows regionalised so that we obtain flows to each UK nation or even each UK NUTs 1 region. This is the approach taken in Greig, Spowage and Roy (2020) with freight data being the main data source used to undertake the regionalisation. Second, businesses can additionally be asked to break down their sales to each UK nation (this already takes place in the Scottish GCS and Welsh TSW) and the resulting flows regionalised to that we obtain flows to each UK NUTs 1 region. A third alternative would be to directly ask businesses to break down their sales to each UK NUTs 1 region. Drawing on the Finnish experience, there is also a fourth alternative. Businesses could be asked to specify the distribution of sales to: their own nation, England (the main trading partner of each devolved nation) and the rUK. Or, if taking a NUTs 1 approach: their own region, London (the largest region by economic activity in the UK), the three most important regions to their business and the rUK.

The first option which may be less viable but places more emphasis on gaining a NUTs 1 perspective would be to ask businesses to break down their sales to their own region, London, the three most important regions to their business and the rUK. The resulting rUK flows could then be regionalised to NUTs 1 level depending on the degree of granularity required.

The second option, which we think would be more viable, would be to ask businesses to break down their sales to each UK nation. In the case of Scotland, Wales and Northern Ireland, it may also suffice to simply ask businesses to break down their sales to England and rUK. The resulting rUK flows could then be regionalised depending on the degree of granularity required. We believe this strikes the right balance between acknowledging the level of knowledge businesses are likely to have on their trade within the UK and achieving the required level of granularity.

Lastly, regardless of the approach taken, consistent treatment of oil and gas extracted from the UK Continental Shelf needs consideration. In Scotland, this is being considered through the Whole of Scotland Economic Accounts Project and is accounted for in the Scottish GCS which requires businesses to break down rUK sales to England, Wales, Northern Ireland and the UK continental shelf. The UK continental shelf, however, is omitted as a destination/source of exports/imports in the Welsh TSW.

Recommendation 2a: A Consistent Approach to Report Units

As discussed, the IDBR only has NI and GB reporting units and does not have "English", "Scottish" or "Welsh" reporting units. This has led to inconsistencies across the four nations. In Scotland, "Scottish" reporting units have been created for the GCS while in Wales, the TSW simply focussed on surveying GB reporting units with Welsh local units. The approach adopted will influence the sector to which exports are attributed to. If we wish to consider interregional trade from a survey-based perspective at the subnational level, this becomes even more problematic since we require reporting units for the 9 English regions. There are three possible options to deal with this issue.

The first option which may be less viable but places more emphasis on gaining a NUTs 1 perspective would be to issue surveys directly to local units. This would allow us to immediately identify which region and sector any resulting exports can be attributed to. While local unit information is collected from the Business Register and Employment Survey, this is an exception and it is possible that local units may find it difficult to provide trade information.

The second option which we consider viable is to adopt the approach used by the Scottish GCS which deviates from the IDBR by creating Scottish RUs. The advantages of this approach are that Scottish RUs are better able to report on Scottish activity and reflect the industrial classification of the dominant Scottish LU. Such an approach could also be used to create dedicated RUs for the 9 English regions.

The third option which we also consider viable is to adopt the approach undertaken in the Welsh TSW simply asking GB RUs (which can be located in Wales, England and Scotland) to report on the activities of their Welsh, Scottish and English LUs. The advantages of this approach are that it easily builds on the IDBR framework. A disadvantage of this approach might be that the industrial classification of the RU, which is based on the dominant industry by employment, may not correspond to the industrial classification of the Welsh LUs. Another possible disadvantage is that it may be easier for Welsh RUs to report on Welsh activity than, say, English or Scottish RUs. However, data provided by the Welsh Government on the TSW in **Table 8** indicates that of the 8000 businesses sampled, businesses headquartered in the rest of the UK were more likely to respond than businesses headquartered in Wales. Similarly, businesses which were not entirely Welsh were more likely to respond than entirely Welsh businesses. These findings may relate to business size with entirely Welsh businesses, which are likely to be smaller, finding it more difficult to quantify their trade. It could also be that having offices in multiple nations within the UK incentivises firms to understand their trade better. Overall, these results are promising and give some indication that asking GB RUs to quantify the activity of their Scottish, English and Welsh LUs is not infeasible and could be a means to ensure consistency in the treatment of RUs across the four nations. This approach may also prove more promising if we wish to gain information from LUs at the NUTs 1 level since it may prove difficult to "create" NUTs 1 level RUs.

Table 8: Trade Survey for Wales Response Rates by Business Headquarters and Composition

	No. Sampled	Response Rate
Businesses Headquartered in Wales	6086	Approximately 13%
Businesses Headquartered in the rest of the UK	1914	Approximately 15%
Entirely Welsh Businesses	5537	Approximately 12%
Not Entirely Welsh Businesses	2463	Approximately 15%

Source: Welsh Government

There are also broader issues to consider, more widely than just the feasibility of businesses providing the information, and the feasibility of adapting a trade survey to the existing survey landscape in the UK. These are discussed in our companion paper which provides a framework for the production of regional supply and use and input output tables for the four nations (see Davidson, Black, Connolly and Spowage, 2021). -

At the moment, Regional Accounts are produced using the RU industry in question, rather than reflecting the industry of the local area. This is done in order for the activity in industries in local areas to add up to the regional and national total, but does lead to the information on local economies not always being completely reflective of the actual activity. So consistency and coherence is preferred over the GVA estimates for an area being the most reflective of that area.

A similar debate occurs when we discuss the approach to producing regional SUTS and we prefer to consider the optimal reporting unit approach within this broader context. At the moment, each table has been produced in order to best answer the policy questions of the organisation in question, and the motivation is to produce accounts that are most reflective of the local economy. If there is a desire for consistency however, this may lead to the tables being less effective for individual area.

This is not an unusual debate in initiatives across the world to produce multi-regional or multi-national tables. In constructing these tables, data producers necessarily rely on a number of strong assumptions, imputations and adjustments to reconcile data from different sources that are not always coherent with each other. This is particularly the case for bilateral trade statistics which are notoriously inconsistent ('asymmetric') and often incomplete. The harmonisation ('balancing') required to deal with the inconsistencies in the data, inevitably diverges from National Statistics and often leads to compromises on sectoral or geographical coverage, or availability across years. These are trade-offs we will have to consider when developing the proposals for Regional SUTs.

Recommendation 2b: A Consistent Approach Statistical Sampling

The four UK nations also have different approaches in terms of their statistical methodology. In particular, we have pointed out differences in the sample size with the NI ABI sampling approximately 9,000 businesses, the TSW sampling approximately 8,000 businesses and the GCS sampling 6,500 businesses. We also noted that sample sizes can make it challenging to estimate full sector breakdowns (by industrial or product classifications) particularly in Scotland where there will be difficulty in obtaining enough responses of Northern Ireland exporters to provide an industrial breakdown of Scottish exports to such a small part of the UK. If a full interregional trade data collection exercise were undertaken, sample sizes would need to be sufficiently large to capture flows between the four nations, increasing the resource burden.

The four nations also have differing approaches to stratification. Across the trade surveys we discussed stratification takes place according to a combination of: business size (determined by the number of employees), industrial classification, area/region, number of relevant local units and export status.

For a consistent approach we recommend that stratification takes place according to: business size and industrial classification. Although Scotland also undertakes stratification according to export status to increase the chance of exporters being sampled, we recognise that there may be businesses which don't export to the rest of the world but do partake in interregional trade. Ideally, each nation should also use the same number of employment bands. However, from a practical point of view this would require a redesign of the sampling, imputation and grossing processes and the code that is in place to undertake these processes. This would not be an easy or quick task. To measure interregional trade flows, the SIC code is sufficient with trade flows being broken down across 11 different sectors, discussed in more detail in the subsequent section.

Recommendation 3a: Remaining Data Gaps

An important issue which we have not yet broached is the lack of a dedicated English trade survey which can ask businesses about the distribution of sales to Scotland, Wales and

Northern Ireland or indeed different English regions. There are two options if approaching this issue.

The first option involves resolving the English data gap simply by treating England as the residual. Importantly, this is predicated on having sufficient Welsh data available. This is a straightforward approach *if* we have sufficient trade data for the devolved nations. Specifically, if we wish to collect data on interregional trade between the four nations and have data on Northern Irish, Scottish and Welsh exports to each nation we can infer English interregional imports from these flows. If we have data on rUK imports for each devolved nation – these are already recorded in Scottish and Northern Irish SUTs but not regularly recorded for Wales – we can then infer English interregional exports which will be the residual. In short, if Northern Ireland, Scotland and Wales have data on exports to each UK nation (obtained from an export-oriented trade survey) as well as data on total rUK imports, English interregional trade flows can be inferred. If we wish to dig deeper, considering the NUTs 1 regions, these English flows would then need to be regionalised, however, if using a residual-based approach, the quality of estimates at the NUTs 1 level is likely to be compromised.

The second option which we recommend would involve developing an export-oriented English trade survey or integrating interregional trade questions on England's trade with the other three nations into an existing survey such as the ABS. This has numerous advantages. First, it would allow us to directly collect data on England's interregional trade. Second, it could be used to assess the efficacy of the residual-based approach currently being used in Section 3 of this report. Third, English flows obtained using this approach are likely to be of better quality and could then be regionalised to obtain NUTs 1 flows. Fourth, while collecting data on the exports of different English regions is likely to be challenging due to the difficulty involved in creating NUTs 1 RUs, the existence of an English trade survey or trade survey questions, would facilitate the inclusion of questions relating to different English regions on a regular basis or as part of a one-off exercise.

Recommendation 3b: Replacement/ supplement of existing surveys

The discussion so far has focussed on the harmonisation of existing surveys to ensure a coherent approach to data collection. Given the non-statutory nature of the Welsh and

Scottish Surveys, and the likely desire to have a consistent approach to reporting units, there is another option which builds on the English survey above.

This would be to introduces a survey of all reporting units in GB, which could replace some of the motivation for these surveys in Scotland and Wales. There are obviously policy interests that are met from these surveys locally (such as detailed destination information for international exports) so this would require a dialogue between ONS and the DAs. However, if a survey of English reporting units is being seriously considered, it would appear much more efficient to extend this to all GB reporting units and collect the data in the same framework, in the same way, in a statutory survey.

In short then, it would seem like a missed opportunity if introducing English trade data collection if this was not extended to Wales and Scotland.

Recommendation 3c: Leveraging Other Data Sources

In the previous section, we discussed other data sources which can be used to provide information on interregional trade flows. To conclude our recommendations on data collection we now consider these alternative data sources. While the UKIS and LCF data sources provide useful points of comparison for interregional trade estimates, it is unclear how they could be used to supplement trade surveys or provide a new means to estimate interregional trade. However, it is possible to supplement survey-based data with transport statistics rather than collecting additional interregional trade data at the NUTs 1 level or even at the national level.

Transport statistics can be used to regionalise rUK or English flows. Rather than improving interregional trade data collection, improvements could instead be made in the collection of trade statistics. An important example of an effective means to collect trade data via transport statistics is the US commodity flow survey (CFS) carried out every 5 years. Businesses selected for inclusion are asked to provide shipment information on a sample of outbound shipments during a one-week period, four times during the year. While the US does not provide official interstate trade flows using this data, it is the main source used by academics to estimate US interstate trade. Importantly, unlike the annual statutory Continuing Survey of Road Goods Transport for Great Britain (CSRGT-GB) and Northern

Ireland (CSRGT-NI), the CFS collects information on the value of the shipment while the CSRGT only collects information on the weight. An important shortcoming of this approach is that it cannot be used to measure trade in services. Overall, we would recommend that interregional trade data be collected as outlined in recommendations 1a, 1b, 2a, 2b and 3a. However, to regionalise flows, particularly English flows into the nine English regions, improving the quality of transport data collected may be viable and beneficial.

Another issue encountered in trade and transport surveys is the distinction between the first and final destination of a good. In Finland (during their one-off trade survey) and Canada (in their annual estimation of interprovincial flows, also survey a sample of wholesalers to gain a deeper understanding of the supply chain. In Finland, wholesalers were sent a separate survey with additional questions on the main commodities sold by firms and the cost of purchasing these products in each region. This allowed the firm survey and wholesaler survey to be linked and information to be gained on regional trade margins. In Canada, the discontinued Wholesale Trade Commodity Survey by Origin and Destination provided data on where wholesalers purchases originate from and where their sales are destined which was used together with the Annual Survey of Manufacturers to estimate interregional trade in manufactured goods. When undertaking interregional trade surveys if the four nations, it may therefore be useful to ask businesses to identify the fraction of their goods sold to wholesalers and then solicit origin and destination information from the wholesalers. Unlike Canada, our focus would be on industry rather than commodity flows reducing complexity and increasing feasibility.

If we consider the Finnish case, it may be beneficial to focus on obtaining the regional distribution of the cost of purchases of some services. This is because businesses may have more information about these regional imports than service providers do about their regional exports.

2.3.2. Estimating Interregional Trade Flows in the UK

We have put forward several options and recommendations for working towards a UK-wide approach to interregional trade data collection. In this subsection, we provide and recommend different options for estimating interregional trade for each sector, giving a summary in **Table 9**. In general, we recommend taking a similar approach to Japan, South

Korea and Canada, collecting primary data on rUK flows or, ideally, flows between the four nations using trade surveys. We also make slightly different recommendations for goods and services. Where necessary, flows can then be regionalised to the national level or, ideally, NUTs 1 level using freight data, interconnector data, regional consumption data or data from travel surveys. Using estimated interregional trade flows, it may then be possible to use hybrid approaches to estimate interregional trade flows in subsequent years. We focus on gravity-based methods here but other hybrid options could also be explored.

Agriculture, Other Primary Goods, Manufactured Goods, Utilities and Construction

For agricultural goods, other primary goods, manufactured goods and utilities, we continue to recommend combining primary data collected through trade surveys with other sources of data to estimate interregional trade flows in goods. This hybrid approach is also in line with Canada and survey-based estimates produced in Japan and South Korea. If data on rUK flows are collected, as demonstrated in Greig, Spowage and Roy (2020) these can then be regionalised using freight data to obtain interregional trade flows. In the case of utilities, a slightly different approach was taken where knowledge of the distribution network together with interconnector data was used to regionalise these flows. For construction, we recommend a similar approach but regionalisation took place according to regional consumption. There is also data on construction new orders, which are used to some extent in the production of official and national statistics already. These data should be investigated, and we will discuss with ONS how they can facilitate and support this project in potentially getting access to this Microdata. Notably, though, in the Canadian case for utilities and construction, it is assumed that most consumption takes place locally.

Ideally, though, data on interregional trade flows between the four nations should be collected with English flows then being regionalised to NUTs 1 level using freight, interconnector and consumption data. With the CSRGT-GB more robust than the CSRGT-NI and tending to record shorter journeys, it seems well suited to regionalise English flows to the nine regions.

As a next step, it may be beneficial to fit a gravity model using the most recent interregional trade estimates for goods where, the relative size of and distance between nations and regions is likely to play an important role. Once fitted, this model can then be used to

estimate interregional in subsequent years if survey-based data on interregional trade data is only collected, say, every 5 years.

Business and Computing Services and Financial Services

For businesses and computing services and financial services, it is notoriously difficult to estimate international and interregional trade flows. There are several possible options. Although it is more difficult to collect data on trade in services, we again recommend combining primary data collected through trade surveys with other sources of data. Again, this hybrid approach is also in line with approaches adopted in Japan, South Korea and Canada. As mentioned in the previous subsection, drawing on the Finnish trade survey, we also recommend asking businesses about their purchases of main services since they may have more knowledge about these imports than services have on exports. If we then have rUK flows these can again be regionalised. Freight data is evidently not appropriate in this setting, but regional consumption can be used. Ideally, however, data on interregional trade flows between the four nations should be collected with English flows then regionalised to NUTs 1 level. In this case, it would be interesting to see whether flows produced by the fitted gravity model are close to survey-based interregional trade flows, given that trade in services is possibly influenced less heavily by geography.

Retail

From a national accounts perspective, retail is a special case since margins are composite goods, being exported and imported entirely via the trade of other goods and services. In Greig, Spowage and Roy (2020) retail margins are therefore determined by the level of interregional imports through an import-orientated methodology. The margins are assumed to have a similar profile as for all domestic goods supplied. The supply table, therefore, determines which products carry a margin.

Both Northern Ireland and Scottish SUTs identify the products on which margins are being generated. The origin and destination of exports and imports of margins should be generated last, as a weighted sum of the export and import of those goods on which margins are generated. For Wales, margins are available from the intermediate analytical tables but do not conform to the same methodology as Scottish or Northern Ireland statistics due to their

historic nature. An alternative strategy for calculating interregional retail trade would involve surveying wholesalers as discussed in the preceding section and undertaken in Finland.

Transport and Communications

Transport and communications differ from other services in that rUK or national interregional trade flows can be regionalised using freight data. In Greig, Spowage and Roy (2020), communications is inferred directly from the volumes of freight flows. Northern Ireland report a large trading surplus in the sector, and very little imports of transportation services. The origin and destination of Welsh and Scotland exports is split between its component sectors, but Northern Ireland do not publish statistics below an overall figure. For Northern Ireland, raw port-to-port maritime statistics are used to estimate their origin-destination of services and this is combined (in sheer volume terms) with road freight to generate similar figures for Scotland. An export orientated approach is used, where reconciliation occurs if the results need to be constrained by the relevant import and export totals. On a pairwise basis this can be done by hand. Again, a gravity model could also be fitted to examine these flows.

Public Services

Very little interregional trade with rUK is reported for public services in most national accounts for Scotland and Northern Ireland. It may be possible for government agencies to establish more accurate estimates of imports and exports but, from our discussions to date, this remains uncertain. Overall, it is not something that we believe will have a material impact on the results given the small scale in terms of estimation. Just over half the component of Northern Ireland exports in 'Public Services' is from non-resident expenditure. This is the basis for allocating Public Service exports.

Recreation

For recreational services, again primary data can be collected via trade surveys, however, it is common across countries to use additional survey data on travellers and tourists to supplement trade data. In the UK case, Greig, Spowage and Roy (2020) use the last available UK Tourist Survey, which provides shares of origin-destination tourist expenditure for England, Scotland, Wales, and Northern Ireland. The Northern Ireland tourist data also

provides a full breakdown of the 'destination' of Northern Ireland tourist exports, and so was also used where possible.

For Scottish, English and Welsh residents, their expenditure in Northern Ireland is published regularly, is consistent with Northern Ireland national accounts, and so it is a straightforward matter to allocate Northern Ireland exports to both Scotland and RUK. Specifically, it is export-orientated, with the destination of Northern Ireland exports being directly observed from their surveys. Estimates for recreational services can be considered in terms of allocating non-resident household expenditure. This can be seen in most raw, published SUTs with further breakdowns possible from data providers. Exports from certain sectors are almost entirely composed of non-resident expenditure (particularly 'Accommodation and Food & Drink' services). Data obtained from both Scotland, WERU and NISRA give a breakdown of non-resident expenditure across all sectors. In all cases, nearly all of exports are identified as non-resident household expenditure in Recreational Services.

Table 9: Recommended Method for Estimating Interregional Trade Flows for each Sector

Description	Sector	Regionalisation Data Sources	Recommended Method for Interregional Trade Estimation
Agriculture	Agriculture	CSRGT-GB, CSRGT-NI, Port-to-Port Maritime Statistics, Transport Scotland	Primary data collection through trade surveys with freight-based regionalisation Gravity-based estimation
Other Primary	Production	CSRGT-GB, CSRGT-NI, Port-to-Port Maritime Statistics, Transport Scotland	Primary data collection through trade surveys with freight-based regionalisation Gravity-based estimation
Manufactured Goods	Production	CSRGT-GB, CSRGT-NI, Port-to-Port Maritime Statistics, Transport Scotland	Primary data collection through trade surveys with freight-based regionalisation Gravity-based estimation
Utilities	Production	Interconnector Data	Primary data collection through trade surveys with interconnector-based regionalisation Gravity-based estimation
Construction	Construction	UK, Northern Ireland, Scotland Use Tables, Re-based WERU Use Table	Primary data collection through trade surveys with demand-based regionalisation
Retail	Distribution	Margins estimated on imports calculated from Supply Tables	Margins estimated on imports calculated from Supply Tables Primary data collection through trade surveys of wholesalers
Transport & Communications	Services	CSRGT-GB, CSRGT-NI, Port-to-Port Maritime Statistics	Primary data collection on service firms' exports and businesses' service purchases through trade surveys with freight-based regionalisation
Business & Computing	Services	UK, Northern Ireland, Scotland Use Tables, Re-based WERU Use Table	Primary data collection on service firms' exports and businesses' service purchases through trade surveys with demand-based regionalisation
Financial	Services	UK, Northern Ireland, Scotland Use Tables, Re-based WERU Use Table	Primary data collection on service firms' exports and businesses' service purchases through trade surveys with demand-based regionalisation
Public	Services	UK, Northern Ireland, Scotland Use Tables, Re-based WERU Use Table	Primary data collection on service firms' exports and businesses' service purchases through trade surveys with demand-based regionalisation
Recreational	Services	Northern Ireland Tourism Surveys, GB Tourism Survey, Transition tables from Scottish Government/NISRA	Primary data collection through trade surveys with travel survey-based regionalisation

3. Results

In this section, we update our trade estimates, building on Greig et al. (2020) and noting where we improve aspects of our methodology. Given differences in data availability across the four nations, we continue to focus on producing estimates for the reference year 2015. All data obtained is for the reference year 2015 unless stated otherwise.

For each sector, our trade estimates are constructed in four steps. In the first step, we collect and combine data on trade flows between each devolved nation and rUK. In the second step, we regionalise data on non-resident sales using tourism data. In the third step, we regionalise other exports using a range of sector-specific indicators. In the fourth step, we sum the regionalised flows from the second and third steps to produce our final trade estimates.

3.1. Collating Data on Trade Flows between each Devolved Nation and the Rest of the UK

In the first step, we collate data on exports and imports between each devolved nation and rUK. The data sources used to achieve this are summarised in **Table 10**. Importantly, improving on Greig et al. (2020) we will consider trade flows arising from non-resident expenditure separately. For reasons discussed in more detail towards the end of this section, we only require data on each devolved nation's non-resident sales to rUK.

Table 10: Data on Trade Flows between each Devolved Nation and rUK

Nation	Description of Data Sources Used
Scotland	• Detailed exports use table published in 2020 by the Scottish Government • Detailed imports supply table obtained from the Scottish Government (*) • Supply and use satellite account tables published in 2020 by the Scottish Government
Northern Ireland	• Supply and use tables published by NISRA in 2020 • NI non-resident expenditure obtained from NISRA (*)
Wales	• Jones et al. (2010) combined use table for reference year 2007 • Economic indices for Wales and the UK published by the Welsh Government in 2020 • Inflation data published by the ONS in 2020

Note: starred items are not currently publicly available.

For Scotland, we rely on the Scottish Government's SUTs. The detailed exports table splits total rUK exports into (i) Scottish sales to non-residents from rUK and (ii) other exports to rUK.

Similarly, we obtain a detailed imports table from the Scottish Government which provides data on imports from rUK excluding non-domestic spending by Scottish residents in rUK.

To account for the offshore oil and gas industry, we use experimental estimates of supply and use published by the Scottish Government as part of the Whole of Scotland Economic Accounts Project. The inclusion of this data is an attempt to fully account for the role offshore extraction activity in UK supply chains, and to ensure Scottish trade figures are not distorted due to the inclusion of trade with the Scottish part of the UK Continental Shelf. This offshore data does not affect our non-resident trade flows but mean that other exports and imports need to be adjusted to reflect offshore activity. For each sector, we adjust Scottish rUK exports by adding Scottish adjacent waters rUK exports and deducting Scottish adjacent waters onshore Scotland purchases. Similarly, we adjust Scottish rUK imports by adding Scottish adjacent waters rUK imports and deducting adjacent waters onshore Scotland sales. Accounting for offshore extraction activity results in very large crude oil exports from Scotland to rUK relative to crude oil imports from the other UK nations. This is likely, in part, due to different treatments of offshore activity in the Scottish offshore satellite accounts, the Scottish and Northern Irish national accounts, and the Welsh CUT.

For Northern Ireland, we rely on data produced by NISRA. Data on Northern Irish imports and exports to rUK are published in the SUTs. However, NI residents spending in rUK and rUK residents spending in NI are not recorded in the SUTs since these flows are part of Household Final Consumption Expenditure calculations. Therefore NI sales to non-residents were obtained from NISRA.

For Wales, data on 2007 Welsh-rUK exports, imports and rUK residents' spending in Wales are obtained from Jones et als. (2010) combined use table (CUT). A new set of tables for the year 2018 are in production but have not been published. Rebasing the data to 2015 using trends in UK international exports resulted in the Welsh trade surplus with rUK becoming even more exaggerated (see Grieg et al., 2020). Here, we instead rebase the data using trends in Welsh and UK economic indices available from the Welsh Government. Specifically, for each sector, we calculate the change in the Welsh index between 2007 and 2015 and use this to scale the relevant sector's Welsh exports to rUK. We then calculate the change in the UK index between 2007 and 2015 and use this to scale the relevant sector's Welsh imports from

rUK. Since indices are unavailable for Agriculture and Farming and Public Services, we leave these series unadjusted.

We then calculate the change in joint spending of English and Scottish residents[5] in Wales from the 2007 UK Tourist Survey (UKTS) (converted to 2015 prices) and the GB Tourist Survey (GBTS) for 2015 and use this to scale each sector's sales to rUK residents. Last, for all sectors and non-resident spending, we convert 2007 prices into 2015 prices using data on CPIH obtained from the ONS. Overall, our rebasing results in the 2015 tables showing a real reduction in the Welsh trade surplus with rUK relative to the 2007 tables.

To proceed with regionalising our rUK flows we need to either obtain data on purchases from non-residents for each devolved nation or calculate English sales to non-residents in rUK. While we have data on purchases from the Scottish Government and NISRA, this data is not available for Wales. Consequently, we infer sales to non-residents in England by using our data on Scottish, Welsh and Northern Irish sales to non-residents shown and data on the destination of spend by residence from the 2010 UKTS[6]. We then obtain the flows in **Table 11.**

3.2. Using Tourism Data to Regionalise Sales to Non-Residents

In the second step, we use an export-oriented approach, regionalising sales to non-residents in **Table 11** using shares derived from destination of spend by residence from the 2010 UKTS. This allows us to obtain **Table 12**. Reassuringly, the regional shares obtained from the 2010 UKTS broadly cohere with Northern Irish data on expenditure of external overnight trips in 2015 and the 2015 GBTS, suggesting that the fraction of non-resident sales to each nation has not changed significantly between 2010 and 2015. We note that to regionalise this data at NUTs1 level, an additional data source would be required to further regionalise the obtained English exports.

[5] Northern Irish non-resident spending is not published by the GBTS so cannot be included in our calculation.
[6] Again, the 2015 GBTS cannot be utilised since data on Northern Ireland is no longer published.

Table 11: 2015 Devolved Nations' Exports and Imports to rUK (£ million)

	SCOTLAND			NORTHERN IRELAND			WALES			England
	Exports	Imports	Sales to Non Residents	Exports	Imports	Sales to Non Residents	Exports	Imports	Sales to Non Residents	Sales to Non Residents
Agriculture and Forestry	1398	676	22	131	286	2	786	303	5	19
Other Primary Goods	9632	741	0	148	431	0	258	42	0	0
Manufactured Goods	13491	25395	606	6505	11224	70	21536	7237	236	586
Utilities	4328	2106	14	92	298	1	1953	906	1	10
Construction	1039	6246	1	1572	96	0	860	1240	0	1
Wholesale, Retail and Margins	441	2134	3	2	1	1	2876	2020	1	3
Transport and Communications	2212	2984	159	899	175	21	1728	1045	124	196
Business and Computer Services	10628	16175	173	988	4144	10	1973	1925	35	140
Financial Services	6356	5475	37	274	895	12	3059	1637	18	42
Public Services	558	604	7	43	0	22	1161	3152	2	20
Recreational Services	239	1549	1756	162	295	139	252	703	704	1672

Table 12: 2015 Interregional Non-Resident Sales (£ million)

	EXPORTS											
	SCOTLAND			NORTHERN IRELAND			WALES			ENGLAND		
	Northern Ireland	Wales	England	Scotland	Wales	England	Scotland	Northern Ireland	England	Scotland	Northern Ireland	Wales
Agriculture and Forestry	2	1	20	1	0	2	0	0	5	10	3	6
Other Primary Goods	0	0	0	0	0	0	0	0	0	0	0	0
Manufactured Goods	41	16	548	17	3	50	8	2	225	305	106	176
Utilities	1	0	13	0	0	0	0	0	1	5	2	3
Construction	0	0	1	0	0	0	0	0	0	1	0	0
Wholesale, Retail and Margins	0	0	2	0	0	1	0	0	1	2	1	1
Transport and Communications	11	4	144	5	1	15	4	1	119	102	35	59
Business and Computer Services	12	5	156	2	0	7	1	0	34	73	25	42
Financial Services	3	1	33	3	1	8	1	0	17	22	8	13
Public Services	0	0	6	5	1	16	0	0	2	10	4	6
Recreational Services	120	48	1589	33	7	99	24	7	673	869	301	501

3.3. Regionalising Other Exports and Imports

To regionalise our exports and imports in **Table 11** we adopt an export-oriented approach wherever feasible in line with the greater reliability of the data on exports to rUK. The data used to regionalise exports is summarised in **Table 13.** The results from this step are given in **Table 14**. Notably, while road freight and subnational energy consumption data is available at the NUTs1 level if combined with comparable Northern Irish data, coastwise freight data is only available for the four nations.

Table 13: Data Sources Used to Regionalise rUK Trade Flows

Sector	Description of Data Sources Used for Regionalisation
1. Agriculture & Forestry 2. Other Primary Goods 3. Manufactured Goods	• Goods lifted by region and country of origin and destination: 2007 – 2016 (Source: Continuing Survey of Road Goods Transport Great Britain, CRGT-GB) • UK coastwise freight, country to country by cargo category, 2015 (Source: Department for Transport Port Statistics) • Freight transport by road: Goods lifted within Northern Ireland by goods vehicles over 3.5 tonnes: 2015 (Available from: Northern Ireland Department for Infrastructure, Source: Continuing Survey of Road Goods Transport Northern Ireland, CRGT-NI) • Goods lifted, entering or leaving Scotland, to or from rest of UK, by origins and destinations of journeys, 2015 (Available from: Transport Scotland, Source: Department for Transport Road Freight Statistics) • HMRC Price per Tonne of Selected Goods
4. Transport & Communications	• Goods lifted by region and country of origin and destination: 2007 – 2016 (Source: Continuing Survey of Road Goods Transport Great Britain, CRGT-GB) • UK coastwise freight, country to country by cargo category, 2015 (Source: Department for Transport Port Statistics) • Goods lifted, entering or leaving Scotland, to or from rest of UK, by origins and destinations of journeys, 2015 (Available from: Transport Scotland, Source: Department for Transport Road Freight Statistics)
5. Utilities	• Sub-National Electricity and Gas Consumption Statistics (Source: Department for Business, Energy and Industrial Strategy)
6. Wholesale, Retail & Margins 7. Construction 8. Business & Computer Services 9. Financial Services 10. Public Services 11. Recreational Services	• Sector-specific consumption shares calculated using UK, Scottish and NI SUTs and Welsh CUT (Source: ONS, Scottish Government, NISRA, Jones et al., 2010)

3.3.1 Using Freight Data to Regionalise Trade in Goods

For trade in agriculture and forestry, other primary goods, and manufacturing, we follow the approach adopted in Greig et al. (2020), using freight data for regionalisation. We first sum data on road freight volumes from the Continuing Survey of Road Goods Transport for Great Britain (CSRGT-GB) and data on UK coastwise freight volumes for 2015. For the road freight data, we use a ten-year pooled sample since focussing on a single year is unlikely to adequately capture the extent to which commodities move between Scotland and Wales.

Although the road freight data is broken down by commodity, the cargo of coastwise freight is not always identified. We assume that all unspecified cargo crossing the Irish Sea has the same product structure as goods moving within Northern Ireland by HGV. This product structure is derived from Northern Ireland Department for Infrastructure freight transport statistics which, in turn, relies on the Continuing Survey of Road Goods Transport for Northern Ireland (CSRGT-NI). Any other unspecified cargo, is assumed to have the same product structure as goods moving within GB by HGV. This product structure is derived using our road freight data.

Having obtained our total freight flows by sector, we now need to value our freight volumes. Using HMRC regional trade statistics data for selected commodities, we multiply each freight flow by the origin country's price per tonnage. This allows us to derive the total value of commodity flows between England, Scotland, Wales, and Northern Ireland.

Last, data from Transport Scotland is used to adjust our commodity flows for transhipment hubs. Given that road and coastwise freight statistics suggests that Wales exports very little directly to Northern Ireland or Scotland, it is likely that England acts as a transhipment hub for incoming and outgoing Welsh trade. Transport Scotland does not record estimates of Welsh-Scottish freight flows since 2010 since the sample is too small. The 2010 data, however, suggests more Welsh-Scottish trade than our derived commodity flows would imply. The figures suggest that 2% of English flows to Scotland originate in Wales while 5% of Scottish flows to England are destined from Wales.

If we compare the Transport Scotland data and coastwise freight data on roll-on roll-off cargo, the coastwise freight data implies that 2.2 million tonnes of wheeled Northern Irish cargo is destined for Scotland while Transport Scotland data suggests that only 0.5 million tonnes of

road freight enters Scotland from Northern Ireland. There are many reasons for this discrepancy, but if we assume that data held by the Scottish Government is a more accurate reflection of Scottish-Northern Ireland direct freight links, this suggests that Scotland acts as a transhipment hub for incoming and outgoing Northern Irish trade. The Transport Scotland data suggests that 78% of Scottish flows to Northern Ireland originate in England while 75% of Northern Irish flows to Scotland are destined for England.

We mentioned previously that the freight statistics imply that Wales exports very little directly to Northern Ireland, suggesting that England acts as transhipment hub. With the absence of data on direct Northern Ireland-Wales freight links, we assume that 2.5% (the average of the Scottish-English-Welsh logistic path) of Welsh flows to England are destined for Northern Ireland and 2.5% of Northern Irish flows to England are destined for Wales.

Having adjusted our valued freight data for transhipment hubs, these flows are then used to regionalise trade in agriculture and forestry, and manufactured goods using an export-oriented approach. For trade in primary goods, we cannot use an export-oriented approach at present due to very large crude oil exports from Scotland to rUK discussed previously. Instead, we use an import-oriented approach to regionalise trade in this sector, ensuring Scottish exports of primary goods are constrained to Welsh and Northern Ireland import totals. To regionalise trade in transport and communications using an export-orientated approach, we use our freight volumes (before valuation) having adjusted them to account for transhipment hubs.

3.3.2. Using Energy Consumption Data to Regionalise Trade in Utilities

Utilities consist of electricity, gas and water related services with trade in electricity and gas dominating trade in water services. For trade in utilities, we assume: (i) England and Wales and (ii) Northern Ireland trade in utilities with Scotland but not each other so Northern Irish rUK imports and exports flow from and to Scotland. We then use an export-oriented approach, regionalising remaining flows using GB subnational electricity consumption. Reassuringly, very similar regional shares are obtained using subnational gas consumption. We note that if data on Northern Ireland were combined with the GB data, this data would available at NUTs 1 level.

3.3.3. Using Consumption Data to Regionalise Trade in Services

For all service sectors as well as trade in construction, we use an export-oriented approach, regionalising flows using the sum of industries' intermediate use and final consumption expenditure from the Scottish and Northern Ireland national accounts and Welsh CUT. English consumption shares are inferred from UK totals less Scottish, Welsh and Northern Irish totals. Again, we scale consumption in each sector using the relevant Welsh indices and convert the 2007 Welsh prices into 2015 prices using data on CPIH obtained from the ONS. Notably, Northern Ireland does not import any public services so exports from Scotland and Wales to Northern Ireland were constrained to zero.

While we have used an import-oriented approach to estimate trade in wholesale, retail and margins in the past, this was difficult to implement in this update due to the low levels of trade for Northern Ireland in this sector. We therefore assumed Scottish and Welsh imports from and exports to Northern Ireland were negligible and regionalised remaining flows using the sum of industries' intermediate use and final consumption expenditure.

3.4. Final Interregional Trade Estimates

Our final interregional trade estimates are provided in **Table 15** and sum **Tables 12** and **14** produced in steps two and three.

Table 14: 2015 Interregional Trade Excluding Non-Resident Flows (£ million)

	EXPORTS											
	SCOTLAND			NORTHERN IRELAND			WALES			ENGLAND		
	Northern Ireland	Wales	England	Scotland	Wales	England	Scotland	Northern Ireland	England	Scotland	Northern Ireland	Wales
Agriculture and Forestry	29	69	1301	12	6	114	18	13	754	646	244	228
Other Primary Goods	70	18	9544	60	1	87	16	69	173	664	292	24
Manufactured Goods	1992	663	10835	597	239	5668	488	1740	19307	24310	7492	6335
Utilities	298	251	3779	92	0	0	189	0	1764	1825	0	655
Construction	32	45	961	173	69	1329	94	47	719	5979	16	1125
Wholesale, Retail and Margins	0	124	317	0	0	2	313	0	2563	1821	1	1896
Transport and Communications	77	249	1886	71	29	799	35	98	1594	2878	0	767
Business and Computer Services	317	542	9769	67	30	891	136	33	1804	15972	3794	1353
Financial Services	175	119	6062	21	11	242	241	92	2726	5212	628	1506
Public Services	0	157	401	4	11	29	126	0	1034	474	0	2984
Recreational Services	6	14	219	12	34	117	23	5	223	1513	283	655

Table 15: 2015 Interregional Trade Including Non-Resident Flows (£ million)

	EXPORTS											
	SCOTLAND			NORTHERN IRELAND			WALES			ENGLAND		
	Northern Ireland	Wales	England	Scotland	Wales	England	Scotland	Northern Ireland	England	Scotland	Northern Ireland	Wales
Agriculture and Forestry	30	69	1321	12	6	115	19	13	759	656	247	234
Other Primary Goods	70	18	9544	60	1	87	16	69	173	664	292	24
Manufactured Goods	2034	680	11384	614	243	5718	496	1742	19533	24614	7597	6510
Utilities	299	251	3792	92	0	0	189	0	1765	1830	2	658
Construction	33	45	962	174	69	1330	94	47	719	5980	16	1125
Wholesale, Retail and Margins	0	124	319	0	0	3	313	0	2564	1823	2	1897
Transport and Communications	88	254	2030	76	30	815	40	99	1713	2979	35	825
Business and Computer Services	329	547	9925	70	31	898	137	34	1837	16045	3819	1395
Financial Services	177	120	6095	24	12	250	242	92	2743	5234	635	1519
Public Services	0	157	407	9	12	45	126	0	1037	484	4	2990
Recreational Services	126	61	1808	45	40	216	47	12	896	2383	585	1156

4. Conclusion

In this report we have discussed an approach to estimating interregional trade within the UK, and produced updated estimates for 2015 to illustrate this method. These approaches use both existing regional tables and other data sources and techniques. Like all the best regional estimation that is produced within the UK, we take the "statistical scavenger" approach – using all information that is available to fill in the gaps to produce the best set of estimates possible.

As well as the proxy information that we use to split up the flows, we do need to bear in mind that the SUTs we have used as the basis for these estimates also are built on top of existing trade surveys. So whilst this is not the answer in all cases, trade survey information is likely to be a part of the answer in preparing better interregional trade estimates. This will both give flows between each constituent region to the rest of the UK, and also give us data about specific destinations and origins which will complement the proxy approaches we set out in this paper.

Importantly, our business interviews reveal that while some businesses can readily supply interregional trade data others face some challenges. However, by understanding the nature of the challenges faced by businesses, it is possible to formulate solutions by combining insights from trade data collection exercises undertaken by the ONS, Scottish Government, NISRA, Welsh Government and other countries.

Therefore, we have set out a number of recommendations on possible future data collections. To summarise, our recommendations involve: introducing an English trade survey, a survey of all GB reporting units, or additional questions to the ABS to capture trade flows between England and the remaining 3 nations; conducting streamlined trade surveys across the 4 nations annually with an in-depth trade collection exercise taking place every 5 years bringing the UK in line with best international practise; having consistent treatment of oil and gas extracted from the UK Continental Shelf; focussing on gaining information on industry flows and firms' sales rather than commodity flows and firms' purchases; and the four nations adopting a consistent approach to sample size and stratification. Our recommendations also point towards leveraging additional data sources where possible and suggest that data

collection exercises relating to transport data, wholesalers, and firms' service purchases may prove beneficial.

In terms of reporting units, our recommendation is to use the reporting unit structure to ensure consistency with regional accounting techniques, and in order to support the development of regional SUTs. We revisit this issue in Davidson, Black, Connolly and Spowage (2021), our companion paper which provides a framework for the production of supply and use and input output tables for the four nations.

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6. Appendix

6.1. Northern Ireland Annual Business Inquiry Interregional Trade Questions

17. **PURCHASES AND IMPORTS OF GOODS AND SERVICES** *see note 17*

(a) Please indicate the value of goods and services purchased from NI and GB during the period of the return

(i)	Goods and services purchased from NI	000	1600
	Of which were: Goods	000	1601
	Of which were: Services	000	1602
(ii)	Goods and services purchased from GB	000	1603
	Of which were: Goods	000	1604
	Of which were: Services	000	1605

(b) Did your business purchase goods or services from businesses based internationally (outside the UK) during the period of the return? Please tick Yes ☐ No ☐ 5012

If yes:

Please give the amounts payable in respect of invoices raised during this period (excluding VAT but including excise duties (less drawback)).

Include: Transactions with branches or subsidiaries of UK businesses that are located outside the UK.
Exclude: Transactions with branches or subsidiaries of foreign businesses that are located within the UK.

Please indicate

(i)	The total value of imports of goods and services (i.e. costs payable to businesses based outside of the UK)	000	120
(ii)	The value of imports of goods and services from each destination below		
(a)	Republic of Ireland	000	5013
	Of which were: Goods	000	124
	Of which were: Services	000	126
(b)	Rest of European Union (EU) (countries included at question 19(a))	000	5014
	Of which were: Goods	000	121
	Of which were: Services	000	125
(c)	Rest of World (countries included at question 19(b))	000	5015
	Of which were: Goods	000	123
	Of which were: Services	000	127
(iii)	Freight and insurance costs associated with imports	000	128

18. **EXPORTS OF GOODS AND SERVICES**

Please complete this section if you answered yes to question 3.2(b): Did your business provide goods or services to businesses based internationally?

Please give the amounts receivable in respect of invoices raised during this period (excluding VAT but including excise duties (less drawback)).

Include: Transactions with branches or subsidiaries of UK businesses that are located outside the UK.
Exclude: Transactions with branches or subsidiaries of foreign businesses that are located within the UK.
See note 18
Please indicate

(i) The value of exports of goods and services to each destination below

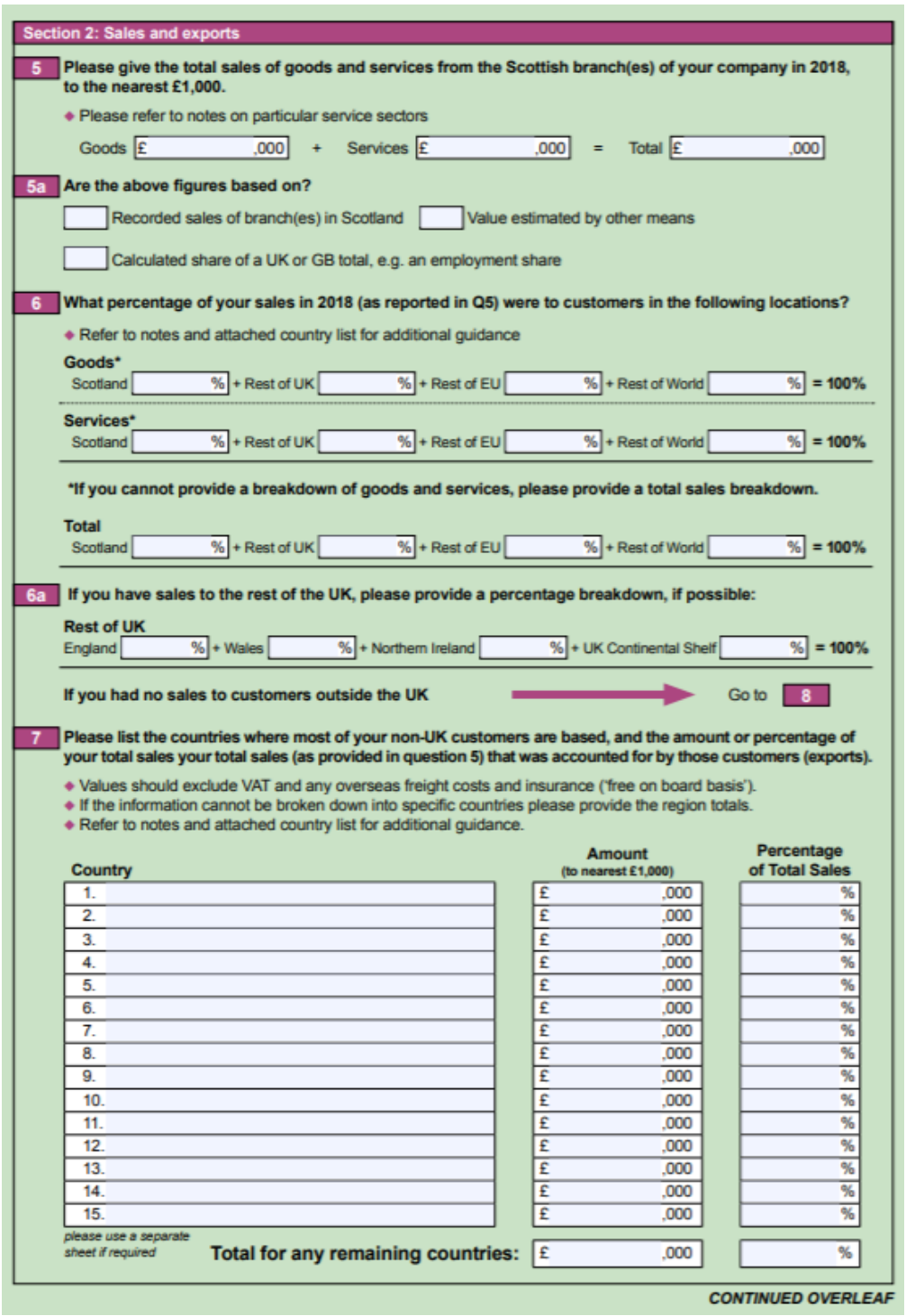
(a)	Republic of Ireland	000	5008
	Of which were: Goods	000	114
	Of which were: Services	000	116

If your business only exports to ROI please complete question 18 (i)(a) and proceed to the Local Unit List

(b)	Rest of European Union (EU) (Please provide a breakdown at question 19(a))	000	5009
	Of which were: Goods	000	111
	Of which were: Services	000	115
(c)	Rest of World (Please provide a breakdown at question 19(b))	000	5010
	Of which were: Goods	000	113
	Of which were: Services	000	117

(ii) Freight and insurance costs associated with exports 000 118

6.2. Scottish Global Connections Survey Interregional Trade Questions



Section 2: Sales and exports

5 **Please give the total sales of goods and services from the Scottish branch(es) of your company in 2018, to the nearest £1,000.**

- Please refer to notes on particular service sectors

Goods £ ,000 + Services £ ,000 = Total £ ,000

5a **Are the above figures based on?**

☐ Recorded sales of branch(es) in Scotland ☐ Value estimated by other means

☐ Calculated share of a UK or GB total, e.g. an employment share

6 **What percentage of your sales in 2018 (as reported in Q5) were to customers in the following locations?**

- Refer to notes and attached country list for additional guidance

Goods*

Scotland % + Rest of UK % + Rest of EU % + Rest of World % **= 100%**

Services*

Scotland % + Rest of UK % + Rest of EU % + Rest of World % **= 100%**

***If you cannot provide a breakdown of goods and services, please provide a total sales breakdown.**

Total

Scotland % + Rest of UK % + Rest of EU % + Rest of World % **= 100%**

6a **If you have sales to the rest of the UK, please provide a percentage breakdown, if possible:**

Rest of UK

England % + Wales % + Northern Ireland % + UK Continental Shelf % **= 100%**

If you had no sales to customers outside the UK → Go to **8**

7 **Please list the countries where most of your non-UK customers are based, and the amount or percentage of your total sales your total sales (as provided in question 5) that was accounted for by those customers (exports).**

- Values should exclude VAT and any overseas freight costs and insurance ('free on board basis').
- If the information cannot be broken down into specific countries please provide the region totals.
- Refer to notes and attached country list for additional guidance.

Country	Amount (to nearest £1,000)	Percentage of Total Sales
1.	£ ,000	%
2.	£ ,000	%
3.	£ ,000	%
4.	£ ,000	%
5.	£ ,000	%
6.	£ ,000	%
7.	£ ,000	%
8.	£ ,000	%
9.	£ ,000	%
10.	£ ,000	%
11.	£ ,000	%
12.	£ ,000	%
13.	£ ,000	%
14.	£ ,000	%
15.	£ ,000	%

please use a separate sheet if required

Total for any remaining countries: £ ,000 %

CONTINUED OVERLEAF

6.3. Trade Survey for Wales Interregional Trade Questions

It is important to note that the dual year of data collection was a one-off and the second wave of the pilot only collected data for the reference year 2019.

B3 For SALES of GOODS from your Welsh-based operations, please select which of the following locations they went to

	GOODS SALES 2017	GOODS SALES 2018
Wales	1	1
Rest of the UK (excluding Wales) GUIDANCE TEXT: Goods sold to the rest of the UK include transactions with businesses (or branches of your own business) and individuals in the rest of the UK	2	2
Rest of the EU (excluding the UK) GUIDANCE TEXT: Goods sold to the rest of the EU include transactions with businesses (or branches of your own business) and individuals in the rest of the EU For a full list of EU members (excluding the UK) please click here	3	3
Rest of the world (excluding the EU and UK) GUIDANCE TEXT: Goods sold to the rest of the world include transactions with businesses (or branches of your own business) and individuals in the rest of the world (excluding EU and UK)	4	4

B4 For total SALES of GOODS from the Welsh based operations, what value was to customers in the following locations? If you do not have exact values, please provide your best estimate.

	GOODS SALES 2017	GOODS SALES 2018
Wales	£	£

Rest of the UK (excluding Wales) GUIDANCE TEXT: Goods sold to the rest of the UK include transactions with businesses (or branches of your own business) and individuals in the rest of the UK	£	£
Rest of the EU (excluding the UK) GUIDANCE TEXT: Goods sold to the rest of the EU include transactions with businesses (or branches of your own business) and individuals in the rest of the EU For a full list of EU members (excluding the UK) please click here	£	£
Rest of the world (excluding the EU and UK) GUIDANCE TEXT: Goods sold to the rest of the world include transactions with businesses (or branches of your own business) and individuals in the rest of the world (excluding EU and UK)	£	£

B5 For SALES of GOODS from your Welsh-based operations, please select which of the following UK locations they went to

	GOODS SALES 2017	GOODS SALES 2018
England	1	1
Scotland	2	2
Northern Ireland	3	3

B6 For total SALES of GOODS from the Welsh based operations, what value was to customers in the following locations? If you do not have exact values, please provide your best estimate.

	GOODS SALES 2017	GOODS SALES 2018
England	£	£
Scotland	£	£
Northern Ireland	£	£

B7 For SALES of SERVICES from your Welsh-based operations, please select which of the following locations they went to

	SERVICES SALES 2017	SERVICES SALES 2018
Wales	1	1
Rest of the UK (excluding Wales) GUIDANCE TEXT: Services sold to the rest of the UK include transactions with businesses (or branches of your own business) and individuals in the rest of the UK	2	2
Rest of the EU (excluding the UK) GUIDANCE TEXT: Services sold to the rest of the EU include transactions with businesses (or branches of your own business) and individuals in the rest of the EU For a full list of EU members (excluding the UK) please click here	3	3
Rest of the world (excluding the EU and UK) GUIDANCE TEXT: Services sold to the rest of the world include transactions with businesses (or branches of your own business) and individuals in the rest of the world (excluding EU and UK)	4	4

B8 Ask all entering value for "SERVICES" at b1 for 2017 and/or 2018For total SALES of SERVICES from the Welsh based operations, what value was to customers in the following locations? If you do not have exact values, please provide your best estimate.

	SERVICES SALES 2017	SERVICES SALES 2018
Wales	£	£
Rest of the UK (excluding Wales) GUIDANCE TEXT: Services sold to the rest of the UK include transactions with businesses (or branches of your own business) and individuals in the rest of the UK	£	£
Rest of the EU (excluding the UK) GUIDANCE TEXT: Services sold to the rest of the EU include transactions with businesses (or branches of your own business) and individuals in the rest of the EU For a full list of EU members (excluding the UK) please click here	£	£
Rest of the world (excluding the EU and UK) GUIDANCE TEXT: Services sold to the rest of the world include transactions with businesses (or branches of your own business) and individuals in the rest of the world (excluding EU and UK)	£	£

B9 For SALES of SERVICES from your Welsh-based operations, please select which of the following UK locations they went to

	SERVICES SALES 2017	SERVICES SALES 2018
England	1	1
Scotland	2	2
Northern Ireland	3	3

B10 Ask all entering value for "rest of the uk" at b8 for 2017 and/or 2018For total SALES of SERVICES from the Welsh based operations, what value was to customers in the following locations? If you do not have exact values, please provide your best estimate.

	SERVICES SALES 2017	SERVICES SALES 2018
England	£	£
Scotland	£	£
Northern Ireland	£	£

C4 For GOODS PURCHASED (including IMPORTS) by your Welsh-based operations, please select which of the following locations they came from

	GOODS PURCHASES 2017	GOODS PURCHASES 2018
Wales	1	1
Rest of the UK (excluding Wales) GUIDANCE TEXT: Goods purchased from the rest of the UK include transactions with businesses (or branches of your own business) and individuals from across the rest of the UK (excluding Wales).	2	2
Rest of the EU (excluding the UK) GUIDANCE TEXT: Goods purchased from the rest of the EU include transactions with businesses (or branches of your own business) excluding those in the UK. For a full list of EU members (excluding the UK) please click here	3	3
Rest of the world (excluding the EU and UK) GUIDANCE TEXT: Goods purchased from the rest of the world include transactions with businesses (or branches of your own business) excluding those in the EU and UK.	4	4

C5 For total GOODS PURCHASED (including IMPORTS) by the Welsh based operations, what value was from suppliers in the following locations? If you do not have exact values, please provide your best estimate.

	GOODS PURCHASES 2017	GOODS PURCHASES 2018
Wales	£	£
Rest of the UK (excluding Wales) GUIDANCE TEXT: Goods purchased from the rest of the UK include transactions with businesses (or branches of your own business) and individuals from across the rest of the UK (excluding Wales).	£	£
Rest of the EU (excluding the UK) GUIDANCE TEXT: Goods purchased from the rest of the EU include transactions with businesses (or branches of your own business) excluding those in the UK. For a full list of EU members (excluding the UK) please click here	£	£
Rest of the world (excluding the EU and UK) GUIDANCE TEXT: Goods purchased from the rest of the world include transactions with businesses (or branches of your own business) excluding those in the EU and UK.	£	£

C6 For GOODS PURCHASED by your Welsh-based operations, please select which of the following UK locations they came from

	GOODS PURCHASES 2017	GOODS PURCHASES 2018
England	1	1
Scotland	2	2
Northern Ireland	3	3

C7 For total GOODS PURCHASED (including IMPORTS) by the Welsh based operations, what value was from suppliers in the following locations? If you do not have exact values, please provide your best estimate.

	GOODS PURCHASES 2017	GOODS PURCHASES 2018
England	£	£
Scotland	£	£
Northern Ireland	£	£

C8 For SERVICES PURCHASED by your Welsh-based operations, please select which of the following locations they came from

	SERVICES PURCHASES 2017	SERVICES PURCHASES 2018
Wales	1	1
Rest of the UK (excluding Wales) GUIDANCE TEXT: Services purchased from the rest of the UK include transactions with businesses (or branches of your own business) and individuals in the rest of the UK (excluding Wales)	2	2
Rest of the EU (excluding the UK) GUIDANCE TEXT: Services purchased from the rest of the EU include transactions with businesses (or branches of your own business) and individuals in the rest of the EU (excluding he UK) For a full list of EU members (excluding the UK) please click here	3	3
Rest of the world (excluding the EU and UK) GUIDANCE TEXT: Services purchased from the rest of the world include transactions with businesses (or branches of your own business) and individuals in the rest of the world (excluding the EU and UK)	4	4

C9 For total SERVICES PURCHASED (including IMPORTS) by the Welsh based operations, what value was from suppliers in the following locations? If you do not have exact values, please provide your best estimate.

	SERVICES PURCHASES 2017	SERVICES PURCHASES 2018
Wales	£	£
Rest of the UK (excluding Wales) GUIDANCE TEXT: Services purchased from the rest of the UK include transactions with businesses (or branches of your own business) and individuals in the rest of the UK (excluding Wales)	£	£
Rest of the EU (excluding the UK) GUIDANCE TEXT: Services purchased from the rest of the EU include transactions with businesses (or branches of your own business) and individuals in the rest of the EU (excluding he UK) For a full list of EU members (excluding the UK) please click here	£	£
Rest of the world (excluding the EU and UK) GUIDANCE TEXT: Services purchased from the rest of the world include transactions with businesses (or branches of your own business) and individuals in the rest of the world (excluding the EU and UK).	£	£

C10 For SERVICES PURCHASED by your Welsh-based operations, please select which of the following locations they came from

	SERVICES PURCHASES 2017	SERVICES PURCHASES 2018
England	1	1
Scotland	2	2
Northern Ireland	3	3

C11 For total SERVICES PURCHASED (including IMPORTS) by the Welsh based operations, what value was from suppliers in the following locations? If you do not have exact values, please provide your best estimate.

	SERVICES PURCHASES 2017	SERVICES PURCHASES 2018
England	£	£
Scotland	£	£
Northern Ireland	£	£

6.4. West Midlands Article by Franticek Brocek and Mairi Spowage

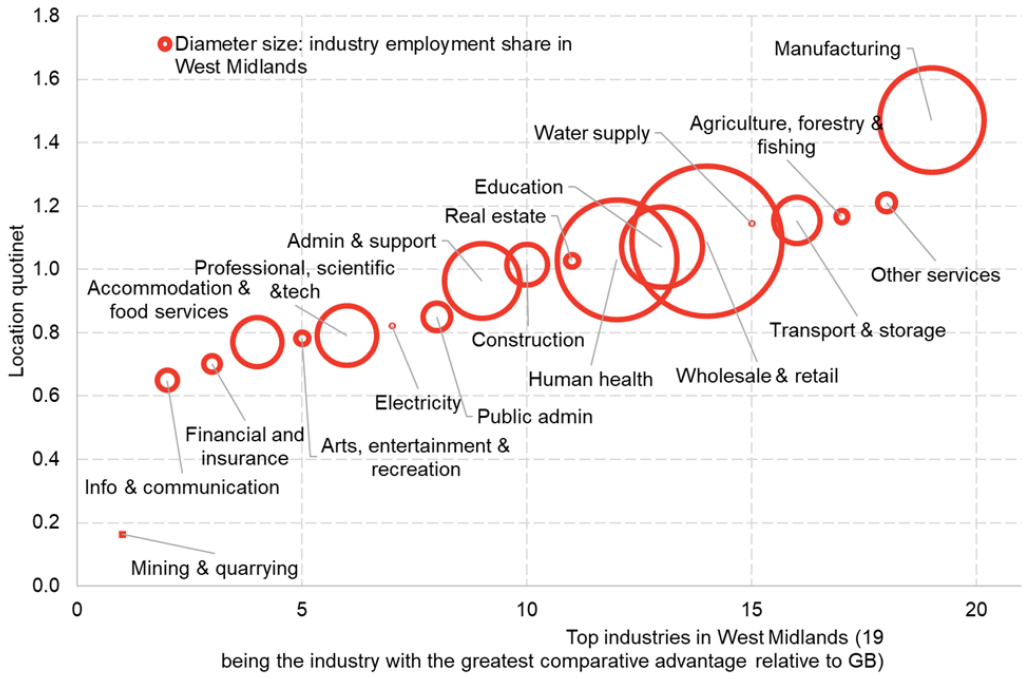
The effect of Covid-19 on the West Midlands economy

The institute has been doing lots of work recently to try to understand what the data is telling us about the differential impact of the COVID-19 pandemic on regional economies. As part of this, we have held some business webinars to find out how this data chimes with the experience of firms in these economies.

This article summarises some of our main findings on the effect the pandemic has had on GVA, local businesses, trade, and the labour market in West Midlands.

The West Midlands economy is different from the rest of GB due to its unique sectoral make up. Chart 1 below shows location quotients which indicate the sectors where West Midlands has a larger share of employment than the UK average. A location quotient of 1 implies that there is a higher share of employment in a given sector in West Midlands compared to GB as a whole.

Chart 1: Location quotients for West Midlands and the UK

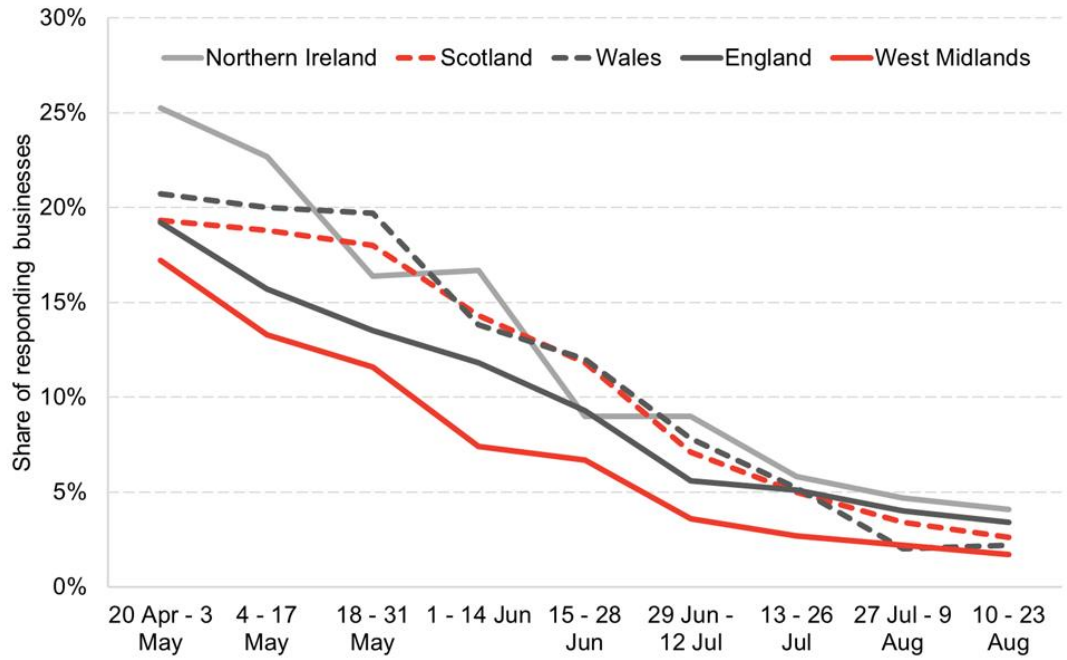


Source: BRES, FAI calculations

West Midlands clearly has a heavier concentration of jobs in the manufacturing sector. Furthermore, the wholesale & retail sector is the sector which employs the most people.

Manufacturing took a strong hit at the start of the pandemic. However, as shown in Chart 2, despite facing lower demand and capacity utilization, a lower percentage of businesses have had to completely pause trading in West Midlands compared to other UK regions.

Chart 2: Share of businesses which are temporarily closed or have paused trading, West Midlands & UK nations, 20th April – 23rd August 2020



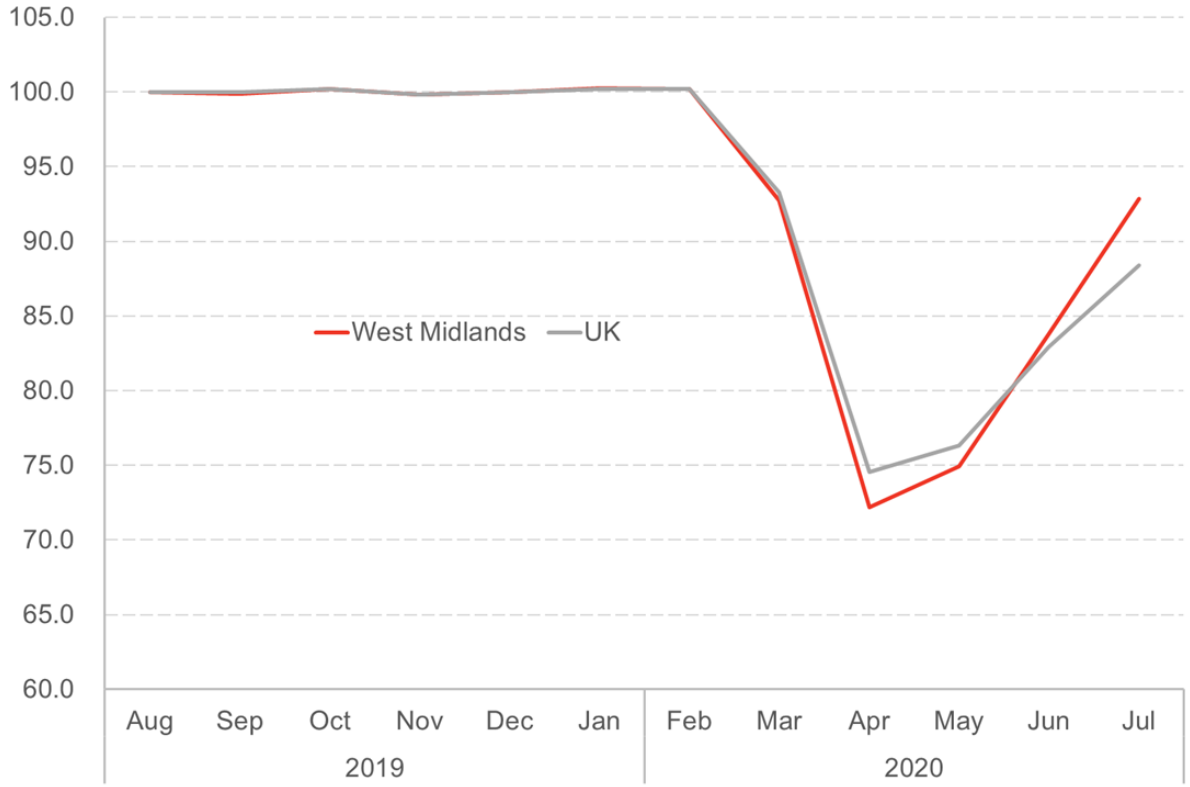
Source ONS BICS

This meant that once demand started picking back up again businesses in West Midlands were able to quickly utilise spare capacity and resume production. Our modelling thus shows that due to its sectoral make-up the West Midlands economy has initially fallen more sharply compared to the UK average, but it has been able to recover slightly faster – Chart 3.

Business Voice

64% of businesses said they thought the West Midlands had been more severely impacted

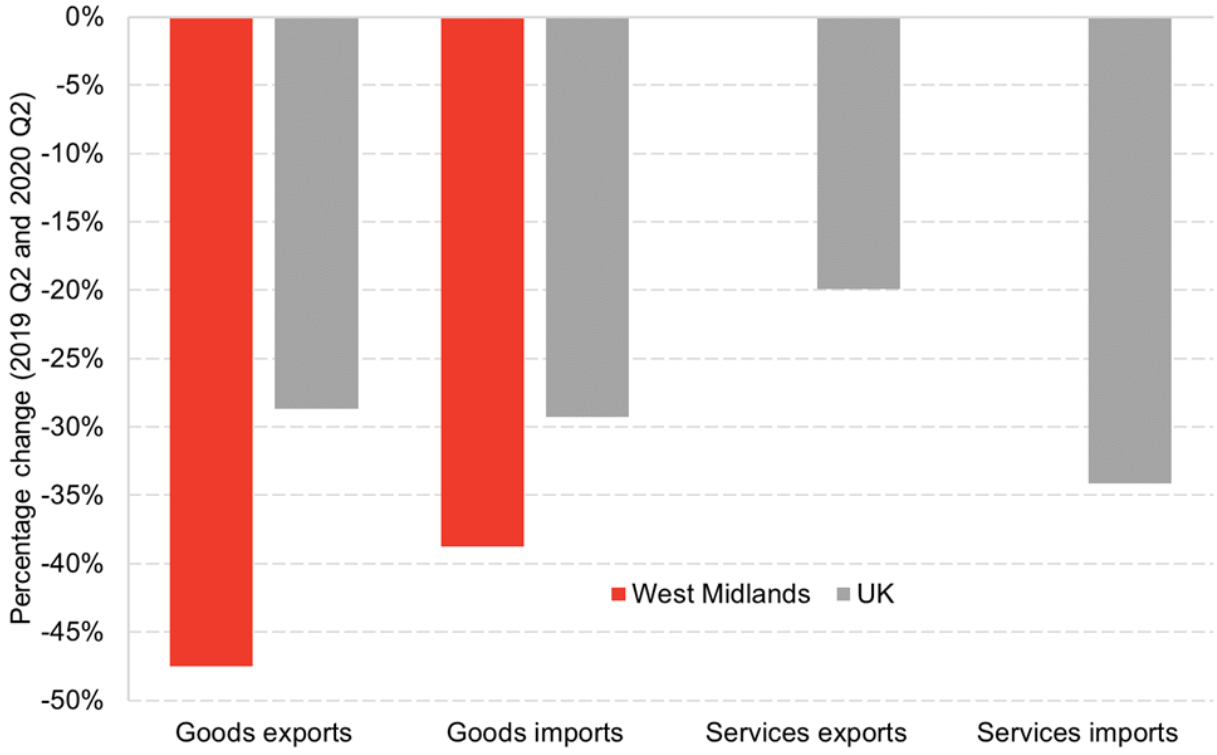
Chart 3: Modelled monthly GVA based on sectoral employment shares, West Midlands and the UK, August 2019 – July 2020



Source: ONS, FAI calculations

Data from the ONS Business Impact of Coronavirus Survey shows that during the second half of May around a third of all businesses in West Midlands have had challenges with exporting activity due to Coronavirus-related transport restrictions. This has resulted in a sharp decline in the volume of trade to and from the West Midlands – Chart 4.

Chart 4: Exports of goods and services, West Midlands and the UK, 2019 Q2 – 2020 Q2

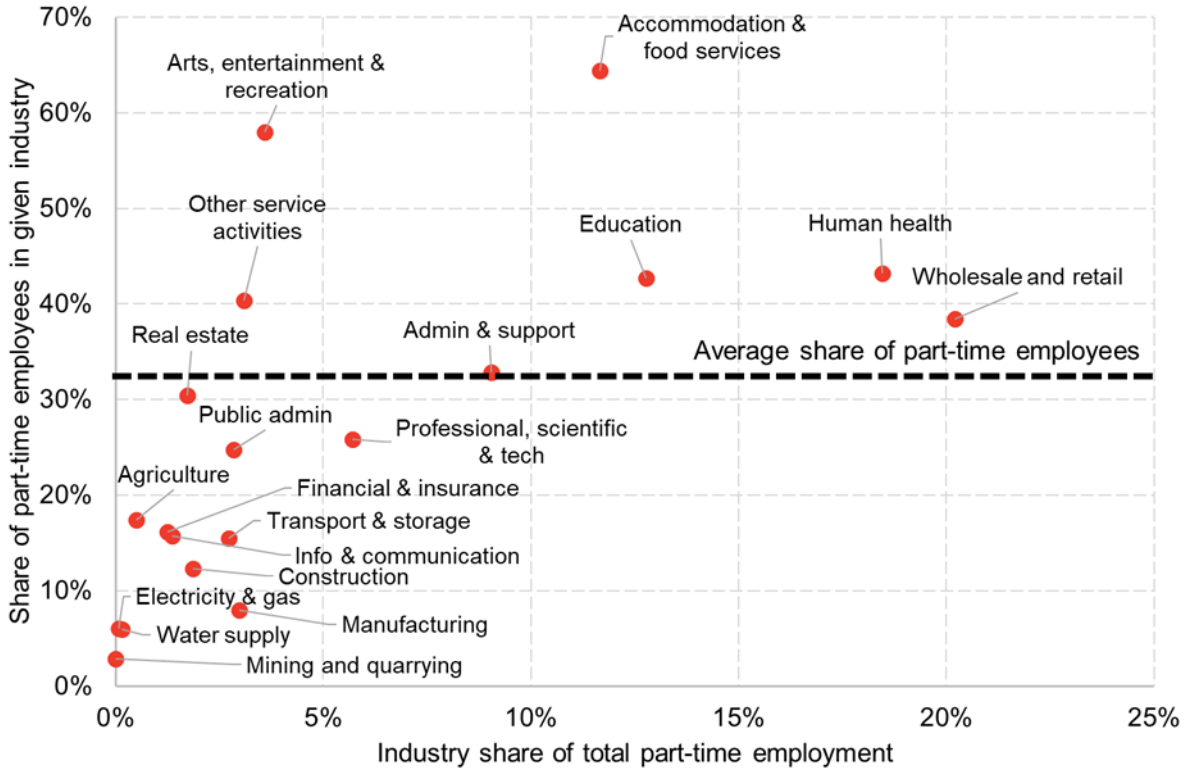


Source: HMRC, ONS, FAI calculations

In Q2 of 2020 goods exports from West Midlands fell by 48% y-o-y. This compares to a decline of only 29% for the UK. The primary factor behind this difference is the heavier reliance of the West Midlands economy on the manufacturing of goods, whereas the UK economy has a higher concentration of economic activity in the service sector, where trade has been less severely affected.

Economic output is an important indicator of performance, but the effect of the downturn on the labour market is a key determinant of wellbeing of workers. In general, part-time workers are more likely to have zero-hour contracts and see falls in working hours during economic downturns. They are also typically less trained than full-time workers and may thus be more vulnerable when businesses decide to implement job cuts. Furthermore, part-time workers are more prevalent in some sectors of the West Midlands economy compared to others – Chart 5.

Chart 5: Share of part-time workers in each industry and industry's share of total part-time employment, West Midlands, 2018

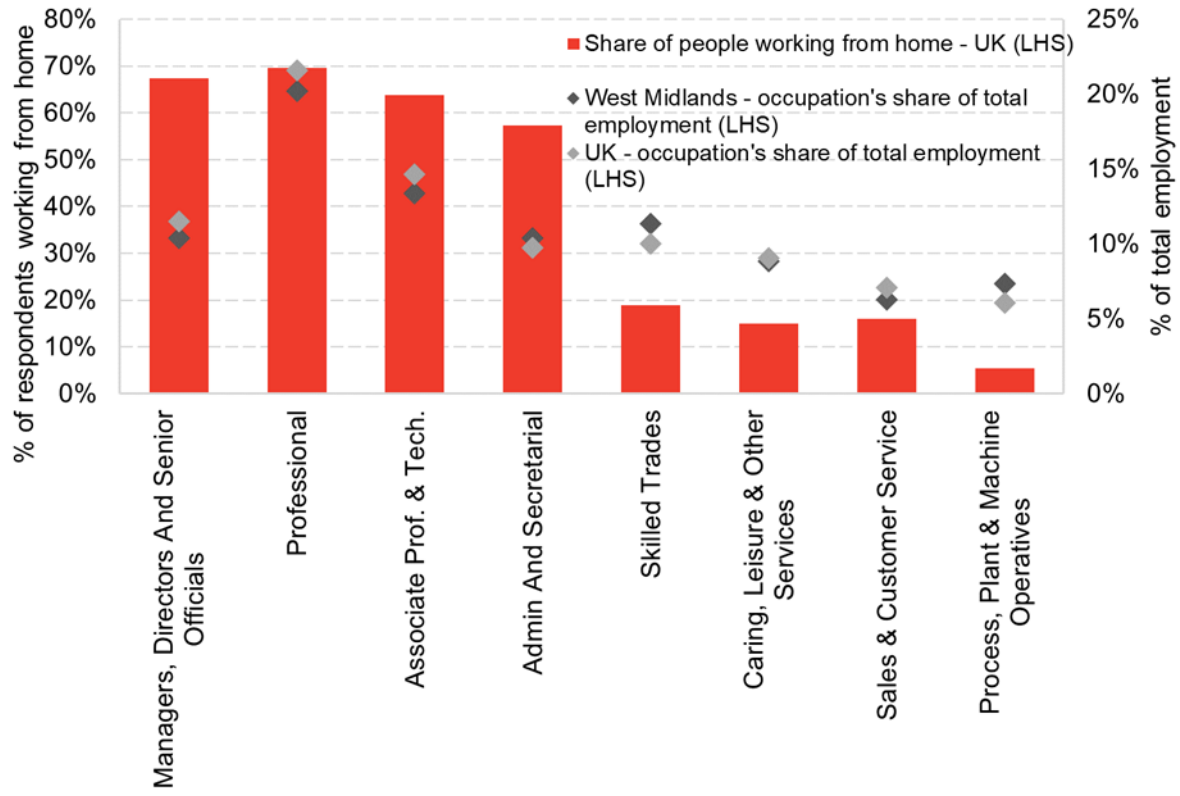


Source: BRES, FAI calculations

The wholesale and retail sector, which supports the highest number of jobs in West Midlands, has a slightly above average share of part-time employment. However, accommodation & food services and arts, entertainment and recreation are sectors which employ the highest proportion of part-time workers relative to full-time workers. These are also the sectors where activity has been most negatively impacted by the lockdown and social distancing measures.

Some companies have been able to adapt to social distancing measures by allowing employees to work from home. However, not all workers are able to work from home.

Chart 6: Share of people working from home across different occupations (UK, April 2020) and share of total employment of each occupation (West Midlands & UK, 2018)



Source: ONS UK Labour Market Survey, LFS/NOMIS

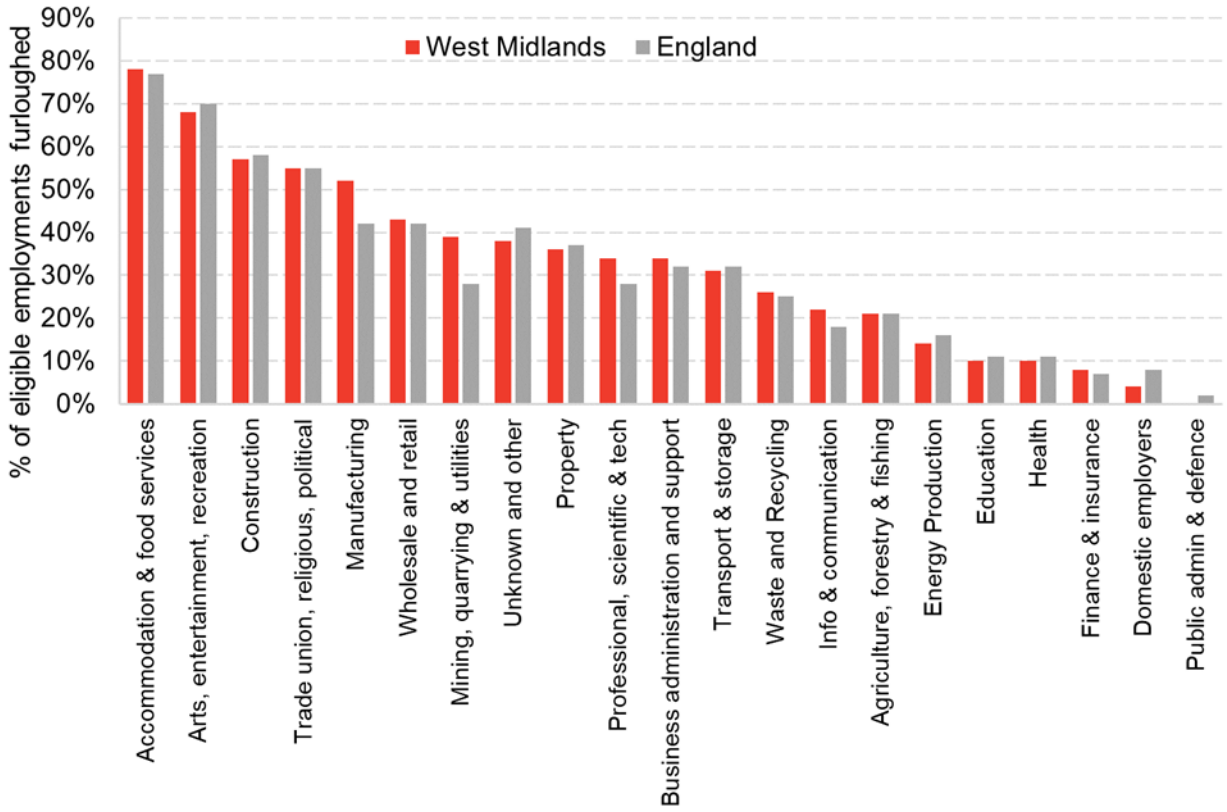
Approximately two thirds of workers across the UK in managerial and professional occupations have worked from home at some point since the start of the pandemic. However, less than a fifth of all workers in low-skilled occupations were able to work from home. Chart 6 shows that West Midlands has a higher share of employment in these low and mid-skilled occupations than the UK average and as a result may have a lower share of workers capable of homeworking.

Business Voice

Almost 90% of businesses agree that there will be a permanent uplift in

For those employees who have not been able to transition to homeworking companies have made wide use of the UK Government's Coronavirus Job Retention scheme to support jobs. The magnitude of 'furloughing' has also varied amongst different sectors of the West Midlands economy.

Chart 7: Share of eligible employments furloughed by sector, West Midlands and England, July 2020

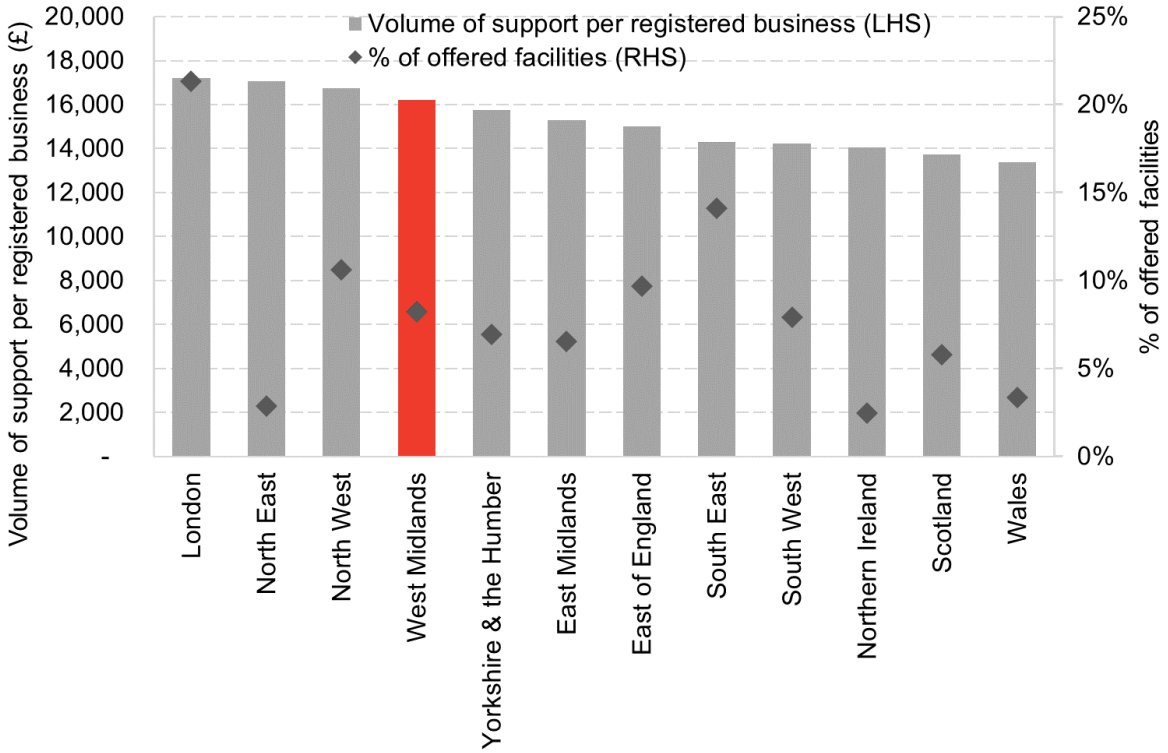


Source: HMRC

In July, 78% of workers in accommodation & food services, 68% in arts, entertainment and recreation, 57% in construction were on furlough in the West Midlands. The most important sectors of the local economy, manufacturing & wholesale & retail, had between 40 – 50% workers furloughed. The share of furloughed jobs halved in August as the scheme is gradually wound down. Nevertheless, as we have previously pointed out in our most recent labour market update, it remains uncertain how many of these positions will still exist after the furlough scheme ends.

The UK Government has also supported companies through the CBILS and BBILS schemes. These schemes have provided support cash-flow support to businesses who were facing declines in demand. Chart 8 shows that businesses in West Midlands benefited from this scheme generously compared to other UK regions, with circa £16,000 awarded per registered business.

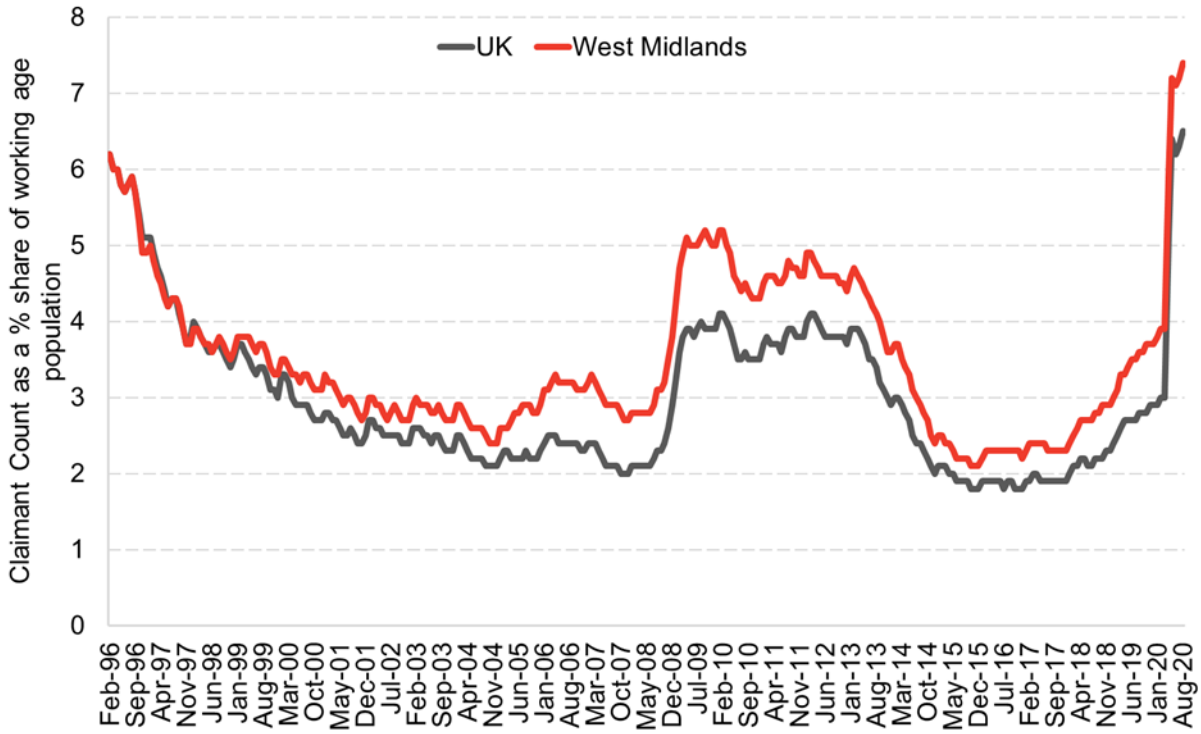
Chart 8: Amount of support for businesses under the UK Government's CBILS and BBLS schemes, English regions & devolved nations of the UK, up to 27th August 2020



Source: British Business Bank, FAI calculations

Despite the supporting measures from the government, not all jobs in West Midlands could be saved. It will be some time before headline labour market data such as the unemployment rate fully reflects the effect of the pandemic. In the meantime, the Claimant Count (the number of people on Job Seeker's allowance and Universal Credit) can serve as an early indicator of people who have lost their jobs.

Chart 9: Claimant Count as a share of working age population, West Midlands, and UK,



February 2016 – August 2020

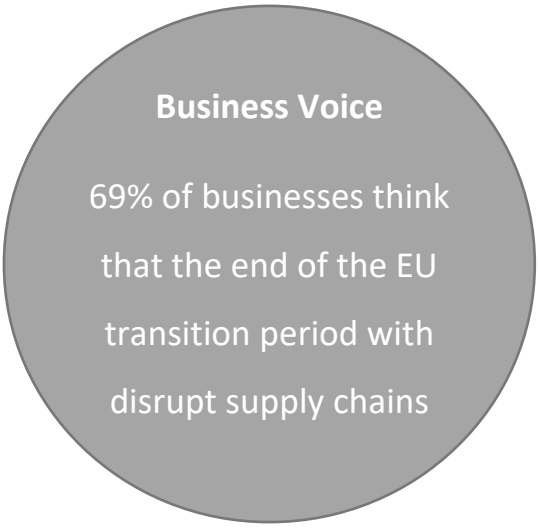
Source: NOMIS

The Claimant Count as a share of working age population rose from 3.9% in February to 7.4% in August in West Midlands. The magnitude of increase has been similar to rUK, but structural factors in the West Midlands labour market have meant that historically the region has had a higher share of claimants.

Summary

The West Midlands labour market has been sharply affected at the beginning of the pandemic, but its sectoral mix has allowed GDP to start recovering faster compared to rUK once the lockdown was eased. Trade in goods declined significantly in West Midlands due to its reliance on the manufacturing industry. Furthermore, a higher concentration of jobs in low-skilled occupations means that only a small share of employees in West Midlands can work from home.

Early data shows signs of redundancies and job losses being on the rise in both West Midlands and the UK, which may be further exacerbated once the furlough scheme comes to an end.



Given the reliance of the West Midlands Economy on manufacturing, the looming end of EU exit transition period also adds to the uncertainty over the outlook. As restrictions are reintroduced and/or tightened, all parts of the UK economy face a challenging outlook. It is incumbent on Governments at all levels to consider the differential impacts on regional economies and what may be required to support the recovery to come.